CHAPTER 3

AFFECTED ENVIRONMENT

&

ENVIRONMENTAL CONSEQUENCES

Changes Between Draft EIS & Final EIS

Minor editorial changes to the text in all sections of the Chapter.

In response to public comments on the DEIS, the effects analysis for most resources has been improved or clarified.

Introduction

This chapter summarizes both the affected physical, biological, social, and economic environments of the project area and the effects of implementing each alternative on that environment. It also presents the scientific and analytic basis for the comparison of alternatives presented in Chapter 2. The effects disclosed have considered the effectiveness of the design criteria and mitigation measures outlined in Chapter 2. Analysis of different resource components utilizes varying measures, due to management direction, research, or field practice. For example, different tree size groupings are used to help analyze different resource components. Therefore, similar analyses cannot always be directly compared.

The effects resulting from each action are described in terms of their context, intensity, and duration. These activities, occurring in the same area over time, under certain circumstances, may be incremental and produce cumulative effects. It is sometimes necessary to look beyond the defined project area boundary to determine the cumulative effects on certain resources. The effects disclosed have considered the past, present and reasonably foreseeable actions outlined in this chapter.

Many of the effects discussed in this chapter are complex and not easily quantified. In this light, it should be kept in mind that many of the values presented are modeled or estimated predictions of effects, and that the actual effects may not occur exactly to the degree presented. In some cases, the value of the analysis is in the comparison of the estimated effects between alternatives, rather than in the absolute values of the effects shown.

Each environmental component is discussed in terms of the consequences of implementing each of the alternatives listed in Chapter 2. This allows the reader, only interested in specific resources, to find all the effects related to that resource in one place. The following format is used for each environmental component:

Regulatory Framework provides management direction from the Forest Plan and other sources for each of the resource areas.

Analysis Method details how the analysis of each resource area was conducted. It also identifies the analysis area, which may be larger than the project area.

Affected Environment describes the environment of the area to be affected by the alternatives, that is, the baseline environment. It provides background for understanding the discussion that follows.

Environmental Consequences of implementing each alternative are discussed. There are three types of effects considered:

1. Direct Effects are caused by the action and occur at the same time and place [40 CRF 1508.8(a)].
2. Indirect Effects are caused by the action but occur later in time or further removed in distance, but are still reasonably foreseeable [40 CFR 1508.8(b)].
3. Cumulative Effects are those that result from the incremental impacts of the action when added to other past, present, and reasonable foreseeable actions [40 CFR 1508.7].

Consistency Finding is a statement for each resource area that demonstrates how the action alternatives are consistent with the Forest Plan and other management direction.

The Chapter begins with a discussion of past, present and reasonably foreseeable actions that may affect the project area. Then, each environmental component is detailed as above.

This FEIS hereby incorporates by reference the fuels, range, plant community fire response, sensitive plants, air, and heritage specialists reports in the Project Record [40 CFR 1502.21]. The other specialist reports are wholly contained in the respective sections of this chapter. The referenced reports are located in each specialist's section of the Project Record. All specialist reports contain the detailed data, methodologies, analyses, conclusions, maps, references and technical documentation (best available science) that the resource specialists relied on to reach the conclusions in this FEIS.

Past, Present, And Reasonably Foreseeable Actions

The project interdisciplinary team (IDT) identified past, present, and reasonably foreseeable future actions, that might have cumulative impacts with the proposed action. Those actions in and adjacent to the project area are listed below. Each resource specialist considered different mixes of these actions, depending on the cumulative effects boundary for the resource area and the resource affected. Only those past, present and reasonably foreseeable future actions that overlap the geographic analysis area boundary for each particular resource are considered, and only if those other actions have or are expected to have overlapping effects (spatially or temporally) with the Tripod Fire Salvage Project. Some past projects may still be having effects on one resource, but not another.

Past actions are analyzed consistent with current case law and guidance developed in 2005 by the Council on Environmental Quality (CEQ). As noted by CEQ, the National Environmental Policy Act (NEPA) is forward looking, but requires a review of past actions to the extent that the review informs agency decision-making regarding the proposed action. According to CEQ, agencies should look at the present effects of past actions that are, in the judgment of the agency, relevant and useful because they have significant cause-and-effect relationships with the direct and indirect effects of the proposal. Agencies are not required to list or analyze the effects of individual past actions unless such information is necessary to describe the cumulative effect of all past actions combined. Generally, agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions, without delving into the historical details of individual past actions (CEQ, 2005). In this EIS, where the past actions listed above may have cumulative effects on the specific resource under discussion, the effects of those actions are described as part of the affected environment information for each resource, and summarized in the cumulative effects analysis. Some resources, like transportation, analyze the past actions, such as past road construction, as part of the overall depiction of the direct and indirect effects analysis.

The past, present and reasonably foreseeable future actions developed by the project team, and examined for overlapping effects with each resource in the Tripod Fire Salvage Project are listed below.

PAST ACTIONS

Timber Sales

Portions of the following timber sales and associated reforestation and fuels treatments overlap or lie adjacent to proposed Tripod Fire Salvage units. Detailed information showing specific overlapping past timber sale harvest units is available in the Soils Appendix E.

Figure 3-1: Past Timber Sales

Timber Sale	Year Sold	Ranger District	Timber Sale	Year Sold	Ranger District
Baldy Salvage*	1982	Methow Valley (MV)	Jem*	1978	MV
Bear*	1993	MV	Kitten*	1979	MV
Beaver	1984	MV	Light	1988	MV
Bobcat	1989	MV	Lightning	1975	MV
Bold*	1976	MV	McCay*	1976	Tonasket
Boulder Blowdown*	1992	MV	Mid Salvage*	1993	MV
Boulder Salvage	1985	MV	Middle Salvage	1987	MV
Bromas*	1988	MV	NF-20*	1971	MV
Buck 83	1983	MV	NG*	1986	Tonasket
Bunny*	1971	MV	North Fork*	1984	Tonasket
Butte Bug Salvage*	1990	MV	Old Tom	1992	MV
Butte**	1988	MV	Pearrygin*	1976	MV
Cabin*	1978	Tonasket	Pebble	1979	MV
Cedar Creek 2*	1962	Tonasket	Radar*	1987	Tonasket
Coma*	1987	Tonasket	RTM Salvage*	1994	Tonasket
Conger	2003	Tonasket	Rusty	1974	Tonasket
Conger II*	2003	Tonasket	Skip	1995	MV
Daniel II*	1982	Tonasket	Sky*	1968	MV
Daniel II Resale*	1989	Tonasket	Soaker*	1998	MV
Danny*	1997	Tonasket	Solar	1998	MV
Deadwood	1974	Tonasket	Solar II*	1999	MV
Deer*	1969	MV	Split	1989	MV
Dunn*	1969	Tonasket	Stone*	1979	MV
E. Chewuck	1981	MV	Strip*	1984	Tonasket
First Butte	1973	MV	Thunder Salvage	1995	MV
Forks	1970	MV	Tripod 1969	1969	MV
Flier	1978	MV	Tripod*	1987	MV
Gotac*	1980	Tonasket	Twentymile Salvage	1976	MV
Hardt*	1989	MV	Volstead*	1967	MV
Humbug	1988	MV			

*Indicates projects that overlap salvage harvest units within Tripod Fire Salvage Project.

Wildfires and Fire Suppression

Wildfire suppression activities have taken place within the project vicinity since the early 1900s. Large fires since 1916 have occurred in 14% of the project area. The following recent large fires overlap the project area:

Tripod Complex (2006)
Farewell Fire (2003)
Spur Peak (2002)
Forks Fire (1970)

Other recent fires within the project vicinity include:

Pearrygin Fire (2005)
Thirtymile Fire (2001)
Isabel Fire (2003)
Thunder Mountain (1994)

Fuels Treatments

Fuels treatments were completed on timber sales, generally in the years immediately following harvest activity. Strip burning, crushing, machine piling and burning, handpiling and burning and prescribed burning have occurred throughout the Tripod Fire Salvage project area as fuels treatments after harvest or non-commercial thinning treatments. Landscape-scale natural fuels underburns have occurred since 1996. A detailed list of all landscape burns within the Chewuch watershed is located in the Fuels analysis file. The following landscape prescribed underburns have occurred in the immediate vicinity of the Tripod Fire Salvage Project area.

Ramsey Peak Blocks 1 and 2 (2006)
Ramsey Peak Block 3 (2005)
Ramsey 3 (2001)
Lower Boulder (2001)
Ramsey 1 and 3 (1999)
Mid-Boulder (1998)
Boulder 1 and Ramsey 4 (1997)

Tripod Fire Suppression Actions, Suppression Rehabilitation and BAER Implementation activities

Fire suppression activities carried out for the Tripod Fire, rehabilitation of the fire suppression activities and Burned Area Emergency Response (BAER) projects are listed in Appendix L.

Restoration activities

Restoration projects have been implemented in the Chewuch watershed, Beaver Creek and Salmon Creek drainages.

Projects in the Chewuch include:

The addition of large wood complexes to the river from1996 to 1998.

Changes to dispersed recreation sites along the Chewuch River to restore riparian habitat, improve future wood recruitment, protect Chinook spawning and provide quality recreation experiences for the public.

Construction of fences to keep livestock away from the Chewuch River.

Road density reduction projects in Cub Creek and Eightmile watersheds.

In-stream flow restoration in the lower 9 miles of the Chewuch River.

Restoration of alluvial fan function, riparian habitat and steelhead spawning habitat on the Twentymile Creek alluvial fan.

Conservation easements by Methow Conservancy on private land in the lower Chewuch River.

Projects in Beaver Creek include:

Restoration of fish passage through irrigation diversion dams, highway crossings and county and National Forest roads.

Fencing projects to reduce livestock impacts to stream channels.

Fencing of a 100 acre wetland that includes the South Fork of Beaver Creek and reintroduction of beavers.

Conservation easement by Methow Conservancy on private agricultural land that includes Beaver Creek.

Projects in Salmon Creek include:

Road density reductions.

Changes in livestock use patterns to reduce sediment delivery and riparian impacts.

Invasive Plants

Treatments with herbicides have occurred, especially in Salmon Creek, for a number of years to control and manage invasive plant populations.

Livestock Grazing

Livestock grazing within the project area began in the early 1900s and peaked in the 1920s. Livestock numbers decreased through the 1950s and then increased after extensive logging in the 1960s through the 1980s. Since the late 1980s new legislation and required standards and guidelines resulted in the current reduced livestock numbers and season of use, which are described in the 3.13 Range section of this chapter.

Recreational Use

Recreational activities have included campground management, trail maintenance, snowmobiling, hunting, camping in dispersed camping spots, camping in developed campgrounds, riding OHVs, riding mountain bikes, hiking, mushroom picking, and driving for pleasure.

Washington Department of Fish and Wildlife (WDFW) Methow Wildlife Management Area

Recently completed projects include replacement of culverts with open-bottom arches, or squash pipes on WDWF land in Beaver Creek and Bear Creek.

Transportation System

The existing road system was constructed over the last 70 years, primarily as a means to access timber resources. The most recent timber sale that built new roads occurred in the late 1990s and constructed less than 2 miles of new system road. Many roads within the project area received repairs and maintenance as part of BAER restoration activities for the Tripod Fire.

Road-side danger trees were felled and continue to be felled in BAER activity areas.

Loomis State Forest DNR Salvage Sales

The Tripod Fire burned about 6,000 acres of common school trust land and 5,500 acres of natural resource conservation area land within the Loomis Forest, managed by the Washington Department of Natural Resources (DNR). On the common school trust land, 7 salvage sales, covering about 1,326 acres, have been sold, in addition to sales of decked green wood felled during construction of Tripod Fire contingency lines. Most of the salvage harvest has been completed, though some still remains.

Heritage Resources

Indigenous populations established seasonal camps for gathering plants and roots, hunting game and gathering mollusks to supplement a salmon-based subsistence pattern. Trappers entered the area around 1800; miners entered the area beginning in the 1850s.

PRESENT AND ON-GOING ACTIONS

Timber Sales

Decks of logs remaining from fireline construction are continuing to be hauled as part of Tripod Decks small sales on the Tonasket Ranger District.

Firewood cutting

Slightly increased levels of personal use and commercial firewood cutting are expected.

Fuels Treatments

Conger T.S. landing pile burning
Bear T.S. slash disposal treatments
Ramsey Peak Block 4 (862 acres; planned for 2007)
Bear Units 28 and 17 (50 acres; planned for 2007)

Tree Planting within Project Area outside of Salvage Harvest units

Soaker and Solar Timber sales tree planting, 126 acres, is planned for 2007.

Tripod Fire Suppression Rehabilitation and BAER Implementation Activities

Fire suppression rehabilitation activities being completed for the Tripod Complex Fire and on-going BAER projects are described in detail in Appendix L.

Restoration activities

Restoration of stream flows, fish passage and habitat complexity on streams and rivers on all land ownerships in the Methow Valley is a stated goal of Upper Columbia River Salmon Recovery Plan for the Okanogan and Methow Rivers (draft) and for Biological Opinions for the agencies that operate the Columbia River Hydro system. Where land owners are willing, the US Bureau of Reclamation is implementing improved irrigation efficiencies as follows; stream-flow restoration, fish passage projects, and habitat complexity projects downstream of the National Forest boundary in the Methow basin.

Where private lands exist, residential development is expected to continue. The Methow Conservancy has obtained and will continue to receive Salmon Recovery funding to purchase conservation easements on private land adjacent to habitat for listed fish species. To date the Conservancy has easements on over 5,000 acres in the Methow Valley, including along the Methow and Chewuch Rivers and some along Beaver Creek.

Invasive Plants

Invasive plant treatments with herbicides will continue in areas with prior NEPA decisions, especially in Salmon Creek, from May through July 2007. The application of herbicides will follow Pacific Northwest Region 6 management direction as described in the 3.7 Invasive Species section of this chapter.

Livestock Grazing

In response to changes in resource conditions caused by the Tripod Fire, livestock grazing systems have been modified or grazing delayed where needed on all six affected allotments. On-going grazing management within the project area includes riding to monitor grazing management, salting and the construction and maintenance of fences, water developments, livestock driveways and corrals. All six allotments have current NEPA decisions, although where listed fish are present, re-initiation of ESA consultation on range permits will take place to describe the changes to grazing systems and determine if there are changes in anticipated effects to listed fish.

Recreational Use

On-going activities include campground management, trail maintenance, snowmobiling, hunting, camping in dispersed camping spots, camping in developed campgrounds, riding OHVs, riding mountain bikes, hiking, mushroom picking, and driving for pleasure.

An emergency closure is being implemented for off-route motorized traffic within the Tripod Fire burned area in spring 2007 to reduce soil disturbance. Roads and trails open to motorized use (vehicles and OHVs) will be designated, while all other off-route travel will be prohibited. This closure will not apply to snowmobiles; motorized winter recreation traffic will still be based on the Forest Travel Plan.

Mushroom Gathering

Large numbers of commercial mushroom pickers are expected from spring to summer 2007. Morels (*Morchella* species) tend to fruit most prolifically following disturbance, particularly fire. The greatest harvest is taken during the first season following the disturbance followed by a dramatic drop in production in subsequent years. Several hundred commercial permits are expected to be issued. Campsites will be designated in order to provide sanitation and garbage facilities. Commercial buyers are expected to set up buying stations adjacent to the National Forest boundary.

On the Okanogan National Forest, there has been no permit requirement for personal use harvesting, although the Forest is requiring permits for personal use mushroom picking in the Tripod fire area this year. It is unknown how many individuals are harvesting annually on the Forest, however the level of personal use is expected to rise this season.

Transportation System

Routine road maintenance will continue. Road repair and maintenance as part of BAER restoration activities for the Tripod Fire will continue.

Road-side danger trees will continue to be removed in areas where BAER activities are occurring.

Washington Department of Fish and Wildlife Methow Wildlife Management Area

Three culverts with open-bottom arches, or squash pipes on WDWF land in Cougar Creek and Ramsey Creek are being replaced.

Loomis State Forest DNR Salvage Sales

Salvage harvest activities on Washington DNR salvage sales on Loomis Forest common school trust land are continuing.

Heritage Resources

Plant and root gathering by members of the Confederated Colville Tribes and by some members of the Yakama Nation continues. Remnants of the area's history remain within the project area.

REASONABLY FORESEEABLE FUTURE ACTIONS

Timber Sales

Mutton T.S. and prescribed fire—N. Fork Salmon Creek.
Flatmoon T.S. and prescribed burn—Eightmile Creek
Buck T.S. and prescribed burn—Cub Creek and Eightmile Creek

Firewood cutting

Slightly increased levels of personal use and commercial firewood cutting are expected.

Fuels treatments

The following landscape-level underburns are planned within the area adjacent to the Tripod Fire Salvage Project: Detailed information is available in the Fuels analysis file.

Conger Integrated Resource Projects (IRP) ladder fuel reduction and underburning (4,262 acres)
Mutton Integrated Resource project prescribed fire on adjacent lands within the Sinlahekin Wildlife Area under provisions of the Wyden Amendment which allows expenditure of Federal funds on adjacent lands if there is benefit to the Federal Government (600 acres).
Cougar Natural Fuels Underburn project (390 acres)

Tree Planting within the Project Area outside of Tripod Salvage Harvest units

Danny Timber Sale tree planting, 236 acres (planned 2008)
Conger II Timber Sale tree planting, 81 acres (planned 2009 or 2010)
Tripod Fire planting, approximately 9,000 acres in areas of high tree mortality (planned 2007-2011) for areas of the fire outside of Tripod Fire Salvage project units.

Tripod Fire Suppression Rehabilitation and BAER Implementation Activities

BAER projects are described in detail in Appendix L.

Restoration activities

Where land owners are willing, the US Bureau of Reclamation will continue to implement improved irrigation efficiencies, in-stream flow restoration, fish passage projects, and habitat complexity projects downstream of the National Forest boundary in the Methow basin.

Where private lands exist, residential development is expected to continue. The Methow Conservancy will continue to receive Salmon Recovery funding to purchase conservation easements on private land adjacent to habitat for listed fish species.

Invasive Plants

Invasive plant treatments with herbicides will continue in areas with prior NEPA decisions. The application of herbicides will follow Pacific Northwest Region 6 management direction as described in section 3.7 Invasive Species section of this chapter.

Livestock Grazing

In response to changes in resource conditions caused by the Tripod Fire, livestock grazing systems will be modified or grazing will be delayed where needed on all six affected allotments. When standards are met that indicate sufficient vegetation recovery has occurred to allow return of grazing without additional impacts to RHCAs and other resources (see Appendix H), the management of the allotments will return to that of the pre-fire grazing systems. The three Tonasket Ranger District allotments within the project area will be used as permitted with increased compliance checks and specific mitigation measures. In the Methow Valley, modifications to permitted use will be made and specific mitigation measures will be in place on each allotment before grazing. Where listed fish are present, re-initiation of ESA consultation on range permits will take place to describe the changes to grazing systems and determine if there are changes in anticipated effects to listed fish.

Recreational Use

On-going activities are expected to continue into the future, including campground management, trail maintenance, snowmobiling, hunting, camping in dispersed camping spots, camping in developed campgrounds, riding OHVs, riding mountain bikes, hiking, mushroom picking, and driving for pleasure.

The emergency closure for off-route motorized traffic within the Tripod Fire burned area is expected to continue until 2009. Roads and trails open to motorized use (vehicles and OHVs) will be designated, while all other off-route travel will be prohibited. This closure will not apply to snowmobiles; motorized winter recreation traffic will still be based on the Forest Travel Plan.

Mushroom Gathering

Salvage harvest activity may trigger a small flush of mushroom fruiting the spring following harvest because of the soil scarification, but is not expected to attract commercial pickers. The amount is expected to be less than the initial flush after the Tripod Fire. Pre-fire levels of commercial use are expected to continue.

Transportation System

Road maintenance on many roads will be reduced from past levels. Some roads will be allowed to deteriorate and may eventually become un-drivable or need to be closed if they become unsafe or if they present a risk of environmental damage.

Periodic danger tree felling will continue as part of routine maintenance along forest roads.

Washington Department of Fish and Wildlife Methow Wildlife Management Area

WDFW conversion of agricultural lands to shrub steppe—700 acres over 3-5 years in the following general areas: along Lester Road south of the Tripod Complex, near Campbell Lake, near Cougar Lake above Pearrygin Lake and in the Ramsey Flats/Sullivan Pond area.

Loomis State Forest DNR Salvage Sales

Salvage harvest activities on one sale on the State Loomis Forest common school trust land is expected to continue into 2008.

Timber Sale Improvement (TSI)

1200 acres of TSI (non-commercial sized tree thinning) is planned on the Tonasket Ranger District; approximately 260 acres associated with the Mutton and Danny Timber Sales and 940 acres associated with the Conger Timber Sale.

Affected Environment And Environmental Consequences

3.1 ECONOMICS

REGULATORY FRAMEWORK

The decision to provide a sustainable and predictable supply of commercially valuable sawtimber was made and documented in the Record of Decision for the Okanogan National Forest Land and Resource Management Plan Final EIS (USDA Forest Service 1989c). The purpose is to help maintain the stability of local and regional economies that depend on a supply of forest products from National Forest system lands. Timber sale projects are expected to maximize net public benefits while achieving management goals for other resources in the most economically efficient manner (Forest Plan, USDA Forest Service 1989a) and to contribute towards having total timber sale program benefits equal or exceed the total costs over time (USDA Forest Service 1998b).

The Tripod Fire caused the mortality of over 35,000 acres of forest designated as part of the sustainable supply of sawtimber on the Methow Valley and Tonasket Ranger Districts (Forest Plan). The Tripod Fire Salvage Project is expected to recover a portion of the sawtimber volume and value from the burned area as part of the timber sale program for the Okanogan and Wenatchee National Forests. The salvaged sawtimber volume offered for sale would be a replacement for the regular timber sale program. Thus, no additional economic benefits would be derived; that is, the supply of sawtimber would remain at levels typically harvested from the Methow Valley and Tonasket Ranger Districts.

ANALYSIS METHOD

The potential economic recovery of sawtimber from the project area was estimated for the three year period following the fire in 2006. Field reconnaissance and office planning during the fall and early winter of that year established which areas were appropriate for salvage harvesting based on terrain and forest conditions. Factors such as road access, logging feasibility, and potential volume and value were considered in developing the proposed action and alternatives to recovering the value from these burned stands. The area and volume determined to be feasible for harvesting is based on this preliminary reconnaissance. These estimates were further refined as better access was provided during the following summer field season. Thus, the volume estimates for the Final EIS are lower than for the Draft EIS due to areas of no or low salvable volume, additional Riparian Habitat Conservation Areas, steep terrain exclusions within tractor units, unfeasible skyline ground, and other factors.

An estimate of the volume to be recovered was determined using field sampling of the trees within the burned areas and interpretations of aerial photographs. Volume loss from degradation of the wood following the fire was based on wood deterioration studies conducted on the Okanogan and Wenatchee National Forests (Hadfield and Magelssen 2006). Sawtimber values, based on delivered log prices, were determined from forest

product price indexes for Washington and Oregon (Church 2007) and from the indices used in the USDA Forest Service Transactional Evidence Appraisal (TEA) program. The TEA program and cost files also provide a basis for the cost estimates of harvesting and hauling sawlogs and the associated costs of road maintenance, logging slash disposal, erosion control, soil restoration, and other work. These cost estimates were further refined for the specific conditions of this project based on past Methow Valley and Tonasket Ranger District timber sale appraisals. The analysis discloses current sawtimber stumpage values expected from the salvage harvest alternatives.

AFFECTED ENVIRONMENT

The Tripod Fire burned through many stands of merchantable timber, comprised of a variety of tree species including Douglas-fir, ponderosa pine, Engelmann spruce, subalpine fir, western larch, and lodgepole pine. Of these, Douglas-fir and western larch currently have the highest market value and are typically grouped together as "Douglas-fir" for valuation. Engelmann spruce, subalpine fir and lodgepole pine (collectively known as "white wood" species) are intermediate in value, with ponderosa pine having the lowest market value due to staining of the wood. The value and recoverable volume of burned trees decreases quickly within several years after a fire due to cracking (checking) from rapid moisture loss, discoloration (staining) from the introduction of staining fungi, degradation of lumber quality from wood-boring larvae tunnels (worm holes), and the subsequent deterioration and loss of wood fiber (saprot) from wood decay fungi (Hadfield 1994, Hadfield and Magelssen 2006, Lowell et al. 1992).

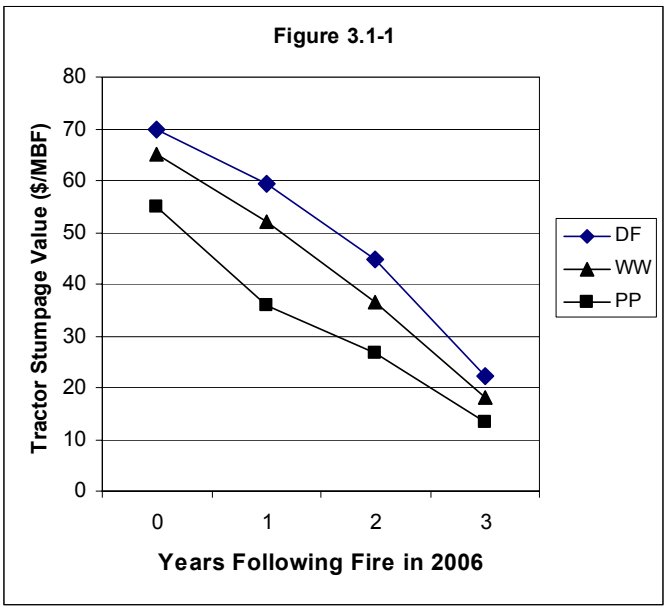
If the burned trees are harvested soon after a fire event the majority of the value can be recovered. The window of opportunity is about one to two years before a majority of the value is lost. By the third year, much of the wood has deteriorated to the point where the sawtimber may not be marketable. Ponderosa pine, in particular, loses much of its marketable value within the first year due to blue stain fungi. Hadfield and Magelssen (2006) found that three quarters of the ponderosa pine samples taken one year after a fire event had blue stain present. By the second year nearly all the sapwood had been stained. And so, ponderosa pine logs from the Tripod Fire area would most likely be processed as blue-stained wood (Reggear 2007). The value of blue-stained ponderosa pine was estimated to have a market value ten to thirty percent lower due to staining (Daugherty 2007, Flatten 2006). Therefore salvage harvest of the Tripod Fire Salvage project would likely occur within two years post-fire.

Another important consideration in determining recoverable salvage value is the cost of harvesting the sawtimber. Ground-based (tractor) harvesting is the least expensive logging system of the three general types typically used on the Okanogan and Wenatchee National Forests. Skyline logging costs are estimated to be about sixty percent higher than for tractor logging while helicopter logging is nearly twice the cost of tractor logging.

The value of the logs at the mill (delivered log price) minus the direct and indirect costs of felling the trees, getting them to a landing to be loaded onto a log truck, and hauling the logs to a sawmill is the stumpage value, expressed as the dollar value per thousand board feet (MBF) of sawtimber. In other words, it is the value of the standing sawtimber trees

and will be used as the basis of measurement and comparisons of economic recovery for the Tripod Fire Salvage Project.

Figure 3.1-1 shows the trend of decreasing stumpage values in the years after a fire while Figure 3.1-2 shows a comparison of stumpage values by species group as they relate to delivered log prices and the costs of harvesting and hauling the logs to the mill.



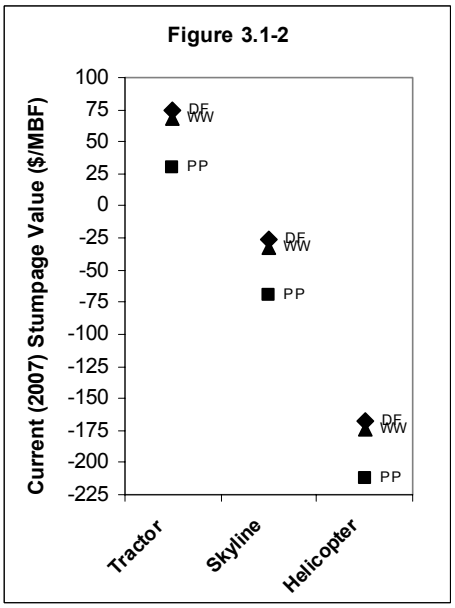


Figure 3.1-1: Loss of sawtimber stumpage value over time after a fire event. Tractor logging stumpage values are shown but the trends are similar for skyline and helicopter logging. The Tripod Fire occurred in 2006 and the stumpage values indicated for that year are for burned trees. Deterioration of wood fiber from cracking, staining, worm holes, and saprot contribute to decreased delivered log prices and increased costs of harvesting and hauling due to inefficiencies of processing the degraded wood fiber. Ponderosa pine in particular loses considerable value the first year due to staining but stumpage values are nearly that of green sawtimber if the burned trees are harvested soon after a fire event.

Figure 3.1-2: A comparison of predicted stumpage values by species in 2007 one year after the fire. Based on current saw log market values and logging costs, Douglas-fir and the white wood species would have a positive value if logged with ground-based (tractor) equipment. Ponderosa pine stumpage value is lower but still positive with tractor logging. All species are predicted to have a negative stumpage value if harvested with skyline or helicopter logging systems.

Because of the deterioration and degradation of sawtimber after the fire and resultant lower market values, the minimum diameter of the trees to be included in the salvage harvest was set at 10 inches DBH in order to have a portion of the tree that still has recoverable value. Trees smaller than this are typically so badly checked by the time they are harvested that no sawtimber volume can be recovered. The largest trees to be considered for salvage harvesting were based on the largest logs typically processed at mills within the hauling zone of the Methow Valley and Tonasket Ranger Districts. The upper diameter limit was set at 28 inches DBH to be able to include logs that are highly valued by several of the mills within the zone of the Methow Valley and Tonasket Ranger

Districts (Arneson 2006, Courtney 2007, Reggear 2007). The 28 inch tree diameter is based on the ability to run a log with a large end diameter no greater than about 31 to 34 inches in diameter through a de-barker at the mills located within the hauling zone. The average taper from DBH (4.5 feet above the ground) to the large end of the butt log is roughly four inches, so the 28 inch DBH maximum tree diameter would generally match the ability of a mill to process the butt logs. The addition of larger diameter logs (the butt log of trees 20 to 21 inches DBH and larger) helps to keep burned tree stumpage values higher owing to increased efficiencies in harvesting, hauling, and processing since the larger logs have proportionately more volume and less defect from checking. Increased logging efficiency reduces costs by about ten to fifteen percent and delivered log prices average about fifteen dollars per MBF higher (Courtney 2007). The sawtimber volume contained in trees 20 to 21 inches DBH and larger account for about 18 percent of total volume of each of the action alternatives, but represents 60 percent of the premium sized sawlogs and up to 30 percent of the total value.

There are 309 acres of tractor salvage harvest on the Tonasket Ranger District that were included in the East Tripod Decision Memo and are now included in the Tripod Fire Salvage Project because they were not able to be winter logged as planned. These units have an upper diameter limit of 18 inches DBH because they were intended to be harvested the winter of 2006/2007 while the trees still had the majority of their recoverable volume and value. Because the trees have already been marked in the field they are not going to be remarked, and so, these units will continue to have an 18 inch DBH limit. A portion of the value in these units could be recovered, but without the benefit of premium log values.

In a good timber market, with higher delivered log prices, stumpage values can result in a positive economic return to the Forest Service to provide payments to counties in lieu of taxes. However, the current timber market in the region is at a low point with delivered log prices down by an average of twenty-five percent from a year ago (Church 2007). To compound the problem, increasing fuel prices add to the cost of harvesting and hauling sawlogs. Despite the dip in delivered log values and increased logging costs, the trees to be harvested are predicted to have a positive stumpage value when harvested using ground-based equipment. Stumpage values for all species are below cost for both skyline and helicopter logging.

ENVIRONMENTAL CONSEQUENCES

Direct and Indirect Effects

Alternative A – No Action

No salvage harvesting of trees burned in the Tripod Fire area would occur and thus no sawtimber would be provided to regional mills and no economic value would be recovered with this alternative. The supply of sawtimber that this volume represents would have to come from other areas of the Okanogan and Wenatchee National Forests to meet the allowable sale quantity.

Alternative B – Proposed Action
Implementing the proposed action would recover about 17.9 million board feet (MMBF) of sawtimber averaging 6.5 MBF per acre, with an estimated average stumpage value of $20 per MBF and a combined total value of about $366,000. The higher costs of skyline logging (about $420 per MBF versus $320 per MBF for tractor) brings the potential value of the tractor volume down considerably when averaged for the whole project. The skyline units are predicted to lose about $345 per acre if logged. The stumpage value of the tractor volume is $43 per MBF with a total value of about $570,000 from 13.2 MMBF of sawtimber recovered. Harvesting the 4.7 MMBF of skyline volume would result in a net loss of about $204,000 with a predicted stumpage value of $-43 per MBF The skyline units do not have sufficient value to recover the costs of harvesting unless delivered log prices rebound to the market values of 2004 and 2005.

Refer to Figure 3.1-3 for a comparison of sawtimber volumes and values by species and logging system for each alternative and to Appendix C for details of the stumpage analysis using values from the Transactional Evidence Appraisal (TEA).

Alternative C
Implementing Alternative C would recover about 14.0 MMBF of sawtimber averaging 6.2 MBF per acre, with an estimated average stumpage value of $23 per MBF and a combined value of $321,000. Similar to Alternative B, skyline logging reduces the total sale value by including sawtimber with a mill value that does not cover the cost of logging. Skyline units are predicted to lose $132,000 with a stumpage value of $-48 per MBF. If only the tractor units were implemented, the 11.2 MMBF of sawtimber harvested would have a stumpage value of $40 per MBF with a total value of $453,000. And as with Alternative B, the saw log market would have to improve considerably in order to recover value from the skyline units.

Refer to Figure 3.1-3 for a comparison of sawtimber volumes and values by species and logging system for each alternative and to Appendix C for details of the stumpage analysis using values from the Transactional Evidence Appraisal (TEA).

Alternative D
Implementing Alternative D would recover about 24.0 MMBF of sawtimber averaging 7.1 MBF per acre. This sale alternative has a negative estimated value but would be offered at a minimum rate of $2 per MBF as required by Forest Service Manual (USDA Forest Service 1998b) direction with a potential minimum sale value of $46,000. However, due to the high costs of helicopter logging, there is little chance that this product mix would sell in today's market since the predicted averaged stumpage value is $-24 per MBF with an expected loss of $579,000. Averaged stumpage values increase considerably for this alternative if the helicopter units ($562 per MBF) are excluded. Helicopter units are predicted to lose $876,000 with a stumpage value of $-178 per MBF. Without the cost of helicopter logging, averaged stumpage values for the combined tractor and skyline units increase to $15 per MBF with an expected total value of $288,000. This is a lower economic recovery than for Alternatives B and C due to the additional acres of skyline logging. If only the tractor units are included, the acres harvested and resulting values are essentially the same as for Alternative B.

Refer to Figure 3.1-3 for a comparison of sawtimber volumes and values by species and logging system for each alternative and to Appendix C for details of the stumpage analysis using values from the Transactional Evidence Appraisal (TEA).

Alternative E

This alternative would harvest the same number of acres using the same logging systems as for Alternative B, but trees 21 inches DBH and larger would not be included for harvest. Implementing Alternative E would recover about 14.4 MMBF of sawtimber averaging 5.2 MBF per acre, with an average stumpage value of $15 per MBF and a combined value of about $210,000. Similar to Alternative B, the higher costs of skyline logging brings the potential value of the Douglas-fir and white wood species down considerably. If only tractor logging units were included, the value would increase to $45 per MBF and the total value would be about $475,000 with 10.6 MMBF of volume recovered.

The elimination of trees 21 to 28 inches DBH from harvest with this alternative account for the 2.6 MMBF reduction in sawtimber volume compared to Alternative B. The larger trees contain higher value sawtimber and are more efficient to harvest, thus contributing to a more economical harvest entry. Not including this premium sawtimber in the harvest entry reduces the stumpage value by $6 per mbf with $187,000 less sale value recovered in comparison with Alternative B.

Figure 3.1-3 below displays salvage harvest volume and value recovery estimates for the three action alternatives with breakdown by logging systems and species. Stumpage value estimates are for 2007, one year after the Tripod Fire, using current sawtimber price indexes and logging costs from the USDA Forest Service Transaction Evidence Appraisal (TEA) program. Negative values are denoted within parentheses. Minimum total and stumpage values shown for Alternative D are based on Forest Service requirements to offer timber sales at a minimum rate of about $2 per MBF if predicted stumpage values are below the minimum. Douglas-fir also includes a minor amount of western larch, appraised using the same index. White wood species includes Engelmann spruce, subalpine fir, and a minor amount of lodgepole pine. Refer to Appendix C for details of marketing scenarios that illustrate the effect of prioritizing the recovery of higher value sawtimber using less expensive logging systems.

Figure 3.1-3: A comparison on sawtimber volumes and values by species and logging system for each alternative.

	Alternative B	Alternative C	Alternative D	Alternative E	
Total Area	2748	2247	3404	2748	Acres
Total Volume	17,866	13,992	24,014	14,408	MBF
Total Value	$366,000	$321,000	($579,000)	$210,000	
Average Stumpage	$20	$23	($24)	$15	$/MBF
Minimum Value	NA	NA	$46,000	NA	
Minimum Stumpage	NA	NA	$2	NA	
Harvest area by logging system					
Tractor	2156	1896	2156	2156	Acres
Skyline	591	351	716	591	Acres
Helicopter	0	0	532	0	Acres
Harvest volume by logging system					
Tractor	13,166	11,247	13,166	10,622	MBF
Skyline	4,700	2,745	5,941	3,786	MBF
Helicopter	0	0	4,908	0	MBF
Harvest value by logging system					
Tractor Value	$570,000	$453,000	$565,000	$403,000	
Tractor Stumpage	$43	$40	$43	$38	
Skyline Value	($204,000)	($132,000)	($269,000)	($193,000)	
Skyline Stumpage	($43)	($48)	($45)	($51)	
Helicopter Value	NA	NA	($876,000)	NA	
Helicopter Stumpage	NA	NA	($178)	NA	
Harvest volume by species					
Douglas-fir	9,182	6,664	13,023	7,446	MBF
Ponderosa pine	6,963	6,787	7,950	5,542	MBF
White woods	1,721	541	3,041	1,420	MBF
Averaged harvest value by species					
Douglas-fir	$342,000	$287,000	($87,000)	$233,000	
Ponderosa pine	($32,000)	$14,000	($454,000)	($60,000)	
White woods	$55,000	$20,000	($39,000)	$37,000	

Cumulative Effects

The geographic boundary for this analysis is the Methow Valley Ranger District and surrounding area. The temporal boundary for this analysis is one year in the future, that time affecting the local timber market. The Washington State Department of Natural Resources has 13.8 MMBF of sawtimber from 1326 acres scheduled for salvage harvest from the Loomis Forest tract. Harvest activities on 831 acres with about 9.8 MMBF are to be completed by late fall of 2007 and the remaining 495 acres of about 4.0 MMBF are to be completed by the fall of 2008.

No other past, present or reasonably foreseeable future actions listed previously would have any effect on economics because only timber sales effect values and the other timber sales have been sold.

There are likely to be future fires within the project area and analysis in Chapter 3.10 Fuels (pg 3-329) discloses that resistance to control would be higher in untreated areas. Therefore, future fires may be more difficult and more expensive to control in unsalvaged areas and the future timber value of regenerated timber stands may be lost from large-scale wildfire.

CONSISTENCY FINDING

The action alternatives B, C, D and E would provide sawtimber to meet the demand for wood products but only alternatives B and C and E would have a positive value. If Alternative D were implemented with consideration for saw log market values and the costs of harvesting by eliminating the helicopter units, it would provide a similar economic benefit as for alternative B. The volume recovered by harvesting burned trees included in the action alternatives would provide a portion of the allowable sale quantity offered by the Okanogan and Wenatchee National Forests.

3.2 Wildlife

The Wildlife section is organized to include the following five subsections: Management Indicator Species, Burned Forest and Snag Habitat, Raptor Habitat and Nest Sites, Landbirds, and Endangered, Threatened and Sensitive Wildlife.

REGULATORY FRAMEWORK

Regulatory requirements vary for many of the species considered and are addressed in the report subsections that deal with individual wildlife groups and species that follow.

ANALYSIS METHOD FOR ALL SPECIES

In this report, the scale of analysis, timeframe for consideration of effects, and criteria used to evaluate effects differ for each species addressed. For all species, however, the same methodology was used to map and assess habitat conditions and effects of the alternatives on habitat. ESRI ArcMap software was used to model forest habitat types from forest-wide vegetation data and mapped plant association groups. Habitat conditions before and after the Tripod Fire were modeled for each habitat type, using satellite imagery that depicted changes in light reflectance before and after the fire. Effects of previous harvest activity were analyzed using digitized maps of recent timber sales near proposed salvage areas. Digitized maps of forest roads and trails were used to analyze effects on grizzly bear core areas, and security habitat for all wide-ranging carnivores.

Field surveys for the project were limited to general reconnaissance of proposed salvage harvest areas and their immediate environs in fall 2006.

All required wildlife surveys were completed or are ongoing as dictated by the specific protocol for each species.

Descriptions of species occurrence are based on unpublished district data, the Washington Department of Fish and Wildlife's Priority Habitats and Species Database, and distribution maps developed under the Washington State Gap Project (Johnson and Cassidy 1997).

<u>Analysis area</u>
Several scales of analysis were used for the species and habitats considered here. Most commonly the three 5th order watersheds (Lower Chewuch, Salmon Creek, and Middle Methow) in which salvage harvest is proposed were the appropriate area for consideration since many species have the ability to range widely, but often not further than that area. For some analyses, larger or smaller areas were considered. The largest area analyzed was the 883,400 acre cumulative area within five 5th order watersheds including and surrounding the fire. The smallest area considered were the units proposed for harvest (as small as 2 acres). Bear Management Units (BMUs) and Lynx Analysis Units (LAUs) were used for grizzly bears and lynx respectively. In some cases, 6th order watersheds were

used to assess effects, and in some cases, 100-acre 'neighborhoods' within and surrounding the harvest units were evaluated. Home range size for the species being analyzed was a factor in deciding what area to consider.

Some of the analyses included examining these different areas on maps. Some involved GIS analysis of the different habitat attributes. Still other analysis involved reviewing ortho-photos and other remotely sensed data.

Time frame
For most of the analysis, a 10-year period was considered for immediate, short-term effects and 50 years was the longest period considered.

TRIPOD FIRE AFFECTED ENVIRONMENT

Habitat types and mortality levels for the Tripod Fire area are described below. Specific environments that affect individual wildlife groups and species are addressed in the subsections for those groups and species.

Habitat Types

Stratification of the vegetation communities within each project area is an important process that allows the determination of effects for the species associated with each community. For the Tripod project, habitat groupings were chosen intentionally to reflect the specific wildlife species present, the distinction in habitats used by the wildlife assessed in this analysis, and the different biophysical environments that exist within the Tripod project area.

Three habitat types (Dry Forest, Mixed Conifer Forest, and Montane Forest) were derived from 'Plant Association Groups' identified specifically for the Okanogan National Forest by Regional Ecologists. Hot-dry, warm-dry, and warm-mesic associations were classified as 'Dry Forest' habitat represented by a predominance of ponderosa pine in the forest overstory. Cool-dry forest plant associations dominated by Douglas-fir below 5,000 feet in elevation were classified as 'Mixed Conifer Forest' habitat. Cool-dry above 5,000 feet, cold-dry, cold-mesic, cool-mesic, cool-moist, and wet-shrub plant associations in the alpine fir series of plant associations characterized by a predominance of alpine fir, Engelmann spruce, and lodgepole pine were all classified as 'Montane Forest' habitat. This coincides with what was mapped for 'capable' lynx habitat where conditions are suitable to grow plants, shrubs, and trees favorable to snowshoe hares. These plant associations within the Montane Forest habitat meet the definitions of lynx habitat described in the Lynx Conservation Assessment and Strategy (Reudiger et al. 2000). Figure F-4 displays the Plant Associations and Plant Association Groups associated with each habitat type.

Mortality Levels

The fire burned slightly more than 175,143 acres in six 5th order watersheds (nineteen 6th order subwatersheds) according to the wildlife GIS analysis. The acreage difference between that amount and the total burned area figure of 175,184 acres obtained by other

analyses is minor, caused by inherent differences when aggregating and analyzing data using GIS technology. Tree mortality resulting from the fire was classified from Burned Area Reflectance Classification analysis (satellite imagery) conducted at the Utah State University Remote Sensing Applications Center in October and November 2006. Five classes were defined at the Methow Valley Ranger District based on comparison with field verified sites. Complete, High, Moderate, Low, and Little Change Detected were the mortality classes defined.

For the entire Tripod Fire, tree mortality included 28,423 acres with Complete mortality (5% in the dry forest, 8% mixed conifer, 19% montane, 8% alpine), 41,702 acres with High mortality (9% in the dry forest, 14% mixed conifer, 25% montane, 33% alpine), 46,242 acres with Moderate mortality (34% in the dry forest, 33% mixed conifer, 25% montane, 29% alpine), and 30,231 acres with Low mortality (33% in the dry forest, 26% mixed conifer, 16% montane, 14% alpine). See Figure 3.2-1 for more details.

Figure 3.2-1: Acres of tree mortality class by forest habitat type for the entire fire area

Mortality Class	Dry Forest	Mixed Conifer	Montane Forest	Alpine Parkland	No Data	Totals (ac. and %)
	Burned Area, Acres					
Complete; scorched + charred	358	1,645	25,100	1,320	0	28,423 (16%)
High; all dead or dying	632	2,931	32,383	5,754	2	41,701 (24%)
Moderate; 2/3 dead or dying	2,418	6,623	32,081	5,101	19	46,242 (26%)
Low; 1/3 dead or dying	2,350	5,187	20,164	2,491	39	30,232 (17%)
Little change detected	1,394	3,916	20,205	2,883	24	28,422 (16%)
No Data	4	9	66	44	0	207
ALL	**7,156**	**20,311**	**129,999**	**17,593**	**85**	**175,143**

For purposes of this analysis, it was assumed that the Complete, High, and Moderate mortality levels were essentially "**stand replacing**" in terms of their effect on many wildlife species' habitat. Likewise it was assumed that Low mortality and Little Change Detected did not have a substantial impact on forest habitat and structure and were "**functionally intact".** Salvage harvest units are proposed in three watersheds (nine subwatersheds). A summary of the effects of the fire on Dry, Mixed Conifer, and Montane forest habitat within those watersheds are displayed in Figure 3.2-2 below. Fire effects on Alpine Parkland are not discussed because there are no proposed harvest units in that habitat type.

Figure 3.2-2: Proportion of burned area showing stand-replacing and functionally intact effects within watersheds in which salvage harvest is proposed

Watershed and Subwatershed	Stand Replacement Fire [a]		Burned but Functionally Intact [b]	
	Acres Burned	% Burned	Acres Burned	% Burned
Lower Chewuch River	52,318	46	20,071	17
Mainstem Lower Chewuch River	4,474	19	2,126	9
Boulder Creek	7,662	59	2,174	17
North Fork Boulder Creek	19,810	60	8,719	26
Pearrygin Creek	2,392	12	2,390	12
Twentymile Creek [c]	17,980	73	4,662	19
Middle Methow River [d]	14,845	30	7,563	15
Upper Beaver Creek	13,767	35	6,257	16
Salmon Creek	8,336	12	10,289	15
North Fork Salmon Creek [c]	2,646	9	928	4
South Fork Salmon Creek	1,203	9	2,301	18
West Fork Salmon Creek	4,487	16	7,060	26

[a] Is the sum of Complete, High, and Moderate Mortality acreage.
[b] Is the sum of Low Mortality and Little Change Detected acreage.
[c] Includes acreage burned in Dry Forest, although there are no proposed harvest units in that habitat in these subwatersheds.
[d] Includes acreage burned in the Bear Creek subwatershed, which has no harvest units proposed in any alternative.

DIRECT AND INDIRECT EFFECTS FOR ALL SPECIES

Effects common to all action alternatives for all wildlife species include noise and activity along roads and at landings including worker traffic, equipment haul, road opening, road construction, log loading, and log hauling; noise and activity within harvest units such as chain saw use, tree falling, and yarding equipment; noise and activity associated with slash piling and pile burning and noise and activity associated with tree planting. While species response varies widely, these effects would be present if an action alternative is chosen and would have similar effects across the action alternatives. The number of acres harvested (Figure 2-2) is the variable factor for disturbance-related effects.

A distinction is noted between effects that cause animals to move, such as when a deer walks away from the road when someone stops to take a picture; and the flight response of a raptor from a nest when a tree is fallen nearby, causing an egg to break. One is a non-consequential displacement that has no effect on the individual or population, and the other reduces production or impacts the chances for survival of the individual or population. It is the latter that is used as ‘disturbance’ for this analysis.

Birds can generally fly from disturbance and there is little measurable impact to bird populations. Exceptions occur when incubating birds are kept from nests for more than a few minutes so that eggs or young chill and egg or nestling mortality occurs. If this occurs early in the nesting period, re-nesting attempts are made and often allow some

production. Re-nesting sometimes results in somewhat lower chances for survival and successful integration of these offspring into the population, since seasonal timing is not optimum. In highly productive years, there is little noticeable consequence.

For many bird species nesting within harvest units and near skid and haul routes, these disturbances would be present. A negative effect is likely, but is small at scales larger than the harvest unit, and not measurable at the three-watershed scale. Mitigation measures are included in all action alternatives that would protect nesting raptors from disturbance during the nesting period.

Large mammals avoid areas of noise and frequently walk or run away. Mitigation that requires protection for den sites found near harvest activity allow for the undisturbed production of young wolves, lynx, and grizzly bears.

The effect of noise and other disturbance on small mammals, reptiles, and amphibians, is not well known. Burrow or den site abandonment might be a consequence, however, high fecundity is common for these groups and their populations are able to absorb years with lower production with little long-term population impact, especially at scales larger than the harvest unit.

CUMULATIVE EFFECTS FOR ALL SPECIES

Past, present and reasonably foreseeable future actions identified by the Tripod Interdisciplinary Team are discussed at the beginning of Chapter 3. The effect of past actions (including timber harvest from Figure 3-1, fire suppression and BAER activities, previous fuels treatments, and past livestock grazing) are noted in the Affected Environment portion of each wildlife subsection below. Generally the area considered for cumulative effects is the three-watershed area where harvest is proposed. The timeframe considered for cumulative effects is 20 years, which is approximately how long it will take the new forest to begin to take over ecological function (see Burned Forest and Snag Habitat, Environmental Consequences, Snag Persistence section.

Disturbance effects identical to those noted above would occur for timber sales, firewood cutting, fuels treatments, and tree planting activities outside the project area. The effects would be localized, and, for projects on federal land, would include mitigation similar to that described for this project.

Recreation activity is ongoing in campgrounds and along trails. The population effects for wildlife are noted in Gaines et al. (2003) and include avoidance of linear recreation routes and campgrounds. A few bird species and some small mammals are habituated to higher levels of recreation use. Food availability for some species is increased intentionally and unintentionally by humans in areas of recreational use. A policy of limiting attractants for contractors, outfitters, guides, and other permittees is included in a July 2001 letter to District Rangers. For the most part, the species of concern that are limited by habitat are already affected by the existing level of recreational use. The future use of trails and campgrounds is expected to grow and could further limit habitat effectiveness.

Invasive plants reduce habitat for all wildlife, especially birds, small mammals, and reptiles. These animals have adapted for millennia to the plant species here and exotic plants limit their ability to survive. Loss of cover and food provided by native plants is correlated with the number of acres infested. Soil disturbance from many types of actions creates access for non-native plant species. Road sides, timber harvest units, high-use livestock areas, and some prescribed burning project areas are places where weeds invade and spread. Some habitat reduction is expected but this would be a small amount since the Forest has plans to aggressively control invasive species.

Mushroom gathering in response to Tripod and other wild fires would create a displacement effect that is not expected to measurably affect any wildlife species. However, other potential effects related to mushroom gathering are noted below for some species.

MANAGEMENT INDICATOR SPECIES

Management Indicator Species (MIS) are species with special habitat needs or whose population changes are believed to indicate the effects of land and resource management activities. As ecological indicators, they can be used to assess the impacts of management actions on a wide range of other wildlife with similar habitat requirements. The Forest Plan (USDA Forest Service 1989a) identified 16 wildlife MIS (including 10 species in the primary cavity excavator guild) and their associated habitat requirements (Figure 3.2-3, below). Fifteen of the 16 MIS have habitat in, and are known or suspected to occur in the project area. Although the northern spotted owl is another MIS under the Forest Plan, this project is outside its range and there are no known records east of the Chewuch River or within the boundary of the Tripod Fire. They are not analyzed further.

Figure 3.2-3: Okanogan N.F. Management Indicator Species and Limiting Habitat

Indicator Species	Limiting Habitat
Mule Deer	Winter Range
Canada Lynx	Lodgepole Pine
Primary Cavity Excavators (10 spp.)	Dead and Defective Trees
Ruffed Grouse	Deciduous and Riparian Ecosystems
Pine Marten	Mature or Old-Growth Forests
Pileated Woodpecker	Mature or Old-Growth Forests
Three-toed Woodpecker	Mature or Old-Growth Forests
Barred Owl	Old-Growth and Mature Forests

MULE DEER

REGULATORY FRAMEWORK

The guidance for providing habitat for mule deer is contained in The Forest Plan (USDA Forest Service 1989a), Chapter 4 Forestwide standards and guidelines and standards and guidelines for MA-5, MA-14, and MA-26. These sections require that winter and summer range and fawning habitat is provided to allow for the viability and productivity of deer populations.

BACKGROUND INFORMATION

Somewhere between 10,000 and 20,000 mule deer reside in the Methow Valley. Exact numbers are not known. These deer are migratory (Myers et al. 1989) and they travel seasonally as far as 60 miles from summer to winter ranges. In the last decade or two, the traditional shrub dominated winter range has been affected to a minor degree by home development, and replaced with shrubs and flowers around homes and, in places, alfalfa fields and haystacks in valley bottom fields.

Ziegler (1978) provided the first compilation of information about Okanogan County mule deer. In the mid 1980s, Myers et al. (1989) gathered additional information about mule deer in the Methow Valley.

The most complete review of mule deer biology and management is included in *Oregon's Mule Deer Management Plan* (ODFW 2003). This plan notes management strategies for mule deer that include hunting management, habitat management (forage and cover enhancement included in timber harvest, prescribed burning and shrub planting), coordinated livestock management, weed management, parasite and disease control, and in some cases predator management. Of these, the only applicable category is habitat management, and this is only slightly related because the Tripod project does not propose to manage any living vegetation.

More than any other factor, deer are affected by winter weather conditions. Very cold winters with deep snow, especially when a crust develops due to intermittent warm periods, can reduce deer populations severely. All management actions combined can be completely overshadowed by one 'bad' winter for deer.

AFFECTED ENVIRONMENT

The fire removed a substantial amount of thermal and hiding cover, but rapid vegetation recovery is expected to supply abundant forage in the next few years. Deer use seasonal ranges throughout the county. The availability of deer forage in the form of shrubs and forbs (and alfalfa fields), and deer cover in tall shrubs or deciduous or coniferous forest remains very high.

The following past actions have contributed to the current condition of the three 5th order watersheds (Lower Chewuch, Salmon Creek, and Middle Methow) in which salvage harvest is proposed:

> Past timber sales listed in Figure 3-1 and salvage harvest on the Loomis State Forest affected deer habitat and continue to influence populations. For the most part, creating forest openings in large areas of continuous forest benefits deer by improving foraging conditions.
>
> Previous vegetation management and accompanying fuels treatments such as prescribed fire have reduced shrub cover and introduced weeds in locations throughout the project area. Improved forage conditions from reduced tree stocking

has been offset with some shrub losses (especially bitterbrush) and some weed increase. Ceanothus is a valuable shrub for deer that has responded favorably to prescribed fire. The net effect is positive for deer.

Livestock grazing has introduced competition for deer forage. Hunting deer has reduced deer numbers.

Despite these past and ongoing effects, mule deer numbers in the county prior to the fire were at or near carrying capacity and continued at that level through November 2006 deer census counts by Washington Department of Fish and Wildlife biologists (Fitkin 2006).

The Tripod Fire burned in all seasonal ranges used by mule deer including about 20,000 acres of National Forest winter range. Zeigler (1978) identified more than 320,000 acres of deer winter range in Okanogan County; about 205,000 in the Methow Valley and more than 115,000 in the Okanogan Valley. About 80% occurs on State and private land.

The burned winter range on Federal land was aggregated for each Bear Management Unit (BMU). BMUs are used as an analysis unit because the availability of deer is a part of the analysis for bear and wolves. Thirty five % of mapped deer winter range in the Lower Chewuch BMU, and 15% in the Middle Methow BMU burned (Figure 3.2-4). This is a small proportion of the winter range in the county.

Figure 3.2-4: Effects of the Tripod Fire on mapped deer winter range(dwr), by BMU

BMU	Deer Winter Range Areas				Total
	Inside Tripod Fire		Outside Tripod Fire		
	ac	*% of dwr in bmu that burned*	ac	*% of all dwr in bmu unburned*	ac
Lower Chewuch	11,104	*35*	20,482	*65*	31,585
% mapped dwr	*12*		*22*		*33*
Middle Methow	8,934	*15*	49,399	*85*	58,332
% mapped dwr	*9*		*52*		*61*
Salmon Creek	0	*0*	5,133	*100*	5,133
% mapped dwr	*0*		*5*		*5*
Grand Total	20,037	*na*	75,013	*na*	95,051
% mapped dwr	*21*		*79*		*100*

About 6,000 acres (30% of the winter range that burned) burned with high mortality levels, removing all cover and forage for deer. In addition, about 14,000 acres (70% of winter range that burned) caused light to moderate mortality levels (Figure 3.2-5).

In areas that burned with high mortality, grasses and forbs will recover in 5-10 years and shrubs will recover in 15-20 years. In areas that burned with lower mortality, grasses and forbs will recover in 3-5 years and shrubs in 5-15 years.

Trees that survived the fire and unburned patches will continue to provide essential cover for wintering deer.

Figure 3.2-5: Current conditions in deer winter range that burned, by BMU and fire mortality level

Fire Mortality Level	BMUs with Mapped Deer Winter range				Total Deer Winter Range that Burned	
	Lower Chewuch		Middle Methow			
	ac	*% of total burned*	ac	% of total burned	ac	*% of total burned*
High	2,678	*24*	3,333	*38*	6,011	*30*
Low to Moderate	8,425	*76*	5,600	*62*	14,025	*70*
Total Burned	11,103	*100*	8,933	*100*	20,036	*100*

The Forest Plan set open road density standards to minimize impacts to wildlife. Open road densities within deer winter range management allocations are currently above Forest Plan standards in two discrete management areas (MA), MA 14-05 and MA 26-04, (Figure 3.2-6).

Figure 3.2-6: Current road densities in deer winter range

MA	Square Miles	Total Miles Open Road	Road Density Miles per Sq. Mi	Forest Plan Standard
5-09	83.9	69.9	0.8	3
5-11	10.2	9.5	0.9	3
14-05	10.7	24.9	**2.3**	2
14-06	31.5	52.5	1.7	2
26-02	1.9	0.3	0.2	1
26-04	21.2	32.3	**1.5**	1

Other management areas meet the open road density standard.

ENVIRONMENTAL CONSEQUENCES

Direct and Indirect Effects

Alternative A, No Action

In low severity burned areas, regrowth will be rapid and will provide forage of an increased palatability and nutritional quality, which will improve the quality of the seasonal ranges. Most of these areas experienced little overstory mortality. Summer range conditions are likely to improve by increasing the amount and value of the forage, potentially improving the physical condition for deer as they go into the winter season.

Winter ranges that burned will be temporarily less useful to deer as a result of the fire. The bitterbrush that provides the majority of winter forage for deer may take longer to recover. Willows, elderberry, serviceberry, and other shrubs resprout more rapidly and

would provide good winter forage, where they are available. Shrubs are likely to recover in 5-10 growing seasons. Forbs and grasses are likely to recover in 2-3 growing seasons.

Cover provided by thick stands is less available as a result of the fire, and will influence how deer use the area, particularly in winter. Tree regeneration in completely burned stands will take 10-50 years before the hiding and thermal characteristics are restored. In areas of less severe mortality, understory regeneration will add cover value in 10 to 20 years.

One consequence of selecting this alternative would be that no road closures would occur and road densities in designated deer winter range (MA14-05 and MA 26-04) would remain above Forest Plan standards.

All Action Alternatives

Salvage Harvest

The project proposes no salvage harvest in mule deer winter range that is still functional. The harvest of dead and dying trees would not impact mule deer winter or summer cover. Tree, shrub, forb, and grass response in burned areas would not be substantially affected by the proposed harvest, and would not be measurably different for any alternative (see vegetation recovery in Chapter 3.6 Plant Communities section). Grifantini (1990) noted the reduction of shrub response following salvage logging and broadcast burning and suggested the result was a reduction in deer habitat capability. A similar response is not expected here because this project is being implemented more quickly after the fire and no broadcast burning is planned.

Salvage harvest would have very little effect on deer cover/forage ratio, as only dead trees are being harvested.

During logging operations, noise and activity along roads, chain saw use and falling and yarding activity and noise could cause deer to avoid those areas.

Travel restrictions (Forest Plan and Travel Plan)

There would be no loss of effectiveness for deer winter range (the goals of the Management Areas where deer winter range is considered would not be affected) if project activities are allowed, because mapped deer winter range is burned and ineffective within the project area. The goals of the management area would be met consistent with Forest Plan Standards and Guidelines (S&G) MA5-17E (page 4-69), MA14-20G (page 4-84), MA14 -17B (page 4-85) or MA26-17C (page 4-109) without additional operating season and access restrictions. Travel plan restrictions would remain in place for hunting activities to protect deer occurring in areas where cover was lost during the fire. Timber sale operators and range permittees would be allowed to enter, but not allowed to hunt. The goals of MA-14 and MA-26 would still be met.

The Forest Plan Standard and Guideline MA26-20J (page 4-109) would be amended to allow timber sale activities in winter within deer winter range in discrete MA26-04 and MA26-02..Harvest activities would have little effect on deer populations because the fire eliminated the value in the winter range.

Roads
Road densities within deer winter range management allocations would be increased or remain at current levels during project activities and reduced or at current levels after the project for all alternatives (compare Figures 3.2-6 and 3.2-7). Allowing open road density to exceed standards would have little consequence for deer because deer activity is reduced in burned areas and because the roads would be closed to the public, open only to timber sale contractors. The goals of the management area would be met.

Action alternatives would open 13.4 to 23.7 miles of currently closed road for use only by timber sale operators. These roads would be closed after timber harvest is complete (See Figure 3.12-2). Some of these are in discrete management areas where road density currently exceeds Forest Plan guidance. Opening roads would further exceed the Forest Plan density standards during project implementation in MAs 14 and 26 (26-17B and 14-17A. Allowing open road density to exceed these standards would have little consequence for deer and would allow the goals of the Management Areas to still be met because limited deer use is expected within the areas burned until after the timber harvest is complete and herbaceous and shrub vegetation recovers (see Chapter 3.6 Plant Communities).

All action alternatives reduce open road density in MA14-05 to the Forest Plan Standard of 2 miles per square mile by closing 3 miles of road after harvest is complete (following direction from a previous management decision). This benefits deer and other wildlife (Gaines et al. 2003) by providing habitat security.

Figure 3.2-7: Deer winter range road density for all action alternatives (B, C, D and E).

MA	Square Miles	During Project		Post Project	
		Total Open Miles	Road Density Mi. per Sq. Mi.	Total Open Miles	Road Density Mi. per Sq. Mi.
5-09	83.9	74.0	0.9	69.9	0.8
5-11	10.2	9.5	0.9	9.5	0.9
14-05	10.7	27.4	2.6	21.9	2.0
14-06	31.5	53.7	1.7	52.5	1.7
26-02	1.9	0.3	0.2	0.3	0.2
26-04	21.2	35.2	1.7	32.3	1.5

Open road density in MA 26-04 would remain at its current density level following project completion in all alternatives, exceeding the Forest Plan Standard of 1 mile per square mile. The road density could not be reduced enough to meet standards within the Tripod project area alone because most of the roads within the MA lie outside the project area. The goals of the Management Area would be met.

All other management areas would meet the Forest Plan open road density standards during and after the project.

Other activities
Piling and burning slash, temporary road construction, road decommissioning, tree planting, firewood harvest, and danger tree falling are not expected to measurably affect

deer populations because these activities are in areas where the habitat suitability was reduced by the fire, there is an abundance of habitat outside the project area, and the habitat for deer will fully recover independent of any alternative chosen.

Cumulative effects

Effects of past actions are considered in Affected Environment above. Below are the potential cumulative effects for deer of ongoing and reasonably foreseeable future actions identified by the Interdisciplinary Team and listed at the beginning of this chapter. The area considered for cumulative effects analysis for deer was the five 5th order watersheds area in which the fire occurred. These effects are in addition to the direct and indirect effects of the Tripod project activities.

Generally the area considered for cumulative effects is the three-watershed area where harvest is proposed. The timeframe considered for cumulative effects is 20 years, which is approximately how long it will take the new forest to begin to take over ecological function (see Burn\ed Forest and Snag Habitat, Environmental Consequences, Snag Persistence section.

Timber sales
Ongoing and future timber harvest (Mutton, Conger, Flatmoon, and Buck) would remove cover for deer on about 8,000 scattered acres (in 5 to 40 acre blocks), but this would in turn provide improved foraging opportunities. DNR salvage sales are removing dead and dying timber from 1,100 acres of State land. This removes some cover although it is mostly standing dead trees with limited habitat losses for deer. The cumulative effect of timber harvest would create more foraging opportunities for deer.

Firewood cutting
No consequences for deer.

Fuels treatments
Conger, Mutton (including Sinlahekin Wildlife Area land), Cougar, Bear and Ramsey fuels projects on Tonasket and Methow Valley Districts amount to as many as 15,000 acres of prescribed fire fuels treatment over the next 4 to 5 years. These would have the effect of reducing tree density and providing for future growth of shrubs, forbs and grasses. In the short term shrubs are reduced and some areas experience increases in exotic plant species. Re-sprouting of bitterbrush and stimulation of *Ceanothus* would improve forage value for deer. Overall deer would benefit from these prescribed fire treatments.

Tree planting
Danny and Conger II tree planting projects would reforest about 300 acres in the Salmon Creek watershed. These two projects would not measurably affect deer populations. 9000 acres of tree planting is planned within the Tripod Fire Area outside of Tripod Fire Salvage project units. This would benefit deer by improving cover lost in the fire.

Suppression rehabilitation and BAER treatments
Fireline and safety zone restoration and seeding are beneficial to protect deer habitat. Soil stabilization with straw (5,500 acres), culvert replacement, trail and fence repair, and danger tree falling would have little consequence for deer.

Restoration activities
No consequences for deer.

Invasive plant treatment
If implemented with strict safety guidelines as planned, treatments for invasive plants would improve habitat for all wildlife including deer by insuring native plant establishment rather than invasive plants. This treatment is a small fraction of the acres infested in the three watershed area.

Livestock grazing
An approach to determine that sufficient vegetation recovery has occurred before allowing livestock to occupy allotments is detailed in Appendix H. This would provide for management of livestock at approximately pre-fire conditions, which balanced deer and livestock needs.

Recreational use
Deer are displaced by some recreational use (generally motorized use) but this is of little consequence to the populations. Snowmachine use occurs on some existing roads in deer winter range, and in combination with any winter logging conducted under this project, could contribute to limited effects to deer. Deer avoid some areas due to higher recreation activity, although some deer are habituated to campgrounds. Winter snowmachine trail use could allow more access for deer predators. Hunting removes about 2300 deer from the county population each year.

Mushroom gathering
No consequence for deer.

Transportation system
Management of the transportation system on the Forest to meet standards and guidelines is working to provide adequately for deer habitat needs.

WDFW Wildlife Management Area activities
Habitat improvement, including 700 acres of shrub steppe restoration would have a minor positive effect for deer on a local scale.

Timber Stand Improvement
1200 acres of timber stand improvement would have a minor effect for deer by providing additional shrub plants for foraging on a local scale.

<u>Cumulative effects conclusion</u>

Nearby ongoing and future land management actions on State and Federal land, considered with the action alternatives, have an overall positive net effect on deer populations by increasing forage value. Hunting reduces deer population growth. When taken together with the effects of past actions described in the Affected Environment section and the Direct and Indirect effects described for the project alternatives, the viability of deer in Okanogan County is not jeopardized in any action alternative. There are no other activities from the list at the beginning of Chapter 3 currently ongoing or

proposed in the three watershed analysis area that might affect deer.

SUMMARY and CONSISTENCY FINDING

The fire created a substantial change for deer in the vicinity of the project. There is little difference in effects for deer habitat in any alternative including Alternative A. Whether harvested or not, deer habitat would recover from the effects of the fire and in a few years deer habitat conditions would be improved over pre-fire conditions. Project activities proposed would not affect the balance of cover and forage needed to sustain viable deer populations in the Methow Valley. Despite difficult winters for the last two years, deer populations in Okanogan County have consistently remained high for a decade and the trend appears to be at least static (Fitkin, personal comm. 2006)

Two Forest Plan amendments related to deer management (access in winter range during winter) are required to implement any action alternative. With those amendments all actions proposed are consistent with deer management direction in the Forest Plan (USDA Forest Service 1989a) and goals of management area allocations would be met.

Winter and summer range and fawning habitat are not impacted by the activities proposed. A forage/cover analysis was not done because salvage harvest of dead trees would have very little effect on cover. All project activities result in very little impact for deer and are not expected to change deer populations in the county noticeably.

CANADA LYNX

Lynx are discussed at length in the Biological Evaluation for this report, found in this Chapter and Section under Endangered, Threatened and Sensitive Wildlife. The U.S. Fish and Wildlife Service has concurred with the analysis and findings in this document regarding effects of the proposed project to Canada lynx and lynx habitat.

PRIMARY CAVITY EXCAVATORS

REGULATORY FRAMEWORK

Primary cavity excavators (PCE), including woodpeckers, sapsuckers, and flickers, are forest dwelling birds specialized for nesting and foraging in dead and dying wood. These are important management indicators because they drill holes used by an even wider array of secondary cavity users. The Forest Plan identifies PCEs as MIS for the availability and quality of dead and defective wood habitat. The conservation measures that insure the viability of these species are included in Forest Plan (Eastside Screens) guidelines. These guidelines define the amount of burned forest, snag, and downed wood habitat needed to sustain viable primary cavity excavator populations and were followed for all alternatives.

BACKGROUND INFORMATION

Primary cavity excavators use burned forest and green forest habitats differently. Tree canopy cover, understory shrub and grass cover, and snag numbers and qualities are all different between these two habitats. Snag habitats in post-fire environments are unique for several reasons: 1) early post-fire forests and associated insect outbreaks result in a rapid increase in food supplies and nest sites, 2) initially, most of the new snags are hard snags consisting of sound sapwood that may delay use by species that prefer soft snags, 3) many woodpecker species appear to favor burned habitats, with some species using them as source habitats, and 4) portions of fires leave few or no green trees for future snag habitat until a new forest has grown and become decadent.

Ten species occur in the project area: pileated, three-toed, black-backed, downy, hairy, Lewis', and white-headed woodpeckers; red-naped and Williamson's sapsuckers; and northern flicker. Among the PCE MIS, the black-backed woodpecker, hairy woodpecker, Lewis' woodpecker, and northern flicker are strongly associated with post-fire habitats, whereas the pileated woodpecker, white-headed woodpecker, downy woodpecker, red-naped sapsucker, and Williamson's sapsucker have much lower associations (Kotliar et al. 2002, Saab and Dudley 1998, Hutto 1995, Sallabanks 1995).

AFFECTED ENVIRONMENT

The fire created an abundance of new snags. Post-fire density, size, and distribution of snags are a result of several factors: fire intensity, past harvest, stand age, tree species composition, and the effects of past disturbances such as wind, fire, pathogens, and insects. The analysis for these species considered all conditions present after the fire. Post-fire snag densities were estimated and are displayed in Figure 3.2-8.

Figure 3.2-8: Estimated snags per acre by size class and habitat within the three watersheds where harvest is proposed. (spa = snags per acre)

Forest Habitat Type	Areas with Stand Replacement fire (spa)		Areas that are Functionally Intact (spa)	
	>10" DBH	>20" DBH	>10" DBH	>20" DBH
Dry	39	3.5	12	0.7
Mixed	42	2.3	14	0.6
Montane	69	3.6	26	1.3

The Affected Environment for PCEs is discussed in more detail in the Burned Forest and Snag Habitat section of this report.

ENVIRONMENTAL CONSEQUENCES SUMMARY FOR ALL ACTION ALTERNATIVES

The summary statements below are from the more extensive analysis in the Burned Forest and Snag Habitat section of this report. Cumulative effects for PCEs are discussed in that section.

The effects of the action alternatives for Primary Cavity Excavators would be very similar.

Some snag and burned forest habitat would be removed, but abundant habitat would be retained for cavity nesters at all scales.

A surplus of high density snag habitat exists within the 5-watershed area, especially in the Montane Forest habitat type.

Snag persistence would follow natural patterns. The burned forest would lose its increased habitat value in 20 years and new conifer forest would begin replacing that habitat. In that time, additional fires would have burned and new parts of the watershed would replace this for burned forest and snag habitat.

Long-term value for primary cavity excavators would come from lightly burned and unburned forest for at least 50 years.

Some habitat would be lost with the removal of snags, but abundant large snag habitat would remain and some of the largest snags would persist for 80 or more years.

Some openings (with scattered snags) created during harvest could provide more aerial foraging opportunities for insect eaters like Lewis's woodpecker and olive-sided flycatchers.

The range of conditions available after harvest would include heavily burned forest, lightly burned forest, and unburned forest within 100-acre 'neighborhoods' surrounding harvest units. In combination with habitat reserves for black-backed woodpeckers, these conditions would provide abundant habitat for a wide array of species including all Management Indicator cavity nesters for at least 20 years.

This analysis considers the watersheds and subwatersheds where harvest is proposed. Another 10 subwatersheds (more than 65,000 acres) burned in the Tripod Fire where no harvest is planned. These acres would also provide snag and burned forest habitat beyond what is analyzed here.

CONSISTENCY FINDING

Based on broad scale analysis conducted by Lehmkuhl et al. (1997) for the Columbia Basin, the primary cavity excavators in Tripod showed trends ranging from:
2 = Habitat is broadly distributed but some gaps exist. Disjunct patches generally allow species to interact as a metapopulation (hairy woodpecker), to;
3 = Habitat exists primarily as patches; some populations are isolated (black-backed woodpecker and Williamson's sapsucker) to;
4 = Habitat exists as isolated patches with limited opportunity for population interactions. Local populations may be extirpated (pileated woodpecker, Lewis's woodpecker, and white-headed woodpecker). *See the MIS broad scale trend analysis chart in Appendix D.* This project does not negatively influence any of these trends for the Columbia Basin.

In all alternatives, the amount of burned forest habitat and the number of snags and down logs retained exceeds Forest Plan (as amended by Regional Forester Amendment #2) requirements for primary cavity excavators at all scales (see the Burned Forest and Snag Habitat section).

RUFFED GROUSE

REGULATORY FRAMEWORK

The Forest Plan identifies ruffed grouse as a MIS representing deciduous and riparian habitat. Forestwide standard and guideline 6-13 addresses perpetuating hardwood stands as a key conservation strategy. A broad scale analysis has not yet been completed for this Management Indicator, but PACFISH riparian standards would be implemented to provide for their viability within the project area.

AFFECTED ENVIRONMENT

Riparian woodlands and shrub habitats are typified by the presence of hardwood tree and shrub species, along with associated wetland herbaceous species. Water is an important component of these habitats, whether it is in the form of standing wetlands, springs, seeps, or flowing water (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.

ENVIRONMENTAL CONSEQUENCES

Riparian corridors are protected by following PACFISH RHCA direction in all alternatives. Consistent with PACFISH, no harvest would occur in RHCAs, although some danger trees or trees in temporary road prisms may be felled. Much riparian habitat was altered by the fire but will recover quickly (see Chapter 3.6 Plant Communities). No riparian or aspen habitat that is still in functioning condition would be altered by any alternative. No riparian corridors are compromised. A few danger trees might be felled, but not removed. This activity would not affect riparian habitat function or recovery. Because of abundant riparian regrowth stimulated by the fire, ruffed grouse habitat will be substantially improved in 10 years over pre-fire conditions. Ruffed grouse populations will consequently be more extensive than at the time of the fire for all alternatives.

AMERICAN MARTEN, PILEATED AND THREE-TOED WOODPECKERS, BARRED OWLS

A strategy of identifying and designating reserves of limiting habitat was prescribed by the Forest Plan (USDA Forest Service 1989a) to insure the viability of these Management Indicator Species. These Management Indicators are termed ‘Management Requirement Species’ and the reserves are termed ‘Management Requirement Cells’. This strategy prevents further losses of key habitat during timber harvest or other land management projects. These four MIS species represent old forest habitat.

No old forest habitat, “Late/Old Structure habitat”, old growth stands, or management requirement cells are affected by any alternative. Habitat remaining for martens, pileated and three-toed woodpeckers, and barred owls would not be affected by any alternative because harvest is only planned for areas where such habitat was already eliminated by

the fire. Because the project would not affect this habitat or these species, there would be no effect to their viability and no direct, indirect or cumulative effects.

BURNED FOREST AND SNAG HABITAT

REGULATORY FRAMEWORK

The direction for providing habitat for primary cavity excavators is from the Forest Plan (USDA Forest Service 1989a) as amended by Regional Forester's Amendment #2 (USDA Forest Service 1995a) and subsequent clarification and interpretation memoranda.

Primary cavity excavators are Management Indicators for a much larger group of species that benefit from, and depend on, dead and decaying trees and logs and holes in trees created by cavity excavators. The amended Forest Plan direction refers to using 'the best available science' to determine 100% potential population levels for primary cavity excavators. For this group of species DecAID is considered the best source and synthesis of available science for determining the 100% level.

On July 3, 2007 the Forest adopted specific guidance to meet the purpose and intent of the Eastside Screens for projects in areas burned. This guidance acknowledged the facts that snags are important and that past management practices have greatly reduced the number of large snags and down logs in managed stands. It also incorporated the current best available science in determining the appropriate numbers of snags to retain to insure viability of all the species that benefit from snags and logs (see Appendix D). Design of all alternatives incorporated the recommendations from this letter. All alternatives would meet this guidance.

A project specific, non-significant Forest Plan amendment is included in Alternative B, C, and D to allow live trees greater than or equal to 21" DBH to be salvaged harvested. This amendment would allow salvage harvest of those fire injured trees greater than or equal to 21" DBH with a low probability of survival within one year of project implementation.

DecAID (Mellen et al. 2006) is an advisory tool to help managers evaluate effects of forest conditions and existing or proposed management activities on organisms that use snags and down wood. DecAID can also help managers decide on snag and down wood sizes and levels needed to help meet wildlife management objectives. DecAID is a summary, synthesis, and integration of published scientific literature, research data, wildlife databases, forest inventory databases, and expert judgment and experience. The information presented on wildlife species' use of snags and down wood is based entirely on scientific field research, and does not rely on modeling the biological potential of wildlife populations.

DecAID is:

- a thorough review of published literature and other available data on wildlife use of decayed wood elements, primarily in Oregon and Washington
- a statistical synthesis of data showing levels of use by individual wildlife species of decayed wood elements

a summary of the patterns of use of decayed wood elements by wildlife species in Oregon and Washington (number of species using specific snag or down wood sizes or amounts)
statistical summaries of forest inventory data on snags and down wood in unharvested forests and entire landscapes across Oregon and Washington
a helpful tool for making informed decisions

Key strategies for conservation include the retention of burned forest habitat and fostering the persistence of a variety of snag and downed log species, sizes, and decay conditions across the landscape. Further information is available in the following sections of DecAID:

Summary Narrative: Advice on Decayed Wood in the Ponderosa Pine/Douglas-fir Forest, Post-fire Vegetation Condition,
Summary Narrative: Advice on Decayed Wood in the Eastside Mixed Conifer Forest, North Cascades, Post-fire Vegetation Condition, and
Summary Narrative: Advice on Decayed Wood in the Montane Mixed Conifer Forest, Post-fire Vegetation Condition.

The Forest Plan (USDA Forest Service 1989a), as amended by the Regional Forester's Amendment #2 (USDA Forest Service 1995a), requires that "all sale activities (including intermediate and regeneration harvest in both even-aged and uneven-aged systems, and salvage) will maintain snag and green replacement trees ≥ 21 inches DBH (or whatever is the representative DBH of the overstory layer if it is less than 21 inches) at 100 percent potential population levels of primary cavity excavators". The Forest Plan as amended directs this to be determined "using the best available science on species requirements as applied through current snag models or other documented procedures." The Forest letter of Guidance of July 3, 2007 (Appendix D) previously mentioned meets this direction.

Down wood requirements from Amendment # 2 are to manage for at least 20 lineal feet of down wood ≥ 12" in diameter per acre in Dry Forest, at least 100 lineal feet ≥ 12" in diameter per acre in Mixed Conifer Forest, and 120 lineal feet ≥ 8 inches in diameter per acre in Montane Forest. Pre-activity down logs may be removed only when they exceed those quantities.

BACKGROUND INFORMATION

Snags and logs provide crucial ecological functions including multiple hydrologic functions, nutrient storage and release, microclimate moderation (such as is needed for winter or summer habitat for many species), restriction of soil movement, sites for feeding, breeding, germination, growth, and decomposition, and terrestrial and aquatic hiding cover (Laudenslayer et al. 2002, Rose et al. 2001, Stevens 1997). Snag and log retention is a key feature of the design of the alternatives for this project. This Chapter focuses on the value of burned forest and burned snags and logs, especially for the Management Indicator Species that have management standards to be adhered to. Many of the benefits of retaining snags and logs will also apply to a variety of birds, mammals, reptiles, amphibians, and invertebrate species not specifically acknowledged here.

Many snags are proposed for removal from harvest units. This does not render the forest uninhabitable by all birds, mammals, reptiles, amphibians, and invertebrates. It simply

changes the suitability of the habitat from one group of species to another. All units would have snags retained sufficient to meet ecological needs and legal requirements dictated by the Forest Plan as amended by the Eastside Screens.

Another important principle that was included in snag retention design was ensuring adequate dead wood was retained within home ranges of species being considered. These area sizes were employed to approximate the home range of many of the species being considered. This is an analysis method that facilitates the examination of habitat components and allows the determination of effects at the smaller scale, in a fashion similar to the Lynx Analysis Unit method employed for lynx.

Some species need unmanaged burned habitat. Woodpecker experts Jonathan Dudley and Robin Russell completed a habitat suitability analysis for black-backed woodpeckers within the fire area using tree mortality, habitat type, and pre-fire crown closure information. Black backed woodpeckers serve well as indicator species for many species requiring dense stands (especially those that contain Douglas fir) that have been burned.

Where a range of conditions are provided that mimic the extremes reported in scientific studies, it has been suggested that suitable habitat is provided for species that benefit from intermediate conditions (Saab et al. 2002). White-headed woodpeckers benefit from lower snag densities, larger trees and snags, lower burn intensities / tree mortality, and more open conditions (Blair et al. 1995, Dixon 1995, Garrett et al. 1996, Marshal 1997) while black-backed woodpeckers benefit from higher snag densities, smaller trees, and higher fire mortality conditions (Kotliar et al. 2002; Saab and Dudley 1998; Marshall 1992, 1997). For the Tripod project, it is assumed that if conditions favorable to these birds are present, other species that respond to intermediate conditions would also be provided for. Comparing the alternatives with the conditions within this range will provide the framework for analysis for all dead and downed wood and burned forest species.

Very extensive data collection occurred before the fire to assess wildlife habitat in general and songbird and cavity nester habitat specifically. Five years of pre-wildfire data collection associated with the Birds and Burning (B and B) project tallied more than 160 cavity nest records. Crews documented tens of thousands of data points identifying the vegetation characteristics at these nest sites within the fire perimeter. Tree and snag data were gathered at 120 random vegetation plots in Dry Forest habitat in and near the fire area. A companion study measured and characterized all snags occurring on 5,100 acres within and near the fire (more than 12,000 snags).

A broad scale analysis conducted by Lehmkuhl et al. (1997) for the ICBEMP project noted trends in populations and habitat for some of the cavity nesting species considered here (see Appendix D, Figure D -2). The trends ranged from:
2=Habitat is broadly distributed but some gaps exist. Disjunct patches generally allow species to interact as a metapopulation (hairy woodpecker), to;
3= Habitat exists primarily as patches; some populations are isolated (black-backed woodpecker and Williamson's sapsucker) to;
4= Habitat exists as isolated patches with limited opportunity for population interactions. Local populations may be extirpated (pileated woodpecker, Lewis's woodpecker, and white-headed woodpecker). This project does not negatively influence any of these trends for the Columbia Basin.

USDA Forest Service Regional 'Current Vegetation Survey' (CVS) plot data inside the fire perimeter and within 1.2 miles of the fire (101 plots) also provided vegetation information for all habitat types in this project.

Figure 3.2-9: Tree data used for this project analysis (120 B and B plots, 101 CVS plots)
Tpa = Trees per acre

Source	Tpa > 10" DBH	Tpa > 20: DBH
CVS plots - Dry	45.7	4.4
CVS plots - Mixed	47.2	2.9
CVS plots - Montane	73.2	4.2
B and B plots - Dry	46.0	4.7

Figure 3.2-10: Baseline pre-fire snag data used for this project analysis
Spa = Snags per acre

Source	Spa > 10" DBH	Spa > 20" DBH
B and B vegetation data	2.7	0.5
B and B snag data	2.5	0.6
CVS plots - Dry	1.6	0
CVS plots - Mixed	2.2	0.1
CVS plots - Montane	7.0	0.4

Very extensive life history information for burned forest and snag dependent species is compiled in DecAID (Mellen et al. 2006), which is available online at: http://wwwnotes.fs.fed.us:81/pnw/DecAID/DecAID.nsf

Several authors note the varied response of vertebrates (mostly birds) to different fire intensity and severity (Saab et al. 2005, Smucker et al 2005, Lehmkuhl 2004, Kotliar et al 2002, Raphael and White 1984). Rose et al. (2001) provide a very comprehensive review of the ecological role of decaying wood in Pacific Northwest forests, including the substantial value of the pulses of dead wood provided in post-fire forests. Beyond the obvious and most commonly studied cavity nester response to wildfire, an increase in populations have been noted for arthropods, fish, mammals, and amphibians (Sedell and Maser 1994, Bull et al. 1997, Rose et al. 2001, Wisdom et al. 2000, Hessburg et al. 2003).

Many cavity nesting bird species benefit from high fire mortality and high post-fire snag density (black-backed woodpecker, mountain bluebird, hairy woodpecker). Several authors suggest that the presence of unlogged, severely burned forests in forested landscapes, may be critical for maintaining populations of certain cavity-nesting birds (Hutto 1995, 2006; Caton 1996; Saab and Dudley 1998). Many cavity nesting birds exhibit marked increases in abundance after the occurrence of stand-replacement fires (Raphael and White 1984, Hutto 1995, Caton 1996, Hitchcox 1996, Murphy and Lehnhausen 1988, Saab and Dudley 1998). The most dramatic increases are for species that are timber drillers and aerial foragers. Cavity-nesters likely respond positively to stand-replacement burns for a number of reasons. Bark beetles and wood-boring beetles often colonize fire-killed or injured trees in high densities. Subsequently, this is followed by an increase in the

abundance of *Picoides* woodpeckers, which are strongly associated with dying or recently killed trees. Bark- and wood-boring insects are key prey for certain woodpeckers. The appearance of *Picoides* woodpeckers in stand-replacement burns typically coincides with the emergence of adult wood-borers (Murphy and Lehnhausen 1988). Although temporary, stand-replacement fires create a rich and concentrated foraging resource in areas where nest site potential also increases. It is thought that many cavity-nesting species are dependent upon both the spatial and temporal occurrence of severe burns to maintain their populations (Hutto 1995, Caton 1996, Hoffman 1997, Machmer 2000).

Other species (including white-headed woodpecker, Williamson's sapsucker, and white-breasted nuthatch) prefer the mixed mortality of lower intensity fire. The degree to which they benefit from this condition depends on tree density and the amount of pre-fire and post-fire tree mortality. A moderate increase in snag density and availability, an increase in arthropod prey (in new snags), availability of seeds and insects associated with live trees, and the continued presence of snags as trees continue to die all characterize this condition. This habitat condition persists for considerably longer than severely burned forest.

Some cavity nesting species are uncommon in post-fire habitat (pileated woodpecker, mountain chickadee, brown creeper, and red-breasted nuthatch). The remaining green forest will provide habitat for cavity nesting species that are uncommon in post-fire forests. No alternative affects green forest and an analysis of this group is not presented in this section.

It is important to consider that conditions on the Okanogan National Forest are possibly drier, harsher sites with lower stand densities than some other places where wildlife studies have been conducted. The DecAID wildlife tolerance levels and respective snag densities may not be the same as what cavity nesting species have adapted to in north-central Washington in the rain shadow of the Cascade Mountains. Based on recent studies on the Okanogan portion of the Forest, it is expected that cavity-nesters here locally may thrive in areas with lower snags densities than what was selected for in Idaho and Montana.

ANALYSIS METHOD

The amount of burned forest retained at multiple scales is the measure used in this analysis to evaluate the effects to species that benefit from these conditions. Mellen et al. (2006) suggest that the analyses for these characteristics are best performed at watershed or larger scales. These measures were evaluated within the 883,400-acre five-watershed area surrounding the project (Upper Chewuch, Lower Chewuch, Middle Methow, Salmon Creek, and Sinlahekin Creek), within the three watersheds where harvest is proposed, within 6th order subwatersheds, within 100-acre 'neighborhoods', and within harvest units.

The largest evaluation area (the five watersheds with a total land area of 883,439 acres) provides the landscape picture of how the fire and salvage compare with what was analyzed for the Columbia Basin (Hann et al. 1997, Hessburg and Agee 2003, Hessburg et al. 1999a, Korol et al. 2002, Wisdom et al. 2000) (see Figures 3.2-26a and 3.2-26b).

Most of the analysis is focused on the three watersheds (9 subwatersheds) where harvest is proposed. The time periods assessed were 10 years post-fire and 50 years post-fire.

Two important factors considered in this analysis for snag and burned forest dependent species were the amount of previous timber harvest and the amount of tree mortality from fire intensity levels. Previous harvest units were classified as 'highly modified', 'lightly modified', or 'natural'.

In addition to the 'tolerance level' analysis method used extensively, a table of relative habitat value was developed for this analysis that assumed that pre-fire clearcuts were of the least value to snag, log, and burned forest dependent wildlife species, and that unharvested 'natural' forest stands that burned at moderate intensity and higher were the most valuable for these species (Figure 3.2-11). Values were applied from this grid to 30-meter cells around harvest units to further evaluate the habitat proposed for harvest and the habitat remaining after harvest. This is not based on scientific studies, but rather on field experience in the different habitats in recent fires on the Okanogan and Wenatchee National Forests. It was developed only to facilitate GIS comparison of conditions found in neighborhoods. These values are not based on research nor are they intended to suggest that one condition is *twice* as good as another. Only that there is an improvement for some species that use burned forest more than unburned forest, and natural stands more than clearcuts.

The main application of this relative habitat value table was to allow determination of the places (100-acre neighborhoods) where previous harvest, burn mortality, and current harvest proposals indicate snag and burned forest habitat below the minimum levels desired for retention. Where this was the case, additional 'islands' of burned forest are identified within harvest units to meet target retention levels.

Figure 3.2-11: Relative values of habitat condition for burned forest species applied in 'neighborhood' analysis
(S.R. = stand replacing. B.F.I. = Burned but Functionally Intact.)

		Burn Mortality		
		Green	**B.F.I.**	**S.R.**
STAND CONDITIONS	Natural	10	20	30
	Uneven-aged	9	17	25
	Understory removal	8	14	21
	Commercial thinning	7	12	17
		6	10	13
	Overstory removal	5	8	10
		4	6	7
	Shelterwood	3	4	5
	Seedtree	2	2	3
	Clearcut	1	1	1

The tree mortality levels within the fire boundary (from Figure 3.2-1) will be assessed as two conditions. 'Complete', 'high', and 'moderate' tree mortality classes were stand-

replacing portions of the fire. 'Low' and 'little change detected' classes were considered functionally intact.

AFFECTED ENVIRONMENT

The Tripod Fire is described in Chapter 1. Chapter 3.6, Plant Communities discusses fire effects on vegetation. The entire fire area was mapped and acres calculated for tree mortality and habitat type (see Figure 3.2-1).

A summary of the effects of the Tripod fire on Dry, Mixed Conifer, and Montane Forest habitat within the watersheds where harvest is proposed is displayed in Figure 3.2-2. Project effects on Alpine Parkland are not discussed because there are no proposed actions in that habitat type.

The following past actions have contributed to the current condition:

Timber sales noted in Figure 3-1 reduced habitat for snag and downed wood dependent species. This amounted to more than 20,000 acres affected in the previous 40 years. Snags were removed for safety reasons and for a period snag cutting was part of a campaign of fire protection and insect and disease reduction.

The Conger and Mutton timber sales in the Salmon Creek watershed were designed to hasten development of Late and Old structure habitat on about 1,000 acres of Dry Forest habitat. This will include the addition of some snag habitat in a few decades.

Fire suppression and Burned Area Emergency Response activities are documented in Appendix L. Suppression included 41 safety zones, 21 helispots, 122 miles of dozer line, and 118 miles of hand line created during suppression actions (about 500 acres of tree removal). This tree cutting removed future snags from these acres.

Over 200 miles (170 miles in 2006 and 47.3 in 2007) of danger tree removal has been completed or will be completed before the project is implemented. This amounts to several thousand snags fallen within 200 feet of roads. Most of these were less than 12" in diameter; with less than 1 tree per mile cut greater than 20" in diameter based on the experience from the fall of 2006.

Since 2001, an average of 86,000 acres of insect and disease mortality has been reported annually for the three watersheds combined. This is not stand replacing mortality, but provides additional snags that are foraging and nesting habitat for cavity nesters.

Recent fuels treatments on approximately 10,000 acres in the vicinity of the project have improved cavity nester habitat by increasing snags and improving insect populations that woodpeckers and other cavity nesters depend on. As a result, somewhat higher populations of primary and secondary cavity users were present before the fire.

There have been 3 other large fires in the Chewuch and Salmon watersheds since 2001. The Farewell Fire (2003, 78,200 acres), Thirtymile Fire (2001, 10,300 acres) and Isabel Fire (2003, 4,300 acres) cumulatively burned about 92,833 acres within the

vicinity of the Tripod Fire, almost all in Montane Forest habitat. About 60% of these acres were stand replacement. These fires also improved conditions for burned forest, snag, and downed log dependent species. No salvage harvest occurred in these fires.

Much of the fire area is unroaded and has had no mechanical vegetation treatment (73,342 acres of land designated as Inventoried Roadless Areas, and 23,177 acres of land with undeveloped character (see Chapter 3.9 Roadless Areas and Areas with Undeveloped Character). The 'natural' conditions there were presumably positive for species that benefit from snags and down logs.

Existing Conditions related to the Tripod Fire.

Existing conditions are reported below at various scales and for various characteristics. The action alternatives section displays changes from these conditions.

Watershed

Figure 3.2-12: Acres burned in three watersheds where harvest is proposed.

	Watershed acres	Watershed acres on National Forest land	National Forest acres burned in Tripod
Lower Chewuch River	191,272	113,979	71,463
Middle Methow River	250,023	39,526	20,026
Salmon Creek	105,506	62,729	18,639

Figure 3.2-13: Comparison of mortality levels within habitats in each watershed where harvest is proposed
(S.R. = stand replacing. B.F.I. = burned but functionally intact.)

Watershed	Total ac. Burned	Dry		Mixed		Montane	
		S.R.	B.F.I.	S.R.	B.F.I.	S.R.	B.F.I.
Lower Chewuch River	71,463	2,405	2,592	7,488	3,982	42,034	12,946
Middle Methow River	20,026	108	124	1,476	1,166	12,184	4,968
Salmon Creek	18,639	86	156	1,331	2,741	6,920	7,391

Subwatershed

Figure 3.2-14: Total acres burned in each subwatershed where harvest is proposed

Watershed and Subwatershed	Acres burned, subwatershed	% burned, subwatershed
Lower Chewuch River	71,463	62
Mainstem Lower Chewuch R.	6,601	28
Boulder Creek	9,837	75
North Fork Boulder Creek	28,540	87
Pearrygin Creek	4,783	24
Twentymile Creek	21,703	91
Middle Methow River	20,026	51
Upper Beaver Creek	20,026	51
Salmon Creek	18,639	30
North Fork Salmon Creek	3,577	16
South Fork Salmon Creek	3,504	27
West Fork Salmon Creek	11,558	42
Grand Total	**110,129**	**51**

Habitat

Figure 3.2-15: Acres burned by habitat type in the three watersheds where harvest is proposed

Habitat	Total acres habitat N.F. land in three watersheds	Acres burned - all mortality classes
Dry Forest	37,787	5,471
Mixed Conifer Forest	66,740	18,186
Montane Forest	111,709	86,441

Snag densities

Snag densities within the three watersheds were determined by the District Forester and District Wildlife Biologist using the 'Birds and Burning' project vegetation data collected in and near the Tripod fire for five years prior to the fire (Figure 3.2-8). CVS vegetation plot data collected 1998-2004 validated the Birds and Burning data. Mortality assumptions (Figure 3.2-16**)** were derived based on experience from 1994, 2001, and 2003 fires in the same vicinity.

Figure 3.2-16: Tree Mortality Assumptions

	Trees <20”	Trees >20”
Dry – stand replacement	85%	75%
Dry – functionally intact	25%	15%
Mixed – stand replacement	90%	80%
Mixed – functionally intact	30%	20%
Montane – stand replacement	95%	85%
Montane – functionally intact	35%	30%

The formula used to generate snags per acre (Figure 3.2-8) was:
trees per acre (from Figure 3.2-9) X mortality assumptions (from Figure 3.2-16)

ENVIRONMENTAL CONSEQUENCES

Direct and Indirect Effects

Alternative A

No harvest would take place. No danger trees would be removed beyond the BAER effort currently underway. Post fire processes would be allowed to occur within the fire boundary naturally.

This alternative provides the most burned forest habitat and the greatest number of snags for primary and secondary excavators. The highest tolerance level or assurance of habitat availability for all burned forest and cavity dependent species occurs with this alternative. All existing snags would be available in several size classes with differing densities. Some opportunistic birds, such as hairy woodpeckers, are capable of excavating nests in harder snags (Raphael and White 1984) and it is expected that they will rapidly invade the fire. Other species, such as the Lewis' woodpecker or the northern flicker, require softer snags for excavating nest sites (Raphael and White 1984) and will expand into the fire as snags begin to decay.

Snag persistence

In post fire environments the pulse of standing and down dead wood is an important ecological phenomenon (Hutto 2006, Rose etal., 2001). It is also an ephemeral event that, when complete (about 20 years), will provide another form of habitat where snags are absent from that particular place on the landscape for many decades. In the case of the Tripod Fire, after dead trees fall, it could be as long as 200 years before large snags again occur where the fire killed all the trees. For millennia this natural process has repeated and most wildlife species are adapted to the ebb and flow of snags and dead wood across the landscape.

Many factors affect the longevity of snags including the condition of the tree before it died; the cause of death, soil type, climate, weather conditions, the protection provided by topography or other vegetation, and the tree species, height, and diameter. However, fall rate is a site-specific process that varies for each area of interest (Keen 1929, Everett et al. 1999).

Everett et al. (1999) measured snag numbers and decay class on 26 wildfires on the east slope of the Cascades in Washington. They estimated 50% of small diameter (<10 inch DBH) ponderosa pine and Douglas-fir snags fell during the first 7-12 years, and all were on the ground in 30 and 45 years, respectively. Fifty percent of medium-diameter (10-16 inch DBH) Douglas-fir snags fell during the first 15 years, yet 10% remained standing after 80 years. Fifty percent of large diameter (>16 inch DBH) ponderosa pine and Douglas-fir snags fell during the first 60 years, and approximately 45% remained standing after 80 years. This longevity is greater than predicted in the widely used FVS-FFE model (See Chapter 3.10 Fire and Fuels), partly because Everett et al. (1999) defined snags with a minimum height of 6 feet while FVS-FFE used 20 feet. In addition, they noted that fire-created snags stand longer, while data used in FVS-FFE came mainly from snags created by other agents (beetles or disease), or were in a more moist environment. Generally, the Everett et al. (1999) definition is more relevant to wildlife habitat.

Based on recent studies (Covert-Bratland et al. 2006, Russell et al. 2006, Chambers and Mast 2005, Dudley 2005, Brown et al. 2003, Lehmkuhl et al. 2003, Haggard and Gaines 2001) as well as earlier research (Everett et al. 1999, Morrison and Raphael 1993, Bull 1983) it is clear that the value of burned forest habitat is ephemeral. While some structures will last as legacies (defined in Rose et al. 2001:581) for decades, the most valuable aspects of burned forest begin to fade after 10 years and many processes are complete after 20 years as the new forest begins to take over ecological function.

For all alternatives, including 'no-action', a substantial gap of snag habitat will occur in the areas burned with stand replacing mortality as described in Agee (2002). The areas of light mortality will continue to provide for cavity nesters for many decades because some additional fire-induced mortality will provide dead trees for foraging, roosting and nesting and live trees will continue to provide future dead wood until the next stand-replacement event.

Landscape changes for dead wood are modeled and displayed in the 3.10 Fuels and Fire Behavior section.

<u>Snag condition</u>
Most of the large snags now present in the Tripod area are trees newly killed by the fire. Many old snags also burned. No remaining pre-fire snags would be targeted for removal. The majority of snags now available as habitat are hard. Insects and decay agents will respond rapidly to begin the natural process of changing hard snags to soft ones.

<u>Snag numbers</u>
Based on estimates of tree mortality by habitat type and mortality group (Figure 3.2-16**)** and the numbers of trees per acre >10" DBH recorded on vegetation plots (Figure 3.2-9**)**, more than 5 million >10" snags were created by the fire in the three watersheds (9 subwatersheds) where harvest is proposed (Figure 3.2-17).

Figure 3.2-17: Estimate of existing snags by habitat within the three-watershed area

	Snags > 10”
Dry Forest	136,775
Mixed Conifer	545,580
Montane Forest	4,322,050
Total	**5,004,405**

All Action Alternatives

Design Criteria

In order to meet Forest Plan guidance, the following design measures would be implemented for burned forest and snag and log dependent species for all action alternatives. These measures are incorporated into alternative descriptions and Mitigation Measures and Design Criteria in Chapter 2 and meet Forest Plan retention requirements for snag and down wood habitat.

No harvest would occur in Inventoried Roadless Areas or areas with undeveloped character (more than 96,000 acres within the fire boundary)

Retain all snags <10” DBH

In harvest units CE01, CE02, CE03, CE08, GA01, and GA07 retain all snags greater than 18 inches DBH

Retain all snags > 28” DBH (≥21” DBH in Alternative E) (except those units above)

In Montane Forest /Lynx Habitat retain all snags < 12” DBH

Retain 10% of the area within each harvest unit in a representative unharvested condition by identifying small retention islands surrounding favorable burned wildlife snags 10-28” DBH (see Appendix D for selection criteria for ‘favorable wildlife snags’). Retention islands would comprise no less than 10% of the acreage within all units and include at least 8 favorable snags for each 10 acres harvested.

Retain 40 acres of habitat representative of existing post-fire conditions in all 100-acre ‘neighborhoods’ within and surrounding harvest units. Neighborhoods are described as a ‘roving’ area of 100 acres within which 40% retention criteria will be applied.

In Montane Forest habitat, retain 6 acres of unharvested habitat representative of existing post-fire conditions in all 20-acre ‘neighborhoods’ within and surrounding harvest units

Retain all fire-injured trees that do not meet the definition of a dead tree and/or that have a moderate or high probability of surviving (see Appendix F).

Designate 45 1,000-acre black-backed woodpecker reserves with at least 500 acres of highly suitable habitat as determined in habitat modeling by Dudley and Russell. Some of these would include harvest units, but all would retain at least 500 acres of highly suitable habitat after project completion. This is intended to provide habitat availability for at least 45 pairs of black-backed woodpeckers in all alternatives.

Dead trees that existed before the Tripod fire would not be targeted for harvest because the wood is not valuable for saw timber. These snags would provide additional numbers beyond those identified as favorable wildlife trees above.

Retain all down logs present at the time that trees are marked for removal.

These criteria, taken together, allow the project to meet current Forest Plan direction as amended by the Regional Forester Amendment #2 and interpreted by the July 2007 Forest letter.

Effects

Harvest prescriptions and habitat retention design criteria (described above and in Appendix F Implementation Marking Guide) are identical across all the action alternatives with the exception that alternative E retains all snags and dying trees greater than or equal to 21" DBH. This would be an average of 2.2 additional snags per acre retained. An average of between 0.3 and 1 large (≥ 20 inches DBH) green trees per acre would occur on the acres harvested in all action alternatives depending on the level of fire severity and tree mortality. The number of acres treated (Figures 3.2-19 and 3.2-19a) and yarding method (Appendix B) are the major differences.

Black-backed woodpeckers are not highly tolerant of salvage harvest (Saab and Dudley 1998, Saab et al. 2002). Forty five reserve areas of sufficient size (1,000 acres) to provide for a pair of black-backed woodpeckers (Goggans et al. 1998) were identified by designating areas that met the key habitat qualities that black-backed woodpeckers selected in Idaho (Saab et al. 2002, Dudley 2005). Using GIS and ground verification, areas were identified that had high pre-fire crown closure, large stand size and continuity, and high mortality. Based on models from data collected in Idaho, black-backed woodpeckers nest in patches with higher burn severity and moderate (40-70%) to high (70-100%) pre-fire crown closure. The 45 1,000-acre areas would provide abundantly for black-backed woodpeckers and other species that benefit from stand replacement fire.

Beschta et al. (1995) noted that dead trees have multiple ecological roles including providing habitat for a variety of species. Leaving 50% of the trees in each diameter class, leaving all trees greater than 20 inches DBH or older than 150 years, and leaving all live trees, are among a variety of post-fire salvage management recommendations advanced by these scientists. The scale at which these recommendations should apply was not defined other than the "portions of the post-fire landscape suitable for salvage logging", so it is not clear if each acre or each small subwatershed was the area of consideration for their recommendations. This, of course is a key question for all such projects. For most of the Tripod Salvage project area these recommendations are exceeded.

The Interdisciplinary Team acknowledges and supports the assertion that Beschta et al. (1995) made that post-fire habitat is important habitat. More recent work by many of the same authors (Beschta et al. 2004) and others (Lindenmeyer and Noss 2006, Hutto 2006) also suggests that salvage harvest must be approached carefully. The role natural disturbances play in maintaining biodiversity and ecosystem processes is only beginning to be understood and so these authors and others identify many strategies for caution. Most of the recommendations from Lindenmeyer and Noss (2006 – page 955) and Hutto (2006 – page 990) were incorporated in the design for this salvage project.

Alternatives B, C, and D would not retain all trees greater than 20" DBH. Alternative E would retain all trees 21" and greater. Not all areas at all scales would have 50% of the dead trees in all size classes retained as suggested by Beschta et al. (1995). However, their underlying rationale for habitat retention and preserving biological and physical processes is fully adopted for all alternatives proposed for this project.

Alternatives were designed to retain large portions of the fire area, the watersheds, subwatersheds, and neighborhoods completely as they are; keeping the largest dead trees and keeping pre-fire snags, and down logs; while acknowledging that some areas would be harvested and would resemble unharvested stands as they would appear 10 or 20 years post fire when snag attrition would have occurred. The species that favor these open habitats would be provided for 10-20 years earlier in harvested areas than if they were not harvested (Hutto 2006).

The tables below display the acres harvested and / or acres retained in analysis areas at various scales for each action alternative.

Watershed

At the watershed scale, no more than 5% of the burned acres in the three watersheds are proposed for harvest (Figure 3.2-18).

Figure 3.2-18: Burned acres in each watershed and percent proposed for harvest in each alternative

Watershed	Watershed acres	Watershed acres on National Forest land	National Forest acres burned in Tripod	% burned proposed harvest		
				Alt B & E	Alt C	Alt D
Lower Chewuch River	191,272	113,979	71,463	2.4	2.0	2.8
Middle Methow River	250,023	39,526	20,026	1.1	0.3	2.5
Salmon Creek	105,506	62,729	18,639	5.0	5.0	5.0

Habitat

Over the three-watershed area, within each habitat type, the highest proportion of burned habitat proposed for harvest is in alternative D where 11.4 % (626 acres) of Dry Forest burned would be harvested (Figure 3.2-19).

Figure 3.2-19: Burned acres proposed for harvest in three watersheds by habitat and alternative

Habitat	Total acres habitat N.F. land in three watersheds	Acres burned - all mortality classes	Acres burned proposed for harvest			% burned proposed for harvest		
			Alt B & E	Alt C	Alt D	Alt B & E	Alt C	Alt D
Dry Forest	37,787	5,471	578	578	626	10.6	10.6	11.4
Mixed Conifer	66,740	18,186	1,352	1,314	1,465	7.4	7.2	8.1
Montane	111,709	86,441	807	344	1,301	0.9	0.4	1.5

Figure 3.2-19a displays the proportion of the total area harvested that lies within each habitat type. Most of the harvest would occur in mixed conifer forest habitat in all alternatives.

Figure 3.2-19a: Proportion of total acres harvested by habitat type.

Habitat	Proportion of proposed harvest from each habitat (%)		
	Alt B & E	Alt C	Alt D
Dry Forest	21	26	18
Mixed Conifer	49	59	43
Montane	30	15*	38
Total Acres	2737	2236	3392

* no lynx habitat harvested

Figure 3.2-20 identifies the harvest in each habitat by the amount of tree mortality. The two classes of tree mortality are Stand Replacing (S.R.) and Burned but Functionally Intact (B.F.I.). No more than 12% of the habitat in any mortality class is removed.

Figure 3.2-20: Harvest by mortality class and habitat within three watersheds

Habitat	Acres S. R.	Acres B.F.I.	alt B&E S.R. harvest (%)	alt B&E B.F.I. harvest (%)	alt C S.R. harvest (%)	alt C B.F.I. harvest (%)	alt D S.R. harvest (%)	alt D B.F.I. harvest (%)
Dry Forest	2,598	2,872	294 (11)	284 (10)	294 (11)	284 (10)	321 (12)	304 (11)
Mixed Conifer	10,296	7,890	787 (8)	565 (7)	761 (7)	554 (7)	869 (8)	595 (8)
Montane Forest	61,138	25,306	560 (0.9)	247 (0.9)	197 (0.3)	147 (0.5)	904 (1.5)	396 (1.6)

Subwatershed

Figures 3.2-21, 3.2-22, and 3.2-23 show the acreage within each subwatershed proposed for harvest for each action alternative. The proportion of the subwatershed burned and the proportion of the burned acres of each watershed that the harvest would represent is also displayed. A small portion of the burned habitat within any subwatershed (less than 15% in Pearrygin Creek subwatershed and less than 7% in any other subwatershed) is proposed for harvest. Subwatersheds are generally 10,000 to 30,000 acres in size.

Figure 3.2-21: Alternatives B and E -- Total acres burned in each subwatershed and acres to harvest

Watershed and Subwatershed	Burned ac. sub w.shed	% burned sub w.shed	Total ac. Harvest	% burned proposed harvest
Lower Chewuch River	71,463	62	1654	2.4
Mainstem Lower Chewuch River	*6,601*	*28*	*107*	*1.6*
Boulder Creek	*9,837*	*75*	*271*	*2.8*
North Fork Boulder Creek	*28,540*	*87*	*665*	*2.3*
Pearrygin Creek	*4,783*	*24*	*606*	*13*
Twentymile Creek	*21,703*	*91*	*4.7*	*0.02*
Middle Methow River	*20,026*	*51*	*216*	*1.1*
Upper Beaver Creek	20,026	51	216	1.1
Salmon Creek	18,639	30	878	5
North Fork Salmon Creek	*3,577*	16	*89*	*2.5*
South Fork Salmon Creek	*3,504*	27	*224*	*6*
West Fork Salmon Creek	*11,558*	42	564	*5*
Grand Total	**110,129**	**51**	**2,748**	**2.5**

Figure 3.2-22: Alternative C -- Total acres burned in each subwatershed and acres to harvest

Watershed and Subwatershed	Burned ac. sub w.shed	% burned sub w.shed	Total ac. Harvest	% burned proposed harvest
Lower Chewuch River	71,463	63	1,394	2.0
Mainstem Lower Chewuch River	6,601	28	100	1.5
Boulder Creek	9,837	75	271	2.8
North Fork Boulder Creek	28,540	87	413	1.4
Pearrygin Creek	4,783	24	606	13
Twentymile Creek	21,703	91	3.3	0.02
Middle Methow River	20,026	51	64	0.3
Upper Beaver Creek	20,026	51	64	0.3
Salmon Creek	15,062	37	789	5
South Fork Salmon Creek	3,504	27	224	6
West Fork Salmon Creek	11,558	42	564	5
Grand Total	**106,551**	**55**	**2,246**	**2.1**

Figure 3.2-23: Alternative D -- Total acres burned in each subwatershed and acres to harvest

Watershed and Subwatershed	Burned ac. sub w.shed	% burned sub w.shed	Total ac. Harvest	% burned proposed harvest
Lower Chewuch River	71,463	63	2,004	2.8
Mainstem Lower Chewuch River	6,601	28	208	3.1
Boulder Creek	9,837	75	271	2.8
North Fork Boulder Creek	28,540	87	853	3.0
Pearrygin Creek	4,783	24	647	14
Twentymile Creek	21,703	91	25	0.1
Middle Methow River	20,026	51	504	2.5
Upper Beaver Creek	20,026	51	504	2.5
Salmon Creek	18,639	30	896	5
North Fork Salmon Creek	3,577	16	107	3.0
South Fork Salmon Creek	3,504	27	224	6
West Fork Salmon Creek	11,558	42	564	5
Grand Total	**110,129**	**51**	**3,403**	**3.1**

Habitat and Subwatershed

Figures 3.2-24 and 3.2-25 combine data from the previous two subsections (Habitat and Subwatershed) and display the amount of forest burned by habitat type in each watershed and subwatershed, and the maximum percent harvest proposed in each habitat type (generally alternative D). Acreages in these two tables also include habitat burned in types or areas where no harvest is proposed (Twentymile Creek dry forest and Bear Creek subwatershed in the Middle Methow River watershed). The final column is the maximum percentage of harvest proposed over all habitat types combined.

A small proportion of the habitat burned (in each of the two mortality groups) is proposed for harvest. Exceptions are notable in the dry forest habitat. As much as 63% (of 52 acres) that burned hot in the South Fork Salmon Creek subwatershed is proposed for harvest in all three alternatives. About 650 acres of dry forest that burned hot in North Fork Boulder and Pearrygin Creeks (28 and 33.1% respectively) are the largest aggregations of Dry Forest stand replacement habitat that would be harvested. At the 5th order watershed scale, 79% or more of all burned habitat types would remain after salvage from any alternative, except within Salmon creek, where 41.6% (86 acres) of the Dry Forest that burned hot would be harvested.

Figure 3.2-24: Acres of Complete, High, and Moderate tree mortality in each watershed and subwatershed where harvest is proposed (by habitat type), and largest percentage of harvest proposed in that burned habitat out of the four action alternatives

Watershed and Subwatershed	Stand replacement acres burned and max. % harvest						
	Dry Forest		Mixed Conifer		Montane Forest		Max %
	Ac.	%	Ac.	%	Ac.	%	
Lower Chewuch River	2,795	10.1	7,488	7.8	42,034	1.5	2.6
Mainstem Lo. Chewuch R.	995	0.5	1,227	5.0	2,252	5.0	4.0
Boulder Creek	759	10.9	2,330	5.8	4,573	0.2	2.9
North Fork Boulder Creek	424	28.0	1,959	8.7	17,427	1.8	3.0
Pearrygin Creek	227	33.1	689	30.4	1,476	4.5	14.6
Twentymile Creek	390	0	1,284	0.9	16,306	0.05	0.1
Middle Methow River	134	2.7	1,710	0.4	13,001	2.5	2.2
Upper Beaver Creek	108	3.4	1,476	0.4	12,184	2.6	2.4
Salmon Creek	86	41.6	1,331	20.7	6,920	1.2	4.7
North Fork Salmon Creek	0	0.0	93	27.7	2,553	1.6	2.5
South Fork Salmon Creek	52	63.3	526	21.8	625	2.1	13.4
West Fork Salmon Creek	33	7.7	712	19.0	3,742	0.7	3.7

Figure 3.2-25: Acres of Low tree mortality and Little Change Detected in each watershed and subwatershed where harvest is proposed (by habitat type), and largest percentage of harvest proposed in that burned habitat out of the four action alternatives.

Watershed and Subwatershed	Burned but Functionally Intact – acres burned and max. % harvest						
	Dry Forest		Mixed Conifer		Montane Forest		Max %
	Ac.	%	Ac.	%	Ac.	%	
Lower Chewuch River	3,143	9.4	3,982	5.1	12,946	1.0	3.1
Mainstem Lo. Chewuch R.	953	0.5	504	1.6	668	2.5	1.4
Boulder Creek	462	4.2	731	3.2	981	0.1	2.0
North Fork Boulder Creek	573	13.3	1,544	6.6	6,602	1.2	2.9
Pearrygin Creek	604	32.2	832	8.3	955	3.2	12.3
Twentymile Creek	551	0	372	0.06	3,739	0.06	0.1
Middle Methow River	182	0.3	1,662	0.1	5,720	2.9	2.2
Upper Beaver Creek	124	0.5	1,166	0.2	4,968	3.4	2.7
Salmon Creek	156	6.0	2,741	14.2	7,391	1.4	4.9
North Fork Salmon Creek	0	0.0	80	19.1	848	3.0	4.3
South Fork Salmon Creek	33	23.9	773	6.5	1,495	0.3	2.7
West Fork Salmon Creek	123	1.2	1,888	17.1	5,049	1.4	5.6

DecAID tolerance levels and tolerance intervals

DecAID uses tolerance levels and intervals to summarize wildlife data in a meta-analysis of data from a variety of studies. Tolerance levels are initially a difficult concept to grasp. They are an unfamiliar, seldom used statistical method. However, it is possibly the best statistically valid approach to analyze and summarize the data in DecAID. Tolerance levels allow predictions about attributes of populations.

For the wildlife data, tolerance intervals are estimates of the percent of all individuals in the population that are within some specified range of values. For example, they describe what percent of pileated woodpeckers in a population use snags, say, up to or above certain diameters. Thus, an 80% tolerance level indicates 80% of the individuals in the population have a value for the parameter of interest (say snag density) between 0 and the value for the 80% tolerance level. Or conversely, 20% of the individuals in the population have a value for the parameter of interest greater than the 80% level. The tolerance interval is the range between 2 tolerance levels. For example, the value for 80% is the level and the range of 0 to 80% is the interval.

DecAID displays three tolerance levels (30%, 50%, and 80%) for DBH of snags and diameter of down wood used by wildlife species, and density of snags and percent cover of down wood in areas used by wildlife species.

Additional explanation and extensive details are available at the DecAID website http://wwwnotes.fs.fed.us:81/pnw/DecAID/DecAID.nsf (Mellen et al. 2006).

Comparison with DecAID snag density (>10" DBH) tolerance levels from inventory plots within the three habitat types are displayed in Figure 3.2-26a for the:

existing condition in the 5-watershed reference area surrounding the fire;
for the existing condition within the three watersheds where harvest is proposed (Alternative A); and for the
post-harvest condition for each of the action alternatives (B, C, D and E) within the three watersheds where harvest is proposed.

It is important to note that the inventory data from DecAID represent landscape conditions that contain little, if any, immediate post-fire habitat. The inventory data in most cases do not represent recent post-fire conditions well because the plots sample conditions arising from a variety of disturbances, including but not limited to fire.

Because much of this analysis concerns snag density and availability, it is also important to note that most of the data on snag density from the wildlife literature that is reported in DecAID were recorded at nest, roost, or den sites. The size of vegetation sample plots varied among studies, although plots usually were < 0.1 hectare (1/4 acre). Snag densities in these "used" plots often were higher than snag densities in random plots in the surrounding stand.

Figure 3.2-26a shows that, after harvest, a large portion of the three-watershed landscape (80% or more of the Dry Forest and Mixed Conifer Forest habitats, and more than 66% of the Montane Forest habitat) would be above the 80% tolerance level for the density of snags > 10" DBH. The portion of these areas that were highly modified (regeneration

harvest since 1980) have few to no snags. This is the comparison with background, pre-fire snag densities.

Figure 3.2-26a: Reference conditions from DecAID inventory data compared with conditions within the fire area for (> 10' DBH) snag densities

	tolerance interval	snags per acre > 10" DBH	DecAID reference conditions	5 large watershed analysis area (883,400 acres) (%)4	alt A (Tripod Fire area – 3 watersheds)	alt B	alt C	alt D	alt E
Habitat			**% of area**						
Ponderosa Pine Douglas-Fir[1]	0-30	0-1.3	54	57	8 (highly mod)	8	8	8	8
	30-50	1.3-2.6	0	1	-	-	-	-	
	50-80	2.6-7.1	26	12	-	11	11	11	10
	80+	> 7.1	20	30	92 (avg=21 spa)	81	81	81	82
Mixed Conifer[2]	0-30	0-4.0	30	51	12 (highly mod)	12	12	12	12
	30-50	4.0-7.1	20	8	-	8	7	8	7
	50-80	7.1-19.8	30	2	-	-	-	-	1
	80+	> 19.8	20	39	88 (avg=29 spa)	80	81	80	80
Montane Forest[3]	0-30	0-10.1	30	24	2 (highly mod)	3	2.5	4	3
	30-50	10.1-16.3	20	5	-	-	-	-	1
	50-80	16.3-32.0	30	12	30 (avg=26 spa)	30	30	29	30
	80+	> 32.0	20	58	68 (avg=69 spa)	67	67.5	67	66

[1] DecAID (Mellen et al. 2006) Figure PPDF_S.inv-2
[2] DecAID (Mellen et al. 2006) Figure EMC_NCR_S.inv-2
[3] DecAID (Mellen et al. 2006) Figure MMC_S.inv-2
[4] Based on CVS plot data.

The key information presented here is that when compared to DecAID reference conditions for the proportion of the landscape where snag densities exceed the 80% tolerance level (20% for each habitat), the ponderosa pine habitat in the large assessment area is at 30% (meaning 30% of the Dry Forest in the 883,400-acre area has more than 7.1 snags per acre >10" DBH), the Mixed Conifer habitat is at 39% (meaning that 39% of the mixed conifer Forest in the 883,400-acre area has more than 19.8 snags per acre >10" DBH), and the Montane Forest habitat is at 58% (meaning that 58% of the montane forest in the 883,400-acre area has more than 32 snags per acre >10" DBH). There is a

substantial excess of snags within the largest area assessed compared with background snag densities.

Comparing the alternatives (No Action Alternative A with the action alternatives) shows little difference over the three watershed area for snag densities. At this scale, removing 100,000 to 150,000 dead and dying trees greater than 10 inches and less than 28” or 21” or 18” depending on the alternative and/or location, would have a similar (very small) effect for snag and burned forest species for all alternatives since there are more than 5 million snags present in this particular analysis.

For birds that benefit from fire and higher snag densities, both the existing condition in the largest area assessed (883,400 acres) and the post-harvest condition within the three-watershed area where harvest is proposed would provide well for their habitat needs. Viability of the species

Comparison with DecAID snag density (>20” DBH) tolerance levels from inventory plots within the three habitat types are displayed in Figure 3.2-26b for the:

existing condition in the 5-watershed reference area surrounding the fire;
for the existing condition within the three watersheds where harvest is proposed (Alternative A); and for the
post-harvest condition for each of the action alternatives (B, C, D and E) within the three watersheds where harvest is proposed.

Figure 3.2-26b: Reference conditions from DecAID inventory data compared with conditions within the fire area for (> 20' DBH) snag densities

	tolerance interval	snags per acre > 20" DBH	DecAID reference conditions	5 large watershed analysis area (883,400 acres) (%)[4]	alt A (Tripod Fire area – 3 watersheds)	alt B	alt C	alt D	alt E
Habitat			**% of area**						
Ponderosa Pine Douglas-Fir[1]	0-50	0-1.1	71	63	38	49	49	49	49
	50-80	1.1-2.5	9	10	15	15	15	15	14
	80+	> 2.5	20	27	47 (avg=6.0 spa)	36	36	36	38
Mixed Conifer[2]	0-30	0-1.1	57	51	20	23	23	22	23
	30-50	1.1 - 2.1	0	2	4	11	11	12	10
	50-80	2.1-5.3	23	22	39	36	36	35	37
	80+	> 5.3	20	25	37 (avg.=7.9 spa)	30	30	29	30
Montane Forest[3]	0-30	0-2.7	30	8	2	4	4	6	4
	30-50	2.7-4.2	20	16	4	4	4	4	3
	50-80	4.2-9.5	30	15	17	16	16	15	17
	80+	> 9.5	20	61	77 avg=13.1 spa)	76	76	75	76

[1] DecAID (Mellen et al. 2006) Figure PPDF_S.inv-3 and inv-22, supported by Harrod et al. 1998.
[2] DecAID (Mellen et al. 2006) Figure EMC_NCR_S.inv-3 and inv 23.
[3] DecAID (Mellen et al. 2006) Figure MMC_S.inv-3 and inv-23.
[4] Based on CVS plot data.

The key information presented here is that when compared to DecAID reference conditions for the proportion of the landscape where snag densities exceed the 80% tolerance level (20% for each habitat), the ponderosa pine habitat in the large assessment area is at 27% (meaning 27% of the Dry Forest in the 883,400-acre area has more than 2.5 snags per acre >20" DBH), the Mixed Conifer habitat is at 25% (meaning that 25% of the mixed conifer Forest in the 883,400-acre area has more than 5.3 snags per acre >20" DBH), and the Montane Forest habitat is at 61% (meaning that 61% of the montane forest in the 883,400-acre area has more than 9.5 snags per acre >10" DBH). There is a substantial excess of snags within the largest area assessed compared with background snag densities.

Comparing the alternatives (Alternative A with the action alternatives) shows little difference over the three watershed area for large snag densities. At this scale, removing

2% to 3% of the 300,000 large trees in the three watershed area would have a similar (very small) effect for snag and burned forest species for all alternatives.

The table shows that, after harvest, a large portion of the three-watershed landscape (36% of the Dry Forest and 29-30% of the Mixed Conifer Forest habitats, and 75-76% of the Montane Forest habitat) would be above the 80% tolerance level for the density of snags > 20" DBH. These figures are substantially above DecAID inventory reference conditions of 20% of the landscape.

Figures 3.2-27a and 3.2-27b compare snag densities for white-headed woodpeckers and black-backed woodpeckers for all alternatives (within the three-watershed area burned) with DecAID wildlife data in ponderosa pine habitat for white-headed woodpeckers, and mixed conifer habitat for black-backed woodpeckers.

Figure 3.2-27a: DecAID snag density (>10" DBH) tolerance intervals compared with conditions after each alternative is implemented for the three watershed area. Based on average snag densities from CVS plots (Figure 3.2-10) and acres from Figure 3.2-20 and estimates of snag densities from Figure 3.2-8.

	DecAID tolerance interval	**snags per acre > 10" DBH**	**alt A**	**alt B**	**alt C**	**alt D**	**alt E**
species			% of landscape				
White-headed woodpecker	0-30	0 – 18.6	43	48	48	49	47
	30-50	18.6 – 52	57	52	52	51	53
	50-80	52 – 98.7	-				
	80+	> 98.7	-				
Black-backed woodpecker	0-30	0 – 57.2	100	100	100	100	100
	30-50	57.2 – 82.4	-				
	50-80	82.4 - 119.2	-	-	-	-	
	80+	> 119.2	-	-	-	-	

From: DecAID (Mellen et al. 2006) PPDF_PF.sp-23, and EMC_PF.sp-6

The burned habitat white-headed woodpecker data in DecAID are from SW Idaho (Saab et al. 2002, Saab and Dudley 1998, Saab et al. 2007). Post-fire data for snags > 20" DBH are not available for white-headed woodpeckers.

The burned habitat black-backed woodpecker data in DecAID are from SW Idaho (Saab et al. 2002, Saab and Dudley 1998, Saab et al. 2007), western Montana (Hejl et al. 2000), and the east-central Washington Cascades (Haggard and Gaines 2001).

The comparisons with these nest site data in the tables indicate that, for all the alternatives (including no-action), about half of the landscape would be within the 30-50% tolerance limit reported at white-headed woodpecker nest sites, and about half of the landscape would be below the 30% tolerance limit. A possible interpretation is that the habitat conditions here are not favorable for white-headed woodpeckers (there is no habitat with a high level of assurance (80% tolerance level or better) of sufficient snag density for this species). Another possibility is that conditions here are suitable (maybe

even highly suitable), but the conditions where research has been done for white-headed woodpeckers is sufficiently different so that the comparison is difficult.

Most likely it is because the wildlife data came from nest sites and the birds select high density snag patches for nest sites. So at a landscape scale because of the high densities at nest sites, good habitat is not expected.

It is possible that Tripod sites are poorer growing conditions for ponderosa pine habitat than others studied in Oregon and Washington. The trees-per-acre averages for CVS plots adjacent to the fire indicate that pre-fire conditions had fewer trees per acre than the 50% tolerance level for snags reported at post-fire nest sites studied. It is probable that some of each supposition is at work here.

Figure 3.2-27b: DecAID snag density (>20" DBH) tolerance intervals compared with conditions after each alternative is implemented for the entire three-watershed area. Based on average snag densities from CVS plots (Figure 3.2-10) and acres from Figure 3.2-20 and estimates of snag densities from Figure 3.2-8.

	DecAID tolerance interval	**snags per acre > 20" DBH**	**alt A**	**alt B**	**alt C**	**alt D**	**alt E**
species			% of landscape				
White-headed woodpecker	0-30	0 – 0.5	78	79	79	79	79
	30-50	0.5 – 1.8	9	9	9	9	9
	50-80	1.8 – 3.8	13	12	12	12	12
	80+	> 3.8	-	-	-	-	-
Black-backed woodpecker	0-30	0 – 0	-	-	-	-	
	30-50	0 – 1.4	85	86	86	86	86
	50-80	1.4 – 5.7	15	14	14	14	14
	80+	> 5.7	-	-	-	-	-

From: DecAID (Mellen et al. 2006) PPDF_S/L.sp-22.

Figure 3.2-27b displays the tolerance levels from DecAID for large tree (>20" DBH) conditions at nest sites for these species in un-burned forest. This could be a more appropriate comparison for white-headed woodpeckers since they possibly exhibit a preference for green forest and prefer trees larger than 20" DBH (Mellen et al. 2006: figure PPDF_S/L.sp-1) and possibly a poorer comparison for black-backed woodpeckers since they exhibit a preference for smaller trees, higher snag densities, and more severely burned forest (Saab and Dudley 1998). There is little measurable difference between all alternatives at this scale.

The white-headed woodpecker data for unburned habitat in DecAID is from central Oregon (Dixon 1995, Frenzel 2004) although the data from the Frenzel study is possibly from a declining population (see the discussion in DecAID (Mellen et al. 2006)), and the black-backed woodpecker data for unburned habitat in DecAID are from northeastern Oregon (Nielson-Pincus 2005).

Based on habitat descriptions in Marshall (1997), the expectation is that much of the Dry Forest that was burned but is still functionally intact would be highly suitable for white-

headed woodpeckers. At least 89% of this condition in Dry Forest would be left as it is after action alternatives are implemented (from Figure 3.2-20).

Figure 3.2-27b also reveals that when comparing the *average >10" DBH* snag densities for Tripod alternatives to average *>10" DBH* snag densities found at post-fire nest sites for black-backed woodpeckers, the entire landscape falls below the 30% tolerance limit in all alternatives. Once again, it is possible there are not many suitable places for black-backed woodpeckers in the Tripod fire. This is not likely based on habitat suitability modeling completed in January 2007. Highly suitable habitat was predicted on more than 68,000 acres within the Tripod fire boundary. It is likely that habitat conditions across the range of black-backed woodpeckers are different and not all of the conditions suitable for these birds have yet been examined thoroughly or described adequately.

DecAID contains the following caveat: "In the wildlife studies, if the vegetation sample plots were placed among snags occurring in locally dense clumps < 1 ha in size, then extrapolating the snag densities from such sample plots to a per-ha basis may yield very high snag densities that may not be appropriately interpreted as stand-wide averages or management objectives" (Mellen et al. 2006).

Forty five habitat reserves for black-backed woodpeckers were designated as a design measure for all alternatives and all of these are predicted to be highly suitable for black-backed woodpeckers (Dudley 2005, Saab et al. 2002). While some harvest would occur within the reserves, considerably more than 50% of each would remain intact. None of the alternatives would limit the effectiveness of these reserves for black-backed woodpeckers and other key post-fire species. Additional habitat outside these reserves would contribute further toward benefiting all the species that black-backed woodpeckers represent as a Management Indicator.

Based on 5 years of cavity nester data collection in and near the fire, and field visits after the fire, the post-fire conditions are expected to be very favorable for cavity nesters that use partially or completely burned forest in all alternatives.

<u>Neighborhood</u>
Neighborhoods are the area immediately adjacent to harvest units. A 100-acre area including all harvest units was examined using a 'roving window' GIS analysis to determine the type of habitat that would remain post-harvest. This analysis clarifies the proportion of the area near harvest units that were open due to previous logging, the places where most trees were killed, or where lower fire intensity would provide for continued development of snag habitat for several decades. A proportion of the neighborhoods were unburned because several harvest units are proposed at the edge of the fire perimeter.

Because much of the harvest planned in the Tripod Fire salvage project is in the area where harvest has occurred in the past, the assessment of the effects of prior logging is important. Some earlier harvest removed most of the habitat of value to cavity nesters. This analysis examines the amount of habitat remaining for three mortality levels and three levels of previous harvest.

The largest proportion of harvest is in stands that were lightly modified in the past

Figure 3.2-28: Alternatives B and E acres (and %) remaining unharvested within 100-acre 'neighborhoods'
(S.R. = Stand Replacing. B.F.I. = Burned but Functionally Intact.)

Previous harvest	Existing	Remaining S.R.	Remaining B.F.I.	Remaining unburned (green)	total % area salvaged
Highly modified	1,805	562 (83)	807 (89)	223 (100)	12
Lightly Modified	4,975	890 (55)	2,014 (74)	632 (100)	29
Natural	7,314	3,196 (80)	2,341 (89)	691 (100)	15
Total	**14,094**	**4,684 (75)**	**5,162 (82)**	**1,546 (100)**	**19**

Figure 3.2-29: Alternative C – acres (and %) remaining unharvested within 100-acre 'neighborhoods'

Previous harvest	Existing	Remaining S.R.	Remaining B.F.I.	Remaining unburned (green)	total % area salvaged
Highly modified	1,207	232 (71)	626 (89)	182 (100)	14
Lightly Modified	4,773	804 (53)	1,971 (74)	597 (100)	30
Natural	4,608	1,662 (79)	1,662 (88)	602 (100)	15
Total	**10,588**	**2,698 (68)**	**4,259 (81)**	**1,481 (100)**	**20**

Figure 3.2-30: Alternative D – acres (and %) remaining unharvested within 100-acre 'neighborhoods'

Previous harvest	Existing	Remaining S.R.	Remaining B.F.I.	Remaining unburned (green)	total % area salvaged
Highly modified	2,068	597 (81)	944 (90)	287 (100)	12
Lightly Modified	3,532	49 (5)	1,207 (61)	636 (100)	46
Natural	8,369	3,507 (76)	2,588 (86)	752 (100)	18
Total	**13,969**	**4,153 (66)**	**4,739 (78)**	**1,675 (100)**	**24**

These tables show that the 100-acre neighborhoods surrounding harvest units include a total of 14,094 acres in alternatives B and E, 10,588 acres in alternative C and 13,969 acres in Alternative D. Little 'highly modified' habitat (places previously logged) that burned (in either category – Stand Replacing or Burned but Functionally Intact) in Tripod would be salvaged in any alternative. No green habitat is removed. 10-20% of the neighborhoods include unburned = green forest habitat. A considerable amount of lightly modified habitat (previous shelterwood and thinning harvest areas) that burned would be harvested. Alternative D harvests nearly all lightly modified habitat that was stand-replacement burned (980 acres) within 100-acre neighborhoods adjacent to harvest units.

The figures also show that only 15%, 15% and 18% respectively for Alternatives B and E, C, and D are places that were not previously harvested.

Alternatives B and E propose to harvest dead trees in 19% of the burned habitat in neighborhoods, Alternative C harvests in 20% and Alternative D harvests in 24% (of the aggregation of all types) of habitat. Alternative E would harvest in the same proportion of

burned habitat as alternative B, but would retain about 6,000 more snags ≥ 21 inches diameter than alternative B. At this scale, additional large snag habitat for cavity users would be provided by alternative E. About 220 more large snags in each 100-acre neighborhood would be available for nesting and roosting. In 20-30 years, down wood amounts would be more abundant and would contribute to foraging habitat for species that benefit from down wood.

No less than 76% of the habitat in 100-acre areas surrounding harvest units would be unharvested (Figure 3.2-30). This includes habitat in all conditions from severely burned 'natural' forest, to unburned clearcuts that have regenerated for 20 years. This means that within these 100-acre areas, species that benefit from each type of habitat would be provided for and at least 76 acres in each 100-acre area will be left as it is.

Harvest Units

A total of 134 harvest units (2 to 181 acres in size) are proposed in action alternatives. These overlap considerably across the alternatives with all 134 being included in Alternative D. Alternatives B, C and E propose a subset of these (see Appendix B). Within harvest units (2,748 acres in alternatives B and E, 2,247 acres in alternative C, and 3,404 acres in alternative D), snag densities would be reduced substantially. After harvest, these units would resemble forest openings with scattered, small reserve islands surrounding individually selected wildlife snags, occasional live trees, and occasional burned trees greater than 28" DBH. Reserves would amount to 10% of the area within harvest units being retained in a representative condition. Small mammals (chipmunks, deer mice), some amphibians and reptiles (long-toed salamanders, rubber boas, western skinks, Western fence lizards), and possibly some unknown invertebrates would likely be limited in these areas for a number of years.

Harvest would hasten the period when some snags would be absent from the acres where logging occurred. As stated by Hutto (2006) these areas would emulate a later stage of succession: something like a forest 10 years after a fire. The period of snag dearth would be approximately 20 yeas longer than the adjacent unharvested areas.

It is not intended for the area within harvest units to provide optimum habitat for all cavity nesters. In fact, black-backed woodpeckers, mountain bluebirds, and other species that exhibit a preference for burned forest are not likely to use these harvested stands. A variety of wildlife species (dusky flycatchers, chipping sparrows, house finches, mule deer, black bears, wild turkeys, tree swallows, Western bluebirds, Nashville warblers) that benefit from forest openings, including some that use snags, will be provided for in these areas

It is instead considered that the 10% area remaining, described in the design criteria above (for Dry Forest and Mixed Conifer Forest), would allow for some foraging and nesting use by common cavity nesters like chickadees and nuthatches, but would be of limited value to the species that require greater snag densities. Other species that prefer more open conditions will thrive in these harvest units.

Alternative E provides a different approach to habitat retention within the harvest units. On average it would provide 2.2 more large snags per acre within the areas harvested compared with alternatives B, C, and D. At the harvest unit scale, this alternative would

provide more options for cavity users and species that require down wood, especially those benefiting from open conditions like Lewis' woodpeckers. More foraging, roosting, and nesting habitat would be provided on the 2,748 acres considered in this alternative. Because of home range size and territorial competition, more snags would not necessarily equate to more cavity users. Because most cavity users prefer larger snags, and because larger snags persist longer, the most important benefit of alternative E could be that snag habitat would be available for a longer period of time. This alternative would also be more consistent than the other action alternatives with the recommendations from Beschta et al. (1995) for leaving large trees.

Within and surrounding harvest units, some of the green trees that survived the fire, especially some of those damaged by fire, will succumb to bark beetle induced mortality (whether or not there is harvest). Some trees that appear to have survived the fire will die in the next five years. This is a natural process after fire and provides both for habitat losses and habitat gains for various species. The amount of harvest proposed for any action alternative would not have a measurable effect on this process.

The area outside harvest units including the 100-acre neighborhoods, the unharvested roadless area, and the unharvested portion of black-backed woodpecker reserves would certainly be more valuable habitat for species that benefit from higher snag densities and burned forest habitat. In these areas, adequate habitat will be available to insure the survival and viability of burned forest species.

Within salvage harvested units, standing snags would not be as abundant as those in areas outside harvest units.

In lynx habitat (Montane Forest), retaining 30% of 20-acre areas within and surrounding harvest units would function to contribute additional snag habitat for cavity users and abundant down wood cover for recovering populations of snowshoe hares as snags collapse and stands regenerate. Cover is a very important factor for snowshoe hares (Hodges 2000).

For all harvested stands in Dry and Mixed Conifer Forest habitat, the 10% of the acreage retained would provide an *average* minimum of about 4 snags per acre > 10" DBH, and 0.4 snags per acre > 20" DBH. This would be allocated for 10-acre areas, so, in general, 9 acres could be largely without snags greater than 10" DBH.

In Montane Forest habitat, the 30% of the acres retained within 20 acre neighborhoods would provide an average minimum of about 20 snags per acre > 10" DBH and about 1.4 snags per acre > 20" DBH. This would be allocated for 20 acre areas, so in general, 14 acres could be largely without snags greater than 10" DBH.

<u>Large trees</u>
The amount of large snags (>20" DBH) habitat that would be remaining after harvest was assessed based on:
1. the average number of large trees per acre derived from 221 inventory plots near the fire (Figure 3.2-9),
2. assumptions about the amount of tree mortality in two categories (stand replacing and functionally intact - Figure 3.2-16), and

3. the amount of harvest proposed in each alternative (Figure 3.2-20**)**.

Results are displayed in Figure 3.2-31. These numbers slightly overestimate the habitat removed since inventory data count all snags >20" and harvest proposed in this project would leave all snags >28" DBH or all snags ≥ 21 inches DBH for Alternative E.

Calculations were:
Average large trees per acre **x** mortality level **x** number of acres for each mortality level = the number of snags for each mortality class (S.R. and B.F.I.). Adding mortality classes together gives the number of snags for that habitat. Large trees per acre **x** mortality level **x** acres of harvest in that habitat for each mortality class = number of dead and dying trees removed. Remaining values are the difference of dead and dying trees removed from existing dead and dying trees.

Alternative E would allow the removal of only those 'large' snags less than 21 inches DBH. This would amount to 18%, 20%, and 17% of the snags present that are greater than 20 inches DBH in the Dry Forest, Mixed Conifer Forest, and Montane Forest respectively based on CVS plot data. Generally this is about 0.5 snags per acre greater than 20" DBH and less than 21" DBH.

These are representations of averages and the actual conditions on each acre would be highly variable. This is simply another analysis model to estimate the types of habitat that would be available.

Figure 3.2-31: Large snags retained in burned habitat within three watersheds

habitat	large snags existing	alt B large snags remaining	alt C large snags remaining	alt D large snags remaining	alt E large snags remaining
Dry	11,103	9,902 (89%)	9,902 (89%)	9,771 (88%)	10,851 (98%)
Mixed	28,415	26,190 (92%)	26,426 (93%)	26,142 (92%)	27,960 (98%)
Montane	252,994	250,717 (99%)	252,048 (99%)	248,946 (98%)	252,564(99%)

By this analysis at least 88% of large snags in Dry Forest, 92% of large snags in Mixed Conifer Forest, and 98% of large snags in Montane Forest habitat would be retained. Alternative E would retain at least 98% of the existing large snags.

Project design criteria; retaining 10% of the area within each harvest unit (which on the dry and mixed conifer forest types would retain an average minimum of four snags per acre > 10" DBH, and 0.4 snags per acre > 20" DBH, and retaining 40 acres of habitat representative of existing post-fire conditions in all 100 acre neighborhoods within and surrounding harvest units (on average no less than 76% of 100 acre neighborhoods would be retained providing an average 34 trees/snags per acre of all sizes over 100 acres (Figures 3.2-28 to 3.2-30)). This would meet the Forest guidance letter of July 3, 2007 to retain an average of four snags/acre over 100 acres of the largest available snags.

<u>Legacy snags</u>
For all action alternatives, a large proportion of the trees in areas of burned forest are retained (at scales larger than the harvest unit). In addition a large proportion of snags greater than 20" DBH are retained (Figure 3.2-31) and all snags >28" DBH are retained.

Because of those conditions, there would be little difference in the habitat these snags provide for the next 5 decades for species that benefit from legacy trees as described in Rose et al. (2001) in any alternative within the three watersheds where harvest is proposed. A few of these legacy snags will be standing more than a century from now. Alternative E proposes to retain an average of 2.2 more large snags per acre. This amounts to about 6,000 snags greater than or equal to 21" DBH.

At the harvest unit scale for Alternatives B, C, and D, about 6,000 of the large snags that Rose et al. (2001) describe as legacy snags would be removed. At the scale of 5-20 acre patches, there would be places where large snag habitat is substantially reduced. For some species of invertebrates and possibly some small mammals this reduced level of large snags could limit populations at this scale until large trees grow and die again.

Planting

Tree planting with a variety of species suitable to the sites where harvest occurred would accelerate recovery of forested habitat (see section 3.5 Forest Vegetation). This effort would not have a measurable effect on snag, log, and burned forest wildlife species for many decades (beyond the time horizon of 50 years considered here). The ultimate development of ponderosa pine forest and large pine snags from pine trees planted would enhance habitat for white-headed woodpeckers and pygmy nuthatches but this is considerably beyond any time horizon considered here.

Danger tree removal

Forty seven miles would be examined and, where snags or trees have the potential to hit the road and present an 'Imminent Danger' of falling as defined in *Field Guide for Danger Tree Identification and Response* (USDA and USDI 2005a) they would be cut (see Implementation Guide – Danger Trees in Appendix F). It is estimated that this would amount to less than 100 trees >20" DBH. Most snags and trees removed would be less than 12" DBH and most snags and trees cut would be left in place. Because this is a small fraction of the available habitat, because only the portion of the trees and snags presenting an imminent danger to the road would be cut, and because there would be adjacent habitat outside the road corridor, this would have a negligible effect on wildlife habitat. There is no difference in the mileage treated in all action alternatives.

Damaged trees

The Tripod Fire affected trees across a complete range of damage levels. Some trees burned around the base, but no damage occurred. Some trees were scorched on the bark, but the canopy was unaffected. Many trees were burned partially, but will recover. For some, although little damage is apparent to the bole or the canopy, the roots have been severely damaged. Others were burned partially and will die from the effects of fire, or from insect and disease attacks to the fire-weakened tree. A large number of trees are obviously completely dead.

Tree size, age, species, health and vigor, fire intensity, fire duration, amount of soil moisture, prior physical injuries, position on the landscape, and conditions after the fire are some factors that affect whether a tree is killed or not.

For some trees, it is difficult to determine if it is dead or will die in coming years. A process to make this judgment is described in the Implementation / Marking Guide in Appendix F.

From an ecological perspective, the most important consideration at all scales, after the decision is made that a tree is likely to die and would then be harvested, is whether there are sufficient structures remaining to further the ecological processes of regeneration, regrowth, and recovery. The design criteria described above included consideration of the trees that were not clearly dead. The number of snags displayed in Figure 3.2-31 was calculated with these trees specifically in mind.

After the harvest of dead trees and trees expected to die within one year of project implementation, many snags of various sizes, many live trees of various sizes, and many dying trees of various sizes would be left at all scales. These snags, live trees, and dying trees would provide adequately to support ecological processes of regeneration, regrowth, and recovery throughout the fire and salvage harvest area.

Forest Plan Amendment

The Interim Wildlife Standard of the Eastside Screens was intended to provide for the retention and enhancement of late and old structural stages in eastside forests for wildlife species that benefit from these conditions. The primary focus was green forests and the screens were not designed to specifically address post-fire environment s as directly as some recent research has (Lindenmeyer and Noss 2006, Hutto 2006).

The Eastside Screens state "Outside of LOS, many types of timber sales activities are allowed. The intent is to maintain or LOS components in stands subject to timber harvest as much as possible…". Three standards apply to this intent:

1. Maintain all remnant late and old seral and/or structural live trees>21"DBH that currently exist within stands proposed for harvest.
2. Manipulate vegetative structure that does not meet late and old structural (LOS) conditions in a manner that moves it toward these conditions as appropriate to meet HRV.
3. Maintain 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.

An amendment is proposed for Alternative B, C, and D that allows the harvest of a proportion of the fire-injured trees that are determined to be dying (as described in the Forest Vegetation section). These would be trees that are greater than or equal to 21" DBH that have a low probability of survival. All trees that are expected to be alive one year from project implementation would be protected.

However, considering the intent of the Eastside Screens to provide for the retention an enhancement of late and old structural stages in eastside forest; harvesting dying trees with a low probability of survival, from stands that were significantly impacted in the Tripod Fire, would not limit the ability of those stands to develop late and old structural conditions at some point in the future (many decades from now). In addition, the salvage harvest proposed in each action alternative would have no effect on future parklike (large diameter, open canopy structure) conditions, where this condition occurred historically, because only dead trees and those fire-injured trees expected to die within one year of project implementation would be harvested.

Wildlife that benefit from late and old structural conditions in live forests were affected severely by the fire. The harvest of dead and dying trees (including some dying trees greater than or equal to 21"DBH) within stands that do not have late and old structural conditions, would have little impact on these species since they are unlikely to be present. Even with the amendment proposed that would allow the harvest of fire-injured trees that would be dead within one year, the intent of the Eastside Screens interim wildlife standard (to provide for old-growth species) would be met.

Down wood

Suggested optimum levels of down woody material for providing acceptable risks of fire hazard and fire severity while providing desirable amounts for soil productivity, soil protection, and wildlife needs were calculated for warm, dry forest types and cool, subalpine forest types by Brown et al. (2003) for the Western U.S. A range of 5 to 20 tons per acre for warm-dry types and 10 to 30 tons per acre for cool types seemed to best meet most resource needs. For wildlife, these optimum levels included both standing and downed coarse woody debris. Levels representing the high end for pre-settlement conditions were found as follows: 5 to 10 tons per acre for warm, dry ponderosa pine and Douglas-fir types, 10 to 20 tons per acre for cool Douglas-fir types, and 8 to 24 tons per acre for cool lodgepole pine and other subalpine types (Brown et al. 2003).

The Brown et al. (2003) information was further refined based on the experience of silviculturists and fire ecologists on the Okanogan and Wenatchee National Forests (Ranges of 5 to 10 tons per acre for warm-dry forest types, 7 to 15 tons per acre for mixed conifer forest types and 10-18 tons per acre for montane forest types were considered optimal considering the historical dynamics of this material on the Okanogan-Wenatchee National Forests. See Chapter 3.10 Fire and Fuels, Affected Environment and Figure 3.10-4). Within harvest units, down wood levels would be reduced substantially compared with areas not harvested. However, project design criteria; retaining 10% of the area within each harvest unit (which on the dry and mixed conifer forest types would retain an average minimum of four snags per acre > 10" DBH, and 0.4 snags per acre > 20" DBH, and retaining 40 acres of habitat representative of existing post-fire conditions in all 100 acre neighborhoods within and surrounding harvest units (on average no less than 76% of 100 acre neighborhoods would be retained providing an average 34 trees/snags per acre of all sizes over 100 acres (Figures 3.2-28 to 3.2-30)) would contribute to down wood over the next ten to twenty years. Additionally, all down logs (present at the time of mark and cruise) would be retained. Therefore, all alternatives would meet the Eastside Screens down log standard.

As reported in the Fuel section (Figure 3.10-8), some mixed conifer areas might be deficient currently in down wood from logs being consumed during the Tripod fire. Design criteria for all action alternatives prescribe leaving all down trees. Together with the snags retained for wildlife habitat and ecosystem function (described above that would fall within ten to twenty years), the green trees that will die and fall in the near or distant future, and future events that cause tree mortality (such as wind storms), down wood amounts would exceed Forest Plan guidance for all areas within 15 years.

Other activities

Piling and burning slash, construction of roads, opening existing roads, and road closures are not expected to affect populations of burned forest and snag dependent species.

Firewood harvest and danger tree falling will remove some snags resulting in a minor reduction of habitat. This reduction would not have a measurable effect on dead wood dependent species.

Long-term

In all action alternatives, the benefit of the retention criteria for snag and burned forest species would last for about 20 years with an additional small lasting benefit to snag dependent species for up to 80 years from the largest few legacy trees remaining from the fire. After 20 years the new forest will begin to exert an ecological influence and within 50 years the species that benefit from burned forest would have been replaced by those that occupy live conifer forest.

Summary And Conclusions For Action Alternatives

The effects of the action alternatives on snag and burned forest habitat are very similar since similar sized snags are harvested in all alternatives, except that Alternative E would retain an average of 2.2 large snags per acre more than the other action alternatives.

There is a surplus within the 5-watershed area for high-density snag habitat, especially in the Montane Forest habitat type.

No more than 5% of the burned acres in any 5th order watershed are planned for harvest (Figure3.2-18).

The highest amount of harvest proposed for any habitat type burned within the three-watershed area is 11.4% of the Dry Forest burned in Alternative D (Figure 3.2-19).

14% of the habitat burned in the Pearrygin Creek subwatershed is proposed for harvest in Alternative D (Figure 3.2-23). All other subwatersheds have less than 7% of the burned habitat proposed for harvest.

A high proportion of the burned Dry Forest is proposed for harvest in the South Fork Salmon Creek subwatershed. A moderate proportion of the burned Dry Forest is proposed for harvest in North Fork Boulder Creek, Pearrygin Creek subwatersheds. A moderate proportion of burned Mixed Conifer forest is proposed for harvest in Pearrygin Creek and North Fork Salmon Creek (Figure 3.2-24).

At least 76% of the habitat within 100-acre neighborhoods would remain as it is currently (Figures 3.2-28 to 30).

Most of the snags would be removed within all harvest units. In Dry and Mixed Conifer Forest, a representative 10% of the area within harvest units would be retained unharvested. In Montane Forest, a representative 30% of 20 acre areas within and surrounding harvest units would be retained unharvested. These areas would function as openings and not as burned forest habitat although some snags and down logs would be retained sufficient to meet Forest Plan requirements as amended.

Snag persistence will follow natural patterns. The burned forest habitat value will be completed in approximately 20 years and new conifer forest will begin replacing that habitat. In that time, additional fires will have burned and new parts of the watershed will replace this for burned forest and snag habitat.

Value for snag dependent species will likely come from lightly burned and unburned forest after highly burned areas cease to function as snag and burned forest habitat in about 20 years.
Some habitat is lost with the removal of snags, but abundant large snag habitat would remain and some of the largest snags will persist for as long as 80 years.
The creation of openings with scattered snags proposed in action alternatives could provide more aerial foraging opportunities for insect eaters like Lewis's woodpecker and olive-sided flycatchers.
The range of conditions available after harvest includes heavily burned forest, lightly burned forest, and unburned forest within 100-acre 'neighborhoods' surrounding harvest units. In combination with habitat reserves for black-backed woodpeckers, these conditions will provide abundant habitat for a wide array of species including all Management Indicator cavity nesters for at least 20 years.
This analysis considers the watersheds and subwatersheds where harvest is proposed. Another 10 subwatersheds (more than 65,000 acres) burned where no harvest is planned. These acres will also provide snag and burned forest habitat beyond what is presented here.

Cumulative Effects

Past actions and their current effects are considered in Affected Environment above. Below are the potential cumulative effects for burned forest and snag and log dependent species. The area considered for cumulative effects for these species was the three 5th order watersheds area in which salvage is proposed. The timeframe considered for cumulative effects is 20 years, which is approximately how long it will take the new forest to begin to take over ecological function (see the Burned Forest and Snag Habitat Environmental consequences, Snag Persistence section).

Timber sales

Ongoing and future timber harvest (Mutton, Conger, Flatmoon, and Buck) would remove some habitat for dead wood species, but Forest guidelines for minimum snag and down log requirements would be met. The DNR salvage sale is taking dead and dying timber from State land about 12 miles north of the northernmost units in the Salmon Creek watershed. This removes additional standing dead trees from 1,100 acres with a decrease in habitat for burned forest species. These harvest areas are in a separate 5th order watershed (Sinlahekin Creek) than the three watershed area where harvest is proposed for Tripod and is therefore beyond the area where effects are cumulative for Tripod.

Firewood cutting

Firewood cutting would remove additional dead trees in the project area, however the amount of habitat lost is not expected to be measurable when compared with that available.

Fuels treatments

Conger, Mutton (including Sinlahekin Wildlife Area land), Cougar, Bear and Ramsey fuels projects on Tonasket and Methow Valley Districts amount to about 5,000 acres of prescribed fire fuels treatment over the next 4 to 5 years. Based on research conducted partially within the fire area, Saab et al. (2006) noted increases in snags following these

types of prescribed fire treatments. These projects are expected to result in similar increases and consequently would improve habitat for species that use snags. Down wood is reduced during prescribed fire treatments. Some compensation occurs from the gain in snags (that ultimately fall). Fuels treatments by definition reduce habitat for species that use down wood.

Tree planting
No consequence for burned forest, snag, and log species.

Suppression rehabilitation and BAER treatments
No consequence for burned forest, snag, and log species.

Restoration activities
No consequence for burned forest, snag, and log species.

Invasive plants
No consequence for burned forest, snag, and log species.

Livestock grazing
No consequence for burned forest, snag, and log species.

Recreational use
No consequence for burned forest, snag, and log species.

Mushroom gathering
No consequence for burned forest, snag, and log species.

Transportation system
Road management influences places where people can cut snags for firewood. Some places have few snags and if large old trees are close to open roads when they die, they do not become part of the landscape for snag users. This practice would continue to result in some habitat loss for snag users along open roads. Roads closed for a multitude of reasons would not experience the same habitat reductions.

Danger trees
Additional ongoing road maintenance, including falling snags and trees dangerous to forest users, would have little effect for species that benefit from snag habitat and burned forest since much of the same habitat will continue to be available nearby. The cutting simply hastens the fall of a tree that is specifically determined to be of imminent danger of falling and so would likely be on the ground soon anyway (USDA and USDI 2005a). Most of the trees and snags fallen would be left in place.

WDFW Wildlife Management Area activities
No consequence for burned forest, snag, and log species.

Timber Stand Improvement (TSI)
TSI could benefit snag species if remaining trees grow bigger, faster, and are allowed to become snags. Chances are high that future forest managers would chose to derive

financial benefit from today's TSI work and that is not consistent with allowing the improved stand to become very decadent.

Cumulative effects conclusion

Timber sales and firewood cutting in combination with the Tripod Salvage project would further reduce snag habitat, but would comply with Forest Plan standards. Fuels treatments would improve habitat for species that benefit from burned forest and would improve their population numbers. Additional wildfire is not predictable – but is inevitable. There would be some additional increase in snag habitat because of wildfires in the large 5-watershed area in the next five decades. The effects of ongoing and foreseeable actions when taken together with effects of past actions described in the Affected Environment section and the Direct and Indirect effects noted for the project alternatives would not have a measurable negative effect on burned forest, snag, and down wood wildlife species. There are no other activities from the list at the beginning of Chapter 3 currently ongoing or proposed in the three-watershed analysis area that might affect this habitat type.

CONSISTENCY FINDING

All alternatives would meet Forest Plan requirements as amended by the Regional Forester Amendment #2 and interpreted by the July 3, 2007 Okanogan-Wenatchee National Forest letter of guidance and as amended by the non-significant Forest Plan Amendment included in these alternatives. Scenario A, 2) a) requirement to maintain all remnant late and old seral and or structural live trees that currently exist is met because project activities would not enter stands with LOS conditions. The Scenario A, 2)b) requirement to manipulate vegetative structure that does not meet LOS conditions in a manner that moves it towards LOS conditions as appropriate to meet HRV is met because salvage harvest of dead trees and those with a low probability of survival within one year of project implementation, would not affect the ability of live components of the stands to move toward LOS conditions. Scenario A, 2)c) requirement to maintain open parklike conditions where this condition occurred historically would be met because salvage harvest of dead trees and trees with a low probability of survival within one year of project implementation would not affect the ability of live components of the stand to develop or maintain large diameter and open canopy structure. The Scenario A, 3) requirement to maintain connectivity and reduce fragmentation of LOS stands would be met because no stands with LOS conditions would be entered and salvage harvest of dead trees and those trees expected to die within one year would not affect canopy closure in stands that meet the definition of connection corridors. The Scenario A, 4)a) green tree replacement requirement is met in all alternatives because no trees expected to survive are proposed for removal with the Forest Plan Amendment (which allows live trees greater than or equal to 21" DBH, that have a low probability of survival within one year of project implementation to be salvage harvested). The 4)a)1) snag requirement is met because the best available science was used to develop guidance to provide habitat condition in post-fire environments (snag abundance and distribution) that contribute towards the viability of primary cavity excavators and secondary cavity nesters. The 4)a)2) down log requirement is met because all down logs would be retained. The retention of an average of four snags per acre over 100 acres (Forest July 3, 2007 Letter of Guidance) is met by

the design criteria of retaining 10% of the area within each salvage harvest unit and 40 acres of every 100 acre neighborhood adjacent to salvage harvest units in an unharvested condition.

The broad scale trends for these species identified by Lehmkuhl et al. (1997) would be locally improved and habitat would be abundantly available for all 10 MIS cavity users identified in the Forest Plan. This project does not negatively influence any of these trends for the Columbia Basin.

Conservation measures are met for MIS considered in the burned forest and snag habitat section because the design criteria for these species meets Forest Plan direction as amended by the Regional Forester amendment #2 (including the July 2007 guidance letter).

Pileated woodpeckers are not necessarily burned forest species, but they would benefit from the additional food resources available in response to the fire, especially near green forest edges. No pileated woodpecker habitat is impacted in any alternative.

Some habitat for some of burned forest species would be removed if an action alternative is selected. The fire itself was a substantial gain for a number of these species and a large population expansion is expected for all wildlife species that benefit from fire.

Amending the Forest Plan to allow the removal of some dying trees greater than or equal to 21" 'DBH would not hinder the ecological processes of regeneration, regrowth, and recovery. Ecologicial functions, including multiple hydrologic function, nutrient storage and release, microclimate moderation, restriction of soil movement, and sites for germination and growth would all be adequately provided in all alternatives by live trees, the fire damaged trees with more than a low probability of survival, the snags greater than 28 inches DBH or less than 10 inches DBH, and the snags retained in wildlife islands within harvest units that surround the "favorable" wildlife trees specifically selected for their habitat value. Habitat would be retained to support the viability of all MIS and Threatened, Endangered and Sensitive species. Species that benefit from snag and log habitat would be perpetuated and current and future habitat needs would be met.

Based on discussions with experts, review of this analysis by experts, detailed examination of the current best available science, and the author's personal experience with dead wood habitat in the vicinity of the Tripod fire both before and after the fire, it is determined that the actions proposed in any alternative would not jeopardize the continued existence of any species or affect the viability of any species found on the Okanogan National Forest.

RAPTOR HABITAT & NEST SITES

REGULATORY FRAMEWORK

The Forest Plan (USDA Forest Service 1989a) provides specific guidance for the protection of raptor territories (Forestwide S&G 6-10, 6-11 and 6-12). In addition the Eastside Screens (Regional Foresters Amendment #2, USDA Forest Service 1995a

section (5) (c)) requires the designation of goshawk habitat protection areas around known active territories. The Migratory Bird Treaty Act also specifically protects raptors from harm or harassment. MBTA Section 703 states “Taking, killing, or possessing migratory birds is unlawful, including any such bird or any part, nest, or egg thereof”.

BACKGROUND INFORMATION

Key strategies for conservation include limiting disturbance at nest sites, protection from illegal shooting, and providing sufficient high quality habitat for nesting and production of prey animals.

Life history information is provided in the Birds of North America series of species accounts for all North American Birds (Poole and Gill, editors). Habitat needs and distribution information for each species is included.

Design Criteria
For this project the ability to find and protect raptor territories is a key provision. Surveys were completed as part of the Conger, Mutton, Flatmoon, and Buck timber sales. Territories found there are being protected. Surveys would be conducted for the duration of the timber harvest to insure that nests are not harmed. Where territories are located, standard provisions in timber sale contracts would be invoked to limit disturbance and allow nesting and fledging to proceed consistent with Forest Plan standard 6-12. Activities would be restricted near nests from March 15 to August 15.

Analysis method
Impacts to raptors will be evaluated on the amount of disturbance at nest sites due to tree falling and yarding near nests and log hauling along routes near nests.

AFFECTED ENVIRONMENT

In the three watersheds where harvest is proposed 114,000 acres of forest habitat burned (Figure 3.2-2). About 75,000 acres (66%) burned with sufficient intensity to be considered stand replacing. These areas will not be suitable nesting habitat for forest dwelling raptors for several decades. The remaining 39,000 acres that were burned, but are functionally intact, are presumed to provide nesting and foraging habitat, and be suitable for one or more raptor species. A summary of the effects of the Tripod fire on Dry, Mixed Conifer, and Montane Forest habitat within the watersheds where harvest is proposed is displayed in Figure 3.2-2.

The following past actions have contributed to current conditions:

> Timber sales noted in Figure 3-1 altered habitat for raptors on more than 20,000 acres. The two most important aspects of raptor habitat are nesting sites and prey availability. Timber harvest influences these factors variously depending on the type of harvest and the raptors and prey considered. The species of greatest concern are those for which habitat is limited (peregrine and prairie falcons, accipiters, great gray owls, and eagles). For prairie and peregrine falcons, eagles, and great gray owls, additional openings in otherwise dense forested habitat are improvements. For

accipiters, small openings and corridors are positive habitat attributes, but larger breaks in forest canopy contribute to habitat losses.

The Conger and Mutton timber sales in the Salmon Creek watershed were designed to hasten development of Late and Old structure habitat on about 1,000 acres of Dry Forest habitat. This will possibly improve habitat for goshawks in 3-5 decades.

Fire suppression and Burned Area Emergency Response activities are documented in Appendix L. They included 41 safety zones, 21 helispots, 122 miles of dozer line, and 118 miles of hand line created during suppression actions (about 500 acres of tree removal). This was a benefit for most species considered here because fireline lanes and small (1-2 acre) openings provide travel routes and hunting opportunities.

Recent fuels treatments on approximately 10,000 acres in the vicinity of the project have possibly improved raptor habitat by providing better conditions for prey animals and more open understory conditions for hunting.

Twelve raptor territories were recorded within or near the fire. Eight goshawk territories, two sharp-shinned hawk territories, a barred owl territory, and a Coopers' hawk territory were known to be active before the fire. All but one goshawk territory burned. It is likely the adult birds will establish new territories in unburned, dense forest habitat. Golden eagle habitat and peregrine falcon habitat also occurs, but nests are not documented.

ENVIRONMENTAL CONSEQUENCES

Direct and Indirect Effects

Alternative A
No harvest and no timber hauling would occur. Raptors displaced by the fire would attempt to find unoccupied habitat that is unburned or lightly burned near previously occupied territories. Prey availability for most of these forest raptors will be limiting for at least 5 years, but would fully recover in 30 years.

No surveys would be needed.

All Action Alternatives
Up to 3,403 acres are proposed for salvage harvest. Dead and dying trees would be cut and removed. Harvesting these dead trees would not directly affect the raptor species considered here since nesting occurs in live trees or on cliffs.

The effect of dead tree harvest would come from noise disturbance during falling and yarding, and displacement from territories caused from noise and activity related to log hauling. Figure 3.2-32 shows the number of miles of log haul route proposed for use in each alternative. It is possible that some raptor nesting could occur in intact forest habitat adjacent to harvest units and/or along haul routes.

Figure 3.2-32: Miles of road proposed for log haul route in each alternative

	Alt B	Alt C	Alt D	Alt E
Miles	195	150	196	195

Helicopter use near raptor nests can be dangerous for pilots and passengers and often fatal for the birds. Disturbance from helicopter use could be detrimental to successful fledging of young. If active territories are found, provisions would be in place to limit helicopter activity to a distance beyond ¼-mile from active territories until after the nesting season.

Raptor surveys would be conducted each nesting season starting in 2007 and continue through the end of timber harvest and log haul. Contract language would be included to protect nest sites when active raptor territories are discovered.

Piling and burning slash would also be restricted near nest sites discovered to the extent deemed necessary by the wildlife biologist.

Opening existing roads, road closures, firewood harvest, and danger tree falling are not expected to affect raptor populations measurably because these activities are very localized or will occur outside the nesting season.

Construction of temporary roads has the potential to negatively affect raptor territories. Surveys would be completed prior to road construction to minimize the effects of this activity on active raptor territories. Where necessary, temporary road construction would be delayed until after the breeding season.

Because design measures are included that provide for protection of active raptor territories found, and because no green forest stands are proposed for harvest, no measurable consequences are expected for nesting raptors as a result of the implementation of action alternatives.

Cumulative effects

Past actions and their current effects are considered in Affected Environment above. On-going and reasonably foreseeable future actions with the potential cumulative effects for raptors are discussed below. The area considered for cumulative effects for raptors was the three 5th order watersheds in which salvage harvest is planned. The timeframe considered for cumulative effects is 20 years, which is approximately how long it will take the new forest to begin to take over ecological function (see the Burned Forest and Snag Habitat Environmental consequences, Snag Persistence section.
The timeframe considered for cumulative effects is 20 years, which is approximately how long it will take the new forest to begin to take over ecological function (see the Burned Forest and Snag Habitat Environmental consequences, Snag Persistence) section.

Timber sales
Ongoing and future timber harvest (Mutton, Conger, Flatmoon, and Buck) could remove nesting habitat for raptors, but could also provide improved prey availability. Surveys

would be completed and protection of raptor territories included. No measurable loss of nesting habitat is expected.

Firewood cutting
No measurable consequences for raptors

Fuels treatments
With as much as 5,000 acres of fuels treatments proposed, some consequence for raptors is possible. Little information is available that discusses the effect of underburning and pile burning (other than human disturbance) on raptors. Aerial ignition operations could disturb nest sites. Because surveys are required on Federal land and State land (the burn on the Sinlahekin Wildlife Area) any direct disturbance to nests would be avoided. There would be no measurable impact to raptor populations expected.

Tree planting
No consequence for raptors

Suppression rehabilitation and BAER treatments
No consequence for raptors

Restoration activities
No consequence for raptors

Invasive plants
No consequence for raptors

Livestock grazing
Livestock grazing has the potential to impact prey populations, especially in riparian areas that are key corridors for hunting and nesting accipiters, by reducing forage used by prey animals. Forest Plan standards are designed to insure resource protections are followed. Grazing outside Federal land could reduce raptor habitat slightly in the same manner.

Recreational use
No consequence for raptors

Mushroom gathering
No consequence for raptors

Transportation system
No consequence for raptors

WDFW Wildlife Management Area activities
No consequence for raptors

Timber Stand Improvement
Thinning stands on 1200 acres would reduce nesting habitat for accipiters. Some improvement of prey species is possible. TSI would have no consequence for falcons and eagles. Great gray owl foraging habitat would be improved.

Cumulative effects conclusion

Other timber sales on Federal land include raptor protections. Prescribed fire could disrupt birds briefly, but no population effects are expected. Tree thinning could reduce nesting opportunities for accipiters. Non-Federal livestock use could reduce raptor prey availability. There are no other activities from the list at the beginning of Chapter 3 currently ongoing or proposed in the three-watershed analysis area that might affect raptors. When considered cumulatively with the effects of past actions noted in the Affected Environment section, and the Direct and Indirect effects described for the project alternatives, actions would be consistent with Forest Service direction and raptor populations would remain viable.

CONSISTENCY FINDING and SUMMARY

All alternatives would be consistent with Forest Plan Direction for raptors and the guidance from the Regional Foresters Amendment #2 for goshawks as habitat protection areas would be established around active, known territories. Conservation measures, including surveys and contract provisions that protect raptor territories, insure the viability of raptor populations.

LANDBIRDS

REGULATORY FRAMEWORK

Concern for declines in populations of landbird species led to the creation of an International Partners in Flight (PIF) network and program in 1990, and eventually of the *Continental Landbird Conservation Plan* (Rich et al. 2004). In 1992, an Oregon-Washington Chapter of PIF formed, and has since developed a series of publications to assist agencies in managing landbird populations and habitats (Altman 2000a, b). In 2000, the USDA Forest Service published the *Landbird Strategic Plan*, setting goals to provide habitat for sustainable landbird populations (USDA Forest Service 2000c). Later that year the Regional Forester issued a letter to all Forests in Oregon and Washington stating that *Landbird Strategic Plan* guidance needs to be considered in all actions. In 2001, President Clinton signed Executive Order 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds*, directing agencies to consider the conservation of landbird species in the design, analysis, and implementation of activities on federally administered lands (Clinton 2001). EO 13186 requires NEPA analysis to evaluate the effects of proposed actions on migratory birds, with an emphasis on priority species.

BACKGROUND INFORMATION

Neotropical migratory birds (NTMB) breed in temperate North America and spend the winter primarily south of the United States-Mexico border. 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 2000a, b; USDI Fish and Wildlife Service 2002).

According to Rich et al. (2004) and Altman (2000a, b) the principal post-settlement conservation issues affecting bird populations in coniferous forest habitat like that in the Tripod project analysis area are the changes to natural fire intensity and frequency related to logging, fire-suppression, inappropriate livestock grazing, and invasion of exotic plants, the loss of old forest and cavity nesting habitat through logging, and the degradation of riparian habitat.

Landbirds, including Neotropical migratory birds (NTMB), were analyzed based on high priority habitats identified in the two applicable Plans for the Tripod assessment area: the Northern Rocky Mountains (Altman 2000a) and East-Slope Cascades Bird Conservation Plans (Altman 2000b). These Plans identify habitats and habitat attributes important to landbirds, describe the desired habitat conditions for a select group of priority species (usually habitat specialists associated closely with declining or deficient habitats), provide specific interim targets (biological objectives) to achieve the desired conditions, and recommend management actions (conservation strategies) that can be implemented. Only a portion of these biological objectives and management actions relate to wildfire and fire salvage. The priority habitats and their focal species for ponderosa pine (PIPO), dry forest, mixed conifer (late-successional), and mesic mixed conifer (late-successional) habitat types are listed in Figure 3.2-33, below.

Figure 3.2-33: Partners in Flight, focal species conservation focus (Altman 2000a, b)

Habitat	Habitat Attribute	Focal Species
PIPO / Dry Forest	old forest-large patches	white-headed woodpecker
PIPO / Dry Forest	large trees	pygmy nuthatch
PIPO / Dry Forest	open understory - regen.	chipping sparrow
PIPO / Dry Forest	burned old forest	Lewis' woodpecker
Dry Forest / Mixed Conifer	grassy openings-dense thickets	flammulated owl
Mixed Conifer	large trees	Brown creeper *
Mixed Conifer	large snags	Williamson's sapsucker
Mesic Mixed Conifer **	large snags	Vaux's swift
Mixed Conifer	multi-layered, structurally diverse	Hermit thrush
Mesic Mixed Conifer	multi-layered, structurally diverse	Varied thrush
Mesic Mixed Conifer	canopy foliage cover	Townsend's warbler
Mesic Mixed Conifer	dense shrub layer	MacGillivray's warbler
Mixed Conifer & Mesic Mixed Conifer	fire edges and openings	olive-sided flycatcher *

* Substantially declining population trends in the Cascade Mountains BBS Physiographic Region.
** Mesic Mixed Conifer is also referred to as Montane Forest.

Detailed life history information for the 13 focal species listed in Figures 3.2-33 and 3.2-36 can be found in the two applicable Conservation Plans (Altman 2000a, b) as well as in the Birds of North America series (Poole and Gill, editors).

Substantial pre-fire landbird abundance data exist for many of the species listed above. First, the Birds and Burning project had seven study sites on the Methow Valley Ranger District that were specific to the Dry Forest habitat type, including two inside the fire named Tripod and Ramsey. The second was a two-state, eight-year bird monitoring project that included the Mixed Conifer habitat type on the Okanogan National Forest. Within this large study area there was a subset in the Montane habitat type. The supplemental monitoring subset on the Tonasket Ranger District was in Salmon Creek, also within the fire area. In addition, an Alpine Bird Study investigated the habitats and species associated with areas above treeline at sites within or near the fire (which were left unburned).

Figure 3.2-34: Relevant recent bird surveys in and near the project area.

Study Name	Location	Habitat Type	# sites	# years
Birds and Burning	Methow Valley	Dry Forest	7	5
Regional Monitoring	Okanogan Highlands	Mixed Conifer	16	8
Supplemental Monitoring	Tonasket	Montane Forest	8	4
Alpine Bird Monitoring	Tonasket	Alpine	5	2

The top 10 most abundant species by habitat type from these studies are displayed in Figure 3.2-35 below. For a list of species acronyms see Appendix D.

Figure 3.2-35: Top 10 rankings by number of bird detections, by habitat type/study area.

Top 10 most abundant species	Dry Forest	Mixed Conifer Forest	Montane Forest	Alpine habitat
	Methow	Methow	Tonasket	Tonasket
	5 years data	8 years data	4 years data	2 years data
1	WETA	RBNU	TOWA	HOLA
2	YRWA	WETA	PISI	SVSP
3	CHSP	HAFL	GCKI	DEJU
4	RBNU	PISI	MOCH	AMPI
5	MOCH	YRWA	DEJU	AMRO
6	PISI	TOWA	HETH	PISI
7	DUFL	MOCH	RBNU	TOSO
8	HAFL	DEJU	YRWA	HETH
9	TOSO	CHSP	GRJA	MOBL
10	AMRO	SWTH	RCKI	FOSP

Where sufficient data were available (from the studies listed in Figure 3.2-34), the relative abundance of the species listed in Figure 3.2-33 were estimated and summarized in Figure 3.2-36 below.

Figure 3.2-36: Relative abundance of PIF Focal Species recorded during the Birds and Burning (2002-2003), Okanogan Highlands (1994-2001), Tonasket subset (1998-2001), and Alpine (2004-2005) bird point counts.

	Dry Forest study area	Mixed Conifer study area	Montane study area	Alpine habitat
Dry Forest				
White-headed woodpecker	Uncommon	Rare	No Records	No Records
Pygmy nuthatch	Common	Rare	No Records	No Records
Chipping sparrow	Abundant	Common	Rare	Uncommon
Lewis' woodpecker	Rare	No Records	No Records	No Records
Flammulated owl	Rare	Rare	No Records	No Records
Mixed Conifer Forest				
Brown creeper	Uncommon	Uncommon	Rare	No Records
Williamson's sapsucker	Common	Uncommon	No Records	No Records
Hermit thrush	Uncommon	Uncommon	Uncommon	Common
Montane Forest				
Varied thrush	No Records	Rare	Uncommon	Uncommon
Vaux's swift	No Records	Uncommon	No Records	No Records
Townsend's warbler	Uncommon	Common	Common	No Records
MacGillivray's warbler	Rare	Uncommon	No Records	No Records
Olive-sided flycatcher	Rare	Uncommon	No Records	No Records

The most abundant focal species in the Dry Forest study was the chipping sparrow, with the rest of the birds on this list uncommon to rarely observed. But while Townsend's warbler and hermit thrush show relatively low occurrence in the Dry Forest inventory, they rank in the top 10 of species recorded in the Montane and Alpine habitat studies.

Figure 3.2-37: Number of species detected by habitat type/study area

		No. spp.	No. unique spp.
Dry Forest	(4 years)	77	12
Mixed Conifer	(8 years)	75	9
Montane	(4 years)	34	3
Alpine	(2 years)	38	9

The Dry Forest habitat study recorded 12 species that were not recorded in any other study (Figure 3.2-37 above). Similarly, the Mixed Conifer study recorded 10 species unique to that habitat, while the Montane study recorded three and the Alpine study recorded nine. While there were 102 different species detected, only 15 species were common to all four habitat types. The Dry and Mixed Conifer Forest studies recorded 28 species that were common to each other but not detected in the Montane or Alpine studies, while the rest of the combinations (Mixed Conifer/Montane, Dry/Montane, Dry/Alpine, and Montane/Alpine) yield just six unique species in common. There were 20 species common to three of the four study areas only, again with the most similarities between the Dry and Mixed Conifer habitat types.

In the Okanogan Highlands province, 13% of the species had declined in abundance and none increased (Huff and Brown 2006:37). Species richness varied considerably among

the large provincial study, with provinces east of the Cascade Crest averaging more species detected than those on the west side (Huff and Brown 2006:25).

Three groupings of the birds from Figure 3.2-33 are apparent and will be employed here. The focal species will be analyzed as:
1) birds that benefit from fire (LEWO, OSFL),
2) birds that might benefit from fire (WHWO, PYNU, CHSP, FLOW, BRCR, WISA),
3) birds that do not benefit from fire (VASW, HETH, VATH, TOWA, MGWA).

The rationale for this grouping includes the fact that birds that benefit from fire and birds that might benefit from fire have a possibility to be affected by the salvage of burned habitat. Birds that don't benefit from fire are not likely to be affected by salvage harvest.

The numbers preceding each species name below correspond to the bird grouping number above.

1) Lewis' woodpecker (LEWO)
According to Wisdom et al. (2000:168), historical source habitats for LEWO occurred in 11 of 13 Ecological Reporting Units (ERU), including the Northern Glaciated Mountains, Columbia Basin, and Northern Cascades ERUs (encompassing the project area). Source habitats for this species experienced the greatest overall decline (-85%) of any species analyzed by Wisdom et al. (2000:168). LEWO depend on late-seral multi-and single-storied lower Montane forests and requires large-diameter snags or trees with cavities for nesting, foraging, or both (Wisdom et al. 2000). Since it is not anatomically specialized for excavating in wood, it selects snags for nesting that are almost always in an advanced state of decay (Tobalske 1997).

LEWO is associated closely with recent burns and responds favorably to stand-replacing fires. Habitat suitability varies with post fire age, size and intensity of burn, and geographic region (Tobalske 1997, Wisdom et al. 2000). When using burned forests for breeding, birds may move to unburned forest after young fledge (Block and Brennan 1987). This woodpecker seldom if ever excavates for wood-boring insects; instead it catches insects by fly-catching (hawking) and gleaning; they also store nuts and grains for use in fall and winter (Tobalske 1997).

Research in Idaho and Montana (Saab and Dudley 1998, Hejl et al. 2000) indicates that moderate post fire salvage logging enhances habitat for LEWO. Other research suggests that LEWO benefit most from stand conditions occurring later in the fire recovery cycle (10-30 years post-fire) (Bock 1970, Raphael and White 1984), although Saab and Dudley (1998) found that moderate salvage harvest mimicked conditions found later in natural situations and provided suitable habitat for Lewis's woodpeckers. In the Methow Valley, the Birds and Burning project indicated that LEWO occupied edge habitats in the dry forest/shrub-steppe interface and riparian habitats with cottonwoods adjacent to open areas (see Figure 3.2-36).

1) Olive-sided flycatcher (OSFL)
According to Wisdom et al. (2000:215, 46), source habitats for OSFL are substantial in nine ERUs (including the project area), and actually increased study-wide (+17%). Their source habitats are old forest single- and multi-storied and stand-initiation stages of

subalpine, Montane, and lower Montane forests. They are associated with forest openings and forest edges (Altman and Sallabanks 2000) and the juxtaposition of early- and late-seral habitats (Wisdom et al. 2000). Altman and Sallabanks (2000) found that they are frequently reported as a species associated with burned forest; likely because of creation of forest openings, increased edge at interface of live and dead forest, and availability of snags (for hunting perches).

Harrison (1975) found that OSFL build nests in green trees, well out from the trunk in a cluster of live needles or twigs. In contrast, Robertson and Hutto (2007) found that suitable nest trees in burned areas were living or dead Engelmann spruce or subalpine fir (Montane forest) that still retained some intact foliage (green or brown needles) within the top meter of trunk.

The OSFL is relatively abundant in naturally disturbed, early post fire forests in the northern Rocky Mountains (Robertson and Hutto 2007), and is most abundant in patches that have burned at moderate and high intensity (Smucker et al. 2005). In the Methow Valley, this species was detected at higher elevations in both the Birds & Burning and Okanogan Highlands studies (Dry and Mixed Conifer forest), but at very low abundance (see Figure 3.2-36).

2) White-headed woodpecker (WHWO)

This species requires late-seral multi- and single-storied lower Montane coniferous forests dominated by pines (in the project area, primarily ponderosa and lodgepole pine with Douglas-fir) (Garrett et al. 1996:4-5, Wisdom et al. 2000:70). Garrett et al. (1996:5) reports that throughout their range, the dominant requisite habitat components are an abundance of mature pines (with large cones and abundant seed production), relatively open canopy (50-70%), availability of soft snags and high stumps for nest cavities, and a generally sparse understory. Major food items include pine seeds and invertebrates (primarily beetles, scale insects, ants, etc.), and dependence on each varies by season. Foraging takes place primarily on live pines, sometimes on snags, and very rarely on logs, on the ground, or in the air.

Widsom et al. (2000:44, 70, 291) reported that source habitats for this species occur in 9 of 13 ERUs, but habitats were never common, and that their source habitats have declined by more than 60% overall. Benefits to this species from the fire would be mainly in the Burned but Functionally Intact range of tree mortality, or at the interface of higher mortality and unburned areas, as they are primarily a green forest dependent species.

2) Pygmy nuthatch (PYNU)

This species' source habitats are late-seral multi- and single-storied lower Montane coniferous forests, which have declined in 12 of 13 ERUs, averaging -67% overall (Wisdom et al. 2000:44, 70, 491). In Washington, they can be found in Douglas-fir zones only when in or near ponderosa pines (Kingery and Ghalambor 2001). PYNU are secondary cavity nesters, preferring large-diameter snags for nesting and roosting and are more numerous in stands with a good mixture of old pines, snags, and vigorous young trees (Kingery and Ghalambor 2001). They probe, peck, and glean insects mainly from the large-diameter live (or dead-topped) ponderosa pines and will occasionally crack open pine seeds and hawk for insects (Kingery and Ghalambor 2001, Wisdom et al. 2000:161). Benefits to this species from the fire would be mainly in the Burned but Functionally Intact

range of tree mortality, or at the interface of higher mortality and unburned areas, as they are primarily a green forest dependent species.

2) Chipping sparrow (CHSP)
Middleton (1998) reports that in Oregon and Washington, CHSP are found in open ponderosa pine forests and brushy habitats bordering mountain meadows. They feed primarily on the ground or in low vegetation on seeds of grasses and various annual plants; during the breeding season they add insects and other invertebrates to their diet. CHSP prefer live conifers for nesting and build nests between 1 and 3 meters above ground (range 0–19 m) in a thick cluster of needles or leaves at outer extremities of trees or shrubs (Middleton 1998). Smucker et al. (2005) found that in burned areas, CHSP increased substantially only at points that burned at moderate intensity. Many previous studies that didn't analyze response by fire intensity have shown mixed results (more abundant in both burned and unburned areas), suggesting that responses differ depending on fire intensity (Smucker et al. 2005). Wisdom et al. (2000) does not address this species.

2) Flammulated owl (FLOW)
This species' source habitats are mid- to late-seral, multi- and single-layered, mid-elevation Montane forests; primarily open ponderosa pine with some Douglas-fir, or forest with similar features (McCallum 1994:4, Wisdom et al. 2000:75). They are broadly distributed throughout 7 ERUs, while their source habitats have declined in 11 of 13 ERUs, averaging -55% overall (Wisdom et al. 2000:44, 181). This species nests in cavities in both snags and large live trees and forages in open, mature stands, but prefers to roost in dense vegetation (sprawling trees or regeneration thickets) (McCallum 1994:5, Wisdom et al. 2000:183). FLOW feed primarily on nocturnal arthropods (moths, beetles, grasshoppers, etc.) by hawking, gleaning from needles, or picking up prey from the ground in open forest or along forest edge with grassland (McCallum 1994:5-6). FLOW use natural cavities or old woodpecker holes (pileated preferred to northern flicker). Benefits to this species from the fire would be mainly in the Little Change Detected to Moderate range of tree mortality, as they are limited by pre-existing cavities or the continued presence of pileated woodpecker and flickers to create new ones.

2) Brown creeper (BRCR)
Source habitats for this species are old-forest Pacific and interior ponderosa pine, which have declined by 50% overall (Wisdom et al. 2000:190, 44). They can be found throughout forested areas of the Rocky Mts. and Pacific Coast states and in all 13 ERUs, but favor late-successional stages of coniferous and mixed coniferous-deciduous forests (Hejl et al. 2002:3, 6; Wisdom et al. 2000:495). BRCR favor closed-canopy forests with an abundance of large dead or dying trees for nesting and large live trees for foraging (Hejl et al. 2002:2, 7). Builds a hammock-like nest behind a loosed flap of bark on a dead or dying tree; gleans, probes, and peck-probes on the trunk surface for a variety of insects, spiders, larvae, and eggs (Hejl et al. 2002:1). This species also uses recently burned areas with fire-killed trees, but less commonly than in mature, unburned forests, and not consistently (see citations in Hejl et al. 2002:7). Shows highest abundance in moderate and severely burned areas in western conifer forests (Kotliar et al. 2002), which may be related to an increased availability of snags for nesting and proximity to live trees for foraging.

2) Williamson's sapsucker (WISA)
This species' source habitats are generally late-seral stages of the Montane and riparian woodland community groups (old-forest aspen, cottonwood-willow, and ponderosa pine) at mid- to high-elevation (Wisdom et al. 2000:190, Dobbs et al. 1997). WISA are more limited in range but can be found in all 13 ERUs, where their source habitats have declined by more than 56% overall. They depend on large (>21" DBH) diameter snags for nesting and roosting (Wisdom et al. 2000:194), preferring aspen to conifers (Dobbs et al. 1997). WISA are omnivorous with high seasonal specialization, feeding exclusively on conifer sap and phloem during prenestling period, shifting to mainly ants after hatching young. They also take other insects (beetles, flies, aphids) during the breeding season, and supplement sap/phloem with berries in the winter. WISA forage mainly in conifers and snags, rarely in aspen, and favor live pine trees; sap trees are generally smaller diameter conifers (Dobbs et al. 1997).

3) Vaux's swift (VASW)
Source habitats for this species are late-seral multi- and single-layered stages of Montane coniferous and mixed deciduous-coniferous forests (Wisdom et al. 2000:63, 75; Bull and Collins 2007). Basin-wide, source habitat changes have been neutral (decline of 8%), although the Columbia Basin ERU has seen substantial increases (+54%) and the N. Glaciated Mts. ERU has seen substantial declines (-92%) in habitat (Wisdom et al. 2000:45, 493). VASW are more common in old-growth forest than in younger stands, as they depend on large hollow snags (live or dead) for nesting and roosting (Bull and Collins 2007). Nests are affixed to the inside of large hollow trees and are accessed either through a broken top or a pileated woodpecker hole; roost trees may be accessed by smaller woodpecker holes. VASW forage for aerial insects over forest canopy, grasslands, and water (Bull and Collins 2007).

3) Hermit thrush (HETH)
This species can be found in high western mountain forests with coniferous or mixed coniferous-deciduous climax vegetation, particularly in the subalpine and Montane zones; also described as a forest interior bird that favors internal forest edges (Jones and Donovan 1996). This species is a terrestrial or bush gleaning omnivore, feeding mostly on insects and other small invertebrates during the breeding season. Smucker et al. (2005:1543) found that this species declined in high intensity and increased in low intensity burned areas, likely because they nest on the ground or low in the foliage of live trees (Jones and Donovan 1996).

3) Varied thrush (VATH)
Source habitats for this species are late-seral multi- and single-layered stages of subalpine and Montane coniferous forests (Wisdom et al. 2000:63, 190; George 2000). Basin-wide, source habitat changes have experienced only a moderate decline (-23%), while the Columbia Basin and N. Glaciated Mts. ERUs have seen substantial decreases (-72 and -93% respectively) (Wisdom et al. 2000:45, 496). Prefers moist, shaded mature forests; forages primarily on the ground for litter-dwelling arthropods, supplementing with fruits and berries in late breeding season and in winter (George 2000). Usually builds nests low to ground, on branches near the trunk of a small conifer, but also on the ground, in shrubs, and towards ends of branches of larger conifers (George 2000). Some evidence that they decline in abundance in burned areas (Smucker et al. 2005:1542).

3) Townsend's warbler (TOWA)
According to Wright et al. (1998), in Washington, forests suitable for breeding are generally characterized by having a high canopy cover, tall conifers, high basal area, numerous conifer saplings, and dense deciduous undergrowth. This species is most abundant in unlogged old-growth, but is also common in late-successional areas. Feeds primarily in the upper third of coniferous canopy; gleans caterpillars, moths, and other invertebrates off needles (and occasionally leaves in understory plants). TOWA typically build nests in lower- to mid-canopy on a main limb or in a group of branchlets of live spruce or fir needles. Numerous studies have found that this species is typically more abundant in unburned forests (Kotliar et al. 2002). Wisdom et al. (2000) does not address this species.

3) MacGillivray's warbler (MGWA)
This species is common in riparian habitats, coniferous forest clearcuts, and mixed coniferous-deciduous forests at low to moderate elevations; requires dense undergrowth and moderate cover (Pitocchelli 1995:5). MGWA feed on or just above the ground by gleaning for insects and other invertebrates in leaf litter or among branches and leaves of trees and shrubs (see citations in Pitocchelli 1995:6). Nests are built on or near the ground and are well concealed by shrubs and dense undergrowth. Some evidence exists that they decline in abundance in burned areas (Smucker et al. 2005:1542). Wisdom et al. (2000) does not address this species.

Species-specific guidance from Altman (2000a, b) are listed in each effects section below, where applicable. Although Altman suggests many Conservation Strategies specifically directed at the management of green forests, there are some recommendations for managing burned areas as well. How these focal species respond to fire and the salvage of burned areas is analyzed below, using Altman as a framework.

AFFECTED ENVIRONMENT

The acres of Dry, Mixed Conifer, and Montane forest habitat that burned in the Tripod fire at various intensities can be found in Figures 3.2-1 and 3.2-2. Although the fire burned approximately 175,143 acres, it burned some habitat types in some watersheds more extensively than in others (Figure 3.2-38 below). This has left a variety of habitat conditions available: temporarily removing habitat for some species, while greatly increasing habitat for others. Fire effects to the Alpine Parkland habitat is displayed below, however, since no action alternative proposes units in this habitat type it will not be discussed in much detail further.

The following past actions have affected current conditions:

> Timber sales noted in Figure 3-1 changed habitat for landbirds. This amounted to more than 20,000 acres affected in the previous 40 years. Habitat for white-headed woodpeckers, pygmy nuthatches, and flammulated owls was reduced substantially (Wisdom et al. 2000). Other PIF focal species were affected variously by previous timber harvest.

Fire suppression and Burned Area Emergency Response activities are documented in Appendix L. They included 41 safety zones, 21 helispots, 122 miles of dozer line, and 118 miles of hand line created during suppression actions (about 500 acres of tree removal). About 200 miles (170 miles in 2006 and 47.3 in 2007) of danger tree removal has been completed or will be completed before the project is implemented. This amounts to several thousand snags fallen within 200 feet of roads. Most of these were less than 12" in diameter; with less than 1 tree per mile cut greater than 20" in diameter based on the experience from the fall of 2006. These actions generally reduced habitat for the landbirds considered here.

Prescribed burning of fuels (10,000 acres) and wildfires (93,000 acres) have improved habitat for birds that benefit from fire and possibly improved habitat for birds that might benefit from fire. Habitat was lost in these events for birds that don't benefit from fire.

Figure 3.2-3: Percent of each subwatershed burned by habitat type.

Watershed and Subwatershed	% of Subwatershed Burned				
	Total	Dry Forest	Mixed Conifer	Montane	Alpine Parkland
Ashnola River Watershed					
Cathedral Fork Subwatershed	2	0	0	0	3
Middle Methow River					
Bear Creek	22	0	20	67	0
Upper Beaver Creek	51	0	20	73	100
Upper Chewuch River					
Mainstem Upper Chewuch River	48	0	26	62	64
Headwaters Chewuch River	11	0	0	9	14
Kay Creek	22	0.6	3	27	20
Windy Creek	79	0	3	85	78
Lower Chewuch River					
Mainstem Lower Chewuch River	28	21	20	50	51
Boulder Creek	75	38	74	98	0
North Fork Boulder Creek	86	97	71	89	83
Twentymile Creek	91	100	86	92	87
Pearrygin Creek	19	7	32	85	0
Sinlahekin Creek					
Upper Sinlahekin Creek	5	0	0	13	54
Middle Sinlahekin Creek	2	0	0	8	0
South Fork Toats Coulee Creek	43	0	0.3	54	91
Deer Park Creek	10	0	0	11	14
Salmon Creek					
North Fork Salmon Creek	11	0	1.5	32	21
South Fork Salmon Creek	26	0	21	52	0
West Fork Salmon Creek	43	0	24	86	94

As stated previously, for purposes of this analysis, it was assumed that the Complete, High, and Moderate mortality levels were essentially "stand replacing" in terms of their effect on many wildlife species' habitat. Likewise it was assumed that Low mortality and

Little Change Detected (from satellite imagery) fire mortality levels allowed forest stands to retain their function.

The area considered for the effects to landbirds were the three habitat types in the nine subwatersheds (three watersheds) where units are proposed under the action alternatives. For more detail on acres burned and acres and percentages proposed for salvage harvest, see Figures 3.2-39 and 3.2-24, and 3.2-25 (earlier in this report).

Figure 3.2-39: Acres burned (over entire fire area) and highest percent of proposed harvest of the four Action Alternatives

All Subwatersheds Combined	Stand Replacement Fire		Burned but Functionally Intact	
	acres burned	highest % proposed harvest	acres burned	highest % proposed harvest
Dry Forest	3,408	9.4%	3,744	8.1%
Mixed Conifer Forest	11,198	7.8%	9,103	6.5%
Montane Forest	89,563	1.0%	40,369	1.0%

ENVIRONMENTAL CONSEQUENCES

Direct and Indirect Effects

The effects from proposed salvage harvest activities would be immediate and long lasting, generally until a new stand (from ground cover to tree canopy) has grown up. However, the effects from salvage would not have a noticeable impact to landbirds when considered against the backdrop of recovery from the effects of the fire itself, especially on a watershed and subwatershed scale (see Figure 3.2-38). All action alternatives are very similar in effect to landbirds. As shown in Figure 3.2-39, a very small percentage of the entire fire area would be impacted (less than 10% in all habitat types over all mortality levels).

At a smaller scale, the Pearrygin Creek and South Fork Salmon Creek subwatersheds, on average, would experience more salvage harvest activity (14.6% and 13.4%, respectively) in the Stand Replacement burned areas. In Functionally Intact areas, the Pearrygin Creek subwatershed would experience a maximum of 12.3% salvage harvest activity. This compares to an maximum over all other subwatersheds in the 0-6% range in both burn types in all habitat types (see Figures 3.2-24 to 3.2-25).

Kotliar et al. (2002) found that in general, woodpeckers and aerial foragers are more abundant in burned forest, whereas most foliage-gleaning species are more abundant in unburned forests. Bird species that are frequently observed in stand-replacement burns are less common in understory burns; similarly, species commonly observed in unburned forests often decrease in abundance with increasing burn intensity. Granivores and species common in open-canopy forests exhibit less consistency among studies. For all species, responses to fire may be influenced by a number of factors including burn intensity and severity, fire size and shape, proximity to unburned forests, pre- and post-fire

cover types, and time since fire. Responses to salvage harvesting burned areas differ as well.

Once again the following section analyzes three groups of key bird species:
1) birds that benefit from fire (LEWO, OSFL),
2) birds that might benefit from fire (WHWO, PYNU, CHSP, FLOW, BRCR, WISA),
3) birds that do not benefit from fire (VASW, HETH, VATH, TOWA, MGWA).

For landbirds, the action alternatives are similar in effects at all scales.

BIRDS THAT BENEFIT FROM FIRE

Direct and Indirect Effects

Alternative A

The Tripod fire produced an abundance of habitat suitable for Lewis' woodpecker and olive-sided flycatcher, in terms of both forage and nesting availability. It is expected that populations will expand substantially in response not only to the Tripod fire, but to other recent fires such as Pearrygin, Farewell, Thirtymile, Isabel, Thunder Mountain, Bottle Springs, and others.

Under this alternative, no active management would take place. Stands that burned will decay and fall as the fire recovery process occurs. Lewis' woodpecker will increase in abundance as snags fall and foraging areas become more open, and will likely reach population peaks around 10 years post-fire. Olive-sided flycatcher will realize an immediate increase in available foraging habitat, and will see population increases similar to Lewis' woodpecker.

All Action Alternatives

The following Biological Objectives are summarized from Altman (2000a, b). Deviations from these guidelines, though they are not management direction, will be addressed below.

For Lewis' woodpecker

Wildfire and prescribed fire management:

- maintain >1% of the landscape (i.e., large areas such as ecoregions, forests) as post-fire old ponderosa pine forest habitat – E. Slope (Altman 2000b)
- maintain >2% of the landscape (i.e., large areas such as ecoregions, forests) as post-fire old ponderosa pine forest habitat – N. Rockies (Altman 2000a)
- maintain >50% of the post-fire landscape as unsalvaged

Where salvage logging is occurring in post-fire old ponderosa pine forest, maintain or provide the following conditions:

- in burns >100 ac, salvage <50% of the standing and down dead
- in all burns, retain all trees/snags >20" DBH and >50% of those 12-20" DBH
- retained snags should be clumped rather than evenly spaced, with both hard and soft decay classes to lengthen the period that stands are suitable nesting habitat (Saab and Dudley 1997)
- retain standing dead or diseased trees where they occur

selective logging can be used to increase suitability of habitat as long as sufficient large living and dead trees are retained

For olive-sided flycatcher:
Wildfire and prescribed fire management:

>2% of the landscape (i.e., large areas such as ecoregions, forests) as post-fire habitat

>40% of the post-fire landscape as unsalvaged

Where salvage logging is occurring in post-fire old forest, maintain or provide the following conditions:

in burns >100 ac, salvage <50% of the standing and down dead

in all burns, retain all trees/snags >20" DBH and >40% of those 12-20 in" DBH

retain patches with mix of live and dead trees/snags to provide potential nest trees (live) within the context of potential foraging and singing perches (dead)

retain standing dead or diseased trees where they occur

selective logging can be used to increase suitability of habitat as long as sufficient large living and dead trees are retained

All these biological objectives are met with the exception that, within salvage units, the biological objective to "retain all large trees/snag >20" DBH" would be followed more closely in alternative E. Live trees would be retained, but in alternatives B, C, and D, most of the snags greater than 20" DBH would be removed. All snags greater than 28" would be retained. Within harvest units, habitat would be limited for the species that benefit from these large snags. Within harvested areas, common landbird species would be more abundant than those listed as PIF Focal Species that occur in burned forest with large snags.

As stated previously, the habitat reduction for these Focal Species would occur on less than 12% of the Dry, Mixed Conifer, and Montane forest habitat burned in the three watersheds where salvage is proposed (see Figure 3.2-19). Because at least 88% of the post-fire habitat available to these species is retained, the reduction in the population increase that would have otherwise occurred in response to the fire would be localized and not substantial at the subwatershed or watershed scale.

Both LEWO and OSFL, as aerial insectivores and open-space foragers, benefit from stand conditions created later in the fire recovery cycle as snags fall and foraging areas become less obstructed. Saab et al. (2007) found that partially logged burned areas provide improved stand conditions for LEWO (1-4 years post-fire) that mimic unlogged stands 5-10 years post-fire. In addition, nest densities were substantially higher for LEWO in the partially logged areas when compared with the unlogged areas, and nest densities increased in both unlogged and partially logged (harvest of 50% of the dead trees) areas as time progressed for the 11 years studied after fires in Idaho.

Long term studies In Idaho (Saab and Dudley 1998, Saab et al. 2007) found that partial logging created a spike in the LEWO population that was 4-20 times that found in the unlogged stands in the 1-4 years post-fire. Populations of LEWO appear to reach carrying capacity around 10 years post-fire (Saab et al. 2007).

Within harvest units, eight snags for every 10 acres would be selected and retained. Snags and broken-top trees that existed pre-fire would be targeted for retention in salvage harvest units. The snags inside and outside of harvest units would provide abundant nesting opportunities for LEWO. Openings created by harvest would enhance foraging opportunities for LEWO and OSFL to mimic stand conditions approximately 5-10 years post-fire. Thousands of acres of potential habitat would remain available for these two species in unharvested areas. Further information on snag retention objectives is contained in the Burned Forest and Snag Habitat section

In the Methow Valley, both species are migratory, thus any winter logging would have no impact on individuals. LEWO nest in softer snags, which are generally poor in quality for lumber use and would not be preferred for harvest. OSFL generally nest in green trees which would not be harvested, but occasionally also nest in Montane forest burned at moderate to high intensity. In burned areas, trees with remaining cover (green or brown needles), including some dead trees that might provide suitable nesting trees may be harvested. Literally millions of nest trees would be available for OSFL and within areas 100 acres or larger, the availability of nesting trees would not be a limiting factor for populations of either bird species.

Salvage activities for all action alternatives, therefore, are not likely to impact individuals or nests of LEWO or OSFL. Both species may be temporarily displaced from foraging areas during salvage activities. On a very localized scale (10-20 acres) there would be habitat benefits from created openings for some nesting pairs, but at the larger scales (100 acres to 6th Field watershed) changes would not be measurable. Because Alternative E would provide on average 2.2 more large snags per acre, additional options could be available for nesting for LEWO. This could result in a few more pairs nesting within the openings created. Alternative E more closely meets the guidance from Altman (2000a, b) for the retention of trees greater than 20” DBH.

BIRDS THAT MIGHT BENEFIT FROM FIRE

Direct and Indirect Effects

Alternative A

This group of landbirds often exhibits mixed responses to fire, generally responding favorably to lower mortality areas and negatively to higher mortality areas, with some exceptions. Birds that respond favorably to higher mortality burns were addressed in the previous section.

White-headed woodpeckers forage primarily on live pine trees. As weak excavators they are limited by the degree of wood decay suitable for nest hole excavation. The abundance of snags created by the fire will not generally benefit this species, except for an increase in insects and other invertebrates to supplement the loss of cones as a food source. Pygmy nuthatches are secondary cavity nesters and also forage mainly on live pine trees. An abundance of new snags will only benefit this species if other primary cavity excavators are able to create suitable nest holes, or if they are able to take advantage of an increased insect food source in the burned area while nesting in adjacent unburned areas. Flammulated owls (FLOW) may benefit due to the increased aerial

insect prey base, but depend on pre-existing cavities (either natural or excavated) for nesting. Fire created snags are generally hardened and difficult to excavate, and burned areas are not attractive to pileated woodpeckers who excavate holes that FLOW prefer. Low mortality or proximity to green forests for nesting would allow FLOW to take advantage of an increase in insect prey.

Chipping sparrows prefer to nest low in live conifers or deciduous shrubs, but they have also shown increased abundance in moderate intensity burns. Smucker et al. (2005) speculates that this species may be taking advantage of a unique combination of resources that occurs after moderate intensity burns (increased food and the presence of live foliage to conceal nests). Although brown creepers prefer unburned forests, they can also show increased abundance in moderate and severely burned areas (compared to other mortality levels). Although they prefer live trees for foraging, they build their nests behind the bark of dead or dying trees. This contrast in needs and adaptability makes it difficult to predict their use of burned areas.

Williamson's sapsuckers prefer nesting in deciduous trees (aspen, cottonwood) but prefer foraging on conifers for insects as well as sap. High mortality areas will not be able to provide much sap, although they will have many insects. Riparian or wet areas that provide aspen and cottonwood (burned or unburned) for nesting and lightly burned coniferous stands will likely be their preferred habitat within the project area.

Under this alternative, no salvage harvest or reforestation would take place, and burned areas would be left to recover naturally. Bird responses to the fire recovery would take their natural course, with most of these species and individuals responding uniquely while the vegetation recovers.

All Action Alternatives

Specific biological objectives and conservation strategies as described in Altman 2000a and 2000b (for these birds that might benefit from fire) are primarily focused on management of green forest habitat. Where there are some indications that snag management is appropriate, management recommendations would be met in all alternatives through design criteria for PCEs and burned forest specialists (such as LEWO and OSFL). Suggested management criteria not listed below (because they address green forests) include retaining large blocks of late-successional habitat, a high percentage of cover (trees, shrubs, ground), thickets or grassy openings, multi-layered forest structure, and restricting firewood cutting in suitable habitat.

<u>For white-headed woodpecker and pygmy nuthatch:</u>

- mean >10 trees/ac >21" DBH, and at least 2 of the trees >31" DBH (foraging trees and replacement snags)
- mean >1.4 snags/ac >8" DBH with >50% >25" DBH in a moderate to advanced state of decay
- All soft snags that are not hazards should be retained; where snags are targeted for removal for safety reasons, cut them high enough to allow for their potential use by WHWO
- Retain broken-topped snags, leaning logs, and high stumps for potential nesting sites, and retain or provide downed woody debris for foraging sites for WHWO

For flammulated owl:

>8 trees/ac >21” DBH to function as recruitment snags
>10 snags/100 ac >12” DBH and > 6 ft tall

For Williamson’s sapsucker:

>1 snag/ac >12” DBH except ponderosa pine should be >18” DBH
retain known or suitable nesting and roosting snags from all harvest and salvage activities and restrict access for fuelwood cutters

The first recommendations for WHWO, PYNU, and FLOW (to retain large trees for foraging and as replacement snags) would be met since no green trees are targeted for harvest. Snags that existed before the fire would not be harvested since they have little commercial value. These would be those “in a moderate to advanced state of decay” when compared to the fire-created snags. However, at all mortality levels (except Little Change Detected), many of these soft snags, leaning logs, and high stumps could have been severely burned (or consumed) and may not function as nesting sites post-fire.

As stated previously in the Burned Forest and Snag Habitat Environmental Consequences section, design criteria for habitat retention within the vicinity of harvest units would retain 40% of the acres within a 100-acre roving window as viable habitat (of varying burn intensities) for landbirds. Even on a 10-acre scale, 10% of the area within units would be retained in small 'islands' of habitat. This would meet guidelines for FLOW and WISA for snag retention at all scales. Alternative E would provide on the average 2.2 more large snags per acre within the areas harvested. This could benefit WHWO, PYNU, and WISA by providing additional nesting and foraging options. Cavities in the snags retained could be beneficial for flammulated owls as well. This alternative could result in a few more pairs of WHWO, PYNU and WISA within the Tripod area for a longer period of time since larger snags would tend to stand longer.

As these species may or may not benefit from the effects of fire, they likewise may or may not be impacted by salvage harvest of burned trees. On a subwatershed scale, between 0.3 and 5.0% of the burned area is proposed for harvest under each alternative (see Figure 3.2-18 in the Burned Forest and Snag Habitat Section), leaving at least 95% of the burned area intact and available for those birds that might benefit from fire.

BIRDS THAT DO NOT BENEFIT FROM FIRE

Direct and Indirect Effects

Alternative A

This group of landbirds is not generally benefited by fire, primarily because they forage in live foliage or require it for nesting cover. Because of this, if fire intensity is low enough to spare the undergrowth and/or the canopy foliage, these birds may not experience a decline and some may even increase in abundance due to an increase in available food (e.g. insects).

Vaux’s swifts depend on large hollow snags for nesting and roosting, and as stated previously many of these may have been damaged or consumed in the fire and may not

function as suitable sites post-fire. Although they may be able to forage for insects over the burned areas, they will likely need to nest and roost in the green areas within and around the burned areas.

Hermit thrush, varied thrush, and MacGillivray's warbler all forage and nest primarily on the ground or low in bushes and understory trees. All species prefer moderate to high canopy closure, while the MGWA requires dense undergrowth, and the VATH and MGWA prefer a moister environment. In most burned areas they will have trouble finding food in the litter and understory (which may have been killed or consumed) as well as suitable nesting sites.

Townsend's warbler nest and forage higher in the canopy than the previous three species, but still require high canopy cover and a dense understory. Smucker et al. (2005) found that TOWA declined substantially in severely burned areas and also showed incremental decreases in relative abundance as fire intensity increased. They found that changes in abundance from before to after fire at moderate and low intensity points were not substantially different than changes at unburned points, suggesting that fire effects may not be severe enough to affect abundance unless the fire burns at high intensity.

Under this alternative, no salvage harvest or reforestation would take place, and burned areas would be left to recover naturally. Bird responses to the fire recovery would take their natural course, with most of these species occupying green forests while vegetation recovers in areas burned.

All Action Alternatives

Specific biological objectives and conservation strategies as described in Altman 2000a and 2000b (for these birds that don't benefit from fire) are primarily focused on management of green forest habitat. Where there are some indications that snag management is appropriate, management recommendations would be met in all alternatives through design criteria for PCEs and burned forest specialists (such as LEWO and OSFL). Suggested management criteria not listed below (because they address green forests) include maintaining some percentage of cover (trees, shrubs, ground), maintaining thickets or grassy openings, and restricting firewood cutting in suitable habitat.

<u>For Vaux's swift:</u>

- recruitment snags (live trees) with signs of defects (e.g., broken tops)
- snags >27" DBH and >82 ft tall and in different stages of decay (including some hollow snags)
- Provide habitat conditions as described above in general proximity to riparian habitats.

The first recommendation for VASW (to retain recruitment snags) would be met since no green trees are targeted for harvest. Recommendations to retain large snags over 27" DBH would not be met in all harvest acres, however snags greater than 28" are retained, so this requirement would be nearly met. The key feature of these snags for Vaux's swifts is their chimney-like hollow nature, or the ability to become hollow. .No harvest / removal would occur in riparian habitats, which would provide thousands of snags suitable for nesting. Also, if a snag that is currently standing is hollow, it would not be cut as a saw

log, so most habitat suitable for Vaux's swifts would be retained. In all cases at all scales, nesting snags would not be limiting for Vaux's swifts.

Further information on snag retention is contained in the Burned Forest and Snag Habitat section.

Since hermit thrush, varied thrush, MacGillivray's warbler, and Townsend's warbler do not generally benefit from the effects of fire, they would generally not be impacted by the salvage of burned trees because they would not be using burned habitat. No green forest is proposed for harvest. They are expected to be absent from burned forest areas that are targeted for harvest. As ground cover and understory vegetation recovers in both harvested and unharvested areas, these birds would recolonize.

Alternative E would provide an average of 2.2 more large snags per acre in the areas proposed for harvest than Alternatives B, C and D. This would be a minor improvement in the availability of future nesting habitat (for the small number of these trees that would become hollow). However, once again, future nesting habitat would not be a limiting factor for Vaux's swifts for any alternative.

SUMMARY: ALL LANDBIRDS

Direct and Indirect Effects

Alternative A
The No Action Alternative removes no snags or downed logs; habitat would be maximized for species that use post-fire conditions such as the olive-sided flycatcher and Lewis's woodpecker. The Burned Forest and Snag Habitat section describes effects to cavity excavators in additional detail.

About half of the Dry Forest and Mixed Conifer Forest habitat acres and about a third of the Montane Forest habitat acres that burned, were burned at lower intensities and would retain habitat function. These places would be valuable for species that might benefit from fire since a variety of habitat conditions would be available.

The fire changed large expanses of forested habitat (see Figure 3.2-2). Species that are foliage or crown feeders and overstory nesting species, would not occupy the severely burned areas, but may still be using the low intensity burn areas, but likely would be displaced to other unburned parts of the forest.

Initially, many landbirds associated with riparian habitats would be displaced; however, these effects are likely short-lived. Although the fire killed much of the conifer overstory, the expected flush of ground vegetation, particularly shrub species, may elevate the amount and distribution of riparian hardwoods to levels higher than existed prior to the fire. Grasses and forbs are expected to reestablish naturally in 5-10 growing seasons; shrubs are expected to reestablish within 20 years. Population numbers for grass and shrub nesting Neotropical migratory birds are expected to remain stable or increase due to recovery of ground vegetation, both inside and outside riparian areas.

All Action Alternatives
An abundance of habitat types and conditions would be present in all subwatersheds, both before and after salvage. The fire altered habitats used by various landbird species, and changes to habitat and the response by landbirds would be variable across the entire burned area (depending on fire severities, habitat type, and time post-fire) (Smucker et al. 2005). Salvage harvest changes and bird responses would be apparent at local (10-100 acre) scales, but not measurable at larger (subwatershed) scales.

Salvage logging between May and August, the primary nesting season, would present the highest risk to any landbirds nesting in the area. Some nests could be destroyed and others might be abandoned from disturbance. Little information is available to determine how many this might be. Because the proportion of the land area burned that is proposed for harvest is small (Figure 3.2-19), the ability for the population to absorb these losses would be high and not measurable at subwatershed or watershed scales.

The removal of dead trees would have a small negative impact on some species of cavity nesting birds (see Burned Forest and Snag Habitat section and "Birds that benefit from fire" section). Effects would primarily be displacement from nests by removal or destruction of nest structures (snags, ground nests) during salvage operations. Negative impacts would be localized and not measurable at a watershed or subwatershed scale (see Figures 3.2-24, 3.2-25). Alternative E would retain about 6000 more snags than alternative B. This would provide additional nesting and foraging opportunities for some species considered here.

Many species require high tree canopy levels for nesting and foraging, and it would likely take at least 30 to 50 years before overstory canopies are restored to levels that begin to approach pre-fire conditions in some areas. Habitat for species that require mature or old growth conditions may take more than 150 years to develop.

In riparian areas, no salvage logging activities are proposed. It is possible that a few trees and snags could be fallen for operational reasons in riparian habitat, but this is an extremely minor effect for landbirds.

Other activities
Tree planting, piling and burning slash, temporary road construction, opening existing roads, road closures and firewood harvest are not expected to affect landbird populations. Danger trees might also be felled, but would be left in place and become down wood habitat.

Cumulative effects

Past actions and their current effects are considered in Affected Environment above. Below are the potential cumulative effects for landbirds. The area considered for cumulative effects for landbirds was the three 5th order watersheds where salvage is proposed. The timeframe considered for cumulative effects is 20 years, which is approximately how long it will take the new forest to begin to take over ecological function (see the Burned Forest and Snag Habitat Environmental consequences, Snag Persistence) section.

Timber sales
Ongoing and future timber harvest (Mutton, Conger, Flatmoon, and Buck) would remove trees valuable to some landbirds. White-headed woodpeckers, pygmy nuthatches, and flammulated owls could experience habitat losses.

Firewood cutting
Some habitat for pygmy nuthatches and white-headed and Lewis's woodpeckers would be removed. This would be a small amount relative to what is available for these birds.

Fuels treatments
Birds that benefit from fire and birds that might benefit from fire would experience population increases in response to as many as 15,000 acres of prescribed burning. Birds that don't benefit from fire would face reductions in populations.

Tree planting
Tree planting beyond salvage units would enhance the re-establishment of conifer forest for the birds that might and the birds that don't benefit from fire listed above and all other bird species (about 80 species) that use conifer forest habitat.

Suppression rehabilitation and BAER treatments
No consequence for landbirds

Restoration activities
No consequence for landbirds

Invasive plants
Reducing the invasion of exotic plants is very beneficial to landbirds, especially those that feed and / or nest on the ground. Habitat may be degraded by encroaching noxious weeds if they are not controlled.

Livestock grazing
Livestock grazing has the potential to remove needed cover and disturb nesting for ground nesting birds. Livestock grazing would be delayed where needed until standards are met that indicate sufficient recovery has occurred to allow return of livestock grazing without additional resource impacts (see section 3.13 Range and Appendix H).

Recreational use
No consequence for landbirds

Mushroom gathering
No consequence for landbirds

Transportation system
No consequence for landbirds

WDFW Wildlife Management Area activities
The WDFW Methow Wildlife Area has long term (3-5 years) plans to convert agricultural lands to shrub-steppe near the project area.

Timber Stand Improvement
Helping Dry Forest stands develop large ponderosa pine trees sooner using timber stand improvement thinning treatments would benefit white-headed woodpeckers, pygmy nuthatches, and flammulated owls as long as some of these big trees become snags. Hermit thrushes, varied thrushes, MacGillivray's warblers, brown creepers, and Townsend's warblers prefer dense Mixed Conifer and/or Montane Forest habitat. Thinning in these areas would reduce habitat suitability for these birds. Most of the 1200 acres is planned for Mixed Conifer habitat.

Cumulative effects conclusion

Timber sales, firewood cutting, livestock grazing, and timber stand improvement have the potential to impact some landbirds through habitat removal. Overall, the Focal Species would not be substantially impacted by any of the cumulative effects described at the beginning of Chapter 3. When taken together with the effects of past actions noted in the Affected Environment section, and the direct and indirect effects described for the project alternatives, biological objectives for landbirds would be met, and landbird viability would be assured.

CONSISTENCY FINDING and SUMMARY

This project may result in an unintentional take of individual birds, however, the project complies with the applicability of the MBTA to federal agencies and requirements for permits for "take". In addition, this project is compliant with the E.O. 13186. The analysis meets the obligations of the January 16, 2001 MOU between the USDA Forest Service and the USDI Fish and Wildlife Service (USFWS) regarding implementation of E.O. 13186. As required under this MOU, this project:

- Identifies management practices that may affect high priority species, as defined in the PIF Northern Rockies and East-slope Cascades Bird Conservation plans (Altman 2000a, 2000b);
- Includes conservation measures to avoid or minimize impacts to migratory birds;
- Incorporates recommendations from the PIF plans for managing habitats for the impacted species listed above.

In conclusion:

- Some snag and burned forest habitat is removed, but abundant habitat is retained for birds that benefit from fire at all scales. The area affected by harvest is a small fraction of the overall fire area, the watersheds, the subwatersheds, and neighborhoods associated with harvest (see Burned Forest and Snag Habitat section).
- Abundant habitat choices would be available at all scales for birds that might benefit from fire.
- No green forest habitat is affected by any alternative. Birds that don't benefit from fire would not be affected by harvest.

All alternatives would meet Forest Service guidance for landbirds and would not impact the viability of landbirds on the Okanogan and Wenatchee National Forest.

ENDANGERED, THREATENED, AND SENSITIVE WILDLIFE

This part of the analysis is the Biological Evaluation for the endangered, threatened, and sensitive wildlife species listed below in compliance with FSM 2672.4 and the Endangered Species Act of 1973 (as amended). On June 22, 2007, the US Fish and Wildlife Service signed a letter of concurrence with the determinations made in the Tripod Biological Assessment for listed fish and wildlife. Conservation measures that will be implemented include monitoring road and fireline closures and bull trout population monitoring.

The Okanogan National Forest Land and Resource Management Plan requires threatened and endangered species to be managed according to recovery plans, and consultation with U.S. Fish and Wildlife Service when threatened and endangered species may be affected by proposals (Forestwide S&Gs 6-17 and 6-18). For the Okanogan National Forest, the species considered are gray wolf, Canada lynx, and grizzly bear (Figure 3.2-40).There is no critical habitat currently designated or proposed within the Tripod Fire Salvage project area.

Forest Service Manual 2670 requires those sensitive species identified by the Regional Forester as Documented or Suspected to occur on a particular National Forest and confirmed as potentially present within a particular project area by a project level wildlife biologist, to be managed to avoid a trend toward federal listing. Nine species fall in this category of consideration (Figure 3.2-40)

The sensitive species common loon, eared grebe, and Columbian sharp-tailed grouse are not recorded near the project area and have no habitat present. The project area is outside the range of the northern spotted owl and marbled murrelet. These species are not considered further.

Figure 3.2-40: List of endangered, threatened, and sensitive wildlife analyzed

Common Name	Scientific Name	Federal Status
Gray Wolf	*Canis lupus*	Endangered
Canada Lynx	*Lynx canadensis*	Threatened
Grizzly Bear	*Ursus arctos horribilis*	Threatened
Bald Eagle	*Haliaeetus leucocephalus*	Sensitive
California Wolverine	*Gulo gulo luteus*	Sensitive
Pacific fisher	*Martes pennanti*	Sensitive
Western Gray Squirrel	*Sciurus griseus*	Sensitive
Townsend's Big-Eared Bat	*Corynorhinus townsendii*	Sensitive
Fringed Myotis	*Myotis thysanodes*	Sensitive
Peregrine Falcon	*Falco peregrinus anatum*	Sensitive
Great Gray Owl	*Strix nebulosa*	Sensitive
Gray Flycatcher	*Empidonax wrightii*	Sensitive

GRAY WOLF (CANIS LUPUS) – ENDANGERED

REGULATORY FRAMEWORK

Guidance for management of wolves and wolf habitat is contained in FSM 2670 (Threatened, Endangered, and Sensitive Species) and the Endangered Species Act as amended (16 U.S.C. 1531-1544, 87 Stat. 884).

There is no recovery plan for gray wolves in the state of Washington. Wolf recovery programs are underway in Idaho and Wyoming, and wolf numbers there have expanded greatly in recent years.

BACKGROUND INFORMATION

Life history information for gray wolves is provided in *Wolf Biology and Ecology* (USDI Fish and Wildlife Service 1994).

Key strategies for conservation of wolves are found in the Northern Rocky Mountain Wolf Recovery Plan and include limiting accidental or intentional shooting, providing for seclusion at den and rendezvous sites, maintaining a year-round source of prey, and maintaining habitat with little or no exposure to human disturbance (USDI Fish and Wildlife Service 1987).

Planned Conservation Measures

To reduce potential adverse effects to gray wolf, the following conservation measures would be implemented under all alternatives:

- If a wolf den or rendezvous site were located at any time during the life of the project, it would be protected from disturbance between April 1 and August 31 and consultation would be re-initiated with US Fish and Wildlife Service.
- Information about the protected status of grizzly bears, wolves, lynx, wolverines, fisher, bald eagles, peregrine falcon, gray flycatcher, great gray owl, Townsend's big-eared bat, fringed myotis, and western gray squirrel would be provided to private and Forest Service personnel working on the project. Information would include penalties for shooting and harassing.

No new access routes would be established for the Tripod Fire Salvage Project, as follows:

- One existing unauthorized road that would be used as a haul route would be added to the National Forest Road System as a closed road. All other unauthorized roads used would be obliterated at the end of logging operations and closed to effectively prevent unwanted use, under the timber sale contract.
- All temporary roads to be built and used as haul routes would be obliterated at the end of logging operations, as part of the timber sale contract[1].
- All currently closed roads to be used as haul routes would remain closed to the public during logging operations, and would be re-closed at the end of logging operations as

[1]Post-harvest activities, including tree-planting and pile-burning may require temporary reopening of closed roads. This would occur only in conjunction with post-sale activities, and only if it is certain that closures would be restored to the same level of effectiveness left by the purchaser.

part of the timber sale contract. The method of closure would be adequate for preventing subsequent unwanted use on these roads.

Analysis method
Gray wolves are wide-ranging carnivores; therefore, the scale of analysis used for this project is larger than the Tripod Fire area. Bear management units or "BMUs" (roughly equivalent to 5th field watersheds) are used to evaluate effects of the project on wolves (Gaines et al. 2003). Salvage is proposed in 3 BMUs (Middle Methow, Lower Chewuch, and Salmon). The timeframe for consideration of effects is 10 years as a reasonable period of time to assess the effectiveness of the conservation measures employed.

Alternatives are evaluated on the basis of den site protection, prey availability, and changes to security habitat.

AFFECTED ENVIRONMENT

Species Occurrence

The best available information before the fire indicated that wolves were present in low numbers in north central Washington (WDFW PHS 2007). Between 1991 and 2000, six wolf sightings occurred in the area. Two reports in the Upper Toats BMU (animal sighting and tracks) occurred in late summer. Two reports in the Lower Chewuch BMU (tracks and vocalization) occurred in late fall and winter. After reports of tracks and vocalizations in the Salmon BMU, a follow-up camera survey (in winter) recorded an adult wolf or wolf hybrid on film. To date, however, no wolf packs have been detected in north-central Washington, and no dens have been located.

Two of the locations where a wolf was observed (in 1992 and 1999) burned during the Tripod fire. Fast-moving flames may have killed wolves, particularly family groups with young pups, although no such reports were received. Under less intense fire conditions, wolves may have been able to move away from approaching flames.

No wolves have been reported since the fire burned. Only a small fraction of the fire area has been surveyed, and wolf presence often goes undetected. Wolves that survived the fire would have moved away from burned areas due to temporary reductions in mule deer abundance. Wolves could return when and where vegetation recovers enough to support seasonal deer use.

Availability of Prey

Current conditions for gray wolves are based largely on conditions for their preferred prey: ungulates. A large mule deer herd provides abundant year-round predaceous foraging opportunities for gray wolves in the Salmon, Middle Methow, and Lower Chewuch watersheds. Mountain goats, moose, and small mammals such as hares and marmots are potential alternate prey here for wolves.

For a more detailed discussion about mule deer, please see the Management Indicator Species section.

Deer use seasonal ranges throughout the Methow Valley. The Tripod Fire burned in all seasonal ranges used by mule deer, including 20,000 acres of winter range. Winter range that burned is confined to National Forest System land, however, and comprises about 10% of all deer winter range in the Methow Valley. Therefore, mule deer populations are expected to remain relatively unchanged as a result of the fire.

Burned deer winter range was confined to 2 BMUs (Middle Methow and Lower Chewuch). The proportion of deer winter range that burned was 35% in Lower Chewuch BMU, and 15% in Middle Methow BMU (see Figure 3.2-4). These percentages indicate that winter deer use would still occur in both BMUs, providing predaceous foraging opportunities for wolves.

About 6,000 ac (30% of winter range that burned) burned with high mortality, removing all cover and forage for deer. In addition, about 14,000 ac (70% of winter range that burned) burned with light to moderate fire mortality (Figure 3.2-5).

In areas that burned with high mortality, grasses and forbs would recover in 5-10 years and shrubs would recover in 15-20 years. In areas that burned with lower mortality, grasses and forbs would recover in 3-5 years and shrubs in 5-15 years.

Residual trees and unburned patches would continue to provide essential cover for wintering deer.

In all forest habitats that burned at low intensity, newly created openings in overstory canopy would increase sunlight reaching the forest floor and stimulate new growth of herbaceous forage and woody browse for deer. In places, release of stored nitrogen by the fire may temporarily increase palatability of new herbaceous forage, and cause more vigorous spring “green up” for a few years following the fire. These areas may be especially attractive to deer in early spring, creating additional predaceous foraging opportunities for gray wolves.

Security Habitat

In addition to prey, availability of security habitat is an important consideration for wolves and other wide-ranging carnivores. Security habitat provides seclusion from human disturbance. Security habitat (areas with open road densities $\leq$ 1 mi/sq mi) currently comprises 27 to 94% of BMUs affected by the Tripod Fire (Figure 3.2-41). Based on these percentages, the level of human influence on gray wolf habitat due to use of existing road and motorized trails is rated “high” in the Lower Chewuch, Middle Methow, and Salmon BMUs (Gaines et al. 2003).

Key Linkage Areas for Wolves

Singleton et al. (2002) reported that the only existing habitat linkage for large carnivores between the North Cascades and Kettle Ranges is a corridor through the Salmon Creek drainage. However, they demonstrated a high degree of ‘permeability’ for wolves throughout northern Washington and southern British Columbia (meaning that they could easily move across the landscape).

Figure 3.2-41: Current availability of security habitat for gray wolves (and wolverine) in bear management units (BMUs) affected by the Tripod Fire of 2006

Security habitat	BMUs					
	Lower Chewuch *	Lower Toats	Middle Methow*	Salmon*	Upper Chewuch	Upper Toats
acres *(% of BMU)*	93,813 *(48%)*	49,088 *(66%)*	38,125 *(27%)*	33,603 *(45%)*	140,589 *(94%)*	81,778 *(73%)*
Human Influence Rating	high	moderate	high	high	low	low

** BMU with proposed salvage.*

ENVIRONMENTAL CONSEQUENCES

Direct and Indirect Effects

Alternative A

No salvage harvest would occur in burned forest. Herbaceous vegetation would recover rapidly in areas that burned at low intensity, increasing the availability of forage for deer in and around areas that still retain tree (hiding) cover. Deer use of these areas may resume within a season or two of the Tripod Fire, and would probably increase over current levels. Predaceous foraging opportunities for wolves would initially decline, but increase again as deer return to lightly burned habitats.

Deer use and predaceous foraging opportunities for wolves would initially remain low in areas that burned at high intensity (about 66% of the total fire area, and 59% of mapped deer winter range within the project area). Use would rise dramatically in 5-10 years, as herbaceous forage and shrubs recover. Within the Okanogan and Methow basins, little change is expected in deer populations because of the fire.

In lightly burned stands, fire-killed trees would eventually fall and as logs, would provide protective cover for small mammals such as hares. Availability of alternative prey may benefit individual wolves.

All Action Alternatives

Prey Availability

Only 10% of available winter range in Okanogan County burned, and a much smaller percentage of that acreage would be salvaged and subject to noise disturbance. Resulting displacement of individual deer would be temporary, and not a measurable effect for wolves.

During summer – when much more habitat is available to both deer and wolves – displacement of individual deer due to intermittent noise disturbance from logging would not affect wolves. Planned use of existing roads would not pose a new disturbance to deer or wolves.

Removing fire-killed trees is not expected to affect deer cover measurably. Removal of fire-killed trees in salvage harvest areas would reduce a small amount of future habitat structure (log cover) for small mammals such as snowshoe hare (alternate prey for wolves). Residual burned trees (<10" and >28" in diameter) and trees in burned forest retention patches, however, would still provide for recruitment of down wood cover in treatment areas. Because deer – not small mammals – are preferred prey of wolves, slightly reduced availability of small mammal prey due to changes in habitat structure would be inconsequential for wolves.

Security Habitat

Availability of security habitat would not change under alternatives B, C, D, or E due to planned conservation measures for preventing new travel routes from becoming established. These measures include reclosing all Maintenance Level 1 roads, decommissioning all new temporary roads (except one unauthorized road that would be used and then closed), and restricting public access on currently closed road systems opened for the project.

Under all alternatives, road densities would increase slightly for the duration of the project, due to construction of temporary roads. Even with short-term increases in road density, however, the project would not reduce security habitat for wolves. Under all alternatives, effects from planned construction and use of roads would be inconsequential to wolves.

Under all alternatives, one existing unauthorized road would be added to the Forest Service Road system, but this road already receives use, and adding it to the system would not result in new human disturbance and would not reduce security habitat for gray wolves.

Den Site Protection

Although no wolf den sites or rendezvous sites have been detected in or near the project area, if a den or rendezvous site were located at any time during the life of the project, it would be protected from disturbance between April 1 and August 31 for dens, or between May 1 and August 31 for rendezvous sites.

Key Linkage Areas

Due to their minimal effects on prey habitat and prey availability, planned measures for protection of den and rendezvous sites, and measures maintaining security habitat, none of the alternatives is expected to affect the ability of wolves to move through key linkage areas in Okanogan County.

Direct and Indirect Effects that Vary By Alternative

Prey Availability

Alternatives B, C, D, and E may slightly reduce availability of prey in some locations, but this would not affect wolves since there is far more prey available throughout the Methow Watershed than several mobile packs of wolves could use. Actions that potentially affect deer are displayed by alternative in Figure 3.2-42 below. Salvage harvest in deer winter range could slightly enhance forage availability by opening the dead stand further for

improved shrub regeneration. Prey availability would not be a limiting factor for wolves because there are more than 10,000 deer currently in the county.

Figure 3.2-42: Tally of proposed activities that may influence availability of prey for wolves, under Alternatives B, C, D and E.

	Salvage in Deer Winter Range (ac)	Salvage in lightly-burned deer winter range (ac)	Salvage in lightly burned non-winter deer habitat (ac)	Miles of Haul Route in Deer Winter Range
Alt B and E	1,101	845	1,169	54
Alt C	1,101	845	932	53
Alt D	1,220	955	1,476	54

Winter logging operations would result in noise above ambient conditions, creating a new disturbance that may temporarily displace wintering deer (and wolves) from habitat in and adjacent to treatment areas and haul routes. The likelihood of disturbance is higher in areas that burned lightly, due to increased likelihood of deer presence. The amount of salvage in deer winter range that burned lightly would range from 845 in Alternative B and E to 955 acres in Alternative D. The miles of haul route through winter range is nearly identical (53-54 miles). Alternative C would potentially entail use of one less road segment (1.2 mi in length) in winter than alternatives B, D and E, and it occurs in an area that burned at high fire intensity, where there is reduced likelihood of deer and wolf presence. Therefore, effects on winter prey availability are essentially the same for all alternatives.

Other activities

Tree planting, piling and burning slash, road closures, firewood harvest, and danger tree falling are not expected to affect wolf prey availability or the habitat that wolves could use for survival other than minor disturbance related displacement described previously.

Temporary road construction and opening existing roads has the potential to affect wolf populations but since these activities would be limited only to personnel associated with the salvage, the effect to wolves is expected to be short term and minimal.

Cumulative Effects

Past actions and their current effects are considered in Affected Environment above. Below, the potential cumulative effects for wolves are described. The area considered for cumulative effects for wolves was the five 5th order watershed area in which the fire occurred. The timeframe considered for cumulative effects is 20 years, which is approximately how long it will take the new forest to begin to take over ecological function (see the Burned Forest and Snag Habitat Environmental consequences, Snag Persistence) section.

Timber sales
Ongoing and future timber harvest (Mutton, Conger, Flatmoon, and Buck) would remove cover for deer, but would provide improved foraging opportunities. The DNR salvage sale is taking dead and dying timber from State land. This removes some cover although it is mostly standing dead trees. Little impact to deer populations means little change in prey availability and little effect for wolves. Disturbance might displace some wolves temporarily.

Firewood cutting
No consequence for wolves

Fuels treatments
No consequence for wolves

Tree planting
No consequence for wolves

Suppression rehabilitation and BAER treatments
Some Burned Area Emergency Response (BAER) activities for the Tripod Fire area are ongoing. BAER activities include mulching, fertilization, noxious weed control, danger tree falling along 170 miles of open road, and road and trail stabilization. The majority of BAER work would be completed prior to implementation of this project, but any pending BAER activities would, in combination with this project, result in a cumulative effect to wolves stemming from noise disturbance. The result would be temporary displacement of individual animals. The effect on gray wolf individuals or populations would be minimal since it is limited in scope and would only occur for another few months.

Restoration activities
No consequence for wolves

Invasive plants
Livestock grazing
Guidelines and laws would help limit the potential impacts to wolves from encounters with livestock.

Recreational use
Snowmachine use occurs on some existing roads in deer winter range, and in combination with any winter logging conducted under this project, could contribute to cumulative effects on deer (and indirectly wolves) stemming from winter noise disturbance. Most of the cumulative effect is attributable to use of existing roads outside the National Forest boundary. High road densities there may discourage wolf presence regardless of whether salvage logging is conducted in winter.

Unregulated recreation use (motorized use in closed areas) would have a cumulative effect to security for wolves (and all wide-ranging carnivores). It is not clear what degree of use currently occurs and what affect the fire in concert with openings created during salvage might have on future unwanted off road use.

Mushroom gathering
No consequence for wolves beyond the slight disturbance and displacement that may have taken place in the spring of 2007 from wolves that avoided people gathering mushrooms.

Transportation system
Open road density beyond 1 mile per square mile limits wolf use of habitat (Gaines et al. 2003). No road density increases are predicted.

WDFW Wildlife Management Area activities
No consequence for wolves

Timber Stand Improvement
No consequence for wolves

Cumulative effects conclusion

No measurable cumulative effects for wolf habitat are expected from any activity detailed in the list at the beginning of Chapter 3. When taken together with the effects of past actions noted in Affected Environment above and the Direct and Indirect effects described for the alternatives, the viability of wolf populations and the opportunity for recovery for wolves in this area are not jeopardized.

CONSISTENCY FINDING and DETERMINATION OF EFFECT

All alternatives are consistent with interim direction and guidance for management of gray wolves, under FSM 2670, the Forest Plan (USDA Forest Service 1989a), and the Endangered Species Act (as amended). Potential adverse effects on gray wolf are reduced to insignificant levels by planned measures for protection of den and rendezvous sites and for preventing new travel routes from becoming established. No increase in accidental or intentional shooting is anticipated. None of the alternatives would measurably reduce the availability of deer (preferred prey). Provisions for retention of burned and live tree structure in salvage harvest areas would reduce potential impacts to future habitat structure for small mammals (alternate prey).

Based upon the available information and evaluation of direct, indirect, and cumulative effects, all alternatives may affect, but would not likely adversely affect gray wolf.

CANADA LYNX (Lynx canadensis)-- THREATENED

REGULATORY FRAMEWORK

Guidance and direction for management of lynx habitat on National Forest land is contained in the following documents:

The Okanogan National Forest Land and Resource Management Plan requires threatened and endangered species to be managed according to recovery plans, and

requires consultation with U.S. Fish and Wildlife Service when threatened and endangered species may be affected by proposals (Forestwide S&Gs 6-17 and 6-18).

The Endangered Species Act as amended (16 U.S.C. 1531-1544, 87 Stat. 884).

The *Lynx Conservation Agreement* (USDA and USDI 2006) is a commitment from the U.S. Forest Service to reduce or eliminate adverse effects to both lynx and lynx habitat until Forest Plans are amended to address lynx conservation. The Agreement stipulates that the Forest Service will use the *Lynx Conservation Assessment and Strategy*, or "LCAS" (Ruediger et al. 2000) and the Lynx Science Report (Ruggiero et al. 2000a) to guide and evaluate management actions in occupied lynx habitat.

The LCAS (Ruediger et al. 2000) provides a unified strategy for conserving lynx across all federal lands, based on a network of Lynx Analysis Units or "LAUs". It also describes risk factors to lynx, measures that managers may take to avoid or minimize adverse effects, and how management actions may affect individual lynx, lynx populations, and lynx habitat. The Lynx Science Report (Ruggiero et al. 2000a) interprets current scientific knowledge about lynx, and provides the rationale behind current conservation efforts.

LCAS conservation measures were incorporated into the design of this project.

The *Lynx Recovery Outline* (USDI Fish and Wildlife Service 2005) is a preliminary assessment that categorizes and prioritizes areas for lynx recovery, based on current and historical records of lynx occurrence and presence of lynx habitat. Four recovery categories are identified: *core, provisional core, secondary, and peripheral*. This outline is not a regulatory document, but it does provide *interim* recovery objectives for each category until a formal recovery plan is completed.

The Tripod Fire Salvage project area is located within the North Cascades core area of north-central Washington, mapped in the Recovery Outline. Designation as core indicates that the priority for conserving lynx and lynx habitat is high. This is considered background information for this analysis.

The Designation of Critical Habitat (USDI Fish and Wildlife Service 2006b) was based in part on the Lynx Recovery Outline. This document designates critical habitat for lynx in 3 states in the contiguous U.S., including Washington. National Forest lands were excluded from designation, however, based on the commitment from the U.S. Forest Service to use the LCAS to guide actions in the occupied habitats that it administers.

The Tripod Fire Salvage project area is confined to National Forest System lands, and therefore would not affect critical habitat for lynx. Critical habitat for lynx is not addressed further in this document.

BACKGROUND INFORMATION

Life history information for lynx and conservation measures "intended to conserve lynx and to reduce or eliminate adverse effects from the spectrum of management activities on

federal lands" are provided in the LCAS (Ruediger et al. 2000) and *Ecology and Conservation of Lynx in the United States* (Ruggiero et al. 2000b).

The presence of reproductive lynx populations in suitable habitat in north-central Washington is well documented (Koehler 1990). Beginning with records from 1978 and continuing through 2007, Washington State's Natural Heritage Database lists several hundred verified and/or highly reliable lynx sightings in all LAUs within and surrounding the Tripod fire.

Planned Conservation Measures

All applicable conservation measures listed in the LCAS would be implemented under all alternatives. They are listed below (as bullets), with an explanation (in italics) of how each provision would be met under this project:

- If more than 30% of lynx habitat within a LAU is currently in unsuitable condition, no further reduction of suitable conditions shall occur as a result of vegetation management (Reudiger et al. 2000:78); and
- Management actions, including salvage sales, shall not change more than 15% of the lynx habitat within an LAU to an unsuitable condition within a 10-yr-period (Reudiger et al. 2000:80).
    - *For the Tripod Fire Salvage Project, all salvage harvest in lynx habitat would occur in areas that burned at moderate to high fire intensity, and are therefore no longer in a suitable condition for lynx. Habitat condition for lynx would be field-verified prior to any action.*
- Design planting to develop characteristics suitable for snowshoe hare habitat (Reudiger et al. 2000: 29).
    - *For the Tripod Fire Salvage Project, salvage harvest areas within capable lynx habitat would be allowed to regenerate naturally except where natural regeneration is judged inadequate. These areas would be replanted favoring Engelmann spruce and/or lodgepole pine (species favorable to lynx and hares).*
    - *Regeneration would be similar to areas not harvested (within 15% tolerance of area, tree size, and/or tree density).*
    - *In order to protect long-term site productivity (and habitat capability for lynx), soil compaction in harvest areas would be minimized by logging over snow, or skidding only on designated skid trails. Soil decompaction would be conducted where necessary to meet soil Best Management Practices.*
- Following a large disturbance [where down trees could contribute to lynx denning habitat], retain at least 10% of the affected area within LAUs in patches of at least 5 acres in size, to provide future denning habitat. (Reudiger et al. 2000).
    - *For the Tripod salvage project, all units would have small retention islands surrounding favorable wildlife trees. Retention islands would comprise 10% of the acreage within all units. In addition, within capable lynx habitat, 30% of the representative burned forest would be retained in a 20-ac moving window surrounding salvage areas, or roughly 6 out of every 20 ac.*
    - *In addition to retention islands, in lynx habitat, all trees less than 12" and all trees greater than 28" in diameter, and most trees likely to survive, would be retained in salvage units in lynx habitat.*

- *Considerably more than 10% of each LAU affected by the fire would be retained in all alternatives. Abundant large patches will be available as denning habitat in all LAUs.*

Allow no net increase in groomed or designated over-the-snow routes and snowmobile play areas, by LAU (Reudiger et al. 2000).

- *No new access routes will be established for the Tripod Fire Salvage Project, as follows:*
- *All temporary roads would be decommissioned and closed effectively to prevent unwanted use. These closures would be in place at the end of logging operations as part of the timber sale contract.*
- *One existing unauthorized road that would be used as a haul route would be added to the National Forest Road System as a closed road. All other unauthorized roads used would be decommissioned at the end of logging operations and closed effectively to prevent unwanted use, under the timber sale contract.*
- *All currently closed roads to be used as haul routes will remain closed to the public during logging operations, and will be re-closed at the end of logging operations as part of the timber sale contract. The method of closure will be adequate for preventing subsequent unwanted use on these roads.*

Additional Conservation Measures:

If an active lynx den, grizzly bear den, or wolf den or wolf rendezvous site is discovered at any phase of the project, construction activities and project associated disturbance would not occur within 800 meters (½-mile) of the site during the denning or rendezvous period and consultation would be re-initiated with U.S. Fish and Wildlife Service. Contract provisions would include this language.

Information about the protected status of grizzly bears, wolves, lynx, wolverines, fisher, bald eagles, peregrine falcon, gray flycatcher, great gray owl, Townsend's big-eared bat, fringed myotis, and western gray squirrel would be provided to private and Forest Service personnel working on the project.

ANALYSIS METHOD

Proposed salvage activities have the potential to affect future habitat for hares and lynx and also have the potential to create unwanted access to areas currently inaccessible to motorized recreation. The alternatives are evaluated on their effect on future foraging and denning habitat and the change in access for snowmobiles and off road vehicles.

The effects of proposed salvage were analyzed by Lynx Analysis Unit (LAU). The size of an LAU approximates the area used by an individual lynx, about 20 to 50 square miles (Ruediger at al. 2000). The timeframe for consideration of effects is 20 years, since after that time lynx and hare habitat is expected to begin to become effective again.

AFFECTED ENVIRONMENT

Prior timber harvest affected 4118 acres since 1980 in the seven lynx analysis units considered (Figure 3.2-43). For this analysis it was assumed (very conservatively) that all these acres were in an unsuitable condition at the time of the fire.

Tripod Fire suppression actions included building 122 miles of bulldozer fireline. About half of this was within capable lynx habitat. Most of the bulldozer fireline in lynx habitat was not on Federal Land and was not within any of the seven Lynx Analysis Units considered here. About seven miles of bulldozer fireline was constructed within lynx habitat on federal land. All of this fireline (amounting to about 24 acres) was rehabilitated post-fire and is expected to recover fully, commensurate with adjacent burned lynx habitat. In some cases the disturbance will generate more vigorous and abundant regrowth than the surrounding burned forest.

Post-fire Conditions for Lynx

The Tripod Fire burned through approximately 128,000 acre of lynx habitat in 13 LAUs. In the area surrounding the Tripod Fire, all lynx habitat is considered occupied. The percentage of habitat in LAUs that burned ranged from 26 to 92%. In the Apex Mountain LAU, the fire burned only in high elevation subalpine parkland that is not considered lynx habitat.

Fire intensity was variable in all affected LAUs. The percentage of available habitat that burned at *low intensity or did not burn* (still within the fire perimeter) ranged from 4% in the Loomis South LAU, to 42% in the West Fork Salmon LAU. In these areas the fire caused low mortality of overstory trees, and removal of ground and understory cover was presumably light and patchy. Created openings were small, and will increase the diversity of understory structure in burned stands within a few years. Affected stands will continue to provide denning structure for lynx, and/or protective cover and forage for snowshoe hares. They are still in a suitable condition for lynx.

The percentage of lynx habitat that burned at *moderate to high fire intensity* ranged from 5% in the Loomis South LAU, to 74% in the Yarrow Creek LAU. This acreage is no longer in suitable condition for lynx, due to heavy or complete consumption of denning structure and ground cover above snow by the fire.

Linkage areas for lynx movement.
Singleton et al. (2002) reported that the only existing habitat linkage for large carnivores between the North Cascades and Kettle Ranges is a corridor through the Salmon Creek drainage. However, they demonstrated a high degree of ‘permeability’ for lynx throughout northern Washington and southern British Columbia (meaning that they could easily move across the landscape).

Habitat Conditions in LAUs with Proposed Salvage

Under Alternatives B, D, and E salvage harvest is proposed in 7 LAUs. Salvage harvest would occur in 6 LAUs under Alternative C. In LAUs with salvage harvest, the proportion of habitat currently in suitable condition after Tripod Fire ranges from 23 to 83% (Figure 3.2-43). Four of these LAUs (Middle Fork Boulder Creek, North Fork Boulder Creek, Blue Buck Ridge, and Yarrow Creek) currently have more than 30% of lynx habitat in an unsuitable condition, due to the Tripod Fire alone. When lingering effects from timber sales since 1980 are considered, the percentage of habitat in unsuitable condition for the West Fork Salmon LAU also rises above 30%. Under LCAS, 30% is considered a

threshold of viability for individual Lynx Analysis Units. No further suitable habitat removal shall occur in these LAUs until at least 70% of the lynx habitat within the LAU have returned to a suitable condition for lynx.

Figure 3.2-43: Current habitat conditions for lynx in LAUs with proposed salvage harvest, due to combined effects from the Tripod Fire and timber harvest since 1980

LAU *	Available lynx habitat	Habitat harvested since 1980		Habitat unsuitable after high intensity fire**		Habitat unsuitable due to prior harvest ***	Total habitat in unsuitable condition	
		ac	%	ac	%	ac	ac	%
BBR	19,980	516	*3*	12,357	*62*	266	12,623	*63*
MFB	21,380	542	*3*	13,694	*64*	265	13,959	*65*
NFB	10,481	866	*8*	7,523	*72*	542	8,065	*77*
NFS	12,642	413	*3*	2,548	*20*	329	2,877	*23*
SFB	11,843	612	*5*	1,504	*13*	527	2,031	*17*
WFS	15,499	839	*5*	4,451	*29*	733	5,184	*33*
YAR	23,766	330	*1*	17,537	*74*	174	17,711	*75*

** Full names of LAUs can be found in Figure 3.2-45*
*** includes habitat that was harvested prior to fire.*
**** includes harvest acres that did not burn or burned at low fire intensity*

Winter recreational use of the existing designated snowmobile trail system may influence use of habitat by lynx. Assuming that most of these trails receive some level of snowmachine use in winter, the overall level of human influence on lynx habitat would be rated high for five of the seven LAUs where salvage harvest is proposed based on density of existing roads and trails (Gaines et al. 2003) (Figure 3.2-44). Snowmachines are restricted to the designated snowmobile trail system in the Okanogan National Forest Travel Plan. This analysis assumes use outside these routes is minor, and not measurable.

Figure 3.2-44: Availability of winter security habitat for lynx in LAUs with proposed salvage harvest (acres and percent of LAU, by route density class), and resulting human influence rating for winter security habitat (methodology developed by Gaines et al. 2003). An underlying assumption is that all existing roads are used by snowmachines in winter.

LAU	Route Density Class (mi/sq mi)								Rating
	0		>0 -1		1-2		>2		
	ac	%	ac	%	ac	%	ac	%	
BBR	8,661	*32*	3,446	*13*	3,126	*12*	11,618	*43*	High
MFB	17,675	*64*	1,922	*7*	2,857	*10*	5,229	*19*	Low
NFB	7,668	*49*	1,324	*8*	1,342	*9*	5,260	*34*	High
NFS	9,381	*40*	1,569	*8*	2,750	*14*	13,413	*39*	High
SFB	1,932	*10*	1,569	*8*	2,750	*14*	13,413	*68*	High
WFS	11,438	*42*	3,297	*12*	3,482	*13*	8,936	*33*	High
YAR	21,127	*75*	1,528	*5*	2,581	*9*	2,760	*10*	Low

ENVIRONMENTAL CONSEQUENCES

Direct and Indirect Effects

Alternative A

Natural regeneration in lynx habitat that burned at high fire intensity will create a dense new cohort of young trees. In approximately 20 years, when young trees have attained heights that protrude above snow, the lynx habitat that burned will provide abundant forage and protective low cover for snowshoe hares. Hare populations will thrive under these conditions. The high density of hares will provide superior foraging opportunities for lynx for at least 2-3 decades. Falling dead trees will provide additional protective cover (as logs) for hares, and after the stand has matured, for lynx kittens.

For the next 20 years there will be few foraging and denning opportunities for lynx in habitat that burned at moderate to high intensity. Lynx that survived the fire are likely to be displaced into areas that did not burn, where they may face increased competition with other predators, and increased risk of mortality due to starvation or predation.

All Action Alternatives

Because all applicable conservation measures from the LCAS would be implemented under *all* action alternatives, potential effects on lynx would be reduced to immeasurable and/or discountable levels. The effects from alternatives B, C, D, and E are addressed collectively, below.

Lynx Habitat

Little negative consequence for lynx habitat recovery is expected. In approximately 20 years, when young trees have attained heights that protrude above snow, the lynx habitat that burned would provide abundant forage and protective low cover for snowshoe hares. Hare populations will thrive under these conditions. As stated in the Forest Vegetation Section

> Salvage harvest would have little or no effect on the residual conifer seed source in harvest units because only dead trees and fire injured trees expected to die would be removed. Conifer seedling abundance is expected to mimic that found in Montana by Kolb (2006) where no difference was found in conifer seedling abundance between salvage logged and un-logged sites that were similar to those in the Tripod area.
> Salvage harvest operations would likely be completed within two years after the fire and there would be little or no logging damage to post-fire natural regeneration (McIver and Starr 2001).
> Soil disturbed by logging would provide favorable conditions for the establishment of natural regeneration because disturbed mineral soil generally produces the best germination and seedling survival for all conifer species that re-establish after a fire (Lotan and Perry 1983, Burns and Honkala 1990)
> Soil disturbance attributed to salvage logging is not expected to impede natural regeneration establishment because seedling stocking on skid trails often reaches higher levels than on adjacent undisturbed areas (Smith and Wass 1976).

Under all alternatives, planned salvage harvest would not affect lynx habitat that is currently in a suitable condition. In no case would trees be removed from lynx habitat in a

suitable condition. Biologists and silviculturists would make a determination of suitability on the ground where a question arises. Potential effects on lynx would stem from the effects of salvage on future habitat structure for prey, and future foraging and denning opportunities for lynx.

The amount of potential lynx habitat affected prior to field review is displayed in Figure 3.2-45. Salvage under alternative B and E would affect as much as 0.2 to 1.2% of the capable lynx habitat acres within seven affected LAUs (Figure 3.2-45). Salvage under alternative D would affect 0.5-2.5% of capable lynx habitat acres in the same LAUs as alternative B. Actual acres affected would likely be less than displayed following field verification. The effects realized from the salvage of trees on these areas within lynx habitat would be removal of some future cover for snowshoe hares, but abundant cover for hares is expected to be available and is not expected to limit hare recovery and re-colonization.

The proportion of *burned* lynx habitat that would be salvaged is also very minor (0.6-3.9% under alternative B and E, and 0.8-11% under alternative D). Alternatives B and E, and D differ in the amount of *burned* lynx habitat that would be treated.

Figure 3.2-45: Proposed salvage harvest in lynx habitat (acres of harvest, and % of available lynx habitat), under alternatives B and E, and D. All treatment areas would be in unsuitable condition for lynx, due to effects from the Tripod Fire.

LAU Name	Proposed harvest in lynx habitat			
	Alt B and E		Alt D	
	ac	%	ac	%
Blue Buck Ridge	94	*0.4*	191	*1.0*
Middle Fork Boulder	204	*1.0*	211	*1.0*
North Fork Boulder	128	*1.2*	200	*1.9*
North Fork Salmon	55	*0.4*	66	*0.5*
South Fork Beaver	109	*0.9*	298	*2.5*
West Fork Salmon	100	*0.6*	100	*0.6*
Yarrow	52	*0.2*	166	*0.7*

Burned stands (whether harvested or not) would not be favorable for lynx or hares for about 20 years. Few lynx will use these areas until they recover sufficiently to provide lynx and hare cover taller than the average snow depth. Under Alternatives B and D, removal of standing dead and dying trees in burned lynx habitat would reduce (but not eliminate) future log cover for hares in regenerating stands. It would also reduce future down wood cover for lynx kittens. Nevertheless, in 20 years enough snags, logs and conifer regeneration would be present in each 20-acre neighborhood where harvest occurred to provide for lynx and hare recovery.

Alternative E would harvest trees from the same number of acres as Alternative B, but would leave the dead and dying trees 21 inches DBH and larger meaning there would be, on average, 2.2 more snags per acre. Until these trees fell there would not be a measurable effect of retaining these dead trees for lynx or hares. When they did fall there would be a slight increase in cover for lynx and hares.

Alternative C would retain all dead trees on about 741 acres proposed for harvest in Alternatives B and E and about 1228 acre proposed for harvest in Alternative D that are in capable lynx habitat as defined in the LCAS and determined by GIS analysis. If Alternative C were selected, field verification would occur to document that the units proposed are not capable of becoming lynx habitat.

Standing dead trees provide little value to hares. Fallen dead trees are valuable cover for hares as long as there is other vegetation available as food nearby. Conifer recovery will not be substantially different for any alternative (see above and the Forest Vegetation section). Future fallen logs retained as today's snags in alternative C would add cover during the period 20-40 years after the fire. This could add slightly to hare recovery, but cover adequate to facilitate abundant hare recovery is expected for all alternatives.

Some units are included in Alternative C that are within MA-12 Forest Plan Lynx Habitat designation. These would be in stands that are determined not to be capable lynx habitat. Because no salvage would occur in lynx habitat under alternative C, its' effects to lynx are identical to the no action alternative. The difference between alternatives that harvest dead and dying trees in lynx habitat (B, D, and E) and those that don't (A and C) is not substantial, and in 20 years there would not be a measurable difference for lynx or hare population recovery for any alternative.

Down wood cover would continue to increase over time in treatment areas for all alternatives due to fall of burned trees that would be left (those smaller or larger than the diameter limit and damaged trees not highly likely to die which in fact do die and fall). Treated areas would provide highly productive hare habitat and superior foraging conditions for lynx within approximately 20 years due to dense regeneration of conifer trees (particularly lodgepole pine).

Under Alternatives B, D, and E, burned habitat retention patches (approximately 6 acres within and surrounding 20 acres salvage harvested) would in time become islands of enhanced cover for hares and lynx kittens, due to higher accumulations of down logs. Large trees left in these patches would provide for lynx and hare habitat needs and would provide structural diversity in salvage harvested stands.

<u>Noise Disturbance</u>
Under all action alternatives, planned use of heavy equipment, motorized vehicles, and chainsaws during logging operations would result in noise above ambient conditions in and around treatment areas, landings, and haul routes. Under Alternatives B, D, and E patches of unburned or lightly burned lynx habitat – still in a suitable condition – adjoin some treatment areas, and the elevated noise level may temporarily displace lynx from these areas. Only a fraction of lynx habitat in suitable condition would be subject to this kind of noise disturbance at any point in time, however, and because all of the potentially harvested acreage is currently unsuitable for lynx, there is a greatly reduced likelihood that lynx would be present. The disturbance from logging would usually last one season for any individual harvest unit and would actually amount to a few days to a few weeks. Temporary displacement of individual lynx would have no consequence for lynx populations.

Snow Compaction and/or Snow Removal

Under all action alternatives, the plans to use existing roads, to restore all existing road closures after logging (including pre-fire closures opened for the fire), and prevent unwanted use on all temporary roads, would prevent new travel routes from becoming established in LAUs. Long-term human use patterns and the amount of compacted snow resulting from winter recreation in lynx habitat would not change from current conditions as a result of proposed salvage harvest.

The option of winter logging under Alternatives B, D, and E would entail plowing roads and operating logging equipment in treatment areas and at landings. Human activity related to logging is of little consequence to lynx (Reudiger et al. 2000).

The presence of plowed roads in lynx habitat may increase the likelihood of bobcat and coyote presence in winter, to the detriment of lynx (Reudiger et al. 2000). Under Alternatives B, D, and E, winter logging could entail snow removal on up to 53.4 and 54.8 miles of road through lynx habitat in seven LAUs, respectively[2]. For both alternatives, more than half of this mileage would occur in habitat that is no longer in suitable condition, and where likelihood of lynx presence is low. Under alternative C, winter logging could entail snow removal on up to 28.8 mi of road through lynx habitat in six LAUs. More than half of this mileage (18.3 mi) passes through burned forest that is no longer in suitable condition; therefore the likelihood of lynx presence is low. In addition, this is a temporary effect that would be short-term and therefore would be a minor effect.

Because snow conditions in suitable habitat outside of units and adjacent to haul routes would still favor lynx, and because snow compaction associated with winter logging would be temporary, effects would be minor for lynx.

Forest Plan Amendment

No amendment is needed to allow harvest operations to occur in winter in MA-12-20G (lynx habitat designation) since the habitat is not in a suitable condition and the goals of the management area would be met. An amendment to the Forest Plan (Standard MA12-17D) is proposed to allow motorized vehicle access for salvage logging operators in Management Area 12-01. Motorized access would have little consequence for lynx since more than 70% of the capable habitat in the affected LAUs is in an unsuitable condition because of the fire. The fire itself probably displaced the lynx that might have been using these areas.

Forest Plan Standard MA 12-20A states that “scheduled and non-scheduled timber harvest shall be designed to perpetuate lynx habitat and to address current habitat needs”. The salvage harvest proposed does not compromise this standard. Lynx habitat would be perpetuated and current and future habitat needs would be met. The suitable habitat remaining would be retained completely, and the habitat that is currently (and temporarily) unsuitable is assumed to be unoccupied. Its’ return to suitability would be very similar whether harvested or not. This Forest Plan standard would be met for all alternatives.

[2] This is the total road mileage through lynx habitat. It is highly unlikely that all routes would be used in winter; therefore effects on lynx would probably be less than described here.

Effects from Travel Routes
Building temporary roads would create some new routes through forested areas. Harvest units would create openings that could be attractive as play areas and travel routes for snowmobiles. As part of project design, access to these areas would be closed effectively to prevent unwanted and unauthorized use. They would remain closed in the Forest Travel Plan.

Key linkage areas
Because lynx have demonstrated the ability to move through openings (especially those with 'islands' of habitat retained as designed for this project), because suitable habitat that was not impacted by the fire would not be affected in any alternative, and because conservation measures from the LCAS are incorporated to minimize impacts to lynx, none of the alternatives is expected to affect the ability of wolves to move through key linkage areas in Okanogan County.

Other activities
Piling and burning slash, firewood harvest, and danger tree falling are not expected to affect lynx populations because of the small area and short duration of these activities.

Cumulative Effects

Past actions and their current effects are considered in Affected Environment above. Below, the potential cumulative effects for lynx are described. The area considered for cumulative effects for lynx was the five seven Lynx Analysis Units where salvage is proposed. The timeframe considered for cumulative effects is 20 years, which is approximately how long it will take the new forest to begin to take over ecological function (see the Burned Forest and Snag Habitat Environmental consequences, Snag Persistence) section. The timeframe considered for cumulative effects is 20 years, which is approximately how long it will take the new forest to begin to take over ecological function (see the Burned Forest and Snag Habitat Environmental consequences, Snag Persistence) section.

Timber sales
Ongoing and future timber harvest (Mutton, Conger, Flatmoon, and Buck) would remove habitat for lynx, but would be required to meet LCAS guidelines. The DNR salvage sales are removing dead and dying timber from State land. These sales are in the South Fork Toats Coulee Lynx Analysis Unit beyond those LAUs where harvest is proposed for Tripod and so are not considered to be affecting the Tripod project cumulatively.

Firewood cutting
No consequence for lynx

Fuels treatments
No consequence for lynx

Tree planting
Up to 4900 acres of capable lynx habitat could be planted where regeneration in 5 years is insufficient to re-establish future suitable lynx habitat. The relative proportion of tree species planted would mimic the species mix present before the fire, so this activity would

be very important for lynx habitat recovery. This is in addition to the similar approach for harvest unit tree planting in capable lynx habitat. This amounts to 22% of the Lynx / Montane Forest habitat in the project area and lynx and hare survival will be improved because of it.

Suppression rehabilitation and BAER treatments
No consequence for lynx

Restoration activities
No consequence for lynx

Invasive plants
No consequence for lynx

Livestock grazing
Active cattle grazing allotments overlap all LAUs where salvage harvest would occur. Livestock grazing within lynx habitat has the potential to affect lynx by reducing forage for snowshoe hares and thus indirectly reducing foraging opportunities for lynx (Reudiger et al. 2000:29). The potential for competition is most pronounced in riparian shrub habitats (such as willow). Livestock grazing would be delayed where needed until standards are met that indicate sufficient recovery has occurred to allow return of livestock grazing without additional resource impacts (see section 3.13 Range and Appendix H). Plans to limit livestock use in burned forest areas until recovery is complete would reduce cumulative impacts to snowshoe hares from cows.

Recreational use
Approximately 6000 people come to the area each year to recreate. The areas where harvest is proposed in lynx habitat are closed to motorized travel from December 1 to March 31 each year for lynx habitat protection. Unauthorized / unwanted use is a small fraction of the recreation activity in lynx habitat, but it could grow. The degree to which unauthorized use is restricted depends to a large extent on the amount of law enforcement and public awareness applied to this area. The potential effect for lynx would be temporary displacement of individuals. Monitoring is planned for the next several winters.

Mushroom gathering
No consequence for lynx beyond the slight disturbance and displacement that may have taken place in the spring of 2007 from lynx that avoided people gathering mushrooms.

Transportation system
Continuing management of road systems to provide reasonable recreation access without adding new routes in lynx habitat is the foreseeable approach. This will result in stable lynx populations for at least the next decade.

WDFW Wildlife Management Area activities
No consequence for lynx

Timber Stand Improvement
Only a small portion of the 1200 acres of thinning planned would occur in lynx habitat. There would be little consequence for lynx or hares because of the small amount of acres included.

Cumulative effects conclusion

The only substantial foreseeable consequence for lynx would be unwanted and unauthorized winter recreation in lynx habitat. Disturbance from these unauthorized activities could displace lynx. Livestock use will be monitored and would meet Forest Plan standards, thus allowing for hare recovery. Tree planting would provide measurable improvement in the burned lynx habitat that does not regenerate naturally. Together with the past actions noted in the Affected Environment section and the Direct and Indirect effects described for the project alternatives, the cumulative effects described here do not jeopardize lynx or pose a negative outcome for lynx habitat. There are no other activities from the list at the beginning of Chapter 3 currently ongoing or proposed in the three-watershed analysis area that might affect lynx.

CONSISTENCY FINDING and DETERMINATION OF EFFECT

All four action alternatives are consistent with guidance in the LCAS (Ruediger at al. 2000) and the Lynx Conservation Agreement (USDA and USDI 2006). Referring to the conservation measures employed for the Tripod project, LCAS states "…projects that implement them are generally not expected to have adverse effects on lynx."

Providing educational materials and protecting any den site discovered during the project would further reduce the potential for negative effects from the project. Retaining burned tree structure and burned habitat patches in treatment areas ensures that future habitat structure would support both hares and lynx. Insuring no new routes are created in lynx habitat is a key provision of the project. Plans to use designated skid trails and implement best management practices for soils, to allow natural regeneration and where planting is needed, to favor trees species beneficial to hares and lynx, would all help maintain long-term habitat capability for lynx.

A very small percentage of the lynx habitat that was burned and rendered unsuitable for about 20 years is proposed for harvest. There will be little measurable impact to forest regeneration from any salvage harvest proposed in that burned lynx habitat. No lynx habitat that is currently in a suitable condition is affected in any alternative. Lynx and hares will respond similarly to areas harvested and areas not harvested.

No new travel routes would be created in any alternative. No harvest would occur in lynx habitat that is in a suitable condition. Due to slightly reduced future foraging and denning opportunities for lynx within treated stands, and the potential for short-term displacement of lynx during logging operations (due to noise disturbance), proposed salvage harvest under Alternatives B, D, and E may affect, but would not likely adversely affect Canada lynx.

Because lynx may travel through areas that are not capable lynx habitat, a small potential for brief displacement of individual lynx exists as a result of noise disturbance during logging operations proposed in alternative C. This would be a very minor effect with no consequence for the lynx population. Therefore, proposed salvage under Alternative C may affect, but would not likely adversely affect Canada lynx.

The U.S. Fish and Wildlife Service has concurred with the analysis and findings in this document regarding effects of the proposed project to Canada lynx and lynx habitat.

Based on the USFWS review and concurrence with this analysis, a review of all recent scientific literature on hares and lynx relevant to this project, discussion with top lynx experts regarding the effects of this project, and the author's personal experience with lynx and lynx habitat in north central Washington since 1989, it is determined that this project does not threaten the viability of lynx in or near the project area.

GRIZZLY BEAR (Ursus arctos)--THREATENED

REGULATORY FRAMEWORK

The Okanogan National Forest Land and Resource Management Plan requires threatened and endangered species to be managed according to recovery plans, and requires consultation with U.S. Fish and Wildlife Service when threatened and endangered species may be affected by proposals (Forestwide S&Gs 6-17 and 6-18).

Guidance for management of grizzly bears and bear habitat is found in the Endangered Species Act as amended (16 U.S.C. 1531-1544, 87 Stat. 884) and the *Grizzly Bear Recovery Plan* (USDI Fish and Wildlife Service 1997).

BACKGROUND INFORMATION

Life history information and conservation strategies for grizzly bears are provided in the *Grizzly Bear Compendium* (IGBC 1987), on file at the Methow Valley Ranger Station. Grizzly bears use a wide variety of habitats found in and around the Tripod Fire area. Food preferences change seasonally and include carrion, deer, moose, small mammals, spawning salmon, insects, grasses, forbs, and berries.

Analysis method
Key strategies for conservation and recovery of grizzly bears include reducing the potential for negative human-bear encounters, protecting den sites, and retaining core area[3] in designated bear management units. Proposed salvage activities have the potential to affect grizzly bears by altering habitat structure for prey (and thus foraging opportunities for bears), and also by reducing core area. Therefore, alternatives are evaluated on the basis of den site protection, and changes to core area (IGBC 1998).

[3] Areas free from human disturbance at least 500 meters from an open road, motorized trail, or high-use trail.

The entire Tripod Fire Area is located with the North Cascades Grizzly Bear Recovery Zone. For this analysis, affected environment for grizzly bears and effects of alternatives are evaluated for bear management units or "BMUs" established under the Grizzly Bear Recovery Plan. Effects are considered for a 10-year timeframe.

Planned Conservation Measures

To reduce potential adverse effects to grizzly bears from proposed salvage harvest, the following conservation measures would be implemented under all action alternatives:

Information about the protected status of grizzly bears, wolves, lynx, wolverines, fisher, bald eagles, peregrine falcon, gray flycatcher, great gray owl, Townsend's big-eared bat, Fringed myotis, and western gray squirrel would be provide to all private and Forest Service personnel working on the project. The information would include penalties for shooting and harassing.

Information about the proper storage of items that attract bears and camping in bear country would be provided to all private and Forest Service personnel working on the project.

In the unlikely event that an occupied grizzly bear den is located, all project activities within 800 meters would be suspended between Oct 1 and May 30 and consultation would be re-initiated with US Fish and Wildlife Service.

AFFECTED ENVIRONMENT

Species Occurrence

The current estimated population size of grizzly bears size in the North Cascades Recovery Zone is small (Romain-Bondi et al. 2004). The best information available before the Tripod Fire indicated that grizzly bears were present in BMUs affected by the fire. Two class I (verified) sightings are recorded, one in the Upper Toats BMU (1990) and one in the Lower Chewuch BMU (1986). There are 9 other class 2 (probable) sightings and 1 other sighting of unknown reliability, scattered among the 6 BMUs that burned. Observations occurred between 1986 and 2003, and in all seasons of the year (WDFW PHS 2007).

Habitat Effects and Food Availability

Tripod Fire burned approximately 175,000 acres of bear habitat in six BMUs. Four forest habitat types were affected: alpine parkland, dry forest, mixed conifer forest, and montane forest. All may be used seasonally by grizzly bears.

The percentage of BMU that burned ranged from 4% in the Lower Toats BMU, to 40% in the Lower Chewuch BMU. The percentage of bear habitat that burned at high mortality ranged from 3 to 29% of the affected BMUs. Most of the acreage that burned at high fire mortality was predictably, in Montane Forest.

Although the Tripod Fire initially reduced herbaceous foraging opportunities for grizzly bears, rapid recovery of vegetation in areas that burned at low intensity may improve conditions for bears, especially in *Vaccinium* plant associations. This is because of

increased availability of herbaceous forage and/or creation of berry fields that may attract bears in fall.

Core Area

Core areas (areas >500m from open roads, motorized trails, and high use hiking trails) provide seclusion from disturbance for grizzly bears. The percentage of BMU acreage that currently qualifies as core area ranges from 17% in the Middle Methow BMU, to 89% in the Upper Chewuch BMU (Figure 3.2-46). BMUs with less than 55% core area (Lower Chewuch, Lower Toats, Middle Methow, and Salmon) are considered to have a high level of human influence on grizzly bear habitat. BMUs with between 55 to 70% core area (Upper Toats) have moderate level of human influence on bear habitat. BMUs with more than 70% core area (Upper Chewuch) have a low level of human influence on bear habitat (Gaines et al. 2003:15).

Figure 3.2-46: Affected environment for grizzly bears: current availability of core area within BMUs affected by the Tripod Fire, and resulting rating for the level of human influence on bear habitat (methodology developed by Gaines et al. 2003).

Core Area	BMU					
	Lower Chewuch	Lower Toats	Middle Methow	Salmon	Upper Chewuch	Upper Toats
acres	78,401	30,113	24,906	25,044	133,406	73,432
% of bmu	*40*	*41*	*17*	*34*	*89*	*66*
RATING	High	High	High	High	Low	Moderate

Key Linkage Areas for Grizzly Bear

According to Singleton et al. (2002), the only habitat linkages for large carnivores between the North Cascades and Kettle Ranges are a corridor that includes the Salmon Creek drainage and a corridor that crosses near Vaseux Lake in southern British Columbia. The project area functions as an important corridor for movement of wolf, wolverine, grizzly, and lynx (ensuring genetic exchange between populations).

ENVIRONMENTAL CONSEQUENCES

Direct and Indirect Effects

Alternative A
No salvage harvest would occur. Herbaceous vegetation will recover rapidly in areas that burned at low fire intensity, increasing herbaceous foraging opportunities for grizzly bears within 3-5 growing seasons following the fire. Deer will return quickly to these areas and provide predaceous foraging opportunities for grizzly bears. Small mammals (including ground squirrels, hares, pocket gophers, and marmots) will also respond rapidly to recovering vegetation and will provide an additional food source for grizzly bears.

Foraging opportunities for grizzly bears will initially remain low in areas that burned at high intensity (about 66% of the total fire area), due to slow recovery of vegetation and reduced prey populations.

All Action Alternatives

Core Area and Potential Disturbance from Use of Roads
Availability of core area for grizzly bears (and seclusion from human disturbance) would not change under Alternatives B, C, D, or E due to planned use of existing roads and to the locations of proposed temporary roads. Under all alternatives, temporary roads would be located in areas where no removal of core would result, due to presence of other roads. Small (<1%) temporary increases in road density would occur in affected BMUs, but would be inconsequential for grizzly bears due to retention of all existing core area.

Even though core area would not be affected, use of temporary roads and temporary use of "closed roads" would still increase the potential for noise disturbance to grizzly bears outside of core area. Plans to decommission all temporary roads and to restore effective closures on Maintenance Level 1 roads (as part of the timber sale contract) ensure that ambient noise levels after this project would be the same or lower than they are now. Plans to restrict public access for the life of this project on the level 1 (closed) roads that are used also help ensure that new human use patterns would not become established as a result of this project.

Motorized use already occurs in summer on all existing haul routes; therefore, use of existing roads for hauling would not pose a new disturbance to grizzly bears or their potential prey.

Under all alternatives, three existing unauthorized road segments totaling 3.3 miles would be added to the Forest Service Road system, but these roads already receive use, and adding them to the system would not result in new human disturbance to grizzly bears.

Potential for Human-Bear Encounters
Under all action alternatives, information about the proper storage of items that attract bears and the protected status of grizzly bears would be provided to all personnel working on the project to reduce the likelihood of encounters and accidental shooting of bears by people.

Den Site Protection
Although no grizzly bear dens have been detected in or near this project area (or anywhere else in the Tripod Fire area), if one is located at any time during the life of this project, it would be protected from disturbance under all alternatives. The likelihood is low, however, due to apparent lack of denning habitat in and around the project area.

Key Linkage Areas
Due to the retention of existing core area, none of the alternatives would reduce the ability of grizzly bears to move through the key linkage area for wide-ranging carnivores in the Salmon BMU.

Direct and Indirect Effects that Vary By Alternative

Prey Availability
Alternatives B, C, D, and E may slightly reduce the availability of small mammal prey within harvest units, due to removal of snags (and ultimately logs). Snag retention measures would limit this effect. The affected acreage is displayed in Figure 3.2-47. Availability of small mammals will not be limiting for grizzly bears for any alternative.

Residual burned trees (<10" and >28" in diameter) and trees in burned forest retention patches would contribute to recruitment of down wood cover in all treatment areas. Down wood cover would also continue to accrue in unburned patches intermingled with treatment areas. Within 5 years, improved habitat conditions for small mammals would result from new vegetation growth (providing forage) both within and outside of harvest units.

Noise Disturbance Associated with Salvage Harvest
Non-winter operation of chainsaws and heavy equipment in treatment areas and at landings would result in noise above ambient conditions, and may pose a short-term disturbance to grizzly bears and their potential prey (such as deer), especially in areas that burned lightly. Individual bears may be displaced from the immediate project area during intermittent periods of disturbance. Loss of predaceous foraging opportunities for individual bears would small and inconsequential.

Figure 3.2-47: Amount of proposed salvage in grizzly bear habitat, by BMU

Proposed Activity	BMU					
	Lower Chewuch		Middle Methow		Salmon	
Salvage in bear habitat	ac	*% of bmu*	ac	*% of bmu*	ac	*% of bmu*
Alt B	1,649	*0.8*	215	*0.2*	874	*1.2*
Alt C	1,390	*0.7*	63	*<0.1*	785	*1.1*
Alt D	1,998	*1.0*	501	*0.4*	892	*1.2*
Salvage in "lightly burned" bear habitat	ac	*% of lightly burned*	ac	*% of lightly burned*	ac	*% of lightly burned*
Alt B	1,151	*2.6*	116	*0.9*	739	*4.9*
Alt C	1,039	*2.3*	53	*0.4*	676	*4.4*
Alt D	1,369	*3.1*	295	*2.2*	756	*5.0*

Other activities
Tree planting, piling and burning slash, temporary road construction, opening existing roads, road closures, firewood harvest, and danger tree falling are not expected to affect grizzly bear populations since these are short term actions in limited areas.

Cumulative Effects

Past actions and their current effects are considered in Affected Environment above. Below are the potential cumulative effects for grizzly bears. The area considered for cumulative effects for grizzly bears was the three BMUs where salvage harvest is proposed. The timeframe considered for cumulative effects is 20 years, which is approximately how long it will take the new forest to begin to take over ecological function (see the Burned Forest and Snag Habitat Environmental consequences, Snag Persistence) section.

Timber sales
Ongoing and future timber harvest (Mutton, Conger, Flatmoon, and Buck) would remove some trees in these areas. Additional food plant production (serviceberry, currant, and *Vaccinium spp*.) is a possible effect of this harvest.

Firewood cutting
No consequence for grizzly bears.

Fuels treatments
Additional food plant production (serviceberry, currant, and *Vaccinium spp*.) is a possible effect of fuels treatment.

Tree planting
No consequence for grizzly bears.

Suppression rehabilitation and BAER treatments
No consequence for grizzly bears.

Restoration activities
No consequence for grizzly bears.

Invasive plants
No consequence for grizzly bears.

Livestock grazing
Guidelines and laws would help limit the potential impacts to grizzly bears from encounters with livestock.

Recreational use
With approximately 6000 people per year recreating in the project area, the potential for bear/human interactions exist.

Mushroom gathering
Some potential for human / bear encounters exists with people hiking in the fire area. Conservation measures of this activity include encouraging users to employ bear safe sanitation practices and camp in designated sites.

Transportation system
Road systems and their effect on core habitat are not expected to change.

WDFW Wildlife Management Area activities
No consequence for grizzly bears.

Timber Stand Improvement
No consequence for grizzly bears.

Cumulative effects conclusion

Bears being destroyed as a result of human encounters is the most apparent potential cumulative effect for grizzly bears, so developing ways to avoid these encounters are the key conservation measures employed. This is the same effect for past actions, Direct and Indirect effects of the alternatives, and the cumulative effects described. Taken together when conservation measures are fully applied (as they are expected to be), the opportunity for grizzly bear recovery in the vicinity of the Tripod Salvage project is not compromised by the actions considered here. There are no other activities from the list at the beginning of Chapter 3 currently ongoing or proposed in the three-watershed analysis area that might affect grizzly bears.

CONSISTENCY FINDING and DETERMINATION OF EFFECT

Based on planned measures for protection of den sites, educating personnel associated with the project about bears, and retention of core area, all action alternatives are consistent with guidance for management of bears and bear habitat in the North Cascades Recovery Zone. There would be no net loss of core area under any alternative. Additional measures for preventing new travel routes from becoming established as a result of this project reduce the potential for increased noise disturbance on bears outside of core area. Provisions for retention of burned trees in salvage harvest areas would provide for continued recruitment of down wood cover for prey. Opportunities for grizzly recovery are not compromised. The current viability of grizzlies in north central Washington would not change as a result of any alternative.

Based upon the available information and evaluation of direct, indirect, and cumulative effects, all alternatives may affect, but would not likely adversely affect grizzly bear.

SENSITIVE SPECIES

REGULATORY FRAMEWORK FOR ALL SENSITIVE SPECIES

Direction and guidance for managing all sensitive species is found in FSM 2670 (threatened, endangered, and sensitive species) and the Forest Plan (USDA Forest Service 1989a). Sensitive animals are required to be protected in the Forest Plan (Forestwide S&G 6-19). Management actions shall not result in a downward trend towards federal listing of sensitive species.

BALD EAGLE (HALIAEETUS LEUCOCEPHALUS)--SENSITIVE

REGULATORY FRAMEWORK

Guidance for management of bald eagles is found in the Endangered Species Act as amended (16 U.S.C. 1531-1544, 87 Stat. 884), in the *Pacific Bald Eagle Recovery Plan* (USDI Fish and Wildlife Service 1986), and in the Management Recommendations for Bald Eagle (Watson and Rodrick 2000).

On June 28, 2007 the U.S. Fish and Wildlife Service removed the bald eagle from the list of Endangered and Threatened wildlife in the lower 48 states. Bald eagles are now managed as a sensitive species in the U.S. Forest Service Pacific Northwest Region.

BACKGROUND INFORMATION

Life history information and conservation guidelines for bald eagles are described in the Management Recommendations for Bald Eagle (Watson and Rodrick 2000).

Key strategies for conservation and recovery of bald eagles include limiting illegal shooting, reducing environmental toxins (such as DDT), reducing lead shot in waterfowl, preventing exposure to poisoned animals that may be eaten as carrion, reducing the risk of electrocution, protecting nest trees and preventing disturbance to nesting pairs, and preventing disturbance to wintering eagles at roost sites.

Risk of Illegal shooting, exposure to toxins, lead shot, and poisoned carrion, and risk of electrocution would not change as a result of proposed management actions on National Forest System lands. Salvage harvest activities could potentially affect bald eagles through disturbance to nesting pairs and to wintering eagles. In this project, however, no salvage harvest activities are proposed in nesting habitat for bald eagle [generally areas within 500 meters of open water, on fish-bearing streams and lakes (USDI Fish and Wildlife Service 1986)]. Therefore alternatives are assessed on their potential to disturb wintering eagles on deer winter range.

Due to their association with deer carrion, effects to bald eagles are evaluated on the basis of mapped deer winter range in BMUs. Effects are considered for a 20-year timeframe.

AFFECTED ENVIRONMENT

The Tripod Fire did not affect nesting habitat for bald eagles. The fire burned across 10% of the available deer winter range in the Methow Valley, but is not expected to affect deer numbers or the availability of winter carrion for bald eagles. Deer are expected to return quickly to areas that burned at low fire intensity, and will provide an ample supply of winter carrion for bald eagles (see deer section earlier in this chapter).

Species Occurrence

There are no bald eagle records within the Tripod Fire area (WDFW PHS 2007). Bald eagles winter throughout the Methow and Okanogan valleys, foraging on carrion and waterfowl. Nesting occurs at lower elevations in both basins, well outside the fire area and current project area.

ENVIRONMENTAL CONSEQUENCES

Direct and Indirect Effects

Alternative A
No salvage harvest would occur in deer winter range or near bald eagle nest sites. There would be no new disturbance to wintering bald eagles.

All Action Alternatives
Protection of Nests
There is no nesting habitat for bald eagles in or near proposed salvage areas, but in the unlikely event that a nest is located, as a raptor nest it would be protected under all action alternatives.

Potential for Disturbance to Wintering Eagles
Proposed salvage harvest in (burned) deer winter range would encompass 1,101 acres under Alternatives B, C, and E, and 1,220 acres under Alternative D.

Bald eagles are immensely wide-ranging birds that adapt quickly to changing prey conditions, especially in winter. There are abundant food sources for wintering eagles in the Methow and Okanogan basins, including winter- and road-killed deer, and livestock afterbirth. Any noise disturbance to eagles associated with winter salvage harvest activities would be brief and inconsequential. None of the alternatives would affect bald eagle use of these basins.

Cumulative effects

Past timber harvest has improved forage conditions for deer and slightly improved prey availability for eagles. Future timber harvest could do the same.

CONSISTENCY FINDING AND SUMMARY

All action alternatives would be consistent with guidance for management of bald eagles under the Bald Eagle Recovery Plan, and for protection of nests under the Migratory Bird Treaty Act. Continued bald eagle population expansion would occur unaffected by any alternative within this project.

Based upon the available information and the evaluation of the direct, indirect, and cumulative effects, all alternatives may impact individuals or habitat but would not likely contribute to a trend toward Federal listing or a loss of viability for bald eagles.

WIDE-RANGING CARNIVORES: Wolverine (Gulo Gulo) And Fisher (Martes Pennanti)

BACKGROUND INFORMATION

Life history information and conservation recommendations for both species are provided in *The scientific basis for conserving forest carnivores: America marten, fisher, lynx, and wolverine in the Western United States* (Ruggeiro et al. 1994).

Wolverines are opportunistic feeders that take a wide variety of prey in summer and primarily scavenge on large mammal carrion in winter, which in this area would be deer. Berries may be important in fall. Snow-covered talus slopes, boulder fields, tree roots, and log jams may be used as natal den sites. Seclusion from human disturbance is an important consideration for females with kits (Banci 1994:111-113).

Fisher take a variety of small- to medium-sized prey, including snowshoe hares, squirrels, and mice. They also feed on deer carrion and fruit (Powell and Zielinski 1994: 39, 53). In the Pacific Northwest they are associated with dense late-successional forests with multi-aged trees and abundant snag and down wood structure. Cavities in snags and logs provide natal and maternal den sites and resting sites.

Key conservation strategies for both species include retention of complex forest structure with large trees and logs, limiting fragmentation of late-successional forest habitat, providing seclusion from human disturbance, and maintaining key linkages between geographically separated populations.

Alternatives are evaluated here on the basis of these criteria. Because both wolverine and fisher are wide-ranging carnivores, BMUs are used here for the scope of analysis (Gaines et al. 2003). The period of consideration is 10 years.

AFFECTED ENVIRONMENT

The Tripod Fire burned approximately 175,000 acres of forest habitat for fisher and wolverine in six BMUs. Most (74%) of the burned acreage was in the Montane Forest habitat type (Johnson and O'Neil 2001).

Stand-replacing fire killed all or most standing trees and removed all understory vegetation on approximately 100,400 acres (66% of the overall fire area). These areas do not support suitable habitat conditions for wide-ranging carnivores. Within the fire perimeter, there were also 58,800 acres of forest that either did not burn, or burned lightly so that overstory trees were not killed (34% of the fire area). This acreage retains enough overstory and understory structure to support continued use by small mammal and avian prey populations, and by wolverine and fisher as well.

Availability of security habitat-- areas free from human disturbance--is an important consideration for all wide-ranging carnivores. The percentage of available security habitat

in BMUs affected by the Tripod Fire was previously reported in Figure 3.2-41 in the gray wolf section. In all three BMUs with proposed salvage, the level of human influence on habitat for wolverine and fisher is currently rated as "high", due to high density of existing open roads and motorized trails.

According to Singleton et al. (2002), the only habitat linkage for large carnivores between the North Cascades and Kettle Ranges is a corridor that includes the Salmon Creek drainage (part of the Salmon BMU). Movement of wolf, wolverine, grizzly bear and lynx through this area ensures genetic exchange between populations, and prevents demographic isolation.

Species Occurrence

There have been no recent documented sightings of fisher in north-central Washington. Wolverines are known to occur in low densities across the north-central Cascades. There are 9 recent reports of wolverine in or near the Tripod Fire area (1980-2001) (WDFW PHS 2007). Six of the 9 occur in or adjacent to the Lower Chewuch BMU. In 2006 and 2007 four wolverines were live-trapped west of the fire area, and fitted with radio-collars. Their movements are currently being studied.

ENVIRONMENTAL CONSEQUENCES

Direct and Indirect Effects

Alternative A
No salvage would occur in burned forest. Large numbers of dead and dying trees – including large trees – may fall over within the next 10 years, providing abundant high quality down wood cover throughout the fire area. Recovery of herbaceous vegetation would occur within 3-5 growing seasons in areas that burned lightly and within 5-10 years in areas that burned at moderate-to-high fire intensity. Deer would return rapidly to lightly burned areas, and within a few years, to remaining parts of the fire. Resumption of summer deer use would provide predaceous foraging opportunities for wolverine, and a renewed supply of carrion in deer winter range areas that burned.

Due to their preference for dense late-successional forest habitat structure, potential fisher use of the fire area is likely to remain low or incidental until overstory canopy structure has recovered (decades from now). If fisher were present, as small mammal prey populations rebound from the fire (aided by an abundance of down wood cover in and around fire-created openings), they might be attracted to and use edges of these burned forest openings.

All Action Alternatives
Security Habitat and Disturbance from Roads
Availability of security habitat for wolverine and fisher (and seclusion from human disturbance) would not change under Alternatives B, C, D, or E due to planned conservation measures that would prevent new travel routes from becoming established. Therefore, the availability of security habitat would not change.

Under all alternatives, road densities in BMUs would increase slightly for the duration of the project (through 2014), due to existence of temporary roads. Noise disturbance would also increase over current levels in some localities, due to harvest-related use of temporary roads and "closed" roads (which presumably receive some OHV use now), in summer. The habitat subject to increased disturbance, however, would only be used incidentally by carnivores due to presence of other nearby open roads.

Winter Disturbance

Winter logging operations in the Lower Chewuch and Middle Methow BMUs (including use of haul routes not already used by snowmachines) may result in noise above ambient conditions, and may displace deer (and consequently wolverines) from adjacent habitat. The potential for disturbance to deer is highest in lightly burned winter range areas (where deer are more likely to be present for the next 3-5 years) – and both the amount of salvage proposed and the miles of road that would be used in these areas is about the same for all alternatives.

Because only a small portion of the available deer winter range would be subject to intermittent salvage-related noise disturbance, only individual animals would likely be displaced. The loss of predaceous foraging opportunities for a wide-ranging carnivore like wolverine would be minimal. Moreover, wolverine use of these areas would probably be incidental at best, due to the low elevation and disturbance from winter recreation. The overall impact to wolverine would be insignificant under all alternatives

Linkage Areas

Removal of fire-killed and dying trees would reduce overstory canopy, snags, and down log recruitment in treatment areas, but it would not result in fragmentation of habitat because both species occur in openings. Due to planned conservation measures for retention of burned habitat patches and burned trees, and for retention of security habitat, none of the alternatives would impact the ability of wide-ranging carnivores to move through the Salmon Creek linkage area.

Direct and Indirect Effects that Vary by Alternative

Habitat Structure for Prey

Removal of fire-killed and dying trees in salvage harvest areas would reduce but not eliminate future habitat structure (log cover) for small mammals such as snowshoe hare, in regenerating stands. The degree of impact would be commensurate with the acreage of salvage harvest proposed under each alternative (See Figures 3.2-18 through 3.2-25).

Under all alternatives, however, residual burned trees <10" and >28" in diameter (≥ 21" for Alternative E), intermingled unburned patches, and burned retention patches (40% of the area within and surrounding harvest units) would still contribute to long-term recruitment of down wood cover, in and around treatment areas. Therefore, treated areas would still support small to medium-sized prey such as hares, and would still provide predaceous foraging opportunities for fisher and wolverine. The slight reduction of predaceous foraging opportunity associated with salvage would be inconsequential to both carnivores, under all alternatives. The prey availability in hundreds of thousands of hares, squirrels, chipmunks, and marmots, along with deer, goats, moose, (and occasionally elk) and their

carrion, far outweighs the need for food from even the densest possible population of fishers and wolverines imaginable. Prey will not be a limiting factor for these carnivores.

Other activities
Tree planting, piling and burning slash, construction of temporary roads, opening existing roads, road closures, firewood harvest, and danger tree falling are not expected to affect wolverine or fisher populations because of the temporary nature and local extent of these activities compared with large ranges for these carnivores.

Cumulative effects

Past actions and their current effects are considered in Affected Environment above. Below, the potential cumulative effects for wolverine and fisher are discussed. The area considered for cumulative effects for these carnivores was the five 5th order watersheds area in which the fire occurred. The timeframe considered for cumulative effects is 20 years, which is approximately how long it will take the new forest to begin to take over ecological function (see the Burned Forest and Snag Habitat Environmental consequences, Snag Persistence) section.

Recreational use
Winter recreation occurs in high elevation areas. Unauthorized use could affect denning wolverines. It is possible that law enforcement capability might not be able to keep up with increasing expansion and pressure in areas occupied by these carnivores. Winter helicopter access for recreation is a regulated activity on the Forest with standards of conduct defined that limit the possible conflicts with wolverines (and fishers). Monitoring of unauthorized use within and surrounding the fire area is planned.

Transportation system
No increase in the transportation system is expected and so secluded areas in seasons other than winter are likely to remain stable and provide similar habitat as currently.

Cumulative effects conclusion

Only unauthorized recreation use has the potential to impact wolverines and fishers cumulatively with the activities planned for Tripod. Planned monitoring will allow management and law enforcement adjustment if needed. There are no other activities from the list at the beginning of Chapter 3 currently ongoing or proposed in the three-watershed analysis area that might affect this species.

CONSISTENCY FINDING AND SUMMARY

All alternatives would be consistent with direction and guidance for management of sensitive species under FSM 2670 and the Forest Plan (USDA Forest Service 1989a), and with key strategies for conservation of wolverine and fisher gleaned from Ruggiero et al. (1994). Linkages with other populations would not be affected by any alternative. None of the alternatives would result in a downward trend toward federal listing under the Endangered Species Act.

Based upon the available information and the evaluation of the direct, indirect, and cumulative effects, it has been determined that implementation of all action alternatives may impact individuals or habitat but would not likely contribute to a trend toward Federal listing or a loss of viability for wolverine and fisher.

WESTERN GRAY SQUIRREL (Sciurus griseus)

BACKGROUND INFORMATION

Life history information is available in the *Draft Washington State Recovery Plan for the Western Gray Squirrel* (Linders and Stinson 2006), and *Terrestrial Mammals of Washington State: location data and predicted distributions, Volume 3* (Johnson and Cassidy 1997).

Gray squirrel distribution in Washington is disjunct, and populations in the Methow Valley are believed to be on the northern periphery of the species' range. Here they inhabit open low elevation forests of Douglas-fir and/or ponderosa pine, near areas with nut-producing trees (Johnson and Cassidy 1997:148). Pine nuts (seeds from immature cones of ponderosa pine) and nuts of walnut trees may be important local food sources. Gray squirrels nest in cavities of large old live and dead conifers and hardwoods (Vander Haegen et al. 2005). In dry forest, riparian areas provide both foraging and nesting opportunities for gray squirrels.

Key strategies for conservation applicable to the Tripod area include maintaining food and nesting resources (nut-bearing trees and shrubs and large tree structure). Proposed alternatives are evaluated on the basis of large tree removal.

Affected environment and effects of the alternatives on western gray squirrels are examined within the three watersheds where harvest is proposed. The period of consideration is 10 years as a reasonable time period to assess the effectiveness of conservation measures applied.

AFFECTED ENVIRONMENT

The Tripod Fire burned approximately 7,156 acres of Dry Forest habitat and 20,302 acres of Mixed Conifer Forest habitat. Stand-replacing fire removed habitat structure for gray squirrels on 11,546 acres (42%) of the potential habitat. Remaining areas (15,912 ac) burned at lower fire intensity. In those areas, residual trees may still provide habitat structure for western gray squirrels, particularly near riparian areas.

Species Occurrence

No observations of gray squirrels are recorded in or near the Tripod fire area (WDFW PHS 2007). The nearest records are from a small population located more than 20 miles from the nearest proposed harvest.

ENVIRONMENTAL CONSEQUENCES

Direct and Indirect Effects

Alternative A
No harvest of burned trees would occur. Over the next 10 years, large tree structure – both live and dead – would persist in lightly burned gray squirrel habitat, providing potential nesting structure for squirrels. Logs would continue to accrue and provide protective ground cover for squirrels.

All Action Alternatives
Because gray squirrels depend on green trees for nesting and foraging and since no green trees are proposed for harvest there would be no effect to the availability of habitat for gray squirrels from any action alternative. Gray squirrels are not known to occupy the Tripod area. The opportunity for gray squirrels to occupy this area in the future would not change because of the harvest proposed in any alternative.

Other activities
Tree planting, piling and burning slash, construction of temporary roads, opening existing roads, road closures, firewood harvest, and danger tree falling are not expected to affect gray squirrel populations because most of these activities will occur in places that burned heavily that are not highly suitable for gray squirrels, and will last only a short time.

Cumulative effects

Because there are no effects of the project there are no cumulative effects.

CONSISTENCY FINDING AND SUMMARY

All alternatives are consistent with direction and guidance for management of sensitive species under FSM 2670 and the Forest Plan (USDA Forest Service 1989a). No live trees or shrubs would be removed in any alternative so food resources and nesting structures will be unaffected by any alternative.

Based upon the available information and the evaluation of the effects, it has been determined that all action alternatives may impact individuals or habitat but would not likely contribute to a trend toward Federal listing or a loss of viability for gray squirrels.

TOWNSEND'S BIG-EARED BAT (Corynorhinus townsendil) AND FRINGED MYOTIS (Myotis thysanodes)

BACKGROUND INFORMATION

Life history information for Townsend's big-eared bat is located in Washington Department of Fish & Wildlife's Priority Habitat and Species Management Recommendations, Volume V: Mammals, Townsend's big-eared bat (Woodruff and Ferguson 2005). Information

about the distribution and habitat needs of fringed myotis is located in the fringed myotis species account (O'Farrell and Studier 1980).

Both species are associated with dry conifer forests and open shrub habitats in eastern Washington. Both species roost in caves, mines, rock outcrops, and buildings and both are sensitive to human disturbance, particularly around roosts. Both bat species are insectivores that focus on moths and often glean them from the foliage of trees and shrubs.

Key strategies for conservation include providing a pesticide-free insect food source and preventing human disturbance in or near winter hibernacula and nursery roosts. These are the measures by which the alternatives were assessed.

Affected environment and effects of the alternatives on both sensitive species of bats are evaluated within the three watersheds where harvest is proposed. The period of consideration is 10 years.

AFFECTED ENVIRONMENT

Tripod fire burned approximately 175,000 ac of forest habitat. Little is known about the assemblage of insects that were present or that will respond to the fire. No caves are known in this portion of the county. Mines and old buildings are abundant and provide the suitable nursery sites known in Okanogan County for Townsend's bats. Roosts are not well known for fringed myotis and none are documented in eastern Washington.

Species Occurrence

No records for these sensitive bats have been recorded in the Tripod fire area (WDFW PHS 2007). The nearest record for fringed myotis is located approximately 16 miles from both the fire area and from the closest proposed salvage area. The nearest record for Townsend's big-eared bat is located approximately 8 miles from the fire area and closest proposed salvage area.

ENVIRONMENTAL CONSEQUENCES

Direct and Indirect Effects

Alternative A
The fire altered the forest habitat for these bats very substantially. A key for all bat species is insect prey availability. Natural recovery processes would occur and no harvest of dead trees would change those processes.

All Action Alternatives
A variety of insects will respond to the fire and to the recovering vegetation within the fire area. It is possible the fire will improve the availability and vulnerability of prey. Some food resources might have been lost. The degree to which the harvest of dead and dying trees affects insect prey for these bats is possibly the most important factor to be evaluated.

Currently little is known about how any timber harvest affects bats or their habitat including insect prey such as moths and other invertebrates. Even less is known about wildfire effects and the benefits or consequences of timber salvage after wildfire. It is possible that removing some dead trees and creating open foraging areas (a process that is beneficial for some aerial insectivorous birds) could benefit these bat species, however no information is available regarding this relationship. Roost availability in rock outcrops and old mines is not expected to change. Little disturbance to these features is expected. No measurable difference would occur in any of the alternatives. Mines and old buildings would not be affected.

Other activities
Tree planting, piling and burning slash, construction of temporary roads, opening existing roads, road closures, firewood harvest, and danger tree falling are short term, localized activities that occur in the daytime and are not expected to affect bat populations. Roost availability would not be affected by any action proposed since no mines or buildings would be altered.

Cumulative effects

Timber harvest has the potential to influence insect populations and consequently prey for these bats. How harvest changes insect abundance, species composition, or availability is not known.

Mine closures have the potential to close crucial winter hibernacula and exclude bats from habitat essential for their survival. A program of mine closure is ongoing in the County. Excluding human use with bat-friendly 'gates' has been proven effective. This practice is expected to continue.

Taken together with the past actions and direct and indirect effects noted above, the cumulative effects described are not likely to jeopardize the continued persistence of these bats in the three watershed area around the Tripod project where salvage activities are planned.

CONSISTENCY FINDING AND SUMMARY

All alternatives are consistent with FSM 2670 and the Forest Plan (USDA Forest Service 1989a); however, information sufficient to determine the effects of timber salvage on Townsend's big-eared bats or fringed bats does not exist. It is possible that salvage might draw these bats to the openings created during harvest, or it is possible that they might avoid harvested areas. No matter what response might be ultimately determined, there would be a wide variety of habitat abundantly available for Townsend's big-eared bats and fringed myotis for any alternative chosen. Hibernacula for both species would be unaffected and insect prey would be abundantly available for any alternative selected. While this salvage project may impact individuals it is not likely to cause a trend toward federal listing for these bats.

PEREGRINE FALCON (Falco peregrinus)

BACKGROUND INFORMATION

Life history information for peregrine falcon is provided in *American peregrine falcon: status of the species in the Columbia River Basin* (Pagel 1995). Cliffs near water are their preferred nesting habitat. Peregrines generally prey on birds over water or open areas, killing birds in the air.

In 1999, the U.S. Fish and Wildlife Service removed peregrine falcon from the federal endangered species list. The species is being monitored through 2015 to ensure that it no longer needs the protection of the Endangered Species Act.

Key strategies for conservation of peregrine falcon include limiting illegal shooting, maintaining abundant avian prey, limiting direct and indirect exposure to pesticides, and limiting disturbance to nesting pairs. Alternatives are evaluated on the basis of their effects on prey availability, and likelihood of disturbance.

Effects on peregrine falcon were evaluated within the three watersheds where harvest is proposed, for a period of 10 years.

AFFECTED ENVIRONMENT

The Tripod fire burned approximately 175,000 ac of forest habitat, including riparian forest that supported abundant and diverse avian prey (primarily songbirds) for peregrine falcon. Few cliff structures suitable for peregrine nesting occur within and near the fire area. The Landbird section reports the effects of the fire and the effects of proposed harvest on birds that are at least supplemental, but generally not primary, prey for peregrine falcons. Cliffs were not affected by the fire.

Species Occurrence

There are no known peregrine falcon aeries (cliff nests) in Okanogan County *(*WDFW PHS 2007). Incidental sightings occur, and recent captures of young peregrine falcons at the Chelan Ridge Raptor Migration Project (40 miles south) indicate that peregrines at least migrate over the area, and probably forage here. Shorebirds, rock doves, and waterfowl are their preferred prey

ENVIRONMENTAL CONSEQUENCES

Direct and Indirect Effects

Alternative A
No tree removal would occur in burned forest habitat. Dead and dying trees would persist as snags, and provide standing decayed wood habitat structure for woodpeckers and a host of other secondary cavity users. They would also provide platform nesting and perching structure for other landbirds – particularly aerial feeders such as flycatchers.

Although peregrines generally do not forage in forested habitat, prey availability might increase slightly in the short-term because avian prey may be more vulnerable in newly created openings. Their primary avian prey, waterfowl, shorebirds, and rock doves were not affected by the fire and will still be available in the area.

All Action Alternatives

Prey Availability

Removal of trees killed or injured in the fire would not measurably affect landbirds as potential prey mostly because the abundance of prey species would far outweigh the potential need (see Landbird section). Waterfowl, shorebirds, and rock doves all would be equally available before and after salvage harvest. Prey availability is not limiting for peregrine falcons.

Likelihood of Disturbance to Nesting Pairs

Under all alternatives, plans to survey any suitable cliffs near areas where helicopters are used for yarding, and restricting helicopter flights to areas away from cliffs during the nesting season if nests are found, would reduce the potential for disturbance to nesting peregrine falcons to a discountable level.

Other activities

Tree planting, piling and burning slash, temporary road construction, opening existing roads, road closures, firewood harvest, and danger tree falling are not expected to affect peregrine falcon populations. Proposed salvage activities would have little or no impact on illegal shooting of peregrines or their exposure to pesticides.

Cumulative effects

No cumulative effects are expected within the three watersheds where harvest is proposed. Helicopter activities conducted during BAER had the potential to disturb peregrine falcons. This in addition to the helicopter harvest actions proposed for alternative D, could slightly impact nesting peregrines. Mitigation measures are included to reduce this effect to immeasurable levels.

CONSISTENCY FINDING AND SUMMARY

All action alternatives are consistent with direction and guidance for management of sensitive species under FSM 2670 and the Forest Plan (USDA Forest Service 1989a), and with key strategies for conserving peregrine falcons.

Because nesting cliffs are limited in and near the project, because prey would not be limiting, and because surveys would allow protection of nesting sites found, it has been determined that all alternatives may impact individuals or habitat but would not likely contribute to a trend toward Federal re-listing or a loss of viability of peregrine falcons.

Great Gray Owl (Strix nebulosa)

BACKGROUND INFORMATION

Life history information for great gray owl is available in *Flammulated, boreal and great gray owls in the United States: a technical conservation assessment* (Hayward and Verner 1994), as well as in *The Birds of North America No. 41* (Bull and Duncan 1993). These publications are on file at the Methow Valley Ranger Station.

Great gray owls require large tree structure for nesting. Nests have been recorded in abandoned goshawk nests, dwarf mistletoe brooms, large broken-topped snags, and artificial platforms. They forage for small mammals in forest openings (meadows, old burns, aspen stands, and harvest areas). Forest openings with scattered trees, meadows, old burns, and aspen stands are important components of great gray owl habitat.

Key strategies for conservation include retention of large tree structure for nesting (including large old snags, trees with mistletoe brooms, and trees with stick nests built by other raptors), maintaining small mammal prey populations, limiting use of rodenticides in forest management, protecting nesting pairs from disturbance, and maintaining openings in dense forest.

Planned Conservation Measures
In order to reduce potential impacts to great gray owls, the following conservations measures would be implemented under all action alternatives:

> To minimize disturbance to nesting pairs, surveys would be ongoing for the duration of the project in all treatment areas that are adjacent to potential nesting habitat for great gray owls. If active nests are located, operation of chainsaws and heavy equipment within ¼ mile of nest trees would occur outside the breeding period for great gray owls.

Affected environment and effects of the alternatives on great gray owl are examined within the three watersheds where harvest is proposed. The period of consideration was 10 years.

AFFECTED ENVIRONMENT

Tripod fire burned approximately 175,000 ac of forest habitat, including 130,000 ac of Montane Forest and 20,300 acres of Mixed Conifer Forest potentially occupied by great gray owls. In 69% of the Montane Forest that burned (89,600 acres), and 55% of Mixed Conifer Forest that burned (11,200 acres), the fire was stand-replacing and left little or no nesting structure for great gray owls or vegetative cover for small mammal prey (see Figure 3.2-24 in the Landbirds section). This habitat is no longer suitable for great gray owl nesting but could provide some foraging habitat at the boundary between intact and high intensity stand-replaced habitat.

Tree cover (including potential nesting structure for great gray owl) persists in areas that burned at low fire intensity or did not burn (49,500 acres). The fire reduced but did not

eliminate understory vegetation, down wood cover, and small mammal prey populations. These areas still provide both nesting and foraging opportunities for great gray owls.

Some burned trees were removed from areas adjacent to some forest roads in an effort to reduce the danger from trees falling to the road. These were mostly trees smaller than 12" DBH and were not suitable for nesting for great gray owls. Some trees greater than 20" DBH were also removed. No counts or tallies were kept. Nesting trees are not limiting for great gray owls.

Species Occurrence

Information from before the fire indicated that great gray owls nested in and around the fire area. Three verified great gray owl records are located north of the project area.

ENVIRONMENTAL CONSEQUENCES

Direct and Indirect Effects

Alternative A
No harvest of burned trees would occur. Habitat conditions for great gray owls would improve substantially over the next 10 years, as vegetation recovers and small mammal populations rebound dramatically over the entire fire area. Areas with residual snags and unburned trees would provide perching structure for foraging great gray owls, and in lightly burned or unburned areas – potential nesting structure. Down wood would continue to accrue in burned and unburned areas as snags and green trees fall, providing protective cover for small mammals in forest openings and in forested stands.

All Action Alternatives
The effect of all action alternatives is similar.

Loss of nest trees
It is unlikely that a great gray owl pair would nest in a dead tree that was valuable for salvage harvest. Nests are in broken top snags with a flat platform type area, or a stick nest or mistletoe broom in a live tree. These are not the type of trees that would be harvested in the project. A slight potential exists for nest trees to be removed if they interfered with the removal of salvage timber or were within a skid road or temporary road to a landing. Surveys planned during project activities would restrict the falling of these trees if they were found to be nest trees.

Prey Habitat
Removal of fire-killed or fire-injured trees would reduce overstory canopy cover and snag densities in treatment areas, and would also reduce down wood habitat structure. This would reduce protective cover as small mammal populations recover and may affect prey availability for great gray owls in areas that would function as 'openings'. Because pocket gophers and voles are favored prey, fewer logs might result in prey being more vulnerable with less cover. This is a very small proportion of the burned landscape (no more than 12% of any habitat type, see Figures 3.2-19 and 3.2-20) and foraging and nesting opportunities would not be limiting.

Foraging Habitat
While no research is available regarding the effects of post-wildfire salvage logging on great gray owls, it is possible that harvest of dead and dying trees could create conditions favorable for great gray owl foraging by mimicking meadow foraging habitat, at least for a few years until conifer regeneration allows young forest cover to re-establish dominance.

In these same areas, planned retention of all burned trees <10" and >28" in diameter (or ≥21 for Alternative E), retention of patches of burned forest habitat in and around proposed salvage (40 acres in every 100 acres, or 6 out every 20 acres in lynx habitat), and retention of all trees likely to survive, would ensure continued availability of snags and down wood cover. Therefore, salvage areas would continue to provide habitat for great gray owls, under all alternatives.

The recovery of herbaceous vegetation is likely to greatly increase small mammal prey populations for great gray owls, within 10 years. Planned salvage in these areas would not affect shrub, forb, and grass recovery (see section 3.5 Forest Vegetation).

With provisions for snag and down wood retention, potential impacts to great gray owls would be reduced to an immeasurable level under *all* action alternatives.

Disturbance to Nesting Pairs
Operation of chainsaws and heavy equipment in treatment areas during spring and summer would result in intermittent noise above ambient conditions, and could result in disturbance to nesting great gray owls. Due to planned surveys for great gray owls, and implementation of seasonal operating restrictions around active nests located, the potential for disturbance to nesting pairs is substantially reduced under all action alternatives.

Other activities
Piling and burning slash, construction of roads, opening existing roads, road closures, firewood harvest, and danger tree falling are not expected to affect owl populations since mitigation measures are designed to detect and protect these owls.

Cumulative effects

Past actions and their current effects are considered in Affected Environment above. Below are the potential cumulative effects for great gray owls. The area considered for cumulative effects for great gray owls was the three 5th order watersheds where salvage is planned. The timeframe considered for cumulative effects is 20 years, which is approximately how long it will take the new forest to begin to take over ecological function (see the Burned Forest and Snag Habitat Environmental consequences, Snag Persistence) section.

Timber sales
Ongoing and future timber harvest (Mutton, Conger, Flatmoon, and Buck) could remove nest trees, but would provide improved foraging opportunities for great gray owls.

The Conger and Mutton timber sales in the Salmon Creek watershed and Ramsey, Bear, Conger, Sinlahekin, Cougar, and Mutton prescribed fire projects could cause disturbance and displacement effects to great gray owls.

Surveys are required for timber sales on the Forest and so nests found would be protected.

Timber Stand Improvement
Thinning timber stands could improve prey availability and vulnerability. More areas to hunt would result in healthier populations. The 1200 acres planned for TSI are within good suitable habitat for great gray owls.

Cumulative effects conclusion

These effects of timber sales and timber stand improvement projects in addition to the past actions and direct and indirect effects of the proposed alternatives would not cause a measurable negative effect and could improve population numbers of these animals. There are no other activities from the list at the beginning of Chapter 3 currently ongoing or proposed in the three-watershed analysis area that might affect great gray owls.

CONSISTENCY FINDING AND SUMMARY

All alternatives are consistent with direction and guidance for management of sensitive species under FSM 2670 and the Forest Plan (USDA Forest Service 1989a).

No rodenticides are planned for use in or near the Tripod project. Small mammal populations are expected to recover rapidly following forest vegetation regeneration. Considering that surveys would be conducted to find newly nesting owls and that very few live trees would be removed, it has been determined that all action alternatives may impact individuals or habitat but would not likely contribute to a trend toward Federal listing or a loss of viability for great gray owl.

GRAY FLYCATCHER (Empidonax wrightii)

SCALE OF ANALYSIS

Affected environment and effects of the alternatives on gray flycatcher are examined within the three watersheds where harvest is proposed. The period of consideration is 10 years.

BACKGROUND INFORMATION

Life history information for gray flycatcher is available in *The Birds of North America No. 458* (Sterling 1999). Distribution and habitat associations in Washington are described in *Breeding Birds of Washington State* (Smith et al. 1997). *Gray Flycatcher Habitat*

Considerations (Woodruff et al. 2004) provides local information. These papers are on file at the Methow Valley Ranger Station.

On the Okanogan National Forest gray flycatchers inhabit dry forest 'savannahs' characterized by open ponderosa pine tree cover, and an understory dominated by bitterbrush and bunchgrasses.

Key strategies for conservation include maintaining open forest conditions in dry forest. Proposed alternatives are evaluated on the basis of their effect on overstory tree cover.

AFFECTED ENVIRONMENT

The Tripod fire burned approximately 175,000 acres of forest habitat, including 7,156 acres of Dry Forest potentially occupied by gray flycatchers. Almost half of this habitat burned at high fire intensity, killing most trees and leaving little or no cover for gray flycatchers. Tree cover will decline further as burned trees fall and additional trees die from injuries. These areas are currently unsuitable for gray flycatchers.

Open tree cover for gray flycatchers persists in areas that burned at low fire intensity (about 4,700 acres). The fire may have improved habitat conditions for gray flycatchers here, by reducing dense canopy and dense understory vegetation that might have favored other species of flycatchers. These parts of the fire still function as gray flycatcher habitat.

Species Occurrence

Verified sightings are documented for Okanogan County in *Breeding Birds of Washington State* (Smith et al. 1997). Despite their limited abundance in the Region and hence Sensitive Species status on National Forests in Oregon and Washington, gray flycatchers occurred commonly on study plots in Dry Forest habitat in recent bird studies on the Okanogan National Forest (unpublished data analyzed in the Landbird section and available at the Okanogan and Wenatchee National Forest Headquarters Office).

ENVIRONMENTAL CONSEQUENCES

Direct and Indirect Effects

Alternative A
No harvest of burned trees or removal of tree cover would occur. Gray flycatcher habitat would persist in low-elevation areas that burned at low fire intensities, and around the edges of severely burned forest, depending on the amount of residual tree cover. Very little is known about gray flycatcher response to fire, but some indication of a positive response to low intensity fire comes from abundant data collected for 5 previous years in the Birds and Burning project in and near the fire area.

All Action Alternatives
The effect of action alternatives is similar.

No live trees are planned for removal; consequently nesting trees would be unaffected. Depending on the amount of structure remaining after harvest, an improvement in habitat for gray flycatchers could be realized.

Openings created by harvest of dead and dying trees from higher mortality areas would not have a negative effect on gray flycatchers and might benefit gray flycatchers (at least near edges of high mortality patches) by creating more aerial foraging habitat similar to the effect documented scientifically for olive-sided flycatchers and Lewis's woodpeckers (Saab et al. 2007, Kotliar et al. 2002). There is insufficient research to support this speculation (which is based on local experience), but publications of local studies on gray flycatchers are forthcoming. The effect would be very small since less than 12% of the dry forest habitat that burned is proposed for salvage in any alternative (Figure 3.2-20).

Other activities
Piling and burning slash, construction of temporary roads, opening existing roads, road closures, firewood harvest, and danger tree falling are short-term, local actions that are not expected to affect gray flycatcher populations.

Cumulative effects

The Conger and Mutton timber sales in the Salmon Creek watershed and Ramsey, Bear, Conger, Sinlahekin, Cougar, and Mutton prescribed fire projects are planned in gray flycatcher habitat. Currently not enough is known about prescribed fire or timber harvest effects to gray flycatchers to determine if these projects would cause positive or negative effects or both.

CONSISTENCY FINDING AND SUMMARY

All alternatives are consistent with FSM 2670 and the Forest Plan (USDA Forest Service 1989a), however, information sufficient to determine the effects of timber salvage on gray flycatchers does not exist. It is possible that salvage might benefit these birds by improving aerial foraging habitat in created openings, or it is possible that they might avoid harvested areas because there are insufficient perches or cover from predators. No matter what response might be ultimately realized, there would be a wide variety of habitat abundantly available for gray flycatchers with any alternative chosen. While this salvage project may impact individuals it is not likely to cause a trend toward federal listing for these birds.

3.3 Fisheries/Hydrology

REGULATORY FRAMEWORK

The Okanogan Land and Resource Management Plan (Forest Plan) provides direction for the Tripod Salvage project area (USDA Forest Service 1989a). The Decision Notice and Environmental Assessment for the Interim Strategies for Managing Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, and Portions of California (PACFISH) amended the Forest Plan in 1995 (USDA and USDI 1995).

The Forest Plan desired condition (page 4-5) includes:

Riparian areas will continue to display riparian ecosystem values.

Habitat to support threatened and endangered species will be protected in accordance with recovery plans.

Fisheries habitat for rearing, spawning, and migration will be in an improved state.

Habitat improvement projects will increase habitat diversity and streambank stability will enhance the fisheries habitat.

Forest soil productivity will be maintained. Water yield and quality will be substantially the same.

Overall open road mileage will be lower than mileage under 1989 conditions.

The project alternatives, which include the design criteria and mitigation measures described in Chapter 2, were designed to be consistent with Standards and Guidelines from the Forest Plan as amended by PACFISH (USDA and USDI 1995:C-3). The Standards and Guidelines that apply to this project include the following:

Riparian (Forest Plan, Page 4-30):

2-3 Ground-based skidding equipment may be allowed, on a case-by-case basis, to operate within the riparian ecosystem when the ground is frozen and there is adequate snowpack. Landing areas shall not be located in riparian areas.

2-4 Maintain vegetation on streambanks that is needed to provide cover and streambank stability.

2-7 New road construction shall not occur in riparian ecosystems, except to cross.

2-9 In streamside management unit class I, II, III streams, management activities shall not degrade water quality for aquatic resources below current Washington State water quality standards, except for temporary changes in permitted activities.

2-10 Timber shall not be felled across the stream.

2-11 Logging equipment shall not operate in stream channels. All logs shall be fully suspended over the stream. Temporary crossings of the riparian ecosystem, including the stream channel, shall be avoided. Exceptions shall only be allowed if approved and located before construction.

2-12 Maintain stream shading necessary to meet temperature requirements of aquatic organisms historically found in the system.

Fisheries (Forest Plan, page 4-31):

3-1 Maintain or enhance biological, chemical, and physical qualities of forest fish habitats.

3-3 Sediment in streams shall be maintained a levels low enough to support good reproductive success of fish populations as well as adequate instream food production by indigenous aquatic communities to support those populations.
Fines: Fines measured as 1.00 mm or less in spawning areas (pool tail outs and glides) should be maintained at less than 20% as the area weighted average.
Macroinvertebrates – Maintain stream substrate so that at least 3 sediment sensitive species typical of the area are present, along with overall densities of 200 individuals per square meter.

3-4 and 3-5 Wood and pools are addressed as "PACFISH" Riparian Management Objectives as described below.

3-6 Manage riparian vegetation to provide sufficient trees near the stream channel to act as a source of large woody debris for future instream fish habitat needs.

PACFISH includes Riparian Habitat Conservation Areas (RHCAs), Riparian Management Objectives (RMOs), and Key Watersheds. PACFISH has eight Riparian Goal statements to guide management of National Forest Lands at the watershed scale. Standards and Guidelines in PACFISH for RHCAs relevant to the tripod Fire Salvage project include:

TM-1 PACFISH: Prohibit timber harvest, including fuelwood cutting, in Riparian Habitat Conservation Areas, except as described below.

TM-1a PACFISH: Where catastrophic events such as fire, flooding volcanic, wind, or insect damage result in degraded riparian conditions, allow salvage and fuelwood cutting only where present and future woody debris needs are met, where cutting would not retard or prevent attainment of other Riparian Management Objectives, and where adverse effects on listed anadromous/inland native fish can be avoided. For priority watersheds, complete Watershed Analysis prior to salvage cutting in RHCAs.

RF-2a PACFISH: For each existing or planned road, meet the Riparian Management Objectives and avoid adverse effects on listed anadromous fish by completing watershed analyses prior to construction of new roads or landings in Riparian Habitat Conservation Areas.

RF-2b PACFISH: For each existing or planned road, meet the Riparian Management Objectives and avoid adverse effects on listed anadromous fish by: minimizing road and landing locations in Riparian Habitat Conservation Areas.

RF-2c PACFISH: For each existing or planned road, meet the Riparian Management Objectives and avoid adverse effects on listed anadromous fish by initiating development and implementation of a Road Management Plan or a Transportation Monitoring Plan.

RF-2d PACFISH: For each existing or planned road, meet the Riparian Management Objectives and avoid adverse effects on listed anadromous fish by avoiding sediment delivery to streams from the road surface.

RF-2e PACFISH: For each existing or planned road, meet the Riparian Management Objectives and avoid adverse effects on listed anadromous fish by avoiding disruption of natural hydrologic flow paths.

RF-2f PACFISH: For each existing or planned road, meet the Riparian Management Objectives and avoid adverse effects on listed anadromous fish by avoiding the 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.

RF-3a PACFISH: Determine the influence of each road on the Riparian Management Objectives. Meet Riparian Management Objectives and avoid adverse effects on listed anadromous fish by 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 that retard attainment of Riparian Management Objectives, or do not protect designated critical habitat for listed anadromous fish from increased sedimentation.

RF-3b PACFISH: Determine the influence of each road on the Riparian Management Objectives. Meet Riparian Management Objectives and avoid adverse effects on listed anadromous fish by prioritizing reconstructing based on the current and potential damage to 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 Riparian Habitat Conservation Areas.

RF-3c PACFISH: Determine the influence of each road on the Riparian Management Objectives. Meet Riparian Management Objectives and avoid adverse effects on listed anadromous 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 listed anadromous fish and their designated critical habitat, and the ecological value of the riparian resources affected.

RF-4 PACFISH: Construct new, and improve existing, culverts, bridges, and other stream crossings to accommodate a 100-year flood, including associated bedload and debris, where those improvements would/do pose a substantial risk to riparian conditions. Substantial risk improvements include those that do not meet design and operation maintenance criteria, or that have been shown to be less effective than designed for controlling erosion, or that retard attainment of Riparian Management Objectives, or that do not protect designated critical habitat from increased sedimentation. Base priority for upgrading on risks to listed anadromous fish and their designated critical habitat and the ecological value of the riparian resources affected. Construct and maintain crossings to prevent diversion of streamflow out of the channel and down the road in the event of a crossing failure.

RF-5 PACFISH: Provide and maintain fish passage at all road crossings of existing and potential fish-bearing streams.

RA-2 PACFISH: Trees may be felled in Riparian Habitat Conservation Areas when they pose a safety risk. Keep felled trees on site when needed to meet woody debris objectives.

RA-4 PACFISH: Prohibit storage of fuels and other toxicants within Riparian Habitat Conservation Areas. Prohibit refueling within Riparian Habitat Conservation Areas unless there are no other alternatives. Refueling sites within a Riparian Habitat Conservation Area must be approved by the Forest Service or Bureau of Land Management and have an approved spill containment plan.

RA-5 PACFISH: Locate water drafting sites to avoid adverse effects to listed anadromous fish/inland native fish and instream flow, and in a manner that does not retard or prevent attainment of Riparian Management Objectives.

PACFISH Riparian Goals (USDA and USDI 1995:C-4) for the project area provided the framework for the fisheries/hydrology analysis, and were identified as follows: Maintain and 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 riparian and aquatic ecosystems developed
3. Instream flows to support healthy riparian and aquatic habitats, the stability and effective function of streams, and the ability to route flood discharges
4. Natural timing and variability of the water table elevation in meadows and wetlands
5. Diversity and productivity of native and 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 with riparian and aquatic zones
    c. help to achieve rates of surface erosion, bank erosion, and channel migration characteristics under which those aquatic and riparian systems developed
7. Riparian and aquatic habitat necessary to foster the unique genetic fish stocks that evolved within the specific geo-climatic region
8. Habitat to support populations of well distributed native and desired non-native plant, vertebrate, and invertebrate populations that contribute to the viability of riparian-dependent communities.

Key Watersheds

Key Watersheds were established 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 or biodiversity* (USDA and USDI 1995:C-19)".

The project area includes three 5th field Hydrologic Unit Code (HUC) watersheds: Salmon Creek, the Middle Methow, and the Chewuch River. The Middle Methow and the

Chewuch River both contain fish species listed under the Endangered Species Act (ESA) and are considered to be PACFISH Key Watersheds.

Watershed Analysis
Watershed Analysis has been completed for the Chewuch Watershed (USDA Forest Service 1994), for the Middle Methow (USDA Forest Service 1997a), and for Salmon Creek (USDA Forest Service 1997b).

Riparian Habitat Conservation Areas are intended to maintain, improve, and restore intermittent stream riparian structures and functions that confer benefits to riparian-dependent and associated species other than fish, enhance habitat conservation for organisms that are dependent on the transition zone between upslope and riparian areas, improve travel and dispersal corridors for many terrestrial animals and plants, and provide for greater connectivity of the watershed.

Riparian Management Objectives (PACFISH, page C-6) describe good anadromous habitat. The numeric values given in PACFISH are intended to be modified to reflect suitable conditions for a given region. Stream survey data collected on the Okanogan-Wenatchee National Forest is used to define proper function for levels of large wood and pools. Riparian Management Objectives for forested stream systems relevant to the project area are: Pool Frequency, Water Temperature, Large Woody Debris, and Width-Depth Ratios. These RMOs are analyzed in the Biological Assessment for the Tripod Salvage sale using the "Pathways and Indicators, (NOAA Fisheries 1996, USDI Fish and Wildlife Service 1999)". Findings from the Biological Assessment were used to describe the affected aquatic environment.

The Endangered Species Act, Forest Plan direction, and the Magnuson-Stevens Fishery Conservation and Management Act require that consultation be completed with respect to effects of proposed activities on Endangered, Threatened, Sensitive, and Management Indicator Species, Critical Habitat, and Essential Fish Habitat. The species and habitat of concern in the Tripod Fire Salvage project are described later in this section. Consultation on effects to ESA listed species will be conducted with the required regulatory agencies (U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS)) prior to issuance of the FEIS and ROD for the Tripod Fire Salvage project. Consultation with NMFS and USFWS is not required if the Forest Service project biologists determine that there will be "No Effect" to listed species and habitat.

The Clean Water Act, as amended in 1977, 1982, and 1987
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 favorable for fishing and swimming all water bodies.

The Clean Water Act requires each state to develop water quality standards. Water bodies that do not meet established standards are identified in a list called the 303(d) list, which is prepared periodically. Each state also prepares a non-degradation policy for all waters that exceed standards. This policy protects these waters from any further

degradation. Within the Tripod Fire Salvage analysis area, roughly a 1-mile segment of the Chewuch River upstream and downstream of the Boulder Creek confluence is listed on the 303(d) list as impaired for water temperature; no other stream segments are listed within the analysis area.

Along with temperature, another standard in the WAC which may be affected by the proposed projects relates to sediment. Nephelometric Turbidity Units(NTUs)) are used as a proxy measure for sediment load in streams, which are essentially a measure of how much light can pass through a sample of water. The designated criteria for suspended sediment are:

> Turbidity shall not exceed
>
> 5 NTU over background when the background is 50 NTU or less, or
>
> A 10% increase in turbidity when the background turbidity is more than 50 NTU.

None of the streams within the project area are on the 303(d) list for non-attainment of this criterion. Turbidity can be affected by the concentration of suspended sediment, organic matter in the water column, phytoplankton, stream discharge, and even the mineralogy of the sediment. Consequently, turbidity can vary from stream to stream or day to day and is an unwieldy standard to use to assess non-point source pollution effects of project activities. This is illustrated by limited data available from streams within the project area. Suspended sediment data from the late 1970s and early 1980s is available for the Middle Fork of Boulder Creek, Lightning Creek, and Twentymile Creek (Bennett 2007). This data suggests that there is a very poor correlation between suspended sediment and turbidity. For Middle Fork Boulder and Lightning Creek, only 68% and 61% respectively of the distribution in the observed turbidity values can be explained by the linear regression between turbidity and suspended sediment. For Twentymile Creek, there is essentially no correlation between suspended sediment and turbidity (r^2=0.0002). Because of the lack of correlation and the low likelihood of excursion from standards due to the proposed project, modeled estimates of sediment delivery to streams will be used to assess project effects to sediment delivery.

The State of Washington, as directed by the Clean Water Act and the Environmental Protection Agency, is responsible for the protection of rivers and other bodies of water in the public interest. Water quality standards for surface waters in the state of Washington, are listed in Chapter 173-201A-WAC (Washington Administrative Code).

The Forest Service responsibilities under the Clean Water Act are defined in a November, 2000 Memorandum of Understanding (MOU) between Washington State Department of Ecology and the Forest Service. The MOU designates the Forest Service as the management agency for the State on National Forest System Lands. This means that the Forest Service is responsible for defining and implementing appropriate Best Management Practices (BMPs) for National Forest Lands. Mitigation Measures and Design Criteria were developed by the IDT for this project and incorporate BMPs. Mitigation Measures and Design Criteria are identified in Chapter 2 under Actions Common to all Alternatives.

ANALYSIS METHOD

Information used to establish the baseline conditions and desired future conditions for aquatic and riparian habitat, fish species and distribution, hydrology, erosion rates, and runoff came from several sources. These sources included field observations, stream and fish distribution inventories, watershed assessments, stream flow data, and an erosion prediction model. In addition to these sources, the project fish biologist and hydrologist conducted an extensive review of current scientific literature regarding wildfires and fire salvage and their effects on aquatic resources. Through this analysis, they considered and used the best available information and science.

Okanogan Forest Plan standards (USDA Forest Service 1989a:4-30 to 4-32) ,PACFISH Goals and RMOs (USDA and USDI 1995:C-3) and standards most pertinent to the desired conditions at the 5th field HUC watershed scale were tracked through the analysis.

Aquatic habitat was evaluated at the landscape scale/5th field HUC and 6th field HUC for Beaver Creek, to assess if streams meet Riparian Management Objectives (USDA and USDI 1995:C-4 to C-6) and if the project would hinder attainment of these objectives. Relevant RMOs are Pool Frequency, Water Temperature, Large Woody Debris, and Width/Depth radio.

Analysis Area
The area of direct effects analysis is located within the project area boundary. Both direct and indirect effects analysis extends to the boundary of all sub-watersheds intersected by the project area. Sub-watersheds are 6th HUC watersheds as defined by the U.S. Geologic Service, or portions of the 5th HUC Chewuch River, Middle Methow River, and Salmon Creek watersheds.

Sub-watersheds analyzed in the Lower Chewuch 5th field HUC are Boulder Creek, North Boulder Creek, and Lower Chewuch-Pearrygin 6th fields. The project area takes place in the Brevicomis Creek, Boulder Creek, and Ramsey Creek drainages. One small unit is proposed on the Chewuch Valley floor downstream of the Brevicomis confluence.

The sub-watershed analyzed in 5th field Middle Methow watershed is the Upper Beaver Creek 6th field. Project activities are proposed in Lightning Creek and Middle Fork of Beaver Creek. A small unit is also proposed on the ridge separating Volstead Creek drainage from the mainstem of Beaver Creek drainage.

In the 5th field Salmon Watershed the South, West, and North Forks of Salmon Creek are included within the analysis area boundary. Within these 6th field HUCs, Cedar, Granite, Little Granite, and McCay Creeks are included in the project area and are analyzed for direct effects of the project.

Fish Distribution
Fish distribution, Critical Habitat for ESA listed spring Chinook and steelhead, and 5th and 6th field HUC boundaries are displayed in Maps A-14 and A-15 in Appendix A. Fish species listed under ESA, the Regional Forester's Sensitive Species list, Management Indicator Species (MIS), and species for which Essential Fish Habitat (EFH) has been

designated under the Magnuson-Stevens Fishery Conservation and Management Act are identified in Figures 3.3-1 and 3.3-2 below.

Figure 3.3-1: Fish Species by Category Present in the Analysis Area by 5th field HUC.

ESA including Critical Habitat (CH)	Regional Forester's Sensitive Species	MIS	EFH
Lower Chewuch River			
Spring Chinook (Endangered) CH	Westslope Cutthroat Trout	Trout	Chinook
Steelhead (Threatened) CH	Redband Trout, spring Chinook, summer steelhead, bull trout		
Bull Trout (Threatened)			
Middle Methow			
Spring Chinook (Endangered) CH	Westslope Cutthroat Trout	Trout	Chinook
Steelhead (Threatened) CH	Redband Trout		Coho
Bull Trout (Threatened)			
Salmon Creek			
Not Present on National Forest		Brook Trout	

Figure 3.3-2: Fish Species Present within the Project Area by 6th field HUC and stream.

	ESA Species	Sensitive	MIS
Mainstem Lower Chewuch River			
Brevicomis Creek	Not fish bearing	Not fish bearing	Not fish bearing
Boulder Creek	None in project area	Redband Trout, Westslope Cutthroat	Non-native brook trout, introduced Westslope cutthroat and rainbow trout
North Fork Boulder Creek	None in project area	Redband Trout, Westslope Cutthroat	Non-native brook trout, introduced Westslope cutthroat and rainbow trout
Bromas	Not fish bearing	Not fish bearing	
Ramsey	Not fish bearing	Not fish bearing	
Middle Methow			
Upper Beaver Creek	None in project area	Westslope Cutthroat	Westslope cutthroat, brook trout
South Fork Salmon Creek			
Cedar Creek	Not present	No Fish	
West Fork Salmon Creek			
Little Granite Creek	Not present		Eastern brook trout
Granite Creek	Not present		Eastern brook trout
McCay Creek	Not present		Eastern brook trout
North Fork Salmon Creek			
Pelican Creek		Rainbow Trout	Eastern brook trout

Fish presence/absence is based on stream and fish distribution inventories for the Chewuch River, Boulder Creek, Ramsey, Beaver Creek, and the tributaries and Salmon Creek.

Concerns over large wood recruitment to streams, stream temperature, riparian area post-fire recovery, and channel and bank stability, and sediment delivery were addressed in large part by designing the Tripod Fire Salvage Project to avoid or minimize disturbance to Riparian Habitat Conservation Areas. A primary concern of the analysis was the potential effects of project-generated sediment on spawning and rearing habitat and on juvenile fish. Potential sediment effects were analyzed using the following sediment and hydrologic modeling results to estimate changes over the baseline conditions. Economics, concern over noxious weed spread, and the concern that harvest activity could have adversely affected the bull trout population in upper Beaver Creek caused this area to be dropped from further consideration for salvage actions.

Estimate of the changes in erosion rates and sediment routing resulting from proposed activities as modeled by Disturbed Water Erosion Prediction Project (WEPP).

WEPP is a continuous simulation, process-based model that incorporates climate, soil, ground cover, and topographic conditions. For sediment generation and water yield, the

analysis area includes the 5th field and 6th field watersheds encompassed by the Tripod Fire Salvage Project area. Hill slope erosion was modeled using the Disturbed WEPP interface for the Water Erosion Prediction Project (WEPP) model (Elliot et al. 2000). Road related erosion was modeled with the WEPP: Road interface of the WEPP model (Elliot et al. 1999b)

Road density is sometimes used as a proxy measure to assess the effects of roads on erosion, and sediment delivery as a measurement of water clarity such as NTUs. The rationale for roads as a proxy measure is that roads are a major erosion source and sediment delivery vector. Where roads are either adjacent to, or cross streams, these delivery mechanisms become more efficient. Instead of relying on proxy measures such as road density, stream crossings, water clarity, hillslope erosion, road erosion, and sediment delivery were modeled with the Disturbed WEPP and WEPP:Roads interface. The benefit of modeling with WEPP is that the results provide a quantitative comparison between alternatives and actions.

Disturbed WEPP and WEPP:Road were used to characterized the affected environment pre- and post-fire. Hillslopes within subwatersheds were stratified and modeled based on slope, soil, vegetation, and burn characteristics. Results from the modeled runs were then applied to the subwatershed on a proportional basis. Road erosion was modeled separately, then combined with hillslope modeling on the subwatershed scale. Road erosion model outputs predict an upper limit of the amount of sediment leaving the road prism and a lower limit of the amount of sediment delivered to streams over a vegetated buffer that corresponds to the distance of the road from the stream. The lower limit is a highly idealized situation, with no rilling or drainage pathways and does not account for the fire effects on the buffer. Because of this, the upper limit of sediment production from roads was used in the analysis. Displayed sediment delivery figures are the modeled result of the 6-year return period values as opposed to the annual average values. For each year in the analysis, the WEPP model was initialized with specific starting conditions representing the degree of expected vegetation recovery following the fire and project activities. The model was then run for a time span that represented 30 years of probable climatic events. The 5th largest values for erosion, sediment delivery, and runoff for the 30-year run are then reported as the 6-year return period results (Elliot et al. 2000). Using the 6-year return period values captures those larger climatic events that have a low probability of happening on a yearly basis.

Because of natural variability in soil type, cover, and slope within the project area, and assumptions made to simplify modeling, reported results are best viewed as a relative measured of potential erosion pre- and post-project activities. Further, at best, a prediction of erosion rates is likely to be within about ±50% of the mean (Elliot et al. 2000). This range is the result of variability in the ecosystem and errors in modeling assumptions. While this may seem high, it is important to remember that soil erosion is heavily dependent on climatic conditions (rainfall), and clearly, predicting the weather even a month or two in advance would result in a wide range of variability. With this in mind, the predicted values of erosion and sediment delivery are useful for displaying comparative, rather than absolute potential effects of the alternatives.

Assessment of changes in runoff timing, magnitude, and sediment delivery to wetlands and riparian habitat.
Among the results of the WEPP modeling is surface runoff component. For each day in a multiple year model run, if there is a precipitation event, WEPP calculates the infiltration and surface runoff from the event. The runoff is routed down the hillslope and tallied at the bottom of the flow element. Runoff values displayed represent the proportional summation of each model scenario over the subwatershed. Hydrologic and sediment modeling, along with comparison of road mileage between existing total and alternatives by 6th field watershed, will be used to describe expected changes in watershed baseline conditions, such as RHCA function, sedimentation, changes to surface runoff, stream substrate quality, stream temperature, and their effects on listed fish species between the existing condition and the expected future condition by alternative.

AFFECTED ENVIRONMENT

Background

Fire and the aquatic environment

Fuel conditions in the dry forests have been affected by management practices in the last 200 years (Hessburg and Agee 2003). Harvest, grazing, fire suppression, and other land uses have increased fuel loads in lower elevation forests in the intermountain northwestern United States. Much of the Tripod Fire burned at higher elevations where wetter forests are dominant and have a longer fire interval between fires than drier, low elevation forests. In their 2003 research, Myers and Pierce looked at several fire proxies, such as pollen and charcoal in lake sediments, to examine the intensity of fire in past centuries. They found that fire activity in forests of the northwestern United States was much greater 1,000 years ago than it is currently in both wet and dry forests. In drier forests, warming trends 1,000 years ago were hypothesized to have reduced grass growth and increased shrub growth, thus creating ladder fuels that increased fire intensity. Meyers and Pierce (2003) concluded that warming trends and drought also appear to be clearly involved in uncharacteristic high severity fire behavior in dry pine forests in the Payette region of Idaho in recent years. Uncharacteristic, high severity fire events in dry forests may be influenced more by climate than forest stand health in future generations.

Some researchers suggest that short term negative effects of fuel treatments on aquatic habitat might often be outweighed by the potential, long-term benefits of the treatment. Avoidance of short term effects can inadvertently lead to conditions favorable to uncharacteristic high severity events (O'Laughlin 2005). This suggestion assumes that uncharacteristic high severity fire effects would have greater negative effects on aquatic habitat and fish populations than short-term negative effects caused by the treatments. This assumption is influenced by many variables such as climate trends, landform shape, type of geology, isolation of fish populations, and the legacy of management actions. Other researchers have reported findings that suggest over various time scales ranging from a few years ago to over a century, that aquatic habitat resulting from disturbances caused by fire is more productive than similar habitats where the fire events were suppressed or altered by human influence (Reeves et al. 1995, Dunham et al. 2003, Benda et al. 2003, Rieman et al. 2005). In 2001 and 2003, a combined total of 100,000 acres was burned in the upper Chewuch watersheds. Following those fires, high intensity,

short duration summer rain events on the burned areas created extensive landslides and delivery of massive amounts of silt, sand, gravel, cobble, boulders, and large wood to Lake Creek, Andrews Creek, and the Chewuch River. Bull trout spawning surveys have been conducted in these areas since 1995, and surveys conducted after the fires shows a neutral to positive increase in bull trout spawning activity following the fires and the distribution of redds has expanded to include the stream reaches where landslides intercepted the stream channels. Similar results were documented on the John Day River following the Tower Fire in 1996 (Howell 2006). The Farewell and Thirtymile Fires burned in the portion of the Chewuch watershed that has very few roads, small amounts of grazing, and little to no timber harvest. In contrast, the Tripod Fire burned through ground that has been more intensively managed, has areas with high road densities, higher levels of grazing, and may not respond in the same way as the Farewell and Thirtymile areas have to date.

Fish persistence after fire depends on the amount of habitat degradation and fragmentation prior to the fire, the habitat needs of the species, and the degree of isolation to neighboring populations. Habitat fragmentation is generally defined as “habitat loss and the breaking apart of habitat” (Fahrig 2003). When habitat is broken apart, ecological processes can be interrupted or altered in ways that are harmful to aquatic dependent species. The greater the habitat degradation and fragmentation over a broad area, the more isolated a species is from neighboring populations, and the more specific the habitat needs of a species, the greater the risk to the fish population from high severity fire events (Dunham et al. 2003). This concern has lead to a considerable investment to reduce fragmentation by improving fish passage in the Methow Basin particularly in Beaver Creek. Migratory bull trout can now access a previously isolated bull trout population in upper Beaver Creek. It is hoped that improved passage for anadromous fish and large migratory bull trout will increase spawning success of bull trout and increase competition with brook trout and possibly reduce the dominance of brook trout in Beaver Creek. This possibility and the importance of restoring and maintaining migratory life forms by restoring or maintaining access for native fish is suggested in Fausch et al. (2006).

Rieman et al. (1997) studied what happened to local fish populations after uncharacteristic fires. Uncharacteristic high intensity fires burned in dry forest conditions in the Boise watershed of Idaho in 1992 and 1994. Stand conditions in that region are similar to drier forests in low to mid-elevations in the northeastern Cascades. Rieman et al. found that aquatic life in some reaches was completely removed from tributaries of the Boise immediately after the fire. Yet, because there were some locations nearby where habitat was in good condition, fire effects were patchy, and populations of salmonids persisted in less intensely burned stream reaches, salmonids reoccupied depopulated stream reaches within one year. After three years, fish densities in some reaches surpassed densities that existed prior to the fires. Uncharacteristic fires in dry forests do not necessary lead to permanent extirpations or population declines.

Riparian habitat and the importance of wood to streams

“Riparian” refers to the land and organisms living along the bank of a watercourse. Riparian areas with mature conifers supply woody debris to the stream system. The term woody debris typically refers to large dead trees or pieces of large dead trees. Large Woody Debris (LWD) (see Glossary) may be most important for its ability to control the routing of sediment and water, to shape the formation and placing of pools, riffles, and

cover, and to act as a substrate for biological activity (Swantson et al. 1982). Large wood often provides important areas for fish to find refuge during high water and provides hiding cover during low water periods.

First and second order streams, also called headwater streams, are heavily influenced by the geomorphology, soils, and vegetation next to the channel. Headwater streams which usually do not contain fish and are typically intermittent in the Tripod Fire Salvage Project area are still important for maintaining downstream fish habitat. Following wildfire, these small streams can become more active and will typically have more water flowing in them. These headwater streams often contain substantial amounts of woody debris, especially when stream power is not great enough to transport the larger pieces of wood. Large woody debris generally stabilizes small streams by dissipating energy and protecting stream banks (Naiman et al. 1992). Woody debris jams store sediment (Heede 1972), and can account for the majority of energy loss of flowing water in steep channels (Beschta and Platts 1986). Following wildfires, first and second order streams on steeper slopes can become conduits for the transport of large wood and inorganic bedload to downstream larger order streams where fish are usually present. This is potentially a very important habitat rejuvenating process for downstream streams.

LWD in streams influences channel morphology, sediment, and water routing. LWD has become one of the central themes in riparian management in recent decades, although few processes that deliver wood are adequately described in the literature (Benda and Sias 2003).

Wood delivery to streams

To date, most research has focused on LWD delivered by processes of forest death, forest growth, bank erosion, mass wasting, stream transport, and decay (Benda and Sias 2003). Sediment and LWD can also be delivered to the stream by a variety of other natural events that occur only occasionally over long time periods, from once every few decades to centuries. These types of events that deliver wood once in a great while include fire, windstorms, landslides, and floods (Reeves et al. 1995, Benda and Sias 2003). Quantitative data is lacking for these types of occurrences. However, it is assumed that the amount of LWD created by the Tripod Fire (which will eventually fall into the streams) in most of the fire area, is similar to historic occurrences. Modeling completed by Benda and Sias (2003) on fire affected riparian areas where fire return intervals are shorter (150 years) shows that toppling of burnt trees can comprise 50% of the wood found in streams, versus 15% where fire return intervals are longer (500 years). Fire and its related effects can be one important way that wood is delivered to streams, especially in watersheds that have shorter fire return intervals (Benda and Sias 2003).

In addition to toppling, landslides and stream channel debris torrents also periodically deliver sediment and wood to valley bottom streams. Landslides often occur when intense storm events follow within a few years of fire. Fire related landslides historically were distributed in patches across the landscape and occurred periodically through time. This pattern of disturbance is essential to maintain ecological processes that support healthy salmonid populations across a landscape (Reeves et al. 1995). Logging and fires create similar kinds of disturbance on the land, but their magnitude, distribution, and frequency vary in important ways. Fires are influenced by natural barriers created by landforms, but vegetation management is less constrained because of human ability to

get around natural barriers (Rieman and Clayton 1997). Human activity has altered characteristics of landslides, creating more chronic delivery of sediment and allowing less wood to reach the stream (Reeves et al. 1995).

Roads and the stream network

Roads are needed for a variety of human activities including mining, logging, grazing, water diversions, recreation, and fuel reduction treatments. As related to soil disturbance on hill slopes, Rieman and Clayton (1997) wrote, "*Road construction causes the most severe disturbance to soils on slopes, far overshadowing fire and logging as a cause of accelerated erosion.*" Numerous studies have been completed identifying how roads may adversely affect the aquatic environment (Furniss et al. 1991, Quigley and Arbelbide 1997, Gresswell 1999, Gucinski et al. 2001). Generally, as the density of roads in a watershed increases, aquatic habitat quality decreases. Road densities in the interior Columbia basin between 1.7 and 4.7 miles per square mile of area were not considered high by Quigley and Arbelbide (1997). Although road density was not directly linked to aquatic function, high road densities were negatively associated with impaired aquatic function at broad spatial scales (Quigley and Arbelbide 1997). In a scientific literature review considering the effects of roads, Trombulak and Frissell (2000) stated, "Our review underscores the importance to conservation of avoiding construction of new roads in roadless or sparsely roaded areas and of removal or restoration of existing roads to benefit both terrestrial and aquatic biota."

Roads and landings can adversely affect stream systems by restricting channel function, increasing sediment, removing shade, and increasing the drainage network which can increase stream power. Roads can increase sediment yield to stream systems through erosion from the surface and cut and fill slopes (FEMAT 1993:V-28). Roads can influence water delivery to streams by intercepting ground water and directly routing it to stream systems rather than allowing water to utilize subsurface channels. This can reduce flows in late summer because subsurface water is not stored. Roads passing streams through culverts can increase sediment delivery if culverts become blocked, causing the stream to erode the road prism overlaying the culvert (Furniss et al. 1991, Gucinski et al. 2001). The additional flow created by roads during storm or runoff events can cause additional erosion of banks, flush out woody debris, and therefore reduce habitat (FEMAT 1993:V-28). Roads also increase the risk of chemical contamination, especially when roads parallel streams (Furniss et al. 1991).

Water Quality

There are two general types of pollutants addressed in the State of Washington Clean Water Act: point sources and non-point sources. Point sources are those that contribute some pollutant directly to a water body via a discrete source. Non-point pollutants are disturbances that occur over a broad area where no discreet conveyance system delivers pollutants to a water body. Forest management activities that could possibly cause non-point pollution are addressed by Design Features and Mitigation Measures in Chapter 2. Types of pollution include chemical contaminants, excessive fine sediment delivery, and increased sunlight allowed to reach the stream. The Design Features and Mitigation Measures describe methods to perform an activity in a manner that would substantially reduce or prevent soil disturbances so that project related activities do not create non-point pollution in water bodies. Water quality standards are maintained by ensuring that the appropriate design features and mitigation measures have been incorporated into

project plans and executed properly on the ground. Water quality can be further described by focusing on sediment delivery, stream temperature, and water quality.

Sediment Delivery
Fine sediment, the amount of sand and silt within gravel and cobble, can be used to measure stream health. As the percentage of fine sediments increase in relation to the percentage of larger stream substrates, the ability of salmonid eggs and juveniles to survive is reduced. Elevated fine sediment can have a detrimental effect on salmonid spawning success when fines fill in space around gravel and suffocate eggs or fry. Salmonid species are sensitive to sediment during spawning and incubation. Excessive amounts of fine sediment can also embed (surround) gravel and cobbles in the streambed, deter spawning and eliminate hiding spaces for juvenile fish, alter the macro-invertebrate community, and fill pools. Fine sediment in stream channels can be naturally occurring or altered from human activities. Logging, grazing, prescribed fire, and roads can all affect sediment size classes and amounts present (Quigley and Arbelbide 1997). These activities on steep landforms and unstable bedrock formations can increase the relative percentage of fine sediment size classes by 1 to 3 magnitudes.

A lack of appropriate sediment size classes delivered episodically over longer time periods can oversimplify stream habitat (Reeves et al. 1995). The phrase “appropriate sediment size classes” refers to natural events, or management activities mimicking natural events, that deliver a variety of sediment size classes to the valley floor. Sediment size classes expected to be delivered would include fines, gravel, cobble, and boulders. The amounts of each size class would be influenced by the lithology, or rock type, where the disturbance originates. In managed landscapes, fine sediment is often chronically delivered (Reeves et al. 1995).

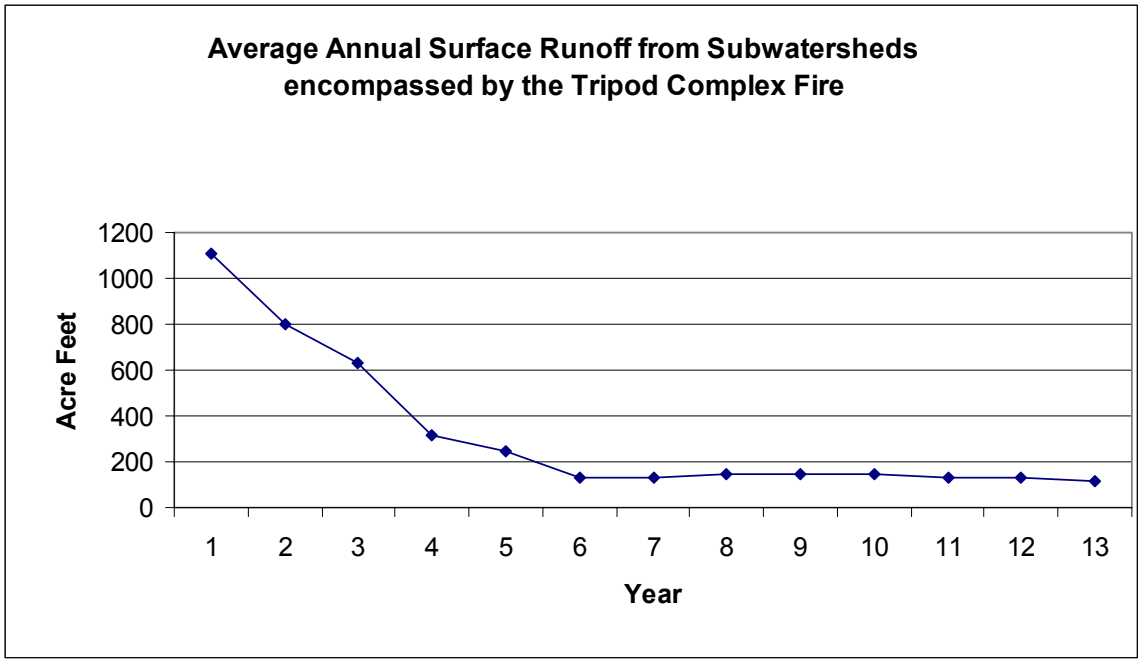
Stream Temperature
Riparian vegetation influences water temperature in streams, especially smaller streams. Shading during summer reduces the amount of sunlight reaching the water.. Resultant stream temperatures are cooler than a comparable stream that is not shaded. Coldwater fish species are dependent on a specific range of temperatures that can be exceeded when riparian vegetation is removed. While large conifer overstory trees are the most effective at shading streams, smaller deciduous trees and shrubs can also be important for shading in smaller streams.

As with other interactions described above, wildfire has been linked to changes in water temperature immediately after a large fire. In 20 streams sampled after the 1988 Yellowstone wildfires, those streams in burned catchments often showed temperatures in excess of 20º C as compared to less than 15º C in similar catchments that did not burn (Minshall et al. 1997). A rise in temperature resulting from a large wildfire could be lethal for individual fish or a population during or immediately after the event (Gresswell 1999). Gresswell summarized his findings by stating, “*Current evidence suggests, however, that even in the case of extensive high-severity fires, local extirpation of fishes is patchy, and re-colonization is rapid. Lasting detrimental effects on fish populations have been limited to areas where native populations have declined and become increasingly isolated because of anthropogenic activities* (Gresswell 1999:193).”

Water Quantity

Changes in water yield from a given watershed can occur as a result of management actions or natural events. Regarding management actions, several studies have looked at past clear-cutting practices and their effects when large areas within a watershed were harvested in a few decades. Changes were not quantitatively evident until there had been drastic alteration of vegetation cover within the watershed. In the H.J. Andrews Experimental Forest, substantial increases in yield did not occur until 40 percent of the timber was cut (USDA Forest Service 1974b). Regarding natural events, water yield in a watershed can increase when vegetation cover, and sometimes soil properties are dramatically altered by a wildfire (Gresswell 1999, Chanasyk et al. 2003). For example, measured water yields were 50% greater than predicted values in the Entiat basin flowing large wildfires in the early 1970's (Helvey 1980). The hydrology of subwatersheds encompassed by the Tripod Fire is characterized as a snowmelt dominated hydrologic regime, with annual peak flows occurring in May and June as the accumulated snowpack melts. Fire effects on snow accumulation and melt can increase snowpack, resulting in greater melt off peak flows, and a stretching of the hydrograph, resulting in an earlier and longer spring runoff. Increases in snowpack may also result in increases in groundwater storage, resulting in higher late season flows (base flow). Anecdotal observations suggest that previous fires appear to have increased base flows in the Chewuch (Molesworth 2007). It is expected that similar changes will occur due to the Tripod Fire. Further, WEPP modeling predicts a 10-fold increase in the annual average surface runoff for the first year after the fire when compared to later years which were modeled as a recovered landscape see Figure 3.3-3. Water yield and the timing of runoff can be altered by reduced ground cover, increase in hydrologic connectivity, decrease in evapotranspiration, and changes in soil properties such as water repellency after high intensity fire.

Figure 3.3-3: Illustration of the 10-fold increase in average annual surface runoff predicted from WEPP modeling following the Tripod Fire. Later years were modeled as having full recovery of vegetation and can be viewed as background runoff rates. The figure clearly shows the large increase in runoff expected as a result of the fire and as discussed in the text.



EXISTING PROJECT AREA CONDITIONS

Existing conditions are described by watershed for the Endangered, Threatened, Sensitive, and MIS fish species, as well as for Critical Habitat and Essential Fish Habitat (EFH). The existing condition is also presented for the relevant PACFISH Riparian Management Objectives (RMOs) established in the analysis area, with respect to the associated Forest Plan standards as amended by PACFISH.

Figure 3.3-4: Watershed acres, percentage burned in the Tripod Fire, and existing road densities by watershed.

6th Field Watershed Name	Total size of watershed (acres)	Percentage of watershed burned	Existing road density in watershed (mi/mi^2)	All open roads* in watershed (mi/mi^2)
Mainstem Lower Chewuch	24,568	28	3.12	2.19
Boulder Creek	13,110	75	1.18	0.76
North Fork Boulder Creek	38,702	86	1.44	0.99
Chewuch River – Pearrygin	25,417	18.8	1.3	1.16
Upper Beaver Creek	40,096	51.4	2.81	1.62
South Fork Salmon	13,242	26.5	1.89	1.45
West Fork Salmon	27,868	43.2	2.00	1.62
North Fork Salmon	35,571	11.5	1.56	1.23

* Open roads are defined as all roads that are not listed as Operational Maintenance Level 1. Some Maintenance Level 1 roads are currently open. All Maintenance Level 1 roads are available for use by Off Highway and All Terrain Vehicles unless designated closed in the Travel Plan. Maintenance Level 1 roads are considered to have a similar hydrological and sediment delivery effect as open roads although sediment delivery from a closed and unused road will decline of the road surface can re-vegetate, if it is hydrologically self-maintaining or well drained, and if there are no stream crossings along the roads that are at high risk of failure.

Figure 3.3-5: Summary of relevant habitat indicators and RMO existing condition by watershed.
Data sources: Okanogan and Wenatchee National Forests stream surveys; 2007 Chewuch and Middle Methow Environmental Baselines and 2001 Salmon Watershed/Conger Environmental Baselines from 5th Field Watershed Biological Assessments.

RMO/Habitat Indicator	Lower Chewuch Mainstem (5th field)	Boulder Creek/North Fork Boulder Creek (6th field)	Upper Beaver Creek (6th field)	North, West, South Salmon Creek (6th fields)
Riparian Habitat Conservation Areas	FAR, road location, recreation, past harvest	FAR, road location, past harvest	FAR, harvest, road location, loss of beaver wetlands	FAR, harvest, road locations and grazing
Water Temperature	FAR	FAR	FA	FA
Large Wood	FAR – Improving	FAR	FA, FAR-South Fork	FAR – below natural capability
Pool Quantity	FA	FAR	FA; FAR-South Fork	FAR
Pool Quality	FAR	FAR	FA	FUR
Bank Stability	FA/FAR; past harvest, recreation	FA	FA	FAR, livestock use
Bankfull Width/Depth	FAR	FA	FA	FA
Sediment/Substrate	FAR; high road density, bank erosion	FAR; road location	FAR	FUR; West Fork. Substrate = FA.
Road Density (overall watershed density and amount of valley bottom roads)	FUR – many valley bottom roads, density > 3 mi/sq. mi.	FAR – valley bottom Roads, density < 2 mi/sq. mi.	FUR – valley bottom road, many crossings, density > 2 mi/sq. mi.	FUR – many RHCA valley bottom roads, but density ≤ 2 mi/sq. mi.

FA = Functioning Appropriately, meets RMOs
FAR = Functioning At Risk, some reaches do not meet RMOs
FUR = functioning at Unacceptable Risk, does not meet RMOs

Lower mainstem Chewuch River (including Brevicomis Creek, Boulder Creek, North Fork Boulder Creek, and the lower mainstem Chewuch – Pearrygin).
The Tripod Fire Salvage Project aquatic analysis area includes the Lower mainstem Chewuch 5th field HUC. The lower 20 miles of the Chewuch River is designated as Critical Habitat for Upper Columbia River (UCR) spring Chinook salmon and UCR summer-run steelhead trout. The lower Chewuch provides roughly 90% of the UCR

spring run Chinook spawning habitat in the Chewuch River watershed, which is about ¼ of the spawning in the Methow basin in most years. The UCR summer run steelhead also use this reach for spawning. In addition to providing spawning habitat, the lower Chewuch is very important for rearing juvenile salmon and steelhead. The reach is used by large migratory bull trout on their way to spawning grounds in the upper watershed and by foraging adult and sub-adult bull trout during the cooler seasons of the year. There are no known bull trout spawning areas in the Lower Chewuch River.

Fish species distribution in the lower Chewuch 5th field HUC

There are no fish in Brevicomis Creek or Ramsey Creek. The lower 2 miles of Boulder Creek provides spawning and limited rearing habitat to UCR summer-run steelhead and limited rearing habitat to UCR spring Chinook and, very rarely, may be visited by foraging bull trout. Above the barrier falls, non-native brook trout, redband rainbow trout, and westslope cutthroat trout have been stocked. It is unknown if Boulder Creek was fish bearing prior to these introductions. Bromas Creek is a small, non-fish bearing stream with a barrier at its confluence with the North Fork of Boulder Creek. Fish are present from upper and lower Tiffany Lakes down through the North Fork of Boulder Creek to the Boulder Creek/Chewuch confluence. Brook trout and cutthroat trout are found in the Middle Fork of Bounder Creek and in Bernhardt Creek up to Roger Lake.

Bull Trout

The upper Chewuch River produces about 25% of the bull trout in the Methow basin. Bull trout production appears to not have been reduced by the Farewell and Thirtymile Fires and may have been improved. The mainstem Chewuch from the mouth is important as a migration corridor to spawning areas in the upper Chewuch watershed. During the summer, water temperatures in the lower 15 to 20 miles of the Chewuch are considered to be too warm for ideal bull trout rearing and foraging habitat, except for the area near the confluence with Eightmile Creek, where cold ground water cools the mainstem river. Bull trout foraging and rearing may increase in the lower mainstem during the spring, fall, and winter when temperatures are favorable.

Spring Chinook Salmon

The lower 20 miles of the Chewuch River support roughly 25% of the spawning habitat in the Methow basin. Spring Chinook are not present within the Tripod Fire Salvage Project area boundary. The aquatic analysis area boundary extends to the mouth of the Chewuch River to assess any project effects to spring Chinook habitat in the lower reaches of the Chewuch River. The Chewuch River and the lower reach of Boulder Creek and Twentymile downstream of barrier waterfalls are designated as Critical Habitat for spring Chinook and as Essential Fish Habitat for Chinook salmon. Brevicomis Creek is too small and steep for spring Chinook to access. The lower mile of Ramsey Creek flows intermittently through an alfalfa field and then into a blocked oxbow of the Chewuch River and is not accessible to fish, including spring Chinook.

Steelhead

Steelhead spawn and rear in the Chewuch River and the accessible lower reach of Twentymile Creek and Boulder Creek. Steelhead juveniles rear within the Chewuch from one to several years. The Chewuch River and lower reaches up to barrier waterfalls in Boulder Creek and Twentymile Creek are designated as Critical Habitat for steelhead. Brevicomis Creek is too small and steep for steelhead to access. The lower mile of

Ramsey Creek flows intermittently through an alfalfa field and then into a blocked oxbow of the Chewuch River and is not accessible to fish, including spring Chinook.

Coho
Currently, coho use has not been well described for the Chewuch River since reintroduction programs were initiated in the late-1990's.

Summer Chinook
Summer Chinook salmon do not use the Chewuch River for spawning.

Redband rainbow trout
The natural distribution and genetic purity of redband rainbow trout has been greatly affected by fish stocking of coastal varieties of rainbow trout and westslope cutthroat trout in the streams and lakes of the Chewuch watersheds including Boulder Creek. Rainbow trout specimens collected in Boulder Creek were determined to be "good" examples of interior redband rainbow trout, intensive fish stocking with cutthroat and rainbows has likely affected the genetic purity of this population (Proebstel et al. 1998).

Westslope cutthroat trout
"Good" examples of Westslope cutthroat trout were found in the Upper Chewuch watershed (Proebestel et al. 1998). The genetic purity of cutthroat trout in Boulder Creek was not sampled, but extensive stocking has probably affected genetic purity if westslopes are present.

Lamprey
Lamprey (possibly Pacific lamprey) have been observed at river mile (RM) 9.0, at Falls Creek and in the Thirtymile reach. Similar to salmon and steelhead, adult Pacific lamprey migrate from the ocean to the Chewuch to spawn. They spawn in small gravel in the streambed. Juvenile lamprey live for up to 4 years in fine silts in slack water areas along the river. Pacific lamprey are a species of concern due to declining numbers. Because lamprey spawn in gravel and rear many years in sandy/silty areas, they are sensitive to changes in the distribution of fine sediment particle size and to disturbance of depositional areas where fine sediments deposit. Such areas could be described as fine sandy beaches along the river, which are also places that are frequently attractive to campers. No inventories for lamprey have been conducted for lamprey in Beaver Creek or in Salmon Creek and there is no anecdotal evidence that they are present.

Lower Chewuch Aquatic Habitat Indicators and Riparian Management Objectives
1. Riparian Habitat Conservation Areas
RHCAs along the Chewuch River have been maintained through the "*Respect the River*" program since 1994. "*Respect the River"* is a program designed to restore and maintain riparian and aquatic habitat for ESA listed fish, while providing quality dispersed primitive camping and access to rivers for the public. This program is vital to ensuring future large wood recruitment along the Chewuch River and security for spawning spring Chinook. Because of the high level of dispersed recreation along the Chewuch River and lack of funding for "*Respect the River*" program in 2007 and uncertain funding in the future, the reach is considered to be Functioning At Risk. In addition to managing recreation along the river, livestock fences and range permittee riding keep livestock from drifting down and congregating in riparian and spawning areas in the lower Chewuch. The combination of

the "*Respect the River*" program, fencing, and permittee efforts have led to improved riparian conditions along the main Chewuch River.

There has been very little harvest within riparian areas in the Brevicomis watershed with the exception of selective tree removal on the alluvial fan. There is a domestic water development from the Brevicomis Creek that includes a small access road located within the RHCA that parallels Brevicomis Creek for a short distance. The water development is for the summer homes located near the confluence of Brevicomis and the Chewuch River. Livestock are grazed along the 5010-500 road system in Upper Bromas Creek, but prior to the fire, did not have access to Brevicomis Creek except where the road intercepted the natural drainage network. Most of Brevicomis Creek was burned over during the Tripod Fire. Overall, RHCAs are considered to be functioning close to their natural capacity.

RHCAs in Bromas Creek in the North Fork of Boulder Creek watershed have been heavily impacted by close proximity of road 3700-800, past timber harvest near streams allow for easy stream access to livestock. Large wood levels and wood recruitment is reduced in many areas along this small stream. There are no fish in Bromas Creek.

Road 3700 is located within the RHCA of Boulder, the Middle Fork of Boulder, and Bernhardt Creeks in many areas, resulting in a loss of future wood recruitment, reduced wood loads due to harvest and removal by firewood cutters and easy access to livestock. However, streambanks are very rocky and resilient to disturbance.

Most of the RHCAs in Ramsey Creek were well forested before the fire and were considered to be functioning at natural potential. Ramsey Creek is a very small stream with headwaters on Forest Service land and an alluvial fan that flows through private land, a large alfalfa field and a dammed-off oxbow of the Chewuch River. Where Ramsey Creek flows across the alluvial fan and through the alfalfa field it has a very weakly defined channel. It has no surface water connection with the Chewuch River. Ramsey Creek is not inhabited by fish and activities in Ramsey Creek have no effect on ESA listed fish or aquatic habitat conditions in the Chewuch River.

2. Stream Temperature

There is no stream temperature data for Brevicomis, Bromas, or Ramsey Creeks. The main concern for stream temperature is in the Chewuch watershed. Temperature data for the Chewuch shows that the Chewuch River is Functioning Appropriately above RM 15 (USDA Forest Service 2007a); Brevicomis Creek enters the Chewuch around RM 18.

Temperature monitoring near the mouth of Boulder Creek shows that the Chewuch River exceeded the 16º C standard every year during the months of July and August. The lower Chewuch in the vicinity of Boulder Creek is listed on the State of Washington's 303(d) list of impaired water bodies because of increased stream temperatures. This is seen to be largely a natural condition related to the orientation of the Chewuch River to the sun, the naturally high width:depth ratio of the river, recent drought conditions, and low summer stream flows.

The effect of the previous Farewell Fire (unpublished temperature monitoring data) appears to have increased late summer water temperatures in the Chewuch River by as much as 2 degrees. To illustrate the possible fire effect on water temperature, Figure 3.3-

6 compares water temperatures in 2002 and 2005 in the Chewuch River within the area burned by the Thirtymile Fire, but before the Farewell Fire with pre-Tripod Fire water temperatures in Boulder Creek. The Farewell Fire did not affect the Boulder Creek drainage in any way.

Figure 3.3-6: Water Temperature Comparison of Boulder Creek and the Chewuch River: 2005 compared to 2002.

	Boulder Creek RM 0.5	Chewuch River RM 29.5
Highest recorded water temperature		
2005	19.8º C	20.5º C
2002	21.1º C	17.5º C
% Change	-6%	+17%
Highest 7-day average maximum temperature		
2005	19.1	19.5
2002	20.2	16.8
% Change	-6%	+17%
# of days 7-day Avg. Max Temp > 15º C		
2005	49	45
2002	53	28
% Change	-8%	+61%

3. Large Woody Debris

Large woody debris accumulations in the lower 20 miles of Chewuch River have been reduced by selective stream side harvest of individual large conifers beginning in the 1950s and by in-channel wood salvage and wood cleanouts beginning in the 1960s and continuing until 1992. Since then, projects to strategically add wood to the river and natural recruitment have begun to restore the large wood levels in the Chewuch River. In 2001, wood loads in the lower 20 miles of the Chewuch River had increased 28% to 50% per reach since 1994. The Chewuch River presently meets PACFISH RMOs for large wood, but may not be at full natural capacity although large wood levels are improving rapidly. The Respect the River program is designed to restore and maintain riparian and aquatic habitat for ESA listed fish and provide quality dispersed primitive camping and access to rivers for the public. This program is vital to ensuring future large wood recruitment along the Chewuch River.

There is no evidence that large wood has been removed from Brevicomis Creek or Ramsey Creek and most of the RHCAs in these streams are at natural wood load capacity. In-channel large wood will immediately increase as a result of the Tripod Fire and in-channel wood levels will be high until a debris torrent transports the material downstream to the Brevicomis alluvial fan and the Chewuch River or the wood decomposes.

The 3700 road system is located within the RHCA for Boulder, Middle Boulder, Bernhardt, and Bromas Creeks in many places, and is located within the floodplain of the creek in some locations. Wood loads in Boulder Creek are reduced because the road location has reduced future recruitment and has provided access for selective removal of large conifers, firewood gathering, and wood removal for road protection.

4. Water Yield

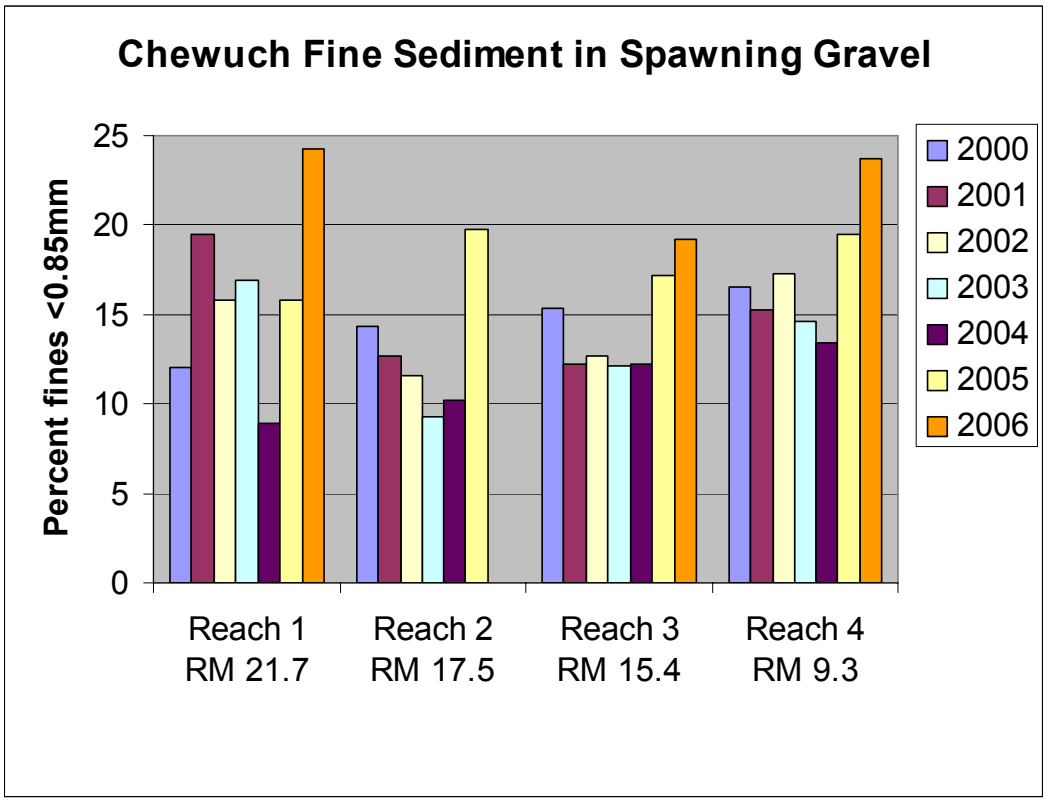
Overall water yield has increase due the extensive recent wildfires in the upper half of the watershed. Some drainages in the lower Chewuch (Cub, Eightmile, Falls, and Boulder Creeks) have had extensive harvest and roading in past decades which improves the efficiency of the drainage network in the watershed and increases the rate at which water is routed out of tributary watersheds and into the mainstem. In addition, most of the beaver ponds in these drainages have been abandoned and natural water storage capacity is considered to be impaired. The recent Farewell and Thirtymile Fires have increased base flow water yield because of reduced evapotranspiration over 100,000 acres and the same is expected from the Tripod Fire. The Farewell and Thirtymile Fires also increased water storage capacity where new wetlands created by landslides partially blocking the river cause water to be impounded.

Low base flow stream conditions in late summer and winter are considered to limit rearing area and spawning habitat for listed fish species in the Chewuch River, particularly the lower 9 miles of the river. Reductions in irrigation withdrawals from the lower 8 miles of the Chewuch are leading to improved late summer base stream flows.

5. Sediment Production

McNeil core sediment samples have been taken for the Chewuch since 2000 to assess fine sediment levels in spring Chinook spawning gravels. The percent fines (Figure 3.3-7) in spawning gravel appears to be below 18% with an increase in 2005 and 2006; this increase is to be expected as sediment from the Farewell and Thirtymile Fires is mobilized downstream.

Figure 3.3-7: Chewuch River Spawning Gravel Sediment Comparison, 2000-2006.



The Farewell and Thirtymile Fires have added tremendous amounts of fine and coarse sediment, obscuring and making it difficult to determine sediment trends due to management actions in the watershed. Increased levels of fine sediment is expected, but increased stream flow, large wood recruitment, and gravels and cobble recruitment may balance out potentially detrimental habitat effects of fine sediment loads coming from the fires. Sediment production from hill slopes in these fire areas likely peaked in 2004 and 2005 and is now moving downstream through the lower Chewuch as evidenced by McNeil core data shown in Figure 3.3-7. Data in 3.3-7 shows that reach 1 and reach 4 were above the Forest Plan standard and guideline for fine sediment <1mm in spawning reaches largely because of the routing of sediment after the Farewell and Thirtymile Fires.

Figure 3.3-8 presents pebble count data and ocular estimates of surface fines collected during a 2002 stream habitat assessment of the Chewuch River before the effects of the Farewell Fire. The data in Figure 3.3-8 are useful to show the natural variability of stream bed surface substrates throughout the Chewuch but, unlike the data in 3.3-7, the minimum size class measured in 3.3-8 is sediment <6mm, and as such, it does not address Fisheries standard 3-3 (listed under regulatory framework above) for sediment <1mm in spawning beds. The data was collected in 2002 after the Thirtymile Fire but before the Farewell Fire and additional landslide activity affected the river. Channel gradient and geomorphology (the physical shape and confinement of the channel by the surrounding geology) are two main drivers for the deposition of fine substrates. Low gradient stream reaches have lower stream energy and fines are deposited, while reaches with higher gradients have a steeper slope, higher energy causing fines to be carried away to

downstream reaches. Reach 12 is on the edge and partially within the Pasayten Wilderness, and has very little management activity, very low road density, low channel gradients, and the highest level of fine-grained substrates in the river. The highest levels of past management activity as represented by road densities are upstream of reaches 1 through 7.

Figure 3.3-8: Chewuch River substrate, % Fines, Bank Erosion, and Embeddedness by reach (Reach 4-16, 2002 Chewuch stream survey)

Reach	River Mile	SA	GR	CO	BO	BR	% Fines < 6 mm	Gradient
1	0-2.0	7%	9%	22%	6%	56%	-	0.4%
2	2.0-7.8	16%	12%	61%	11%	-	-	0.7%
3	7.8-8.8	3%	10%	43%	44%	-	-	1.5%
4	9.5-11.8	14%	37%	45%	4%	-	18%	0.5%
5	11.8-14.1	17%	44%	39%	-	-	21%	0.3%
6	14.1-15.7	17%	22%	50%	11%	-	20%	0.6%
7	15.7-18.0	15%	39%	46%	-	-	19%	0.3%
8	18.0-22.8	12%	21%	51%	16%	-	14%	1.0%
9	22.8-24.3	8%	9%	46%	37%	-	9%	1.8%
10	24.3-25.7	10%	10%	29%	51%	-	11%	3.3%
11	25.7-29.3	13%	12%	48%	27%	-	15%	2.6%
12	29.3-32.6	38%	62%	-	-	-	70%	0.2%
13	32.6-33.7	13%	31%	37%	19%	-	19%	1.8%
14	33.7-34.6	8%	14%	17%	57%	4%	11%	6.5%
15	34.6-36.2	12%	44%	38%	5%	-	25%	1.2%
16	36.2-36.4	4%	17%	22%	36%	21%	8%	8.0%

SA = sand. GR = gravel. CO = cobble. BO = boulder. BR = bedrock.

Middle Methow 5th field HUC: Upper Beaver Creek 6th field HUC.
Project activities are proposed within the Upper Beaver Creek 6th field HUC, which is in the Middle Methow 5th field HUC. The Beaver Creek watershed is 71,000 acres in size with a confluence at RM 35 on the Methow River. The Upper Beaver Creek 6th field watershed includes 40,096 acres of the Beaver Creek watershed. The Tripod Fire burned over 51.4% of the Upper Beaver Creek Watershed.

Fish Distribution
There has been an extensive effort by the Washington Department of Transportation (WSDOT), the Washington Department of Fish and Wildlife (WDFW), Okanogan County Conservation District, U.S. Bureau of Reclamation, USFS, and private land owners to remove fish passage barriers and improve stream flows in the Beaver Creek watershed. At least 13 fish passage barriers under roads or at irrigation diversions have been removed, restoring fish passage for steelhead, bull trout, coho salmon, and spring Chinook salmon. As a result of this work, steelhead spawning levels are increasing in the lower 8 miles of Beaver Creek and a spring Chinook salmon was observed at RM 8 in Beaver Creek in 2006. Spring Chinook are presently considered not to be present in the Upper Beaver Creek watershed. Fish barrier removals on National Forest land were completed in 2005 and 2006. Steelhead and bull trout now have access to all potential habitat on National Forest lands in the Upper Beaver Creek watershed. Until a few years

ago, WDFW was stocking brook trout in Beaver Lake, WDFW has since curtailed this practice and it is hoped that the elimination of brook trout stocking, combined with increased competition by steelhead and large migratory bull trout will weaken brook trout dominance in the upper South Fork, mainstem Beaver, and Middle Fork Beaver. No pure bull trout have been observed in Lightning Creek above a natural waterfall barrier in lower Lightning Creek, however cutthroat trout and a bull trout-brook trout hybrid have been found in upper Lightning Creek, indicating that the present barrier was not historically a barrier. Post-fire increases in large wood and bedload transport could bury the barrier in the near future and restore upstream access to upper Lightning Creek in the future. At present, bull trout are considered to not be present in Lightning Creek above the natural barrier. Genetically "good" examples of interior redband rainbow trout have been collected from Beaver Creek and the South Fork of Beaver Creek, indicating that the genetic purity of these stocks has not been influenced by stocking.

Upper Beaver Creek Habitat Indicators and Riparian Management Objectives

1. Natural Stand Conditions in Riparian Areas.

Road location in the RHCA of the South Fork of Beaver Creek, past selective timber harvest, and recent regeneration of harvest units that include riparian areas allow livestock access to large sections of the South Fork of Beaver Creek and segments of Blue Buck, upper Lightning, and Middle Fork of Beaver Creeks. Recent fencing projects along the South Fork to protect riparian areas and stream banks and to improve cattle distribution have been implemented. Reduced livestock effects to streams in the watershed should allow for full riparian function and stream bank stability in the near future. The Tripod Fire burned through RHCAs in the upper mainstem of Beaver Creek and over Blue Buck Creek. Fences in the Blue Buck RHCA that were built to protect a remnant population of bull trout, were destroyed in the Tripod Fire. Prior to the fire, these streams were well forested and in good functional condition with high levels of large wood, shade, and few road crossings or locations within the RHCAs. Post-fire, the RHCAs are burned and all of the conifers are dead, however, in the fall of 2006 root crowns of riparian shrubs were sprouting and grasses were growing, and a rapid recovery of shrubs and forbs is expected. RHCAs in the upper mainstem of Beaver and Blue Buck Creeks are in a good condition and are expected to recover rapidly from the fire. Riparian areas in the lower and middle reaches of Lightning Creek and the Middle Fork are also in good condition, however the upper reaches have been impacted by clear cut harvests, road locations in RHCAs, which has created reduced levels of wood recruitment, and increased livestock access and localized impacts to RHCAs. Beaver-created wetlands in upper Lightning and in the Middle for of Beaver Creek are no longer maintained by beaver and are diminishing. Recent improvement to livestock grazing management in the watershed is anticipated to allow for beaver re-colonization and recovery of wetland function. In the South Fork of Beaver Creek, a large beaver pond complex on the creek was fenced in 1992; beavers were introduced, and the area has been restored to a fully functional beaver pond complex.

2. Stream Temperature

On the National Forest, Beaver Creek is within state standards and is suitable as habitat for bull trout. Beaver Creek is not listed on the State of Washington's 303(d) list of water bodies for increased stream temperatures. There are many seeps and springs in the Beaver Creek watershed and ground water storage and cold air drainages are likely key factors for keeping water temperatures in Upper Beaver Creek cool.

3. Large Woody Debris

Large wood levels were inventoried in the mainstem of Beaver, Blue Buck, Lightning, and South Fork Beaver Creeks during 2004 stream inventories. All stream reaches exceed PACFISH standards for large wood levels except the upper South Fork of Beaver Creek where the stream flows through a large network of beaver ponds. The levels of large wood suggested in PACFISH are too low for streams in the Methow basin based on wood counts conducted in unmanaged streams throughout the basin. Comparisons of wood counts in Beaver Creek with other "unmanaged" streams show that Beaver Creek has good levels of LWD, but future recruitment is compromised along the South Fork of Beaver Creek road. Much of the wood observed was old and decaying. Large wood levels in the South Fork of Beaver Creek have declined since 1992, in part due to the removal of LWD by firewood cutters.

4. Water Yield

High road densities can increase the drainage network by intercepting water and channeling through road ditches and road surface to stream channels at a higher rate than if the water remains to infiltrate through the ground. Wetlands created by beavers increase water storage and slow the rate at which water moves downstream. Created openings such as clearcuts and burned over areas can increase stream flow because there is less water taken up through vegetative evapotranspiration, and less interception of snow and rain by the forest canopy. Total road densities are 2.81 miles/square mile in the upper Beaver Creek watershed which is considered to be high. Many beaver ponds in Lightning Creek, the Middle Methow, and the South Fork of Beaver Creek have been abandoned and no longer store water. One major wetland has been fenced, recolonized with beaver, and is now fully functional and storing large quantities of water. About 51% of the watershed burned in 2006. Before the fire, water yield during spring freshet had probably increased due to higher road densities and increased size of the drainage network. Abandoned beaver ponds and the loss of infiltration due to roads may have reduced late summer base flows downstream, although recent beaver recolonization is beginning to improve base flows.

5. Sediment Production

The Beaver Creek watershed has naturally high levels of sandy-sized sediment. High road densities have increased fine sediment levels. Bank erosion can be a major source of instream fine sediment along stream banks composed of fine-grained material. Stream habitat data for Beaver Creek show that about 2% of the stream banks in the watershed are unstable and are actively eroding, which is considered to be a low level of bank erosion and meets the RMO of greater than 80% stable banks. Cattle were the main source of this erosion, which was observed mainly along the South Fork and segments of the Middle Fork. Fencing and changes in livestock management patterns in the watershed should result in even less bank erosion in the future. Fine sediment levels, as well as coarse sediment such as spawning gravel, are expected to increase dramatically as a result of the Tripod Fire. Burned Area Emergency Rehabilitation (BAER) treatments to improve road drainage and reduce the risk of stream crossing failure should help to reduce the effects of the road system on fine sediment within the burned area.

Salmon Creek, including South, West, and North Forks
Salmon Creek drains into Conconully Reservoir and then the Okanogan River. Project activities are proposed within the subwatersheds of Cedar, McCay, Granite, Little Granite, and Pelican Creeks. The Tripod fire burned 11.5% of the North Fork, 26.5% of the South Fork, and 43.2% of the West Fork of Salmon Creek.

Fish Distribution
There are no fish species listed by the ESA on National Forest lands above Conconully Reservoir. Anadromous salmon or steelhead trout are not present in this watershed. Conconully dam was constructed in 1910 without fish passage facilities, thus there is no passage to or from the Okanogan River where steelhead trout, Chinook salmon, and sockeye salmon reside. Conconully Reservoir also functions as a sediment trap and activities that take place on National Forest land in the Salmon Creek watershed will not affect habitat for listed anadromous aquatic species. Bull trout have not been detected in the Salmon Creek watershed and are considered to not be present.

Resident rainbow trout are present in Pelican Creek in the North Fork of Salmon Creek. The high level of stocking with rainbow trout has likely compromised the genetic purity of native redband rainbow stocks if they were present. Stocked westslope cutthroat trout are present in the North Fork of Salmon Creek.

Brook trout are present in McCay, Granite, and Little Granite Creeks in the West Fork of Salmon Creek. Prior to stocking with brook trout, these creeks were probably non-fish bearing. Brook trout are a non-native and undesirable species because they hybridize with bull trout and compete with native cutthroat trout.

Cedar Creek in the South Fork of Salmon Creek watershed is not inhabited by fish.

Salmon Creek Habitat Indicators and Riparian Management Objectives
1. Natural Stand Conditions in Riparian Areas.
The existing riparian habitat in the South, West, and North Forks of Salmon Creek have been degraded by past timber harvest, road construction, and livestock grazing. Stream survey data collected on the Tonasket Ranger District from 1994 through 2001, suggests that most of the riparian areas have been logged. Road locations near streams and past timber harvest allows for easy livestock access to streams.

2. Stream Temperature
The Salmon Creek watershed is not listed on the 303(d) list as being impaired for water temperatures.

3. Large Woody Debris
Past riparian harvest has reduced large wood levels below natural capabilities. Wood levels should increase as trees killed by the Tripod Fire fall into the stream channels with the burn. However, reduced availability of recruitment trees in harvested RHCAs will mean that in-stream wood levels will still be below the natural capability of the area.

4. Water Yield
The upper reaches of the Salmon Creek watershed are unroaded, but recently burned. Water yield in intermittent/perennial streams is possibly affected in the project area from

past management activities such as channel simplification due to riparian harvest and grazing, and the resulting loss of natural water storage capacity, and by increased drainage network efficiency from moderately high road densities. Total road densities are 1.89 miles/square miles in the South Fork, 2.00 miles/square mil in the West Fork, and 1.56 miles/square mile in the North Fork.

5. Sediment Production

Road densities are moderately high in the South, West, and Middle Forks of Salmon Creek (see Figure 3.3-4). The Salmon Creek Watershed Analysis (USDA Forest Service 1997b) and previous Timber Sale Analysis documents indicates that fine sediment loads are a concern in the watershed an in the Tripod Fire Salvage Project area. The Salmon Creek Watershed Analysis states that the North Fork of Salmon Creek was dredged by miners in the late 1800s, and that this has affected the quality of spawning habitat by reducing the amount of smaller sized substrates suitable for spawning.

ENVIRONMENTAL CONSEQUENCES

This section is organized to display analysis results based on effects of the Alternatives to Habitat Indicators, Riparian Management Objectives, and fish species in the project area.

Direct and Indirect Effects

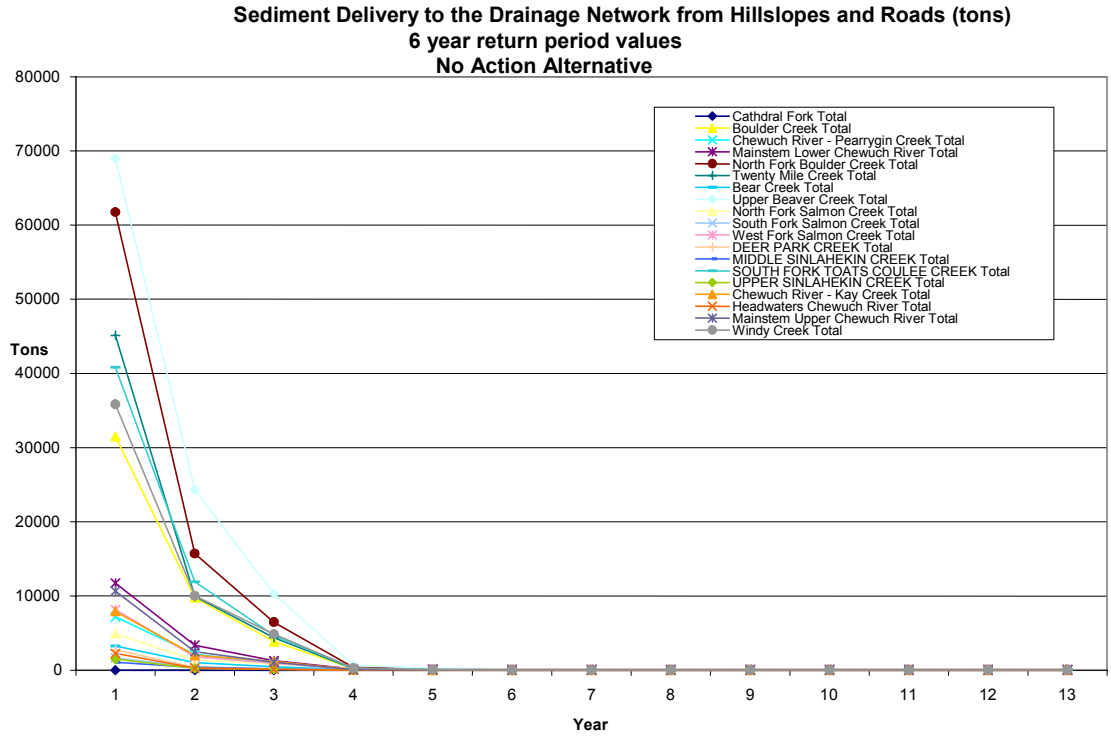
Alternative A – No Action

Existing road use in the project area is expected to remain at the current level and possibly increase. Recent road maintenance during emergency fire suppression and erosion control and drainage network maintenance funded by BAER has improved road conditions throughout most of the project area and extensive maintenance is not presently required. Future road maintenance would occur at minimal levels due to projected reductions in road maintenance funding. Most existing erosion problems on existing roads were addressed through BAER and the road network would be in relatively good condition for several years, but reduced maintenance budgets would not allow for future comprehensive road maintenance.

Figure 3.3-9 shows the WEPP modeled 6-year sediment delivery from hillslopes and roads by each 6th field watershed affected by the Tripod Fire beginning in 2007. The effects of the 2001 Thirtymile Fire and the 2003 Farewell Fire were not included in the model because their contribution to hillslope erosion in the subwatersheds was expected to be minimal due to recovery of vegetation and ground cover. The value of this model is to illustrate any differences in sedimentation caused by the action alternatives.

The project area is located within the following 6th fields: Boulder Creek, North Fork Boulder Creek, Chewuch River – Pearrygin, Mainstem Lower Chewuch, Upper Beaver Creek, and North Fork, West Fork, and South Fork Salmon Creeks.

Figure 3.3-9: Sediment Delivery by 6th Field HUC.



Road-related Sediment Production

Roads paralleling tributary streams within the project area alter channel function, sediment routing, and water delivery. Culverts have been or would be upgraded through BAER to accommodate increased flow and debris expected from the Tripod Fire and the possibility of sediment delivery from culvert and road prism failure has been reduced. However, road systems and road prisms traversing hill slopes have altered intermittent stream function, especially sediment and water routing, and this effect has not been eliminated by BAER treatments.

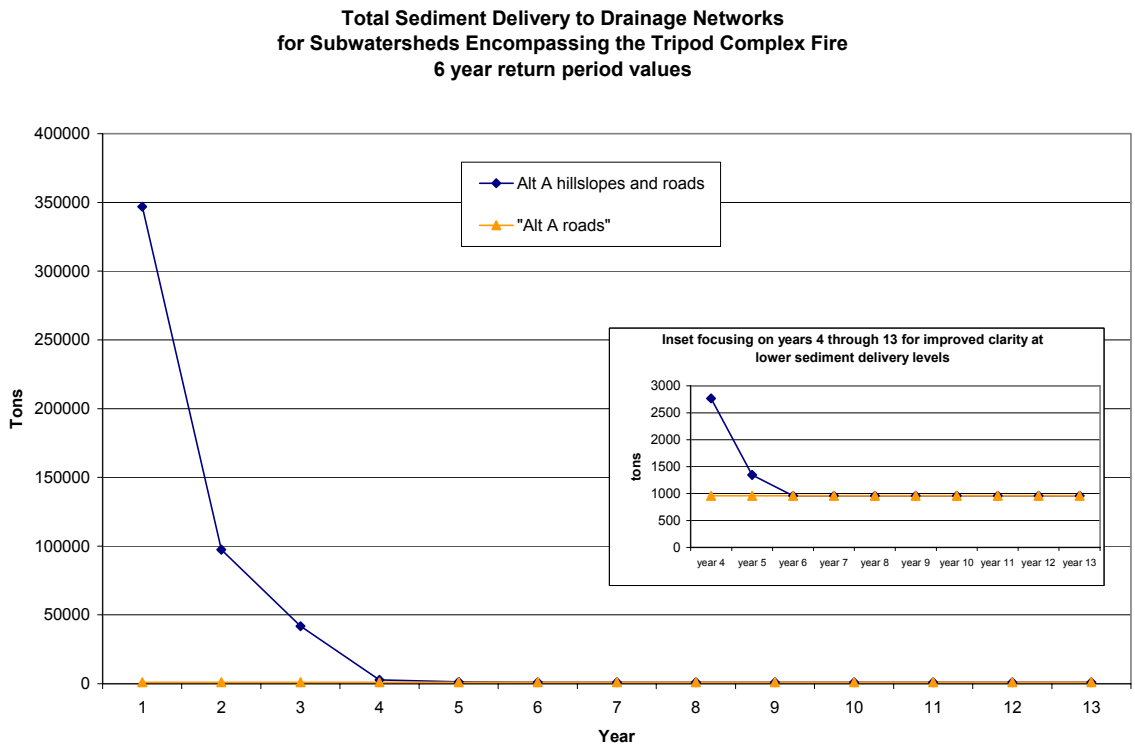
The FS 3700 road system along Boulder, Middle Fork Boulder, Bromas, and Bernhardt Creeks and associated spurs, and FS 4235 road system and associated spurs along the South Fork of Beaver Creek are hydrologically connected to the stream network. Road systems on National Forest lands in the West, South, and North Forks of Salmon Creek are also extending the drainage network for these streams.

No road closures of presently open Maintenance Level 1 roads would occur due to the lack of funds to maintain the Maintenance Level 1 road network. Fine sediment levels in the Chewuch River, Beaver Creek, and the South and West Forks of Salmon Creeks approach the upper end of Forest Plan standards. Except for BAER road maintenance projects and BAER projects to improve drainage through culverts, none of the

alternatives, including the No Action alternative, address existing road-related effects to aquatic habitat as this was not identified in the Purpose and Need for this project.

Sediment delivery from Hillslopes
There would be no change in present sediment delivery from hillslopes because tractor, skyline, and helicopter harvest and landing construction would not occur. In Figure 3.3-10, sediment delivery from roads is shown separate from the total sediment delivery to illustrate both the chronic nature of road related sediment under recovered conditions and to show the overwhelming influence of sediment delivery from the burned environment in early years.

Figure 3.3-10: Total Sediment Delivery to Drainage Networks



Fish Species Effects
There would be no additional changes to road networks and there would be no change in road related effects or hill slope effects from the present condition of any of the 6th field watersheds as described in the Affected Environment section. There would be no change in current trends for fish habitat conditions in any of the watersheds under Alternative A. Alternative A would have “No Effect” on UCR spring Chinook, UCR steelhead, and Columbia River bull trout. Alternative A represents background conditions as affected by the Farewell, Thirtymile, and Tripod Fires. There would be no actions taken with regard to the Purpose and Need as described in Chapter 1. Because no federal actions would be taken as related to the Purpose and Need, there would be “No Effect” on Critical Habitat for UCR spring Chinook and steelhead and “No Effect” on EFH for Chinook and coho

salmon. Alternative A would have “No Impact” on redband rainbow trout and westslope cutthroat trout.

Direct and Indirect Effects

Alternative A, by 5th field/6th field HUC

Lower Chewuch 5th field HUC Habitat Indicators and RMOs

1. Riparian Habitat Conservation Areas
Following the Tripod Fire, shrubs and forbs in RHCAs within the burned area would rapidly sprout and re-grow. In the fall of 2006, immediately following the fire, grass, forbs, and shrubs were already beginning to sprout in the Boulder Creek watershed. Tree seedlings would re-colonize more slowly. Depending on storm events, fire affected landscape responses such as landslides, would create depositional areas in streams and would bury some riparian areas with sand, gravel, cobbles, boulders, and logs. This is most likely to be observed on alluvial fans and could be dramatic on the Twentymile and Boulder alluvial fans, and on Boulder Creek, especially downstream of Pebble Creek.

2. Stream Temperature
Based on pre- and post-fire stream temperature data collected for the Farewell Fire, stream temperatures in the lower Chewuch 5th field and Boulder Creek would likely increase following the Tripod Fire, and the number of days that the Chewuch exceeds 16º C will increase. This effect would be greatest in late July and early August when the highest instream temperatures are typically observed. Increased stream temperatures in the lower Chewuch could reduce the suitability of spawning, rearing, and migration habitat for spring Chinook, rearing habitat for steelhead, and foraging and migration habitat for bull trout. Tripod Fire effects that could cause increased summer water temperatures may be offset by anticipated increased stream flows and improved ground water storage in alluvial stream reaches affected by landslides.

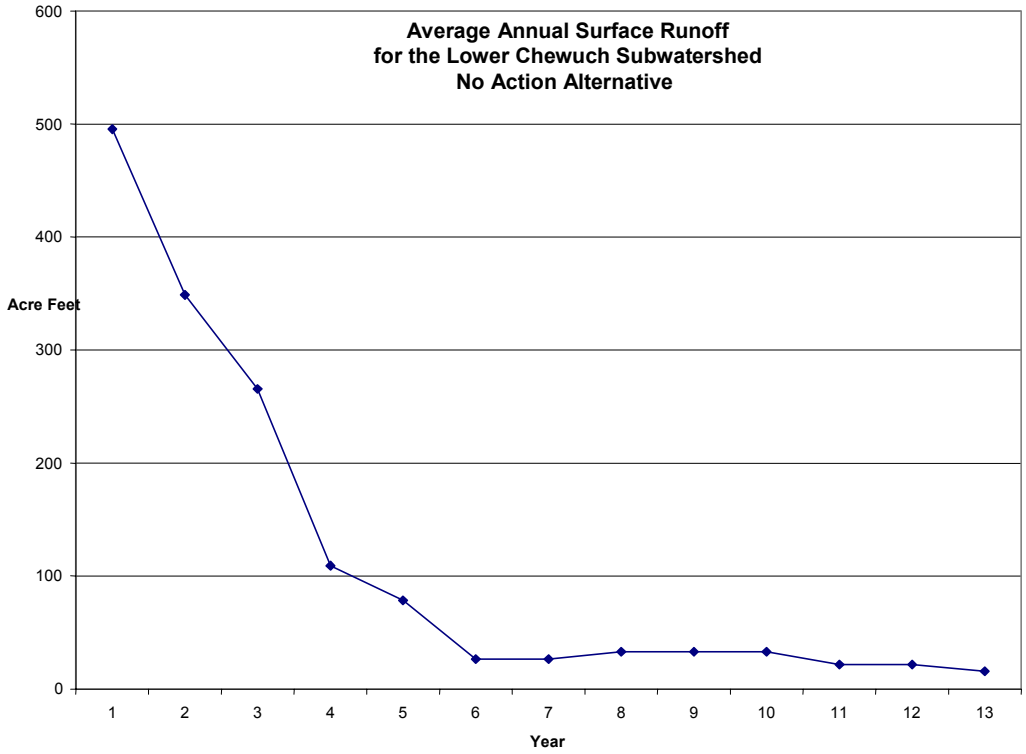
3. Large Woody Debris
Based on data collected from the Farewell and Thirtymile Fires (USDA Forest Service 2005e), large wood levels in Boulder Creek and tributaries would probably increase dramatically. Wood would be recruited to the channel directly from streambanks as burned trees fall over and from debris avalanches as wood is swept downstream in a slurry of silt, sand, and rock. Large wood levels would be lower in areas where large recruitment trees were removed in past timber harvest and along roads in RHCAs such as Road #3700 that parallels Boulder Creek. Future wood recruitment has been substantially reduced in burned-over stream reaches and would not be available to provide future wood to streams until the forest re-grows and matures in 100 to 150 years.

4. Water Yield
Estimated changes for storm runoff after the Tripod Fire in subwatersheds within the Lower Chewuch range from a 242% to 311% increase in runoff during the 25-year 1-hour storm event when compared to pre-fire levels (Higginson 2006). WEPP predictions of average annual surface runoff for the Lower Chewuch are displayed in Figure 3.3-11.

The Tripod Fire would undoubtedly cause an additional increase in water yield and channel response to increased stream flow is expected. The Tripod Fire should improve winter and summer base flow conditions that would benefit listed fish in the Chewuch River. This benefit would subside as vegetation recovers and summer evapotranspiration increases and as the forest re-grows a canopy high enough to intercept rain and snow.

Figure 3.3-11: Illustration Of The Predicted Increase In Average Annual Surface Runoff For The Lower Chewuch Subwatershed.

Later years were modeled as having full recovery of vegetation and can be viewed as background runoff rates. The figure clearly shows the large increase in runoff expected as a result of the fire and as discussed in the text.



5. Sediment Production

Figures 3.3-12a and 3.3-12b display the amount of sediment delivery from hillslopes and roads to the lower Chewuch as a result of the Tripod Fire.

Figure 3.3-12a: Chewuch Alternative A Sediment.

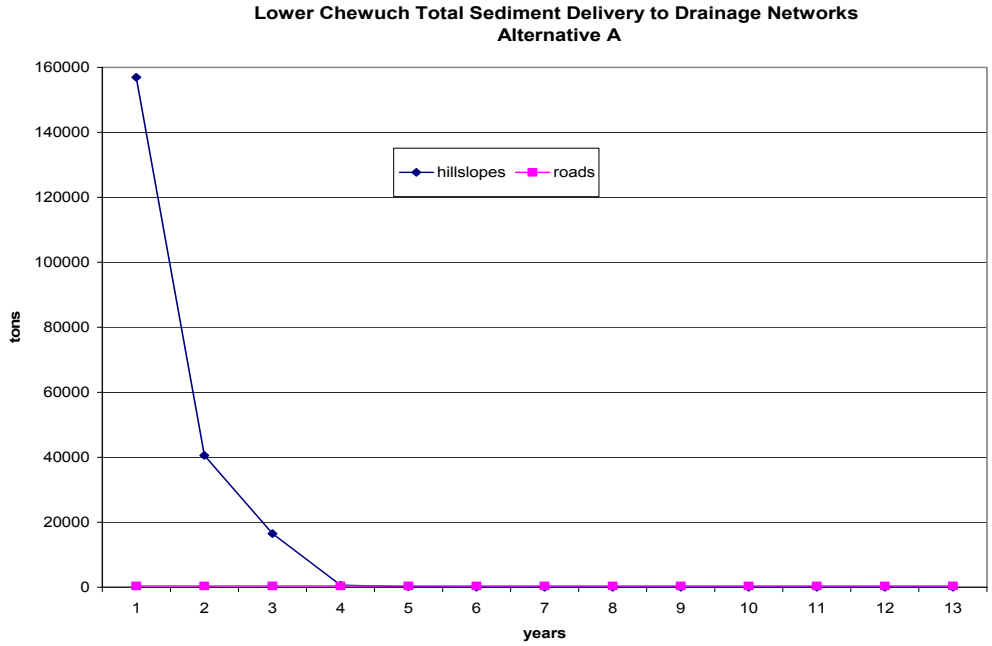
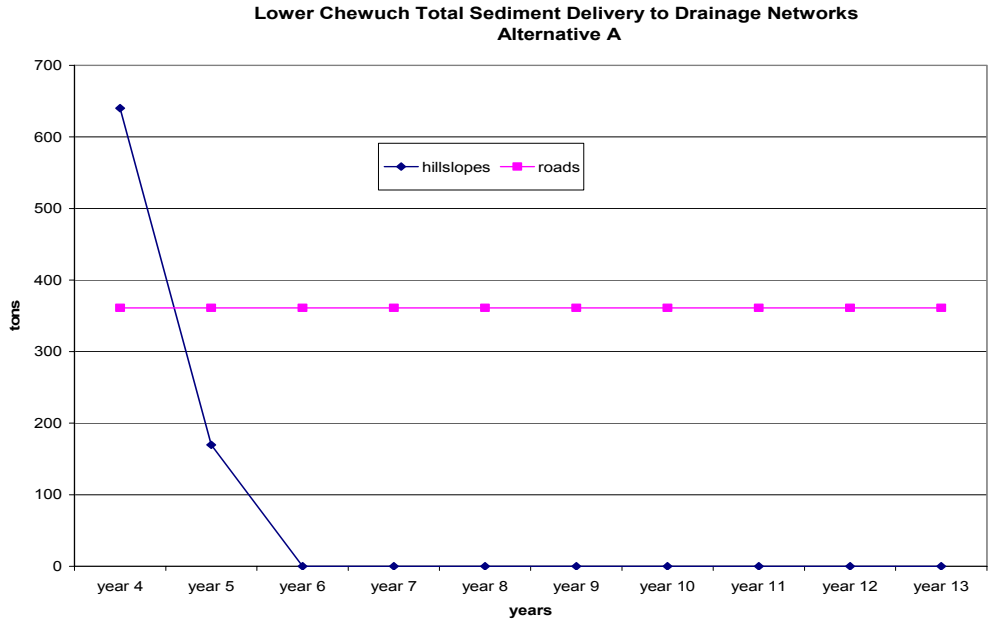


Figure 3.3-12b is an expansion of data in 3.3-12a to show the effects of roads on sediment delivery.

Figure 3.3-12b: Chewuch Alternative A Sediment Delivery from Hillslopes and Roads.



The effects of the 2001 Thirtymile and 2003 Farewell Fires were not included in the model because their contribution to hillslope erosion in the subwatersheds was expected to be minimal due to recovery of vegetation and ground cover. The effects of the Thirtymile Fire are beginning to subside, the effects of the Farewell Fire are in the 4th year of delivery and routing through the stream network, and can be observed in the Chewuch River. Figure 3.3-7 displays the current effect of the Farewell and Thirtymile Fires on spawning gravels in the Chewuch River. The Tripod Fire would add to this effect of spawning gravels, with the greatest effect to the lower Chewuch River downstream of Boulder Creek.

The sediment that is delivered to the stream channels would move downstream at a rate that depends on stream flows to suspend and carry the material and on the physical structure of the stream and river channels. Steep, high gradient stream and river reaches transport sediment, while broad unconfined reaches tend to capture and store sediment. Figure 3.3-13 does not display the transport and mobilization of sediment through time and space. During higher flows, such as the spring snowmelt or during flooding, sediment would mobilize and be carried downstream and be deposited on the floodplains and on bars in downstream reaches. Large wood and functioning floodplains that are connected to the river during high bank conditions act to trap and store sediment over time. Sediment that has not been immobilized on floodplains will work its way downstream to the mainstem Chewuch, then the Methow River, and eventually the Columbia River.

Effects to fish

Based on spawning observations and post-fire data collected from the 2001 Thirtymile Fire and 2003 Farewell Fire, there would likely be a neutral to beneficial effect to fish habitat in the lower Chewuch 5th field HUC as a result of the Tripod Fire under Alternative A. Boulder and Twentymile Creeks would likely be major post-Tripod Fire influences on habitat in the mainstem Chewuch. Increased levels of large wood, delivery of bedload that includes fine sediment, spawning gravel, cobbles, and boulders combined with increased stream flows from the Tripod Fire are expected to strongly influence the lower Chewuch River 5th field. Landslides could affect channel position at the confluences of Twentymile and Boulder Creeks, and impoundments created by landslides may increase water storage capacity on alluvial fans and at tributary junctions. Following the Farewell Fire, bull trout spawning distribution has increased and spawning counts have so far been maintained and possibly increased over pre-fire conditions. The Tripod Fire and subsequent landscape-level responses may have a neutral to beneficial effect (similar to effects observed following the Thirtymile and Farewell Fires) on habitat for spring Chinook, steelhead, and bull trout in the lower Chewuch 5th field HUC. Migration and foraging habitat for migratory bull trout may also be improved or maintained. However, this optimism is somewhat tempered because of the large amount of the Chewuch watershed that has been burned since 2001, the unknown long-term effect of the fires, the higher levels of roading in the Tripod Fire area (compared to the Farewell/Thirtymile burned area) that could modify and impede the delivery of large wood and bedload to the lower stream reaches in the watershed, the expected increase in late summer water temperatures in the lower Chewuch, and Tripod BAER treatments designed to protect downstream property by impeding the type of landscape responses that appear to rebuild aquatic habitat.

Middle Methow 5th field/upper Beaver Creek 6th field HUC Habitat Indicators and RMOs

1. Upper Beaver Creek Riparian Habitat Conservation Areas

Following the Tripod Fire, shrubs and forbs in RHCAs within the burned area would rapidly sprout and re-grow. In the fall of 2006, immediately following the fire, grass, forbs, and shrubs were already beginning to sprout in the Blue Buck watershed that had some of the highest burn intensities. Tree seedlings would re-colonize more slowly. Depending on storm events, fire affected landscape responses such as landslides, would create depositional areas in streams and would bury some riparian areas with sand, gravel, cobbles, boulders, and logs. This is most likely to be observed on alluvial fans in the Blue Buck subwatershed and along Lightning Creek.

2. Water Temperature

Although the forest canopy is burned over, much of the stream surface in the mainstem Beaver Creek and Lightning Creek would remain shaded by topography. The streams within the Beaver Creek watershed are small and shrubs would quickly re-grow to shade the water surface. Temperatures would increase in the fire area in Beaver Creek but would be moderated by shading from topography and the rapid re-growth and shading of shrubs. Stream temperatures in Beaver Creek within the fire area are cold and are expected to remain suitable for bull trout and steelhead following the Tripod Fire.

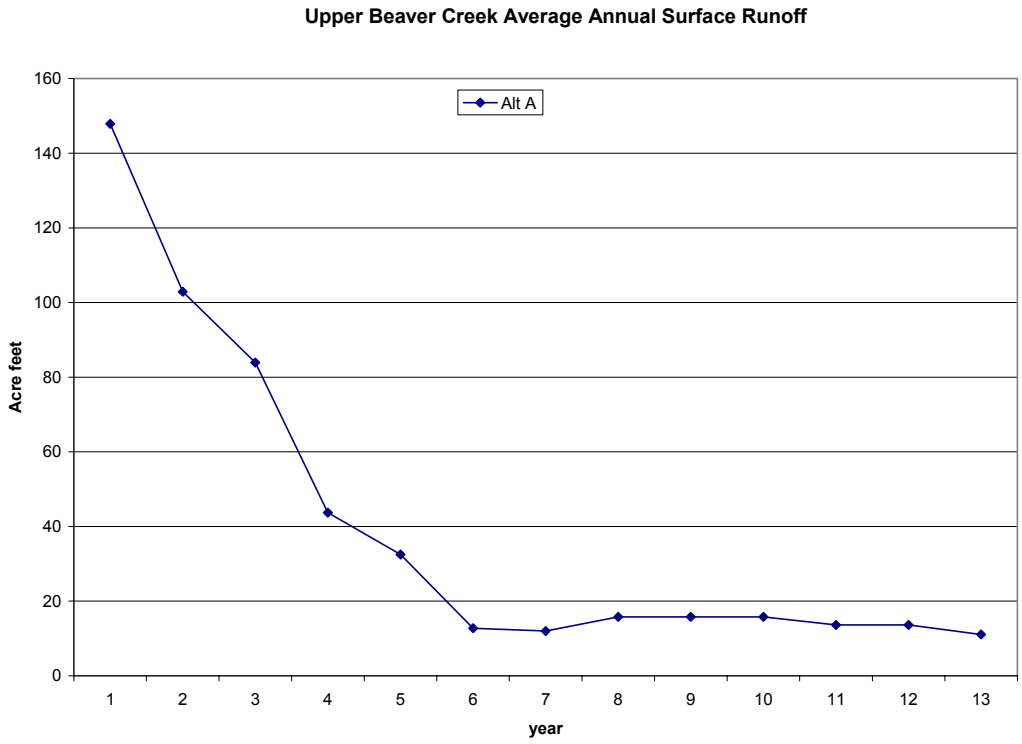
3. Large Woody Debris

Large wood levels would increase dramatically in all stream reaches as a result of the Tripod Fire except in a few places where past harvest along the streams has reduced trees available for harvest. Although road densities are moderately high, very few roads parallel streams in the Beaver Creek watershed within the burn area and roads have not affected wood recruitment within the burn area. BAER projects to increase culvert sizes would help to improve the transport of wood downstream through road crossings. Future wood recruitment has been eliminated by the fire and future wood would not be available until the forest re-grows and matures.

4. Water Yield

The effects of the fire should make more water available during summer base flow conditions which would slightly improve base flow water yield until vegetative recovery occurs. The estimated change for storm runoff after the Tripod Fire in Upper Beaver Creek is a 153% increase in runoff during the 25-year 1-hour storm event (Higginson 2006). WEPP predictions of average annual surface runoff for Upper Beaver Creek are displayed in Figure 3.3-14. In the figure, later years were modeled as having full recovery of vegetation and can be viewed as background runoff rates. The figure clearly shows the large increase in runoff expected as a result of the fire.

Figure 3.3-14: Upper Beaver Creek Average Annual Surface Runoff



5. Sediment Production

BAER treatments such as straw mulch were applied to some high intensity burned areas and may reduce fine and coarse sediment delivery from erosion. However, these treatments would not likely affect sediment delivery from large landslides that could occur in the Blue Buck sub-drainage and fine sediment levels from the fire would still increase substantially.

Figure 3.3-15: Total Sediment Delivery to Drainage Network for Upper Beaver Creek 6-Year Return Period Values

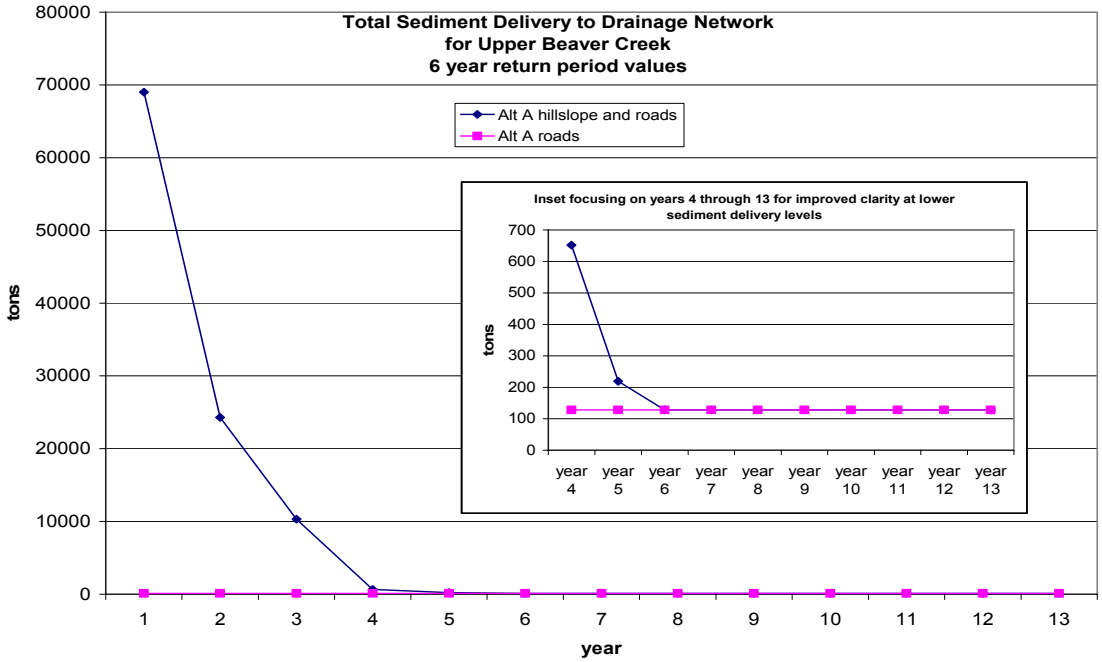


Figure 3.3-15 displays WEPP modeled background sediment delivery from hillslopes and roads in Upper Beaver Creek. The effects of the Tripod Fire on delivered sediment are dominant but subside after about 6 years. The inset chart in Figure 3.3-15 shows the influence of the existing road network on long term sediment delivery. As the fire effects subside, this chronic effect becomes more influential on aquatic habitat because fine sediment delivered from roads would become a more dominant component of delivered sediment. BAER treatments such as straw mulch are not reflected in the results displayed above. BAER analysis (Higginson 2006) suggests that such treatments have the potential to reduce sediment yields from hillslopes by a considerable amount and may accelerate the recovery shown above by perhaps one year.

Fish Distribution

The weak bull trout population in the Upper Beaver Creek watershed may persist as an immediate result of the Tripod Fire. BAER treatments included the removal of the fish barrier culverts and all of the barriers that once isolated this population have been removed. Bull trout have been observed migrating into Beaver Creek and rebuilding of the Blue Buck population is now possible. Natural barriers are presently found on lower Lightning Creek and on the mainstem of Beaver Creek upstream of Blue Buck Creek. Fish passage above these two natural barriers could be restored if they become buried by post-fire increases in large wood and bedload. Conversely, temporary barriers could increase if logs and boulders combine to block passage. These types of barriers are often temporary and/or are passable by fish during high stream flows. Spawning habitat may improve following the Tripod Fire as landslides occur and deliver bedload that includes spawning gravels to streams. This benefit may be reduced by BAER landscape

treatments designed to reduce landscape processes that deliver sediment, including spawning gravels, to stream channels.

Upper Salmon Creek HUC Habitat Indicators and RMOs

1. Salmon Creek Riparian Habitat Conservation Areas

Salmon Creek RHCAs within the Tripod Fire area upstream of the project area are in unroaded areas and are essentially intact. Within the project area, past timber harvest, roading, and livestock grazing have impacted RHCAs. Vigorous re-sprouting of riparian shrubs is anticipated as a result of the Tripod Fire and would restore RHCAs to a functioning condition within the next 3 to 6 years.

2. Temperature

The Tripod Fire removed most of the streamside shade and an increase in stream temperatures is expected as a result of the fire. Stream sizes are small and rapid re-sprouting of riparian vegetation would quickly provide shade as long as livestock grazing does not reduce riparian shrub re-growth.

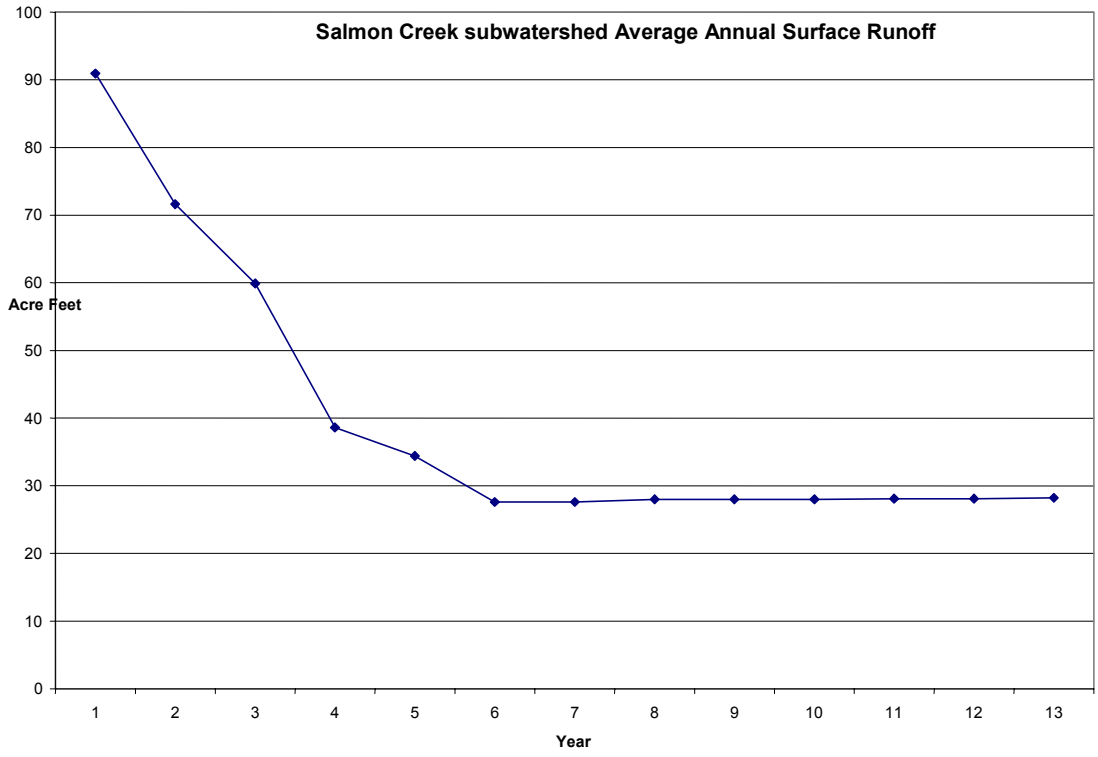
3. Large Woody Debris

Large wood levels would increase as a result of the Tripod Fire. However, available wood recruitment within the project area has been lowered by past timber harvest, road relocations in RHCA, and livestock grazing effects. Trees for future wood recruitment would not be mature and available for 100 to 150 years.

4. Water Yield

The Tripod Fire should slightly increase late summer base flows due to reduced levels of evapotranspiration. This effect should last until vegetation begins to recover. WEPP predictions of average annual surface runoff for Salmon Creek are displayed in Figure 3.3-16. In the figure, later years were modeled as having full recovery of vegetation and can be viewed as background runoff rates. Again, the figure clearly shows the large increase in runoff expected as a result of the fire.

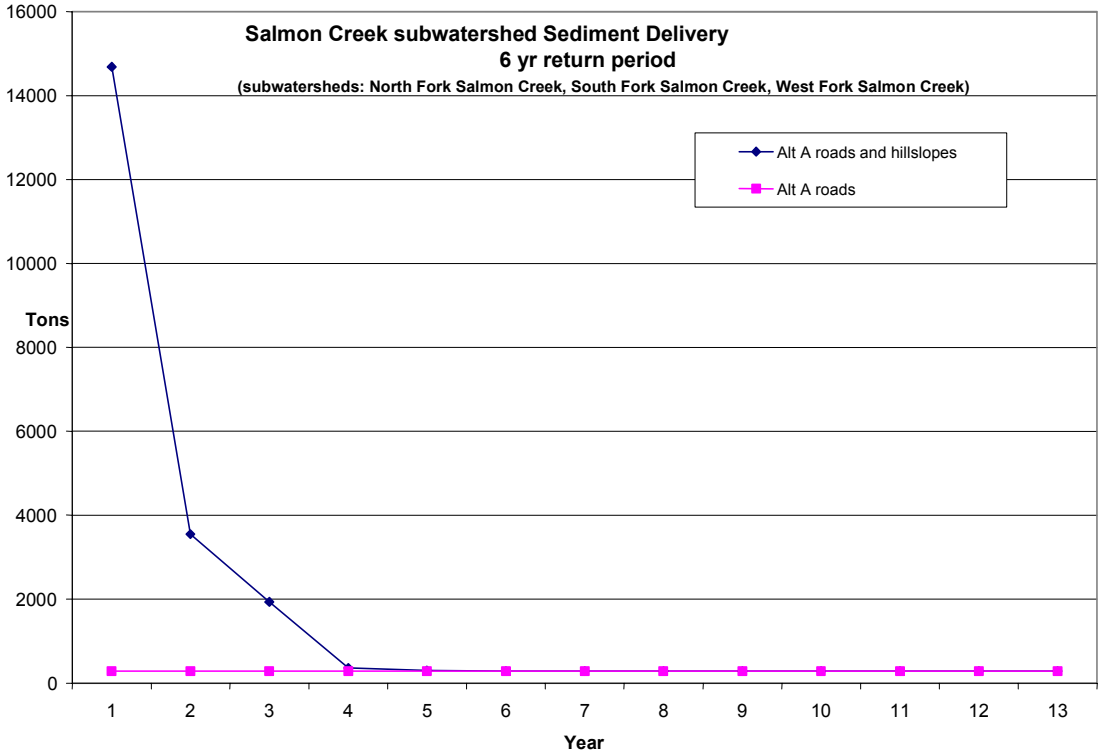
Figure 3.3-16: Salmon Creek Subwatershed Average annual Surface Runoff



5. Sediment Production

Figure 3.3-17 displays WEPP modeled background sediment delivery from hillslopes and roads for Salmon Creek. The effects of the Tripod Fire on delivered sediment are dominant, but subside after about 5 years. About half of the sediment delivered from roads occurs in the North Fork Salmon Creek. As the fire effects subside, this chronic effect becomes more influential on aquatic habitat because fine sediment would be come a more dominant component of the delivered sediment.

Figure 3.3-17: Salmon Creek Subwatershed Sediment Delivery 6-Year Return Period



Fish Distribution

Fire intensities in the Salmon Creek watershed were of a lower intensity than in the Boulder and Beaver Creek watersheds. Increased levels of large wood may help improve aquatic habitat within the burned areas in the upper Salmon Creek watershed. The Tripod Fire would have little to no influence on fish habitat in lower Salmon Creek below Conconully Reservoir because the reservoir would act as a sediment and wood reservoir and prevent downstream delivery of these materials.

Effects Common to All Action Alternatives in Lower Chewuch River, Middle Methow (Beaver Creek), and Salmon Creek

1. Riparian Habitat Conservation Areas

There would be no timber harvest, road construction, or landing development within RHCAs. Therefore, at the reach scale, RHCAs would not be functionally affected by any of the action alternatives. Wood recruitment levels would not be affected and vegetative recovery in burned over RHCAs would take place at the same rate as burned over RHCAs outside of the project area. Stream shade would not be affected by the project.

Small segments of RHCAs surrounding intermittent, non-fish bearing streams may need to be crossed by logging equipment during log skidding operations. These crossings would be perpendicular to the stream channel and designated by the sale administrator. The crossings would typically be less than 20 feet wide and fully restored after logging is completed. These small 20-foot sections would cause a localized impact to the riparian

area at the crossing that would include soil disturbance, crushing of riparian vegetation, and possibly the felling of a few trees. The width of this disturbance would typically be a corridor through the RHCA less than 20 feet in width. This impact would be limited to the crossing area and would not be great enough to translate into a reach-scale RHCA effect or represent a change to the function of RHCAs at the 6th of 5th field HUCs. The crossing areas would re-vegetate and recover within 2 to 3 years following the harvest activity.

There would be no prescribed fire within salvage units, however slash on landings may be piled and burned.

2. Stream Temperature

The large increases in fire-related sediment delivery to the drainage network has the potential to increase width/depth ratios of streams within the project area. Streams with high width:depth ratios are more susceptible to heating from incoming solar radiation, and may increase in stream temperature. Similarly, decreases in stream shade due to the fire may also increase stream temperatures. However, the minor increases in sediment due to project activities and the fact that there would be no harvest within RHCAs, except as needed for danger tree felling, would indicate that there would not be increases from project activities. The salvage harvest project would not have an effect on stream temperatures at the localized reach scale or at the 6th of 5th field HUC scale.

3. Large Woody Debris

There would be no salvage harvest within RHCAs along perennial and intermittent streams and large woody debris levels would not be affected by salvage harvest operations. Unstable areas that are prone to mass wasting or landslides would be included as RHCAs and would be excluded from salvage harvest. All wood presently in RHCAs would remain available for recruitment to stream channels. Hazard tree felling along road systems and within RHCAs requires trees to be felled towards stream channels and left in place. Hazard tree felling within RHCAs and stream channels could increase large woody debris in the RHCAs.

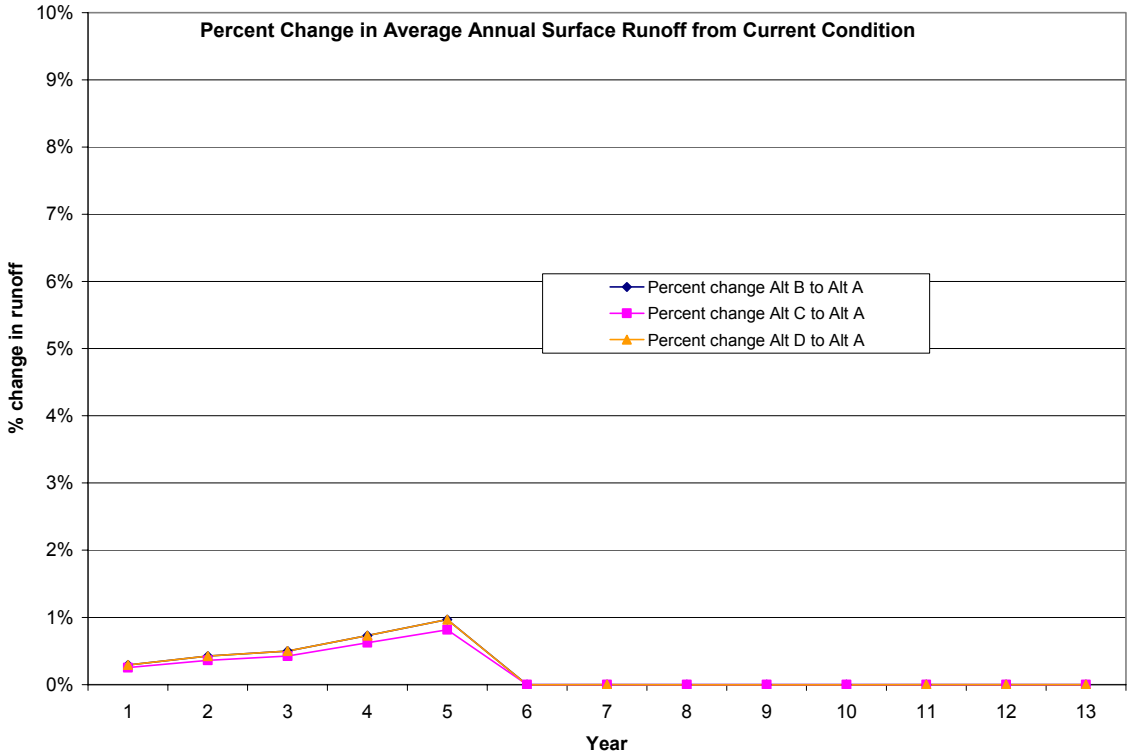
4. Water Yield

The hydrology of subwatersheds encompassed by the Tripod Fire is characterized as a snowmelt dominated hydrologic regime, with annual peak flows occurring in May and June as the abundant snowpack melts. Fire effects on snow accumulation and melt can result in greater melt-off peak flows, resulting in a longer spring runoff. Increases in snowpack may also result in increases in groundwater storage, resulting in higher late season flows (base flow). Anecdotal observations suggest that previous fires may have slightly increased base flows in the Chewuch (Molesworth 2007). It is expected that similar changes would occur due to the Tripod Fire. The trees that would be salvaged are dead and are no longer taking up water, harvest of these dead trees would not change water yield from the existing burned condition. There would be no new permanent road construction and no change to water routing, timing or water yield from new system roads. There would be up to 3 miles of temporary road construction spread out over the entire project area. These roads would be decommissioned and returned to a natural hydrological state following the project and would not have long term effect to the drainage network or water yield and timing. Most of the temporary road segments are less than 500 feet in length and are needed to access individual units from the existing road system. The temporary roads would be built on gentle terrain, outside of RHCAs.

The temporary roads are spread out over such a broad area they would have no effect to water yield at the 6th field or 5th field HUC scale.

Percent change in the Average Annual Surface runoff between each of the Action Alternatives and the No Action Alternative is displayed in Figure 3.3-18. Earlier figures (3.3-3, 3.3-11, 3.3-14, and 3.3-16) highlight that removal of vegetation and reduction in evapotranspiration as a result of the Tripod Fire account for the early year increases in average annual surface runoff. As shown in Figure 3.3-18, there would be very small increases in runoff resulting from project implementation. These increases are largely a result of slower recovery of vegetation and minor soil impacts due to yarding practices. However, these changes are very small, and since measurement error for standard stream flow measurement equipment is around 10%, the small increase in surface runoff (which represents a small portion of total runoff) resulting from project implementation would not likely be detectable with any confidence.

Figure 3.3-18: Percent Change in Average Annual Surface Runoff from Current Condition



5. Sediment Production

None of the above items 1 - 4 would change due to project implementation. However, increased sediment production and delivery to fish habitat could arise due to tractor harvest, temporary road construction, and use of existing roads. Therefore, sediment production and delivery to stream channels are the only riparian and aquatic components analyzed in further detail. The following section describes definitions and reports summaries of road activities that affect sediment production for this project prior to site specific discussions of alternatives.

There are no fish in Ramsey Creek. Erosion and sediment delivery from hillslopes and roads in the Ramsey Creek subwatershed within the Lower Chewuch – Pearrygin 6th field HUC does not contribute to fish habitat in the mainstem of the Chewuch or Methow Rivers because there is no physical surface connection to these rivers and fish bearing water. Activities in the Ramsey Creek drainage do not affect fish or fish habitat and are not discussed further in this section. Effects to RHCAs in Ramsey Creek are covered in the Chapter 3.6 and 3.2.

Road Management for All Alternatives

Temporary road construction and reopening of existing system roads are proposed in all Action Alternatives. No new permanent road construction is proposed and no substantial reductions in existing road densities are proposed. New temporary roads would be fully decommissioned after the project is completed. The effect of all the action alternatives to the transportation system is essentially no net change in total road densities.

Temporary roads are short spurs that extend from the existing road system to access individual logging units. In general, temporary road locations (their distance from water courses) and mitigation measures would minimize sediment delivery to project area streams that can result from construction of these roads.

Temporary roads would typically be no more than 500' long, would not require extensive engineering design, and would not be needed for future forest management. At the conclusion of project activities, temporary roads are obliterated and restored to forest productivity. Obliteration would require removal of any culverts and restoration of natural drainage cross sections. Typically sub-soiling or prism removal with an excavator would be employed to de-compact soils and seeding would be applied to discourage noxious weed invasion and surface erosion. Mitigation Measures associated with temporary road construction would be carried out, including locating roads on gentle terrain, outside of RHCAs, and minimizing road drainage connectivity with the stream network. In order to reduce the possibility of soil entering stream channels, no side casting of soil material would be allowed within RHCAs. No temporary roads would be constructed within RHCAs.

Road re-opening involves the maintenance of short sections of an existing specified road to meet project needs. Re-opening typically takes place when an existing road becomes unsafe for vehicular use or when current road design capabilities do not meet project needs. Emergency fire suppression road use and emergency BAER projects addressed most of the road reconstruction needs prior to this salvage project.

Water for maintaining roads for the project would not be drafted from stream reaches where listed fish are present.

Figure 3.3-19 summarizes the proposed temporary road construction by watershed.

Figure 3.3-19: Approximate Miles of Temporary Road Construction by Alternative.

Lower Chewuch 5th field HUC	Lower mainstem Chewuch 6th field	Boulder / North Fork Boulder	Lower mainstem Chewuch – Pearrygin	Upper Beaver Creek	Salmon Creek
Alt B	0.15 miles	1.3 miles	0.6 miles	0.3 miles	0.6 miles
Alt C	0.15 miles	0.4 miles	0.6 miles	0.3 miles	0.6 miles
Alt D	0.15 miles	1.3 miles	0.6 miles	0.3 miles	0.6 miles

Unauthorized Roads

There would be 6.7 miles of existing, unauthorized roads used during the project. Following the project 3.3 miles of unauthorized road would be placed on the roads system and would be closed until needed again in the future. There would be 2.7 miles of unauthorized road that would be decommissioned and would not be used in the future. There would be 0.73 miles of unauthorized road in the Ramsey Creek sub-watershed (Chewuch-Pearrygin 6th field) that would be re-opened and left open after the sale. Road management, and a discussion on open and closed roads, can be found under section 3.12 Transportation. Figure 3.3-20 displays unauthorized road treatment by watershed.

Figure 3.3-20: Unauthorized Road Treatments by Watershed.

	Lower mainstem Chewuch 6th field	Boulder / North Fork Boulder	Lower mainstem Chewuch – Pearrygin	Upper Beaver Creek	Salmon Creek
Unauthorized roads to be left open after the sale	0	0	0.73 miles	0	0
Unauthorized roads to be closed after the sale	0	3.3 miles		0	0
Unauthorized roads to be decommissioned after the sale	0.23 miles	0.56 miles	1.4 miles	0	0.48 miles

Road related sediment delivery may also occur on existing roads that are not being reconstructed, but are being maintained and used for project activities For analysis of the aquatic environment, any existing road that would be used for vegetation treatment or access to treatment sites is considered “utilized” and is summarized in Figure 3.3-21 Effects from existing roads on the aquatic environment involve sediment generation and altered water routing from both initial road maintenance and vehicle use. Paved roads generate less sediment delivery from the road surface than gravel and natural surface roads because there is no sediment delivery from the road surface; however erosion and sediment delivery can increase from un-vegetated cut and fill slopes due to increases in runoff from impervious pavement. Gravel roads generate less fine sediment than natural surface roads because gravel serves to armor roads and to increase infiltration rates on

the road prism which decreases surface runoff and erosion. Alternatives B, D and E utilize the same road network. Alternative C utilizes slightly less gravel roads. Figure 3.3-21 displays the road mileage that would be used for the project by road surface by each 6th field drainage.

Figure 3.3-21: Approximate miles of existing road by surface type utilized for the project.

HUC 6 Watershed	Total Haul Routes (mi)	Paved (mi)	Gravel (mi)	Natural Surface (mi)
Lower Chewuch mainstem	15.4	12.1	0	3.3
Boulder Creek	11.7	3.6	4.8	3.3
North Fork Boulder	35.6	2.8	19.3	13.4
Chewuch River – Pearrygin	20.8	1.0	14.8	5
Lower Beaver Creek	2.7	2.7	0	0
Upper Beaver Creek	35.3	3.7	24.8	6.8
West Fork Salmon	31.0	4.6	15.2	11.2
North Fork Salmon	11.6	0.8	8.4	2.4
Total	**188**	**41**	**99**	**49**

Road location in valley floors near streams and overall density is often used as an indicator of watershed health. Road density is considered very high in the Lower Chewuch Mainstem, high in upper Beaver Creek and high in the Salmon Creek watersheds (See Figure 3.3-4).

There would be no long term change in road densities in any of the Alternatives when considered at the 5th field watershed scale and when the sediment delivery effect to fish habitat is considered. During the project there would be a small increase of up to 3 miles of temporary road spread out through out the project area. The increase in temporary roads would create a small temporary increase in total road density and road effects to drainage network when considered for each 6th field HUC. This effect is discountable because it is distributed across the entire project area and three 5th field HUCs.

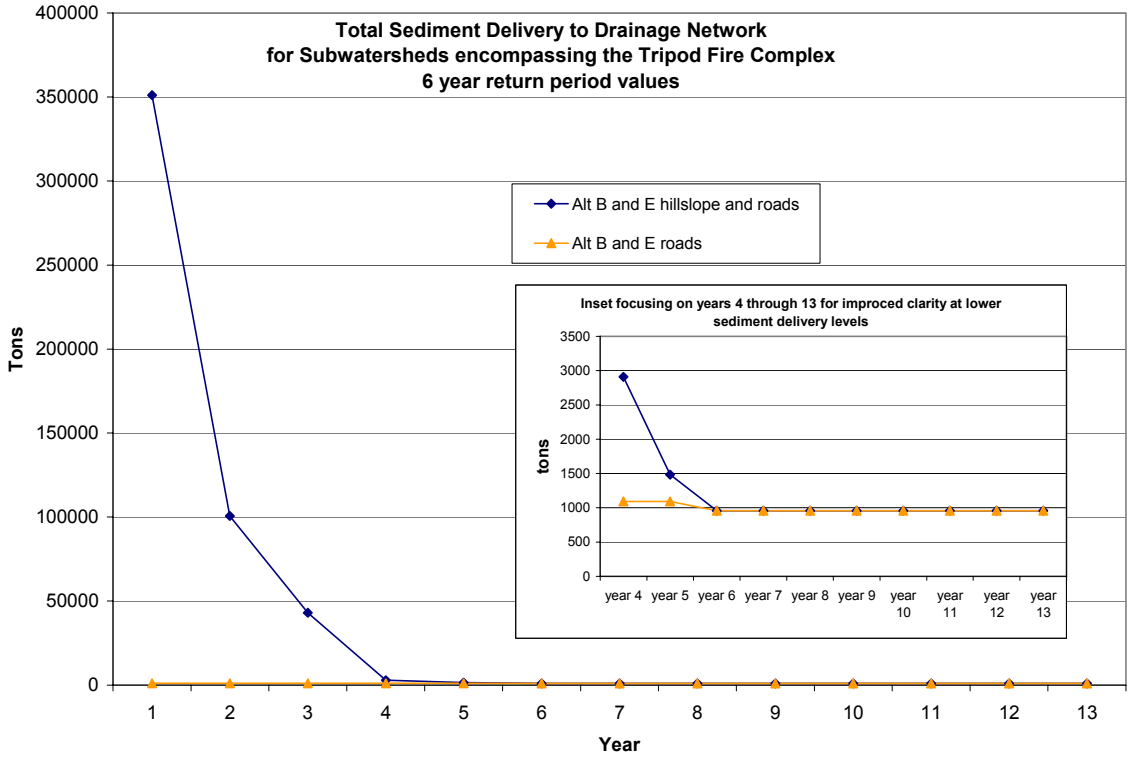
Effects Discussion by Alternative

All Action Alternatives

Figure 3.3-22 shows the effect of Alternative B and E on the 6-year return period values of total delivered sediment beginning in 2007. Figure 3.3-22 also shows how the chronic effect of fine sediment delivery from roads is masked by the much larger fire related sedimentation effect until vegetation recovers and the road effect becomes the dominant sediment source. While not specifically modeled or enumerated, there is the potential for hillslope sediment delivery resulting from natural, post-fire mass wasting events not related to management actions. These effects are likely to be similar to landslide/mass wasting effects discussed in earlier sections of this chapter. Landslides would deliver both fine and course sediment to the drainage network as well as large wood. Based on recent events, sediment delivery of this nature may have neutral to positive influences on spawning activity, and would likely improve hydrologic function in affected watersheds. To avoid management related mass wasting events, unstable areas that are prone to mass wasting would be included in RHCAs and excluded from salvage harvest. Also, ongoing

BAER treatments to improve road drainage and reduce the risk of stream crossing failure should reduce the possibility of mass wasting associated with roads. The inset chart focuses on years 4 through 13 in order to display the slight increase in sediment delivered from road related activities associated with the Tripod Fire Salvage Project. The difference between use of roads for project implementation is 135 tons per year for years 1-5, after which it is assumed that road effects would match pre-project levels. The road effects for Alternatives C and D (101 and 135 tons respectively) are essentially the same as Alternative B and E because the amount of roads are essentially the same. In Alternative A the road effect line would be flat (see inset, Figure 3.3-10) and would not show an increase in years 1 through 5 because it is assumed that without increased traffic use pulverizing the road prism, the sediment delivery from roads would be essentially the same as pre-fire.

Figure 3.3-22: Total Sediment Delivery to Drainage Network for Subwatersheds Encompassing the Tripod Fire Complex, 6 Year Return Values



All Action Alternatives: Comparison of delivered sediment from hillslopes and roads to fish-bearing waters

The action alternatives have very similar effects that are virtually indistinguishable from each other. The differences between the action alternatives would not be measurable (using available technology) in stream channels where fish reside. Alternative C has slightly less tractor logging and associated road use and would have a slightly smaller amount of sediment production and delivery to the drainage network, but this small difference would not be measurable in downstream reaches. Figure 3.3-23 shows the accumulative amount of sediment delivery to the drainage network in tons for all

watersheds for all alternatives and shows that there would be virtually no difference between any of the action alternatives. The Tripod Fire would generate nearly 500,000 tons in Alternative A. The difference between the action alternatives and Alternative A is about 1,500 tons of accumulated sediment delivery or roughly 0.3%. The accumulated percentage of sediment delivery is shown in Figure 3.3-25. It is important to note that only a very small fraction of the sediment delivered to the drainage network might end up in spawning gravels as highlighted in Figure 3.3-7, and that it would be below the limits of detection of our sampling protocol. This is discussed below in the Lower Chewuch discussion.

Figure 3.3-23: Accumulated Sediment Delivery to Drainage Network by Alternative

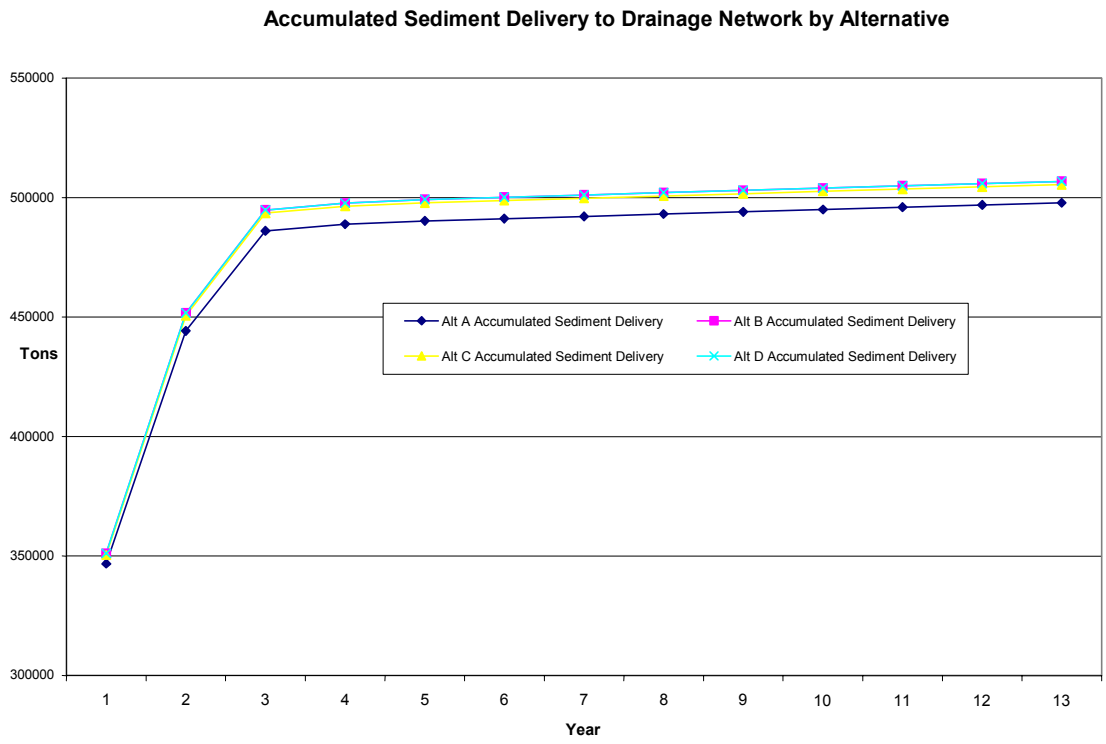
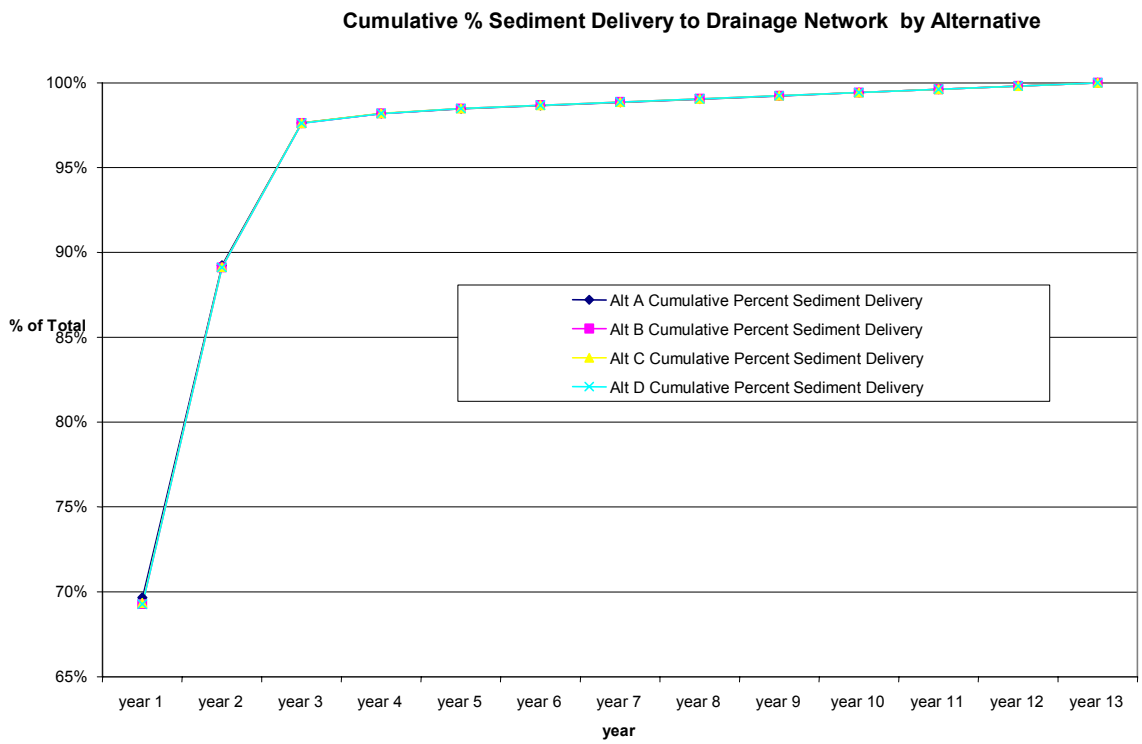


Figure 3.3-25 shows sediment delivery as the percent change in delivery from the fire affected background level in Alternative A. The figure also shows that there is a virtually indistinguishable difference in accumulated sediment delivery between the action alternatives. The sediment that is delivered to the drainage network would move downstream at a rate that depends on stream flows to suspend and carry the material and the physical structure of the stream and river channels. Steep, high gradient stream and river reaches transport sediment, while broad unconfined reaches tend to capture and store sediment. Figure 3.3-25 does not display the transport and mobilization of sediment through time and space. During higher flows, such as the spring snow melt or during flooding, sediment would mobilize and be carried downstream and deposited on the floodplains and on bars in downstream reaches. Large wood and functioning flood plains

that are connected to the river during high bank conditions act to trap and store sediment over time. Sediment that has not been immobilized on floodplains would work its way downstream to the mainstem Chewuch, then the Methow River and eventually the Columbia River. All sediment that moves into the Columbia River would eventually be captured behind Wells Dam, 8 miles downstream from the Methow/Columbia Rivers confluence.

The calculations for sediment delivery to the drainage network from hillslopes and roads in Alternative A do not include hillslope and road delivery effects caused by the Farewell and Thirtymile Fires because their contribution to hillslope erosion in the subwatersheds was expected to be minimal due to the recovery of vegetation and ground cover. An important point illustrated in both Figures 3.3-23 and 3.3-25 is that about 97% of the sediment delivered to the streams for the life of the proposed project occurs in the first three years and that the overwhelming majority of this sediment is a result of fire effects alone.

Figure 3.3-25: Cumulative %Sediment Delivery Network by Alternative



Lower Chewuch

Figure 3.3-26 shows the WEPP modeled sediment delivery to the drainage network from hillslopes and roads that has the potential to affect fish habitat in the Lower Chewuch River 5th field. The graph excludes harvest in Ramsey Creek in the Lower Chewuch mainstem – Pearrygin 6th field HUC because activities in Ramsey Creek do not affect habitat inhabited by fish. The graph shows that the effects of each action alternative on sediment delivery above the background level (Alternative A) is very small. Because of

the time elapsed since the Farewell and Thirtymile Fires, their effects are likely near pre-fire sediment delivery rates.

As mentioned earlier, only a small percentage of the sediment delivered to the drainage network would be deposited in spawning gravels. To assess potential effects of the increased sediment delivery on spawning habitat and attainment of standards and guidelines, the change to percent fines sediment in spawning beds via McNeil core samples 2000 - 2006 was used. The increase in fine sediment observed in the McNeil core samples was a result of the Thirtymile (2001) and Farewell (2003) Fires. Both fires and landslides occurred above the survey reaches displayed in Figure 3.3-7. The mean changes in percent fines of spawning gravels before and after the Thirtymile and Farewell Fires are displayed in 3.3-25a below. The fires may have induced surface erosion and landslide effects that were not detected in spawning beds prior to 2005 because flows were not sufficient to rework substrate and incorporate fines into the spawning gravel (Molesworth 2007).

Figure 3.3-25a: Chewuch River Mean % Fines <0.85mm Before and After the Thirtymile and Farewell Fires and Several Landslide Events.
No sediment samples were collected in reach 2 in 2006 because the river abandoned the main channel at the historic sample sites. New sample sites will be selected in 2007.

Reach/ River Mi.	Mean % fines <0.85 mm, 2000-2004	Mean % fines <0.85 mm, 2005-and 2006	Change in percentage points*
1 21.7	14.64%	20.00%	+ 5.36%
2 17.5	11.62%	19.80%	+ 8.18%
3 15.4	12.90%	18.18%	+ 5.28%
4 9.3	15.42%	21.60%	+ 6.18%
Average	13.65%	19.90%	+ 6.25%

* Percentage point means what the rise or amount of percent fines increased by and not the percent increase. This method refers to the change in percent fines as a unit, rather than a percent of the pre-fire fine levels.

The following two assumptions (bolded) are used to estimate how a fire would influence the magnitude of sediment delivered to spawning gravels in the mainstem Chewuch. The predicted and proportional increase in sediment delivery to the drainage network from the proposed harvest activities allowed a projection of the effects management activities could have on spawning areas.

1. **Large fires and subsequent landslides increased total average percent fines in spawning beds in the Chewuch River by 6.25 percentage points.**

Prior to the Farewell and Thirtymile Fires and subsequent landslide events, mean percent fines for the four survey reaches in the Chewuch River were 13.65% (Figure 3.3-25a). The mean percent fines after the fires and landslide events were 19.90%, which is a 6.25 percentage point increase from the pre-fire percent fines. The USFS considered the change between the mean percent fines in spawning gravels from the 2000 to 2006 period as a typical increase of spawning bed fines that we would expect after a large fire event.

Erosion modeling with WEPP predicted a total baseline increase in sediment delivered to the Lower Chewuch watershed during the five years following the Tripod Fire of about 204,804 tons and modeled results for fully recovered vegetation (10 years after the fire) of 361 tons. The estimate is that immediately after a large fire, and for the next four years, there would be large increase in sediment delivered to the drainage network.

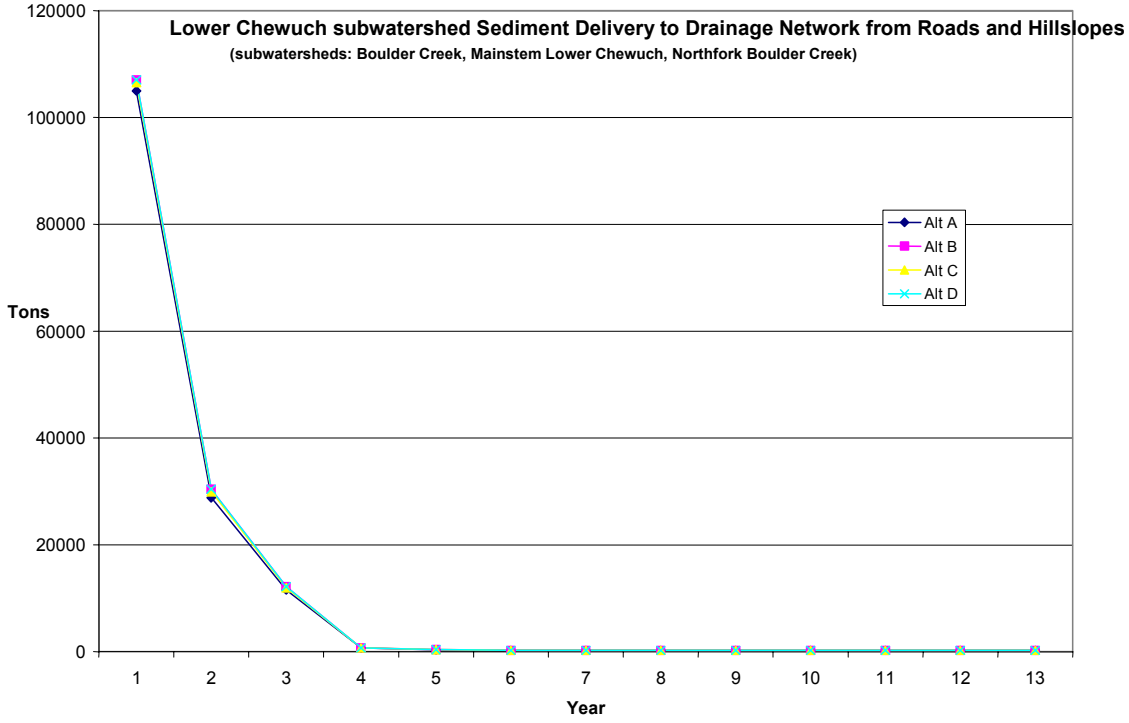
2. **Increase in spawning bed fines is proportional to increases in modeled sediment delivery resulting from large fires, or 204,804 tons, α 6.25 percentage point increase in spawning bed fines.**

The WEPP model suggests the Tripod Fire **and** proposed harvest activities would deliver about 208,971 tons of sediment to the Lower Chewuch drainage network during the five years following the fire. The salvage would have a modeled increase of 4,167 tons over the baseline increase during this time, which is an increase of about 2% greater than the baseline. We assume the harvest activities would have a proportional effect to spawning gravels similar to the proportional effect to sediment delivered to the drainage network compared to the fire.

Using the assumptions above, it is estimated that the sediment delivery from the Tripod Fire alone could increase the present percent fines in spawning gravels by as much as 6.25 percentage points, or from 19.90% to 26.15% of spawning gravels, if the mainstem Chewuch responds similarly to Tripod Fire effects as observed after the Farewell and Thirtymile Fires. This is an unknown because larger substrate sizes, wood levels, and stream flow would also increase and actual increases in fine sediment levels in spawning gravels may be less.

Likewise, the proposed harvest activities could increase the baseline sediment delivery to the drainage network by as much as 2%, which could increase fine sediment in spawning beds by 0.13% over the potential 6.25% or from 26.15% to 26.28%. Increases to fine sediment levels in spawning beds of this magnitude are well within the error of McNeil Core sampling for reaches in the Lower Chewuch and are statistically unmeasurable. Margins of error for Lower Chewuch reaches 1, 3, and 4 (reach 2 not measured in 2006) for 2006 were ±6.73%, ±6.63%, and ±5.74% respectively at the 80% confidence level (USDA Forest Service 2007d).

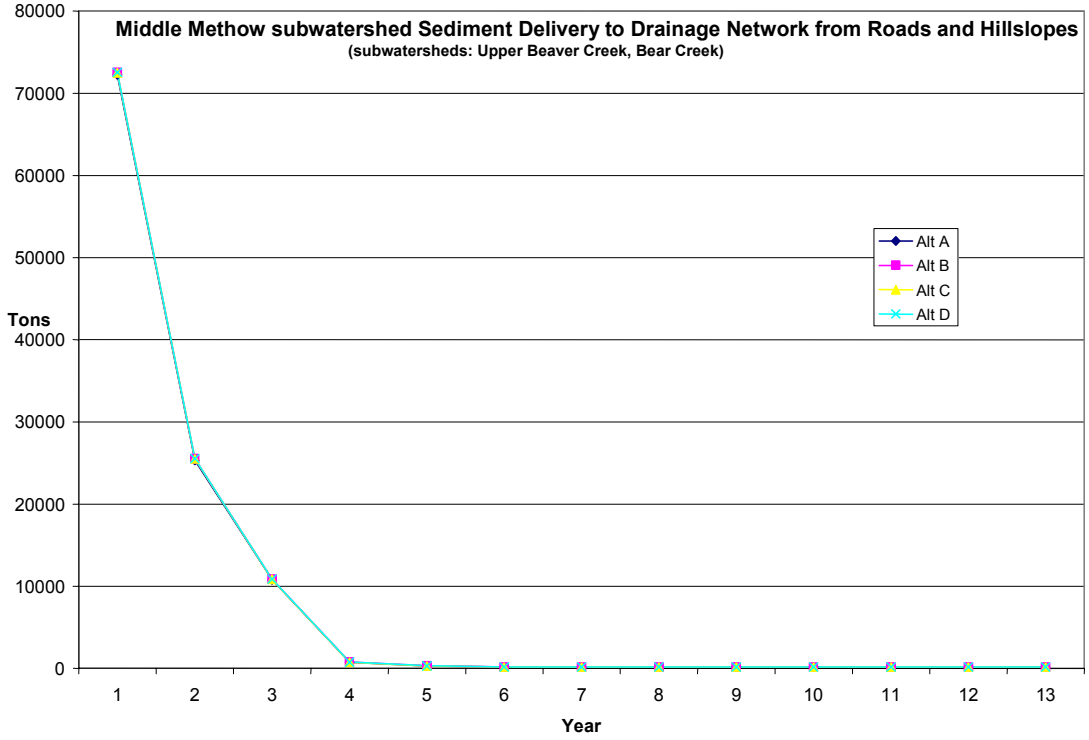
Figure 3.3-26: Lower Chewuch Watershed Sediment Delivery to Drainage Network from Roads and Hillslopes



Upper Beaver Creek

Figure 3.3-27 shows that there would be no difference between the action and no action alternatives in the Upper Beaver Creek watershed. There would be no measurable sediment delivery to aquatic habitat or fish in this watershed as a result of the project because RHCAs are excluded from harvest. Therefore, there would be no effect overall to fish or fish habitat in the Upper Beaver Creek watershed from any of the action alternatives.

Figure 3.3-27: Middle Methow Subwatershed Sediment Delivery to Drainage Network from Roads and Hillslopes



South, West, and North Fork Salmon Creek

Figure 3.3-28 below shows that there would be no difference between the action and no action alternatives in the Salmon Creek watershed. There would be no effect to sediment delivery rates to aquatic habitat or fish in this watershed as a result of the project. Because RHCAs are excluded from harvest, there would be no affect overall from to fish or fish habitat in the Salmon Creek watershed from any of the action alternatives.

Figure 3.3-28: Salmon Creek Subwatershed Sediment Delivery to Drainage Network from Roads and Hillslopes

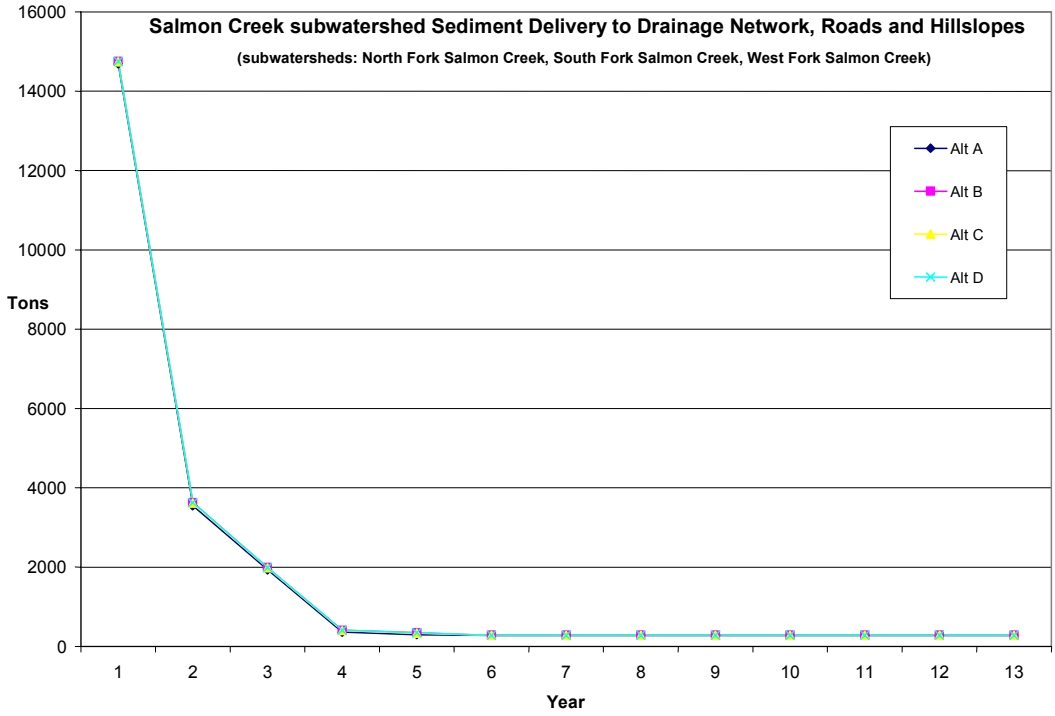


Figure 3.3-29: Habitat Effects Summary, All Action Alternatives.

Alt	RHCAs	Temp.	Large Wood	Water Yield	Sediment	Total Road Density
A	Protected	Natural increase from fires	Natural increase from fires	Natural increase from fires	Natural increase from fires	High densities, see Figure 3.12-3
B & E	Protected	No change from A	No change from A	Minor predicted increase from A, not measurable with confidence	Similar to D. Small increase over A	No change from A
C	Protected	No change from A	No change from A	Minor predicted increase from A, not measurable with confidence	Slightly less than B and D, small increase over A	No change from A
D	Protected	No change from A	No change from A	Minor predicted increase from A, not measurable with confidence	Similar to B. Small increase over A	No change from A

Fish Species Effects

ESA listed spring Chinook salmon, steelhead, and bull trout

The very large background sediment delivery rate from the recent wildfires surrounding and including the project area dwarfs the effect of the action alternatives on sediment delivery from roads and hill slopes. There would be no measurable change in fine sediment levels in habitat occupied by listed fish species in the lower two miles of Boulder Creek, the lower 18 miles of the Chewuch River, or in the South Fork of Beaver Creek. The project would have no effect on RHCAs adjacent to habitat occupied by listed fish because no activities would take place adjacent to that habitat. Upstream of occupied habitat there would be no harvest within RHCAs which would protect stream shade and maintain water temperatures, allow for large wood recruitment and minimize sediment delivery to stream channels from project activities. None of the alternatives would affect Riparian Management Objectives at the reach scale or the 6th and 5th field HUC scale. There would be no long term increase or decrease in road density in the analysis area. Changes to the transportation network that would reduce road effects to aquatic ecosystems were beyond the purpose and need for this project and there would be no effective change in total road densities, which would remain high in the lower Chewuch and Upper Beaver Creek. Project activities would create a small increase in sediment delivery to streams channels that would not be measurable using available technology. Alternative C would cause slightly less hill slope erosion because fewer units would be tractor logged. Alternative D and B and E are essentially the same in terms of effect on hill slope and road related sediment delivery. It is unlikely that these small changes are detectable by fish. Because of this small unknown effect, the action alternatives “may affect but would not adversely affect” individual UCR spring Chinook and steelhead, and Columbia River bull trout. Critical habitat for UCR spring Chinook and steelhead and EFH for Chinook and coho salmon would not be adversely affected.

Westslope cutthroat trout and redband rainbow trout

Westslopes and redbands of questionable genetic integrity are present downslope of units in the North Fork Boulder Creek 6th field, Lightning Creek in the Upper Beaver Creek watershed, and possibly Pelican Creek in the North Fork Salmon Creek watershed. Fish habitat for these species is closer to project area activities than habitat for ESA listed species and there could be a small increase in fine sediment over fire-caused background levels in these areas that could slightly reduce habitat quality for westslopes and redbands for 1 to 2 years following project activities. This sediment effect may have a small impact to individuals but is not likely to reduce fish production or reduce the viability of these species in this area or lead to a trend towards listing. Stream shade, water temperature, and wood recruitment would all be maintained and would not be affected by project activities.

Mitigation Measure effectiveness:

1. Effectiveness of RHCAs. RHCAs are effective at protecting riparian and aquatic habitat because (FEMAT, 1993):
   a. they protect the forest surrounding streams, wetlands and lakes which provides for
   b. shade from the forest canopy,
   c. large wood recruitment when trees die and fall over,
   d. nutrient recruitment to streams in the form of leaf litter and insects falling from the surrounding vegetation,

e. bank protection from root masses binding stream bank soils,
f. and filtering of sediment from the vegetation growing between the edge of the stream and the uplands
g. sediment filtering and sequestering from the stream during over bank flows.
h. RHCAs can also reduce livestock effects by providing a natural barrier to stream banks.
i. Unique habitats for plants and wildlife.

2. Effectiveness of No Salvage and leaving large wood within RHCAs:
   a. There is no documentation that shows benefit to aquatic ecosystems by removing burned trees and recruitment LWD from RHCAs following wildfire.
   b. Future recruitment is compromised until the forest regrows to maturity which may take 100 to 150 years.
   c. The roughness provided by high levels of wood can help to reduce the severity of landslides, provides an organic component to downstream stream reaches following landlsides,
   d. Wood forms the primary storage sites for fine sediment following landslides. (Thompson 2006)
   e. Landslides can contribute to habitat complexity and productivity (Pojar and Geertsema, 2006 in press).
   f. Standing tree boles and wood covering stream channels provide more shade to streams than channels devoid of this material.
3. Minimizing landings, roads in RHCAs and near stream channels, yarding away from RHCAs, and rehabilitating skid roads with water bars, slash and revegetation will help reduce fine sediment delivery to stream channels and prevent or reduce damage to aquatic ecosystems. (Furniss et al. 1991, Waters, 1995).
4. Maintaining natural barriers would reduce potential impacts to stream banks from livestock.

Cumulative Effects

Past, present, and reasonably foreseeable future actions in or near the Tripod project area are listed at the beginning of this chapter. Of those actions, the following have a cumulative effect on sediment delivery to aquatic habitat: roads, livestock grazing, recreation activities in RHCAs, wildfire suppression activities such as fire line construction, and timber harvest. Activities that are not ground disturbing or occur in the uplands away from RHCAs, such as mushroom gathering, upland fuels treatments, upland non-commercial thinning, upland recreation, recreation on existing roads and trails do not directly affect riparian and aquatic habitat and do not contribute to cumulative effects to these habitats. Planning for future timber harvest projects, range permit renewals, and restoration activities include mitigation measures and design features to reduce the effects of these activities to aquatic habitat.

Cumulative effects were considered for the Mainstem Lower Chewuch from the confluence with Brevicomis Creek down to the mouth of the Chewuch including Boulder Creek. Cumulative effects in the Middle Methow 5th field were considered in the Upper Beaver Creek 6th field from Lightning Creek and Middle Fork of Beaver Creek down to the confluence with the mainstem of Beaver Creek including the South Fork of Beaver Creek. Cumulative effects for the Salmon Creek watershed extend from the project area

downstream to the Conconully Reservoir. The cumulative effects future temporal boundary is seven years.

Activities since the early 1900s have altered riparian function and resulting fish habitat, as well as hindered fish productivity downstream of the project area. Past activities affecting the riparian areas include ground based logging in much of the project area, extensive cattle grazing, extensive road construction, including valley bottom placement next to stream channels, recreation activities in riparian areas and fire suppression. In the North Fork of Salmon Creek, dredging associated with mining also occurred. Current stream channel condition, partly resulting from historic activities, includes simplified channel structure in intermittent project area streams; an increase in the drainage network created by skid trails, roads, and railroad, and elevated fine sediment levels in project stream networks. Riparian areas and springs in some areas have been impacted by livestock.

Streams within the project area have delivered chronic amounts of fine sediment to the mainstem Chewuch River, Beaver Creek, and Salmon Creek for several decades. These chronic sediment effects are presently masked by the effects of the Thirtymile, Farewell, and Tripod Fires. Chronic effects and elevated levels of fine sediment delivery from existing high road densities would be a much larger part of the whole once the fire effects subside in the next 3 to 6 years.

Fire suppression activities such as fire line construction with machinery, are decommissioned by pulling soil back into the line, rehabilitated with water bars, and are covered with organic debris as soon as they are no longer needed to control or contain the fire. Firelines that were built during the Tripod Fire are considered to be stabilized and rehabilitated and are not considered to contribute to cumulative effects.

Where private lands exist, residential development is expected to continue, although effects are uncertain. The Methow Conservancy has obtained and will continue to receive Salmon Recovery funding to purchase conservation easements on private land adjacent to habitat for listed fish species. To date they have easements on over 5,000 acres in the Methow Valley, much of which is along the Methow, Twisp, Chewuch Rivers and some along Beaver Creek. Restoration of stream flows, fish passage, and habitat complexity on streams and rivers on all land ownerships in the Methow Valley is a stated goal of Upper Columbia River Salmon Recovery Plan for the Okanogan and Methow Rivers (draft) and for Biological Opinions for the agencies that operate the Columbia River Hydro system. Where landowners are willing, the U.S. Bureau of Reclamation is implementing improved irrigation efficiencies, in-stream flow restoration, fish passage projects, and habitat complexity projects downstream of the National Forest boundary in the Methow basin. These efforts are expected to continue into the foreseeable future.

On the National Forest, past restoration efforts have benefited RHCAs particularly along the Chewuch River. However present funding for restoration activities such as addressing road effects to aquatic habitat and hydrologic processes, and to minimize recreation effects and maintain past investments in RHCAs has declined dramatically over past levels. Restoration funding to address fish passage issues continues to be favorable.

Livestock grazing would resume within areas affected by the Tripod Fire when vegetative conditions are recovered to the point where grazing can be supported (Appendix H) and

RHCAs would not be negatively impacted. Past grazing has impacted riparian areas in stream segments throughout the analysis area, but changes in grazing strategies and fencing projects to protect RHCAs, particularly along the Chewuch River and in Beaver Creek were leading to improved riparian conditions prior to the Tripod Fire. Much of this infrastructure was lost in the Tripod Fire and would need to be reestablished or addressed in some way before livestock are returned to burned areas in the Tripod Fire area. Where listed fish are present, re-initiation of ESA consultation on range permits will take place to describe the changes to grazing systems and if there are changes in anticipated effects to listed fish and to describe actions that would be taken to minimize these effects.

Considering past, present, and reasonably foreseeable future actions, and in light of the size and severity of recent wildfires with the anticipated effects of the Tripod Fire Salvage Project, aquatic habitat and fish, including ESA listed fish, are unlikely to experience reduced viability from the Tripod Fire Salvage Project. Overall the effects of the salvage project on habitat conditions would be very small. Overall habitat conditions should show an improving trend for in the Chewuch and Middle Methow watersheds for the foreseeable future as long as funding is available for habitat restoration projects. Of greatest need and uncertainty, is funding to address effects from high road densities, maintenance of dispersed recreation sites within riparian areas, and maintenance of livestock fences and watering areas.

Listed fish are not present in the Salmon Creek watershed above Conconully Dam and there is much less emphasis on habitat restoration efforts in this area, but projects to improve fish passage and reduce impacts from livestock have been implemented. The effects of proposed Tripod Fire Salvage Project combined with past, present and foreseeable future actions could be a small increase in fine sediment delivery and immeasurable effect to habitat for redband, rainbow trout and westslope cutthroat trout in the South, West, and North Forks of Salmon Creek.

Steelhead and Chinook spawning and incubation could be negatively affected by increasing sedimentation from the extent of wildfires in the Chewuch and Beaver Creek watersheds, but may also benefit from increased stream flows, delivery of spawning gravels and large wood, and stimulation of food webs fueled by nutrient releases from the fires. Fish populations appear to be responding favorably to the Farewell and Thirtymile Fires which burned over large “unmanaged” and unroaded areas. In contrast, the southern half of the Tripod Fire burned over some heavily roaded areas and it remains to be seen if there would be a similar benefit to listed spring Chinook, steelhead, and bull trout. The sediment delivery effects of the Tripod Fire Salvage Project combined with past, present, and reasonably foreseeable future actions would be inconsequential considering the huge increases in fine sediment and stream flows expected from the fire effects on the expositing landscape.

Long term, critical habitat for listed steelhead and spring Chinook salmon, and Essential Fish Habitat for coho and Chinook, when considered cumulatively with the effects of other activities occurring both within and adjacent to the project area, would not be measurably affected by any of the action alternatives.

Project activities in All Action Alternatives would have no cumulative effect on 303(d) listings for the Chewuch River because shade over intermittent and perennial streams is not being removed and stream temperature would not be influenced.

CONSISTENCY FINDING

The design criteria and mitigation measures listed in Chapter 2 were used to insure that all of the alternatives are consistent with the Forest Plan as amended by PACFISH. Action Alternatives would meet management objectives to maintain conditions in RHCAs, maintain stream temperatures, prevent chemical contamination, maintain large wood within channels, and provide for long term woody debris input. They would also meet Forest Plan standards and objectives (given the riparian buffers) and PACFISH objectives at the 6th and 5th field watershed scale.

Standards and Guidelines

The aquatic and riparian Standard and Guidelines are met as follows:

Riparian

Forest Plan 2-3 is met by mitigation measure (MM) 35
Forest Plan 2-4 is met by MM 11, 12, 15, and 20
Forest Plan 2-9 is met through alternative design and MM 11 through 49.
Forest Plan 2-10 is met through MM12, 13, and 20
Forest Plan 2-12 is met by alternative design and MM 9, 12, and 14.

Fisheries:

Forest Plan 3-1 is met through alternative design and MM 11 through 49.
Forest Plan 3-3 is met through alternative design and MM 11 through 49. Further, two reaches of the Chewuch River are expected to exceed the 20% fine standard in spawning beds for sediment <1mm due to the sedimentation effects of past fires and the Tripod Fire. Salvage harvest activities may add 0.13% of this increase which would not be measurable in spawning beds in the Chewuch River.
Forest Plan 3-4 and 5 are met through MM 11, 12, 13, 14, 15, 17, and 18.
Forest plan 3-6 is addressed by MM 11, 12, 13, 14.

PACFISH

TM-1 and TM-1a are addressed through design and by MM 11,12, 12, and 14 because no salvage harvest would occur in RHCA boundaries.
RF-2a through RF 5 are addressed by design and by MM 14, 16, 21, 23, 24, 25, 26, 27, 28, and 29. Analysis of the transportation system is addressed in section 3.12.
RA-2 is addressed by MM 13.
RA-4 is addressed by MM 21.
RA-5 is addressed by MM 29 and 30.

Clean Water Act

A roughly one mile segment of the Chewuch River, upstream and downstream for the Boulder Creek confluence is listed on the 303(d) list as impaired for water temperature. Though the stream temperatures of this reach will likely increase and the number of days the Chewuch River exceeds 16° C. will increase due to the Tripod Fire, the salvage harvest proposed would not have an effect on stream temperatures on this localized reach

scale or at the 6th or 5th HUC scale. Therefore, this project would be consistent with the Clean Water Act.

Endangered Species Act (ESA) and Magnuson-Stevens Fishery Conservation and Management Act (MSA) Consultation

Informal consultation on the proposed action was initiated with USDI Fish and Wildlife Service and National Oceanic and Atmospheric Administration National Marine Fisheries Service (NMFS) in May, 2007, in accordance with the regulations implementing the ESA, 50 CFR 402.14(b)(1). On June 22, 2007, the USDI Fish and Wildlife Service concurred with the determination that the Tripod Fire Salvage Project "may affect, not likely to adversely affect" bull trout. On June 4, 2007, NMFS concurred that the proposed action is not likely to adversely affect UCR steelhead or UCR spring-run Chinook salmon. NMFS also concurred that the proposed action is not likely to affect critical habitat for these species.

NMFS also determined that conservation recommendations pursuant to the MSA (305(b)(4)(A)) are not necessary.

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3.4. Soils

REGULATORY FRAMEWORK

Forest Plan Soil Standards and Guidelines
Management practices must be designed and implemented to maintain or improve soil and water quality, emphasizing protection over restoration. (Forest Service Manual 2521, Section 2520.3, R6 Supplement 2500-98-1)

When initiating new activities:
1. Design new activities that do not exceed detrimental soil conditions on more than 20 percent of an activity area. (This includes the permanent transportation system.)
2. In areas where less than 20 percent detrimental soil conditions exist from prior activities, the cumulative detrimental effect of the current activity following project implementation and restoration must not exceed 20 percent.
3. In areas where more than 20 percent detrimental soil conditions exist from prior activities, the cumulative detrimental effects from project implementation and restoration must, at a minimum, not exceed the conditions prior to the planned activity and should move toward a net improvement in soil quality.

The Okanogan Forest Plan Standard and Guideline 13-10 (USDA Forest Service 1989a) clarifies the Regional Standard as follows: Ground yarding systems shall be restricted to meet Regional guidelines for soil compaction displacement and puddling. No more than 15% of an area (excluding roads) shall be in a puddled, displaced, or compacted condition following completion of management activities.

ANALYSIS METHOD

Effects of the Tripod Salvage proposal concentrate on effects relative to soil disturbance exceeding criteria for detrimental soil condition described in the Forest Plan. Analysis of effects or proposed actions relies heavily on local experience of both fire salvage and green tree harvest activities and comparison with those of the soil characteristics of the units in this area.

Soil interpretations were used to assess effects of each alternative. In the following assessments, detrimental soil disturbance will be used as a surrogate to explain soil productivity, soil microorganisms, and available soil water (holding capacity) effects because these effects are linked so closely to the integrity of the surface volcanic ash soil horizons. The effects analysis was developed from soil survey interpretations, air photo interpretation, and on-site field transects of proposed treatment units. Based upon field analysis, soil properties occur in very predictable patterns depending upon topographic position. Topographic expression was extremely obvious within the project area. Hence, air photo interpretation was also a useful tool to help determine the magnitude of soil effects across the project area.

The effects analysis will focus primarily on detrimental soil disturbance from proposed ground based harvest or sanitation treatments, effects of wild-land fire intensities, and effects of road management actions. The effect of these management actions on

detrimental soil compaction/displacement, erosion, and coarse woody debris (CWD) will be described.

The scale of analysis for soil resources (the activity area as described in Regional standards and guidelines) is the harvest unit. Individual GIS resource layers, literature, past monitoring and field observations were used for analysis.

AFFECTED ENVIRONMENT

Geology/Geomorphology
The project area is dominated by glacial and fluvial landforms. Glacial fluvial deposits occur in the valley bottom with glacial drift occurring on adjacent slopes. Dissected glaciated slopes dominate the area. Bedrock is composed of Cretaceous or older massive weakly foliated granitic bedrock (Stoffel 1990). The primary rock units of this group consist of medium to coarse-grained tonalities, granodiorites, and quartz monsonites. Typically, these rock units are hard and resistant to weathering, forming prominent ridges. Soil weathering products are normally quite coarse and lack fine silt and clay fractions.

Volcanic ash typically forms a veneer over most of the terrain in the project area. Volcanic ash deposits are normally deeper on northern aspects and shallow on southern exposures or ridge tops. The depth of ash deposits has been strongly influenced by differential erosion processes and by the amount of canopy closure existing during the time of fallout.

The Cordilleran Ice Sheet over rode the project area as late as 12 to 14 thousand years ago and has strongly influenced topographic expression (Waitt 1972). This massive ice sheet filled all valleys and over-rode many of the ridges within the project area. All major ridge complexes have a rounded appearance caused by ice scour from the continental ice sheet.

Topographic expression in the project area has been described in the in-service publication *Landtype Associations of Central Washington* (USDA Forest Service 2004a). Continental glacial processes have shaped all landforms within the project area. This process also helps to explain soil properties and the occurrence of soils across the landscape.

Six dominant landform groups occur within the project area, Ia8, Ja8, Jb2, La2, Lb8 and Ou2 (USDA Forest Service 2004a) (Appendix E).

Soil Development and Occurrence
The glacial till deposits are typically thick enough to mask the effects of underlying bedrock (USDA Forest Service 2004a). In areas of glacial deposition (moraines), soils consistently occur on gentle benches or undulating rounded ridges and are often characterized by thick surfaces of light colored volcanic ash overlying cobbly glacial till.

Soil Classification
Soils occur in rather predictable patterns, which have been verified by field assessments completed by Forest Service Soil Scientists. A soil survey is complete in the project area, the Okanogan-Methow Highland Area (USDA NRCS 2004). Representative soils

were selected to represent the soil-site features of each landform group. The representative soil has similar properties and would have similar management responses as the other soils it represents. These representative soils occur within the planned harvest units and are listed in Figure 3.4-1, Soil-site Relationships and Figure 3.4-2, Representative Soils. The representative soil map unit number is highlighted in the table along with the other soils it represents. Soil classification nomenclature conveys specific soil properties that are explained in the "Soil Properties" section below (USDA NRCS 2005).

Figure 3.4-1 Soil-site Relationships (harvest units)

Soil Group Number	Soil Series occurring by landform
Soil Group 1, *Valley Bottoms, seasonally wet soils*, 0-15%	
386, 105, 150, 243, 315	Vitrandic Eutrocryepts-Cryaquolls, 0-5% slopes
Soil Group 2, *Glacial Moraines, ash soils,* 0-35% slopes	
237, 119, 175, 222, 240, 243, 244, 246, 249, 250, 263, 274, 312, 334, 335, 336, 392, 394	Myerscreek-Manley Complex, 0-35% slopes
Soil Group 3, *Glacial Moraines, mixed ash soils,* 0-35% slopes	
286, 123, 132, 155, 156, 212, 232, 229, 254, 280, 288, 328, 341, 397	Pebcreek, 15-35% slopes
Soil Group 4 *Dissected Glaciated Mountain slopes, ash soils,* moderately steep, 35-65% slopes	
396, 127, 238, 241, 242, 245, 247, 267, 325, 395, 404	Wapal, 35-65% slopes
Soil Group 5 *Dissected Glaciated Mountain slopes, mixed ash soils,* moderately steep, 35-65% slopes	
289, 118, 124, 154, 203, 213, 214, 230, 290, 343, 350, 351, 354, 374, 398, 399	Pebcreek-Brevco Complex, 35-65% slopes

Figure 3.4-2 Representative Soil Series

Soil Name	Family or Higher Taxonomic Classification
Brevco	Loamy-skeletal, isotic, frigid Vitrandic Haploxerepts
Manley	Ashy over sandy or sandy-skeletal, glass over isotic, Xeric Vitrixerands
Myerscreek	Loamy-skeletal, isotic, Vitrandic Eutrocryepts
Pebcreek	sandy-skeletal, frigid, Vitrandic Haploxerepts
Wapal	sandy-skeletal, isotic, frigid, Vitrandic Haploxerepts

Soil Properties

The hard crystalline bedrock and glacial till deposits typically weather into soils with coarse textures (sandy loams) with a fair amount of rock cobbles in soil profiles. The bedrock weathering products and glacial till deposits are typically low in base saturation and clay content. Some isolated glacial till and glacial fluvial deposits contain finer textured material producing fine textured sub soils.

Due to past differential erosion and historic vegetation patterns, soils within the project area have varying thickness of volcanic ash. The glacial till is composed of sub-rounded to rounded cobbles and boulders. These rock fragments often comprise more than 25% of the soil regoliths (skeletal). Often these cobbly rock fragments occur mixed in the upper volcanic ash surfaces.

Soil textures of the volcanic ash are most often very fine sandy loams depending upon the degree of mixing of weathered granite bedrock or glacial till material. Soil textures in the glacial till deposits include cobbly sandy loams and loamy sands. Where glacial materials exist in lower soil profiles, materials generally range in size from medium to coarse sands with very cobbly or bouldery rock matrixes.

The *Myerscreek -Manley* representative soil series, Soil Group 2, are *Andisols* with relatively thick volcanic ash surfaces. These Andisol soils typically occur on northern or protected exposures and normally have 17-23 inches of light colored volcanic ash forming soil surfaces. The depth of volcanic ash overlies bouldery glacial till or fractured bedrock.

The *Pebcreek* representative soil series, Soil Group 3 and 5 are *Inceptisols*, which are weakly developed soils occurring in warm, dry climates. These soils have thin dark colored "ashy" surfaces with very coarse textured regoliths. More than 25% subrounded glacial till cobbles or angular rock fragments comprise soil regoliths.

Soil Environments

Soil Groups with representative soils discussed below are displayed on Soil Group Maps for each alternative (Appendix A). Each representative soil is assigned a soils group number for easier analysis, discussion and map display. Surface soil properties provide an insight into the environmental conditions, which strongly influenced soil development.

Soil Group 1*, Cryaquolls* representative soils are seasonally wet due to fluctuating water tables and close to perennial water. These soils have a high rock content and poor soil development.

Manley representative soil in Soil Group 2, occur on 0-35% slopes and have relatively light-colored soil surfaces comprised of thick volcanic ash deposits. The relatively light colored surfaces suggest that herbaceous species have not been a dominant part of understory composition. These soils likely supported relatively closed canopy forest communities.

Pebcreek representative soils occur in Soil Group 3, 15-35% slopes, and Soil Group 5, 35-65% slopes; have relatively shallow, dark-colored surfaces that are very light-colored when dry. These soils likely supported open to closed canopy forest communities with varying amounts of grass in the understory, which would persist for long periods. The above soils occur in units listed in Figures E-1, E-2 and E-3 display Proposed Action Treatments by Soil Map unit (Soil Appendix E).

Soil Interpretations

Refer to Figure 3.4-4 Relative Soil Interpretations for each representative soil. The NRCS, NASIS (National Soil Information System) was used to determine soil interpretations within the project area.

<u>Available Soil Water (holding capacity)</u>

The project area occurs in a relatively warm, dry area. Soil moisture stress locally has a substantial effect on vegetation growth and vigor. Volcanic ash soils within the project area have very low bulk density with extremely high pore space. Soils with high pore space also have relatively high water holding capacities. The depth of volcanic ash would strongly influence the amount of available soil water for many plant species,

especially those that have relatively shallow root systems. Other site influences, which can limit available soil water, are elevation and aspect. Soils on low elevation or southern to westerly exposures typically lose an exceptionally high amount of annual precipitation through active evaporation, runoff, and evapo-transporation.

Soil Group 2, representative soil, *Manley* has deep volcanic ash surfaces providing relatively high available soil water. These soils occur predominately on northern exposures with lower evapo-transporation losses, low elevation benches, or upper elevations slopes. Due to the depth of ash, these soils would have high available water and could support fairly closed canopy forests. Representative Soil Group 2, *Myerscreek* representative soil has an underlying layer of dense till. This layer can be less permeable to water and cause occasional seeps.

Soil Group 4, Wapal representative soils are on 35-65% slopes. The upper surface of these soils is void of rocks and overlay coarse unconsolidated glacial till. Runoff can be rapid and soils have low available water.

The other representative Soil Group 3, *Inceptisols (*which includes the *Pebcreek,* 15-35% slope and Soil Group 5, Pebecreek, 35-65% slope) tend to have relatively shallow volcanic ash layers and occur at lower elevations or southern exposures. This group of soils would have low to moderate levels of available soil water depending upon slope and aspect positions. *Brevco* soils in Soil Group 5 are moderately deep over bed rock and would have low available water as would other associated shallow and lithic soils. Runoff is rapid for these soils.

Soil Erosion

Refer to Figure 3.4-4, Relative Soil Interpretations for a listing of erosion hazard ratings for each Soil Group. These erosion rates reflect the influences of surface soil texture, surface rock content, ground vegetation recovery and slope steepness.

Most soils in the analysis area have coarse sandy loam textures with mixed ash content. Soils are friable and have weak structure. This characteristic can result in erosive conditions if site characteristics such as ground cover are not present to limit erosion.

Most of the thick “ashy” soils, Soil Group 2, *Manley* representative soils have fairly rapid vegetation recovery. Ground vegetation, composed of low shrubs and pine grass, would recover fairly rapidly, reducing the effects of over story disturbance.

Detrimental Soil Compaction/Displacement

Salvage operations that can contribute to soil compaction/displacement include ground-base log yarding, where heavy equipment create skid trails. To a lesser extent, skyline yarding can compact or displace soils when logs drag on the surface during in-haul. Detrimental soil compaction can be a contributing factor to soil erosion and reduction of soil productivity. Severely compacted soils would normally restrict water infiltration rates, possibly resulting in greater chances of overland flow with subsequent increases in soil erosion (Froehlich, no date). Soil compaction also has the potential to affect long-term site productivity. Long-term site productivity losses from soil compaction can range from 6 to 25% of both diameter and height growth and persist for 32 years after initial logging. Recovery of compaction in the surface (6 inches) can occur sooner (Wert and Thomas 1981). Soil Group 2, *Manley* representative soils within the project area has

conditions that are susceptible to soil compaction and displacement. Refer to Figure 3.4-4, Relative Soil Interpretations for compaction and displacement hazard ratings.

Soil Group 2 soils have thick volcanic ash surfaces, which are void of rock fragments. Volcanic ash with low bulk densities overlying cobbly glacial till or weathered granitic bedrock creates susceptible conditions for soil compaction. Soil Group 3 soils have 15 to 35 % rock fragments in the surface soil layers and are less susceptible to compaction than Soil Group 2 soils.

Displacement also would be more prevalent on Soil Group 2 and 4 soils and than Soil Group 3 and 5 soils. These groups both have ash or sandy surfaces void or rocks verses soils with rock in the surface.

Bench slope topography is common throughout the area due to glaciation resulting in short steep slopes. This is common on the lower slopes away from the dissected landforms.

Livestock grazing can be a contributing factor toward detrimental soil compaction as well as ground based mechanical harvest equipment. This normally occurs when livestock grazing tends to be concentrated and not well distributed. Livestock can also delay vegetation recovery by trampling and overgrazing. Livestock trails have been recognized in proposed units. These trails normally follow existing skid/forwarder trails that have been seeded to palatable forage. Livestock maintain existing compaction on existing skid/forwarder trails and landings with concentrated and heavy use. Units that have visible heavy livestock use are B006, B007, B008, BR12, HA02, HA03, RA09, and RA15. Use in these units is associated with isolated wet soils, seeps and water troughs. Current grazing allotments occur over the majority of the units and are discussed in Chapter 3.13. Areas such as Granite Creek and Lightning Creek have less livestock use due to limited access. Other natural barriers such as downed logs and dense trees have kept livestock out of areas previous to the Tripod Fire but the fire probably eliminated many of those barriers.

Soil Productivity

Productivity of the soils within the project area varies depending on a variety of both physical and chemical properties. These properties generally include, but are not limited to: slope, aspect, elevation, precipitation, soil type, and soil depth, available water capacity of the soil, soil drainage, surface organic matter (including Coarse Woody Debris) and bulk density of the soil.

Volcanic ash deposits are generally associated with more productive sites, compared to glacial till deposits, which are much lower in biomass production. The Soil Group 2 and 4 soils tend to be more productive soils due to the extended depth of both volcanic ash and/or glacial till deposits and the location where these soils have adequate soil moisture. The volcanic ash material is higher in productivity than the glacial soils due to its higher levels of total Nitrogen (N), available Phosphorus (P), extractable Potassium (K), and higher water holding capacity.

Another issue that deals with productivity, and other soil functions, is coarse woody debris, CWD. CWD is material derived from tree limbs, boles, and roots in various stages of decay larger than 3 inches in diameter (Harmon et al. 1986). The creation and accumulation of CWD depends on forest type, successional stage, insect and disease

activity, weather events, fire-return events, burn severity and decay. CWD can protect soils from erosion, displacement, and compaction. In addition, CWD can protect forests from both abiotic and biotic elements. Residues provide shade and protection from wind and snow and can be critical factors in protecting newly established seedlings. Decaying logs on the ground are excellent for nitrogen fixation (Graham et al. 1991). Considering the contributions of CWD and the historical dynamics of this material on the Okanogan and Wenatchee National Forests, its optimum range is estimated at about 5-10 tons/acre in dry forests; 10-18 tons/acre in the mixed conifer forests; and 7-15 tons/acre in the montane forests (Harrod 2007, USDA Forest Service 2000a). Current post fire CWD conditions are discussed in Chapter 3.10 Fuels.

Effective Ground Cover

The Regional policy describes minimum effective ground cover percentages after soil disturbing activity based on soil erosion hazard classes. Effective ground cover is typically provided by vegetation which usually recovers in a period of years. Effects to effective ground cover from proposed actions will be discussed in the Environmental Effects section, and are used as an erosion and sedimentation factor in Chapter 3.4 Fisheries/Hydrology, where erosion is discussed and modeled. The description of existing condition here describes conditions as a result of the fire. Analysis of erosion and sediment production is covered in Chapter 3.4 Fisheries/Hydrology.

Fire Suppression

Fire suppression activities such as fire line construction can be sources of erosion and sedimentation. Fire suppression activities from the Tripod Fire include mechanically constructed firelines and safety zones that overlap proposed units. There were approximately 26 miles of mechanically constructed firelines within proposed harvest units. These firelines were approximately 6 feet wide and resulted in an estimated 19 acres of exposed soil. There were approximately 29 miles of hand firelines within proposed units. These firelines were approximately 3 feet wide and resulted in an estimated 11 acres of exposed soil. Firelines have been water barred and slashed and mechanically constructed lines were also seeded to prevent soil erosion. Safety zones have been decompacted, slashed and seeded to speed vegetation recovery. About 10 miles of road were also used as fire line and these have also been rehabilitated to pre-existing conditions.

Burned Area Assessment

Fire affects soil properties in a special way, with reduced infiltration and increase in water repellency especially important to watershed function. Erosion is the most visible and dramatic impact of fire apart from the consumption of vegetation (USDA Forest Service 2006).

Terms such as fire and burn intensity, and burn and fire severity are sometimes used interchangeably though they are indicators of different effects. Fire or burn intensity relates to the amount and rate of surface fuel consumption. It is not a good indicator of the degree of chemical, physical and biological changes to the soil or other resources. The use of fire or burn severity provides a more accurate method to assess the effects of fire to the soil resources and ecosystems in general. Fire or burn severity reflects the amount of heat that is released by a fire and how it affects other resources. It is dependent on the type of fuels and the behavior of the fuels when they are burned. The Forest Service Burned Area Emergency Response (BAER) program has agreed to use Burn Severity (BAER Handbook 2509.13) as a standard for burned area assessments,

with burn severity the preferred term. Burn severity is classified as high, moderate, low or unburned to very low based on the following descriptions:

> **High Severity** (vegetation) – more than 40% of the polygon exhibits soil features likely to significantly increase runoff and erosion (e.g., absence of duff layer, hydrophobic soils, and soil discoloration). High severity fires are lethal to conifers with all needles burned of the trees.
>
> **Moderate Severity** (vegetation) – Less than 40% of the polygon exhibits high severity indicators. Duff layers may be absent or mostly absent. Moderate severity fire kill the majority of conifers and needles on the trees are scorched (red/brown).
>
> **Low Severity** (vegetation) – Duff layers are burned but intact. Unburned areas are intermingled with lightly burned areas. Low severity fires cause some tree mortality (torching) but stands have a notable live tree component.

The BAER process is intended to provide for a rapid assessment of threat to life, property and natural resources resulting from wildfire watershed impacts. As the fire was being contained, a BAER assessment was conducted for the Tripod Complex and provides for further characterization of the fire's effects on soils by mapping the burn severity. Field observations indicated only incidental amounts of detrimentally burned (oxidized) soil conditions in the high burn severity areas. The detrimentally burned soils usually resulted from piles of existing downed wood or stumps and were incidental due to concentrated heat and not covering extensive areas (Tripod Complex BAER Soils Report, Greene 2006a). Burn severity distribution (unburned/very low, low, moderate, and high) is displayed for harvest units in Burn Severity Levels Map (Appendix A). The Burn Area Reflectance Classification (BARC) map (USDA RSAC 2006) shows a change in reflectance from pre fire to post fire.

The loss of the surface duff material (forest floor), which acts as a mulch, exposes the mineral soil to rapid drying. The loss of the duff also reduces water storage capacity on site. Therefore, the areas mapped with moderate and high burn severity can be expected to experience increased runoff and erosion if short-duration, high intensity rainfall events occur. Erosion risk can be expected to drop considerably after the first growing season as vegetation (especially grasses, forbs and mosses) re-establishes (Greene 2005). Susceptibility to erosion has already been reduced by the increase in effective ground cover due to extensive needle-cast in areas where the tree crowns (needles) were not consumed, DeBano et al. 1998, Neary et al. 2005a.

The Burned Area Emergency Response (BAER) assessment team evaluated fire related erosion and runoff risk to life, property, and resources and made recommendations for emergency stabilization and weed spread reduction measures. Recommendations were based on results from burn severity mapping, evaluation of resource values at risk, and analysis of the cost-effectiveness of mitigation treatments. Treatments were targeted at high priority areas including: Bluebuck and Beaver Creek, due to concerns for weed spread and high value fisheries.

Treatments that overlap proposed harvest units included seeding on approximately 103 acres of moderate and high severity burn areas to reduce erosion and weed invasion and spread potential from adjacent private and state lands and mulch treatments (hydro-mulch, wheat straw) placed on approximately 326 acres (204 acres were completed in fall 2006 and 126 acres are planned for spring 2007) to slow soil erosion on high burn

severity, high runoff landforms. These treatments overlap all logging systems in proposed harvest units.

Further discussion of erosion and runoff processes including erosion estimates using the WEPP model is discussed in Chapter 3.4 Fisheries/Hydrology.

Mass Wasting

Dissected Glaciated Mountain Slopes Ja8 and Jb2 are described above. Units in these landforms exhibit flashy surface runoff with Units in Ja8 having a higher erosion potential than Units in Jb2. Units in Ja8 are dominated by subalpine fir and occur at higher elevations that units in Jb2 which are dominated by Douglas-fir. Draws or dissected channels in these units commonly have shallow rapid landslides. High burn severity areas with no existing vegetation are most at risk for accelerated erosion (Appendix A - Burn Severity Levels Map).

Soil Micro-organisms

Ectomycorrhizae fungi (ECM) are required for nutrient and water uptake by forest tree species in the Pacific Northwest. Both timber harvest and fire have the potential to impact ectomycorrhizae populations. Fire impacts microbial activity directly by heat and indirectly by causing physical and chemical changes to the post-fire environment. Some studies have indicated that the greatest reductions in ectomycorrhizae were associated with the hottest burns because these associations occur more frequently in organic horizons that can be consumed by fire. Some studies, however, do not report mycorrhizal reductions following harvest and fire, especially in low intensity burns (Amaranthus 1991).

Management practices that retain living trees and shrubs and input of organic matter provide the energy source and substrata necessary for ECM linkages (Amaranthus and Perry 1994). Amaranthus found that ECM root tip abundance and diversity on Douglas fir seedlings was reduced in severely compacted soils (Amaranthus et al. 1996).

Soil displacement can have adverse effects on microorganism function by reducing the depth of surface horizons. If surface horizons are shallow, displacement would have more serious or lasting effects. Many of the microorganisms are important for tree seedling establishment and initial growth. Often microorganism activity is highest in the surface organic duff layer and surface mineral soil. The deeper ashy soils are expected to have higher microorganism activity than the thin ashy soils. The mixed ash soils in Soil Group 2 and 4 are considered more susceptible to displacement and loss of microorganism activity. The depth of ash would be used to infer effects to microorganism function.

Existing Detrimental Soil Conditions (DSC)

Existing detrimental soil condition refers to evident soil disturbance remaining on the ground due to past activities as described below. Ocular estimates were given based on surface soil disturbance classes described in *Interim Protocol for Assessments and Management of Soil Quality Conditions* (Howes 2001).

Harvest activities within the project area date back to 1962 and are as recent as 2006. Prior to the Tripod Fire, vegetative recovery in these units has been in the form of pine grass, bunchgrasses, as well as snowberry and other low-lying shrubs. The rooting activity from these deep-rooted grasses and other vegetation has very likely reduced the

level of compaction from past harvest activities (Waldron et al. 1982). Vegetation recovery occurs through time. Previous timber harvest that overlaps salvage units is displayed in Figure E-4, Appendix E.

Figures E-5, E-6, and E-7, Estimated Existing Detrimental Soil (Appendix E) include a detailed listing of soil conditions by harvest unit for each alternative. Units for Tripod Salvage project were assessed for the extent and degree of previously impacted soil using field observation starting in the fall of 2006, the soil survey (USDA NRCS 2004) with field verification by the Forest Soil Scientist, prior history of activity (including harvest entries), and prior knowledge of the sites from previous assessment by both district and Forest staff. Additional observations were obtained from other field going specialists. Estimates for detrimental soil were obtained by field visiting some units that had proposed harvest operations. Field reviews also took place during Burned Area Emergency Restoration (BAER) analysis. This process looked at the burn severity of the soils and documented remaining vegetation and effective ground cover (Greene 2006a).

Units were grouped into three ranges (Low 0-5; Moderate 10; High 15-20) of existing detrimental soil condition as a percentage of area based on those field assessments and previous monitoring. Sampling of proposed treatment areas indicated that some detrimental soil compaction still exists from past logging and fuels treatment. This is consistent with the research findings that suggest soil compaction is a long-term effect (Froehlich 1979). Field surveys in 2004 indicated that on stands occupying slopes of less than 40%, which had experienced previous timber entries, detrimental soil compaction was estimated to be between 15 to 40% of the area, Soil Monitoring Report, (Greene 2006b). This varies with year of previous entries, vegetation recovery and livestock impacts.

The Tripod Fire made evaluation of existing soil conditions much easier by removing vegetation and ground cover. Old skid trails, rutting and compaction from machinery is more obvious without the covering effect of forest litter (duff) and ground vegetation. The units with a history of multiple entries were evaluated more closely by the soil specialist to determine the existing detrimental soil condition (DSC). An estimate was made of DSC as a percentage of the areas, converted into acres, and assigned for each harvest unit to provide a consistent tracking measure.

ENVIRONMENTAL CONSEQUENCES

Direct/Indirect Effects:

Alternative A - No Action

Detrimental Soil Condition (DSC)

This alternative would produce no increase or reduction in detrimental soil disturbance (detrimental soil condition) from proposed salvage logging operations and associated activities. Existing detrimental soil acres are 240 acres for Alternative B, D, E and 218 acres for Alternative C.

Soil Productivity

Effective ground cover would increase over a period of a few years as vegetation becomes re-established, with no temporary reductions due to surface disturbance and

yarding of salvage logs. Increases of effective ground cover from sub-merchantable tree material left from felling and bucking of salvage trees would not occur. The Tripod Fire is expected to cause elevated rates of soil erosion (Chapter 3.3 Fisheries/Hydrology). The duration would be temporary as the re-establishment of an effective ground cover would occur at a gradual rate over a 2- to 10-year timeframe as trees, brush, and forbs begin reoccupying sites and coarse woody debris from fire-killed trees gradually fall to the ground. Seed and detritus from adjacent live stands would also eventually lend to the natural revegetation of bare, unprotected soils on severely burned soils.
Soil Microorganisms are complex and re-colonization to pre-burn levels is common, with the amount of recovery time relative to fire severity (Neary et al. 2005a).

Coarse Woody Debris
Current CWD amounts would not be affected by any salvage harvest because all downed logs would be retained. Standing dead trees would eventually fall over and add to the existing fuel load. Figure 3.4-3 shows the comparisons of post-fire CWD levels compared to recommended levels.

Figure 3.4-3 Existing and Recommended CWD Fuel Loading

Forest Type	Post-fire CWD (tons/acre)	Recommended CWD (tons/acre >3"dbh) *
Dry	0.5 – 2.0	5-10
Mixed Conifer	0.5 – 3.0	7-15
Montane	1.0 – 7.0	10-18

* Brown et al, 2003, as modified by Harrod 2007

Effects Common to All Action Alternatives (B, C, D, E)
Soil Interpretations Table
The relative soil interpretations included in Figure 3.4-4, Relative Soil Interpretations are based upon soil/site features within the project area. These interpretations are qualitative, not quantitative. As such, they are meant to help compare soil map units within the project area. Interpretation ratings were determined by the NRCS, National Soil Information System (Nasis) and ratings assigned in the in-service publication *Landtype Associations of Central Washington* (USDA Forest Service 2004a).

Figure 3.4-4 Relative Soil Interpretations (based on soil/site factors and Okanogan-Methow Highlands Area Soil Survey information)

Soil Map Unit #	**Soil Map Unit Name**	**Subsoiler Operability**	**Soil Erosion** **Vegetation Recovery**	**Soil Compaction** **Displace-ment Hazard**	**Soil Water Availability**	**Soil Productivity** **Forest CWD Tons/acre**
Soil Group 1, *Valley Bottoms, seasonally wet soils,* 0-15% slopes						
386, 105, 150, 243, 315	Vitrandic Eutrocryepts-Cryaquolls, 0-5% slopes	Unsuitable	Low High	Moderate Low	High	Moderate (3-7)
Soil Group 2, *Glacial Moraines, ash soils,* 0-35% slopes						
237, 119, 175,	Myerscreek-Manley Complex, 0-	Suited	Low High	Severe Low	High	Moderate (7-15)

Soil Map Unit #	Soil Map Unit Name	Subsoiler Operability	Soil Erosion Vegetation Recovery	Soil Compaction Displace-ment Hazard	Soil Water Availability	Soil Productivity Forest CWD Tons/acre
222, 240, 243, 244, 246, 249, 250, 263, 274, 312, 334, 335, 336, 392, 394	35% slopes					
Soil Group 3, *Glacial Moraines, mixed ash soils,* 0-35% slopes						
286, 123, 132, 155, 156, 212, 232, 229, 254, 280, 288, 328, 341, 397	Pebcreek, 15-35% slopes	Unsuitable	Low High	Moderate Low	Moderate	Moderate (3-7)
Soil Group 4 *Dissected Glaciated Mountain slopes, ash soils,* 35-65% slopes						
396, 127, 238, 241, 242, 245, 247, 267, 325, 395, 404	Wapal, 35-65% slopes	Unsuitable	Moderate Moderate	Mode rate High	Moderate	Moderate (7-15)
Soil Group 5 *Dissected Glaciated Mountain slopes, mixed ash soils.* 35-65% slopes						
289, 118, 124, 154, 203,	Pebcreek-Brevco Complex, 35-65% slopes	Unsuitable	Moderate Moderate	Low Seve re	Low	Moderate (3-7)

Soil Map Unit #	Soil Map Unit Name	Subsoiler Operability	Soil Erosion Vegetation Recovery	Soil Compaction Displace-ment Hazard	Soil Water Availability	Soil Productivity Forest CWD Tons/acre
213, 214, 230, 290, 343, 350, 351, 354, 374, 398, 399						

Figure 3.4-5 shows salvage harvest units by Soil Mapunit for all proposed harvest units. Figures E-1, E-2 and E-3 in Soil Appendix E list the harvest units by soil group for each action alternative.

Figure 3.4-5 Salvage harvest units by Soil Map unit

Soil Map Unit #	Soil Map Unit Name	Total Acres Treated* (Harvest Units) Commercial Thin		
		Ground based	Skyline	Helicopter
Soil Group 1 *Valley Bottoms, seasonally wet soils*				
386, 105, 150, 243, 315	Vitrandic Eutrocryepts-Cryaquolls, 0-5%	**34** (B008, GA03, GA07, GA08, MK02, MK04)	**4** (LI25, LI35)	
Soil Group 2 *Glacial Moraines, ash soils*				
237, 119, 175, 222, 240, 243, 244, 246, 249, 250, 263, 274, 311, 312, 334, 335, 336, 392, 394	Myerscreek-Manley Complex 15-35% slopes	**609** (B008, B009, BR19, BR31, CA01, CA03, CE01, CE03, CE08, CE11, GA01, GA02, GA03, GA04, GA06, GA07, GA08, HA03, HA04, HA05, JU04, JU18, LI50, MK01, MK02, MK07, MK08, PE02, PE03, PE04, RA06, RA07, RA09, RA11)	**173** (BR30, CE04, LI10, LI18, LI19, PE05, RA08, RA10)	**88** (LI02,LI07, LI16, LI21, LI22, LI48, LI51, LI52, LI53, LI61, PE06)
Soil Group 3 *Glacial Moraines, mixed ash soils*				
286, 123, 132, 155, 156, 212, 229, 232, 242, 254, 280, 288, 328, 341, 397	Pebcreek 15-35% slopes	**731** (BL02, B002, B003, B004, B006, BR05, BR10, BR12, BR19, BR22, BR26, BR27,	**165** (B005, B019, BR03, BR09,	**55** (BR01, BR06, BR13, BR24, JU10)

Soil Map Unit #	Soil Map Unit Name	Total Acres Treated* (Harvest Units) Commercial Thin		
		Ground based	**Skyline**	**Helicopter**
		CA03, CE01, CE02, CE03, CE08, GA02, GA03, GA05, GA06, GA07, GA09, HA01, HA02, HA05, HA08, MK03, MK04, MK06, RA02, RA04, RA05, RA06, RA09, RA11)	BR11, BR14, BR15, CE04, LI10, LI17, JU11, JU20, RA01, RA10)	
Soil Group 4 *Dissected Glaciated Mountain Slopes ash soils 35-65%*				
396, 127, 241, 242, 245, 247, 267, 395, 404	Wapal, 35-65% slopes	**343** (BL02, B007, B008, B009, B010, BR02, GA08, GA09, HA03, HA04, JU04, JU08, MK04, MK06, MK07, PE01, PE02, PE04, RA06, RA09, RA13, RA14, RA15)	**166** (B011, BR07, BR09, LI08, JU07, JU11, LI08, PE05, RA18)	**197** (BR01, BR06, BR08, BR24, JU03, JU09, LI02, LI03, LI04, LI07)
Soil Group 5 *Dissected Glaciated Mountain Slopes, mixed ash soils 35-65%*				
289, 118, 124, 154, 203, 213, 214, 230, 290, 343, 350, 351, 354, 374, 398, 399	Pebcreek-Brevco Complex, 35-65% slopes	**439** (B004, B006, BR02, BR04, BR16, BR19, BR22, BR27, BR31, CA03, CE02, CE03, CE11, GA08, GA09, HA02, JU18, LI01, LI39, LI46, LI54, MK01, MK02, MK03, MK07, RA06, RA09, RA11, RA15, RA17)	**208** (B005,B019, BR03, BR11, BR21, BR29, CE04, LI09, LI17, LI18, LI19, LI25, LI32, LI34, LI35, RA01, RA08, RA10, RA10, RA18)	**192** (LI02, LI03, LI04, LI20, LI21, LI22, LI23, LI24, LI36, LI37, LI48, LI49, LI53, LI61)

Detrimental Soil Disturbance (Compaction)

Ground based log yarding compacts soils on skid trails where the machines operate. Skyline yarding can also compact soils where the logs drag along the corridors. Many of the salvage units have been harvested in the past and have soils that are detrimentally compacted.

Designated skid/forwarder trails normally comprise approximately 10-15 percent of a treatment unit. Salvage units estimated to incur detrimental soil conditions exceeding the 15 percent Forest Plan Standard and Guideline (due to log yarding) and requiring active restoration are listed by Alternative in Figures E-8, E-9, and E-10, Estimated Additional Potential Detrimental Soil and Estimated Active Soil Restoration, Appendix E. If project monitoring indicates that activity generated compaction levels in additional units (to those listed in Appendix E) exceeds Forest Plan standards and guidelines, these units would also be actively restored. Active restoration would include sub-soiling or excavator plugging-designated skid/forwarder trails and landings which would reduce the effects of additional detrimental soil compaction. The beneficial effects of these sub-soiling or excavator plugging would occur immediately following the treatment. Alternative B and E would have 222.5 acres of additional detrimental soil and 129.5 acres would be actively restored. Alternative C would have 177 acres of additional detrimental soil and 116.5 acres would be actively restored. Alternative D would have 226 acres of additional detrimental soil and 129.5 acres would be actively restored. These treatments would be an effective method to reduce levels of additional detrimental soils below the threshold standard of 15 percent. Subsoiling or excavator plugging treatments are considered restoration treatments because skid/forwarder trails would be left in an improved condition following Alternatives B, C, D and E. Appropriate grass seeding would be considered as a companion treatment with the subsoiling and would assist in the prolonged recovery of these soils. The above mitigations would ensure effective ground cover percents required by R6 Soil Quality policy following summer ground soil disturbing activities.

Ground based equipment would not be allowed to operate on Soil Group 1 soils when they are saturated with standing water present. Soils would need to be dry for ground based operations which is an effective method to minimize soil compaction. Alternative B, D and E have 34 acres; Alternative C has 33 acres in Soil Group 1 for ground based yarding.

Soil Group 2 includes soils that are susceptible to compaction. These soil map units have deep ash with little surface or profile rock. Alternative B, D and E have 609 acres in Soil Group 2 proposed for ground-based operations. Alternative C has 514 acres in Soil Group 2 proposed for ground based operations. Proposed harvest units that have ash soils and high existing detrimental soil are B008, BR19, CE03, GA05 and JU18. Portions of these units have had multiple timber harvest entries and are currently above the 15% detrimental soil standard (Figure E-4, Appendix E). Active restoration of these units would include sub-soiling or excavator plugging-designated skid/forwarder trails and landings, which is an effective method to reduce levels of additional detrimental soil compaction below the threshold standard of 15 percent detrimental soil compaction.

Within the project area, subsoiling skid/forwarder trails would not be an acceptable restoration measure in the rocky soil map units in Soil Group 3. These soil map units are not suitable for sub-soiling due to the amount of profile and surface rock fragments (Andrus and Froehlich 1983). However, these soils have enough surface rock to provide

support for equipment and are not prone to compaction. Alternative B, D and E have 731 acres; Alternative C has 654 acres in Soil Group 3 proposed for ground based operations.

Natural grass release and additional grass from seeding is an effective method to move soils to a more desirable condition in the future. The release of grassy understories would indirectly increase the degree of pore space within compacted surface layers. This is considered passive restoration.

BAER treatments discussed in the Tripod BAER 2508 Report (USDA Forest Service 2006) would also assist vegetation re-establishment to de-compact soils.
Landings are proposed for all logging systems in all action alternatives. Landing size would range from 0.3 to 0.5 acre per landing and one landing is estimated to be needed to serve every 12 acres of ground based logging. Therefore landings serving ground-based logging units would detrimentally affect (compact) soils over 54 to 90 acres for Alternative B, D and E. Landings would detrimentally affect (compact) soils over 47 to 79 acres under Alternative C. The upper end of these ranges estimate detrimental soil impacts to accommodate equipment used to delimb trees if a feller/buncher operation is used versus a cut-to-length logging system. Landing slash piles would be smaller than a green timber harvest as only dead or dying trees are being cut. These slash piles would be burned creating some detrimental soils which is accounted for in the additional detrimental soil. Landings would be actively restored and seeded as listed in Chapter 2.

Skyline operations also require landings. Alternatives B and E, C, and D would skyline yard 591 acres, 351 acres and 716 acres respectively. Landings would be placed on roads or turnouts and average 0.25 acres in size. Alternative B and E would have an estimated 145 landings totaling 36 acres of detrimental soil. Alternative C would have an estimated 85 landings totaling 21 acres of detrimental soil. Alternative D would have an estimated 175 landings totaling 44 acres of detrimental soil. Landings on roads and turnouts would be actively restored to pre-landing conditions and seeded.

Helicopter operations are only proposed in Alternative D on 532 acres. Approximately 10 landings are proposed. These landings would average 1.25 acres each for a total of 12.5 acres of soil disturbance. Landings would be actively restored and seeded as indicated in Chapter 2.

Monitoring conducted in 2004 indicated that winter ground-based yarding on the Methow and Tonasket Ranger Districts resulted in less than 5% soil disturbance (Greene 2006b). Winter logging is effective at causing minimal detrimental soil disturbance (Flatten 2004). All proposed harvest units may be winter logged but winter logging is not required.

Ground-based yarding would be accomplished by a conventional tractor or rubber-tired skidder, a cut-to-length system, or a feller/buncher. Certain logging systems can minimize soil impacts. The cut-to-length system (forwarder) typically produces little to no exposed mineral soil surfaces as there is no dragging of trees overland. The bulk of the soil effect is from compaction from the machinery driving over the areas being harvested. Trails are typically 40 to 60 feet apart with average-sized systems in this area. The area within the trails that is detrimentally disturbed is highly variable but is often less than half of the trail area. Downed wood and slash that is dropped in the trail in front of the processor and also driven over by the forwarder distributes the weight of the machinery and reduces compaction levels. Displacement of volcanic ash soils can

occur when skidding operations occur during the driest parts of year. The use of the cut-to-length forward/processor system essentially eliminates this concern also. This equipment is not required, but is sometimes used in this area.

Feller/buncher equipment employs whole tree yarding and is more common in the area. The feller/buncher commonly uses single 40 foot spacing between multiple-pass skid trails. As discussed above, minimal detrimental soil would be expected and any unacceptable level of rutting or compaction exceeding 15% detrimental soil would be actively restored.

Trees need to be removed after they are cut with the feller/buncher and this skidding on multiple-pass trails would cause the majority of detrimental soil impacts. Designated trails along with mitigations listed in Chapter 2 would insure that detrimental soil remains below the 15% standard. Figures E-8, E-9, and E-10 (Appendix E) displays the amount of potential detrimental soil from harvest operations and the amount of active restoration that would be needed to meet the soil standard.

Investigation of logging systems on the east slopes of the Cascades found that helicopter logging resulted in less that one percent of an area being severely disturbed (Klock 1975). Soil disturbance from helicopter logging is primarily limited to landings and roads. Alternative D proposes helicopter yarding over 532 acres, resulting in 5 acres of detrimental soils.

Skyline systems would result in less than 3% soil disturbance as slash is usually on corridors and no skid trails are needed. Skyline systems affect very little ground but can create long, continuous areas of bare soil where the trailing end of logs is dragged uphill, called skyline corridors. The continuity of these corridors is often broken by downed wood, slash dropping onto the corridor soil surface, and ground irregularities; refer to Chapter 2 mitigations. No active restoration is required for skyline operations as slash would be left in corridors. Action Alternatives B, C and D propose 591 acres, 351 acres and 532 acres of skyline yarding respectively.

Detrimental Soil Displacement/Erosion

Soils most susceptible to displacement and subsequent erosion by ground-based yarding occur in Soil Groups 4 and 5. These soil groups have moderately steep 35-65% slopes. Soil Group 5 contains soil map units that have a dominant rock component. Lithic (less than 20 inches) to moderately deep (20-40 inches) soils are also dominant. Soil Group 4 soils have ash caps that are more erosive and prone to displacement than Soil Group 5 soils. Alternatives B, D and E have 343 acres in Soil Group 4 and 439 acres in Soil Group 5. Alternative C has 284 acres in Soil Group 4 and 408 acres in Soil Group 5. All these units are in ground based harvest operations. These acres are estimated from the Soil Survey (USDA NRCS 2004) as verified in the field.

A portion of these acres are located in riparian buffers with no harvest planned. Steep-slope acres within harvest units are short, steep pitches which are common in glacial topography. These steep slopes would be logged utilizing Chapter 2 design criteria. Areas lacking existing vegetation or non-merchantable tree parts (slash) due to high burn severity are prone to erosion and displacement from both equipment and tree dragging. Equipment would avoid areas that have bare mineral soil exposed on these slopes. Slopes that have vegetation and slash can withstand single passes by equipment, Thunder Fire Monitoring Results (Quintal and Radek 1996, Busskohl 2007).

Alternatively, go back trails, trails that follow gentler slopes (less than 35%) or trails that contour around the slopes may be used to access these steeper slopes. Line pulling is an effective method to avoid putting machinery on steep slopes. These methods can be used in both winter and summer logging conditions to avoid soil displacement on slopes over 35%.

Single pass trails by a feller/buncher during summer logging would have minimal soil impacts when vegetation, duff or slash is available. This has been observed on previous green sale monitoring and in Soil Monitoring Report (Greene 2006b).

No new specified road construction is included in any alternative and temporary road construction would not exceed three miles for Alternative B, D and E and no more than two miles for Alternative C. Four acres of initial soil disturbance would be associated with the temporary roads for Alternative B, D and E and two acres initial soil disturbance for Alternative C. These roads would be actively restored and no long-term impacts are expected (Chapter 2 – Design Criteria).

Tree planting would occur in all action alternatives. No machinery would be used and planting would be done by hand incurring little soil disturbance.

Chapter 3.4 discusses estimated sedimentation that would result from the soil displacement described above.

Coarse Woody Debris

Soil productivity is irreplaceable in human timescales and should be protected (Beschta et al. 1995). Organic matter in the soil surface horizon plays a role in the regulation of water availability, movement and storage, soil structure and soil stability. Site productivity and recovery is often dependent on the amount of surface organic matter remaining in post-fire watersheds (Jurgensen et. al. 1997).

A component of soil productivity and other soil functions is coarse woody debris (CWD). CWD is material derived from tree limbs, boles, and roots in various stages of decay. The creation and accumulation of CWD depends on forest type, successional stage, insect and disease activity, weather events, fire-return events, and decay. CWD can protect soils from erosion, displacement, and compaction. In addition, CWD can protect forests from both abiotic and biotic elements. Residues provide shade and protection from wind and snow and can be critical factors in protecting newly established seedlings. Decaying logs on the ground are excellent for nitrogen fixation (Graham et al. 1991).

The CWD standards were expressed in tons/acre for specific forest settings (Graham et al. 1994). It was originally felt that each piece of CWD would equate to a ton. This measure was adjusted slightly after more careful review of piece size and affects of decay in 2002 (Snell and Brown 1980).

The Soil Group 1 and 3, *Cryaquolls* and *Pebcreek* representative soils in inferred transitional forest communities would typically range from 3-7 tons per acre of CWD (USDA Forest Service 2000a). The Soil Group 2 and 4 *Manley and Wapal* representative soils site features support forest stands that tend to transition to closed canopy forests. These soils normally border soils that support vegetation that have frequent low intensity fires, which strongly influences the fire return intervals on the these ashy soils. CWD loading would typically range from 7-15 tons per acre. Soil Groups 5

soils contain shallow soils and rock outcrop areas and CWD loading would typically range from 3-7 tons per acre. These recommendations for CWD are based on amounts needed to maintain forest productivity and to protect the site from severe soil erosion. CWD amounts necessary for ecologic needs was also guided by recommendations in (Brown and others 2003, as modified by Harrod 2007). See Figure 3.4-3. This study estimated amount of fuels greater than 3" in diameter recommended by forest types. The amounts of CWD recommended from these two references are comparable. Existing CWD (post-fire) is estimated in Figure 3.4-3, Relative Soil Interpretations. Existing CWD is lower than recommended levels due to the Tripod Fire consuming this material. However, all downed logs would be retained and dead and dying trees left standing in harvest units (Chapter 3.2) would in most cases supply CWD as they fall over the next twenty years sufficient to meet recommended levels. An exception is in the mixed conifer forest in areas of low fire mortality (Figures 3.10-7 and 3.10-8). Relatively fewer snags were created by the fire to contribute to this fuel load, while pre-fire large woody debris was mostly consumed. In these areas, CWD would be recruited from surviving green trees.

Whole tree yarding may occur if the feller/buncher logging system is used. The majority of slash associated with harvest trees would be removed. Remaining logging slash on the ground along with retention of all down logs and CWD recruited from existing unburned material and standing dead trees left on proposed units post logging would meet CWD requirements in the Regional Forester Amendment #2. High burn severity soils have the most concern.

Oliver and Larson (1996) have documented that disturbances such as fire and harvest can release nitrogen into the soil. Immediate increases in readily available soil nitrogen can be attributed to the release of simple organic compounds from heat-disrupted soil organic matter and heat-killed microbial tissues. The long-term consequences of nutrient losses on soil productivity are relational to how often and how severely the soil is burned. Soil productivity may actually increase where fire burns with low severity, as the available nutrients that were tied up in understory vegetation and forest floor organic matter are released to the surviving forest vegetation. However, management practices that remove remaining organic matter from low productivity sites after a wildfire may decrease soil productivity.

Coarse woody debris (CWD) enhances microsite conditions and habitat, but is not in itself a great source of nutrients. Nutrients captured in coarse wood are brought to CWD habitat by animals and recycled by decomposers such as fungi.

<u>Soil Productivity</u>
CWD contribution to soil productivity is discussed above.
Existing site conditions have been discussed in existing condition. Soil Group 2 soils are the most productive followed by Soil Groups 3 and 4 for tree growth. This is tied to the depth of ash and site characteristics.

Tree planting is being considered in all alternatives. Trees would eventually assist in soil stabilization as well as delivery of litter and twigs adding to soil nutrients. Planting and vegetation recovery are discussed in Chapter 3 – Forest vegetation and Plant community sections. Alternative B and E, C, and D would plant trees on 2,748 acres, 2,247 acres and 3,404 acres respectively. Natural regeneration would occur on all other

acres within the fire area; however forest establishment would be slower than on acres that are planted.

Effective Ground Cover

The Tripod Fire removed ground cover and created conditions that elevated surface erosion rates. This is especially true in steep, high severity burned areas. Surface erosion from rainfall begins immediately following a fire and decreases dramatically as vegetation reestablishes itself in 3-4 years (Elliot et al. 1999). Vegetation acts as a barrier and shields the soil from the impact of raindrops. In fact, any material on the surface helps protect the soil from the impacts of raindrops that displace the soil. Effective ground cover includes limbs, tree boles, vegetation or other material protecting soil from erosion.

Increased effective ground cover from logging litter can reduce soil loss in post-fire watersheds. Logging slash created from harvest operations would, in most cases, increase the amount of effective ground cover [in the short term] by adding slash to the forest floor. Alternative A would not remove any standing dead trees. Alternative B and E would remove standing dead trees over 2,748 acres. Alternative C would remove standing dead trees over 2,247 acres. Alternative D would remove standing dead trees over 3,404 acres. In the long-term, the boles removed from the site in salvage operations would not be available for long-term down wood. This would have little effect on erosion hazard, absent another high severity fire, as vegetative growth and duff layers will have been recovered.

A primary concern of salvage logging operations is the risk of increased erosion within an already highly erodible environment (Beschta et al. 1995). There is an increased likelihood of overland flow in high severity burned areas (Neary et al. 2005a) that could flow to disturbed areas such as skid/forwarder trails, skyline corridors and landings from yarding operations. Surface soils would have stabilized and infiltration improved considerably by the time of first operations one year after the fire (Robichaud et al. 2000), reducing the likelihood of undisturbed areas within units producing overland flow that would run onto freshly exposed areas. Chapter 3.4 discusses results from the WEPP (Water Erosion Prediction Project) modeling that estimates sedimentation.

High and moderate burn severity areas in skyline yarded units would tend to have less downed wood on the ground, so there is likely to be somewhat less material available to break the skyline corridor bare soil. Alternative A proposes no skyline yarding. Alternatives B and E propose 591 acres of skyline yarding. Alternative C proposes 351 acres of skyline yarding. Alternative D proposes 716 acres of skyline yarding. Effective ground cover, and erosion hazard, would not be substantially increased. Keeping erosion control measures (water bars, slash, etc.) current during and after operations is very effective in minimizing erosion hazard.

Mass Wasting

Soil movement is a concern on steep slopes occurring within the Ja8 and Jb2 LTAs. These are dominating in proposed skyline and helicopter units. Lower portions of these landtypes could occur on ground based units. However, equipment would not operate in any v- shaped channels that have active soil movement. Intermittent stream channels would be buffered as required by PACFISH, with no tree removal from them, although trees could be felled within RHCAs and left on site.

Skyline logging would be monitored for any soil movement in corridors if soil is exposed. Slash in corridors would minimize soil movement. Helicopter operations would result in no adverse soil impacts. Figure 3.4-6 shows the acres for each logging system for each action alternative in the dissected landtypes.

Figure 3.4-6 Dissected Glaciated Mountain slope Landtype acres for each Action Alternative

Logging System	Alternative B and E Landtypes acres		Alternative C Landtypes acres		Alternative D Landtypes acres	
	JA8	JB2	JA8	JB2	JA8	JB2
Ground Based	327	994	64	925	327	994
Skyline	190	321	23	258	190	440
Helicopter	0	0	0	0	370	93

Cumulative Effects Analysis for Action Alternatives B, C D and E

This cumulative effects analysis considers the effects on soils from past actions going back 45 years, along with ongoing actions and reasonably foreseeable future actions that have been proposed at this point in time. A complete list of past, present and reasonably foreseeable future actions is listed at the beginning of this chapter. Only those activities such as timber sales, past fires, and livestock grazing that have affected soils are considered in this cumulative effects analysis. Because effects on soils are localized, this cumulative effects analysis is limited to the immediate area surrounding the actual units.

Details regarding impacts of past activities have already been discussed in the existing condition information presented at the beginning of this soils section. Compaction, displacement, and erosion are aspects of soil impacts that have remained on the landscape from past activities. Past sales and fires have also been considered when estimating existing detrimental soil.

A summary of the cumulative effects of past, present and foreseeable activities on detrimental soil conditions is found in Figure 3.4-6, Cumulative Effects Summary. Figures E-11, E-12, and E-13 display additional potential detrimental soil conditions caused by past activities, estimates active soil restoration to meet the 15 percent Forest Plan standard and guideline, and estimates post project detrimental soil for individual harvest units (Appendix E). According to Regional Soil policy, the cumulative detrimental effects from project implementation and restoration must, at a minimum, not exceed the conditions prior to the planned activity and should move toward a net improvement from disturbance caused by proposed activities in harvest units. Design criteria, mitigations and restoration would insure this standard would be met.

No active restoration would be considered for skyline operations except water bars and slash as listed in Chapter 2. No active restoration acres are listed for skyline and helicopter operations in the units as detrimental soil conditions fall within the 15% detrimental soil standard since these units were either never logged or logged using systems that caused minimal disturbance. All landings would be restored. Landings are included in the estimated additional detrimental soil but broken out separately.

The Forks 1970 Fire overlaps unit HA02 and the Bromas Fire overlaps with unit BR09. Transitory range for livestock diminished after conifers grew back from this fire. No soil cumulative impacts are being considered from these fires as vegetation has re-established, stabilizing soils.

Livestock grazing would be assessed within the fire area annually and permitted when adequate vegetation recovery has occurred. Removal of natural barriers by the fire would allow livestock better distribution which would help eliminate livestock concentrations and soil compaction. Cattle trails and stock driveways would have continued use and therefore not a concern for soil productivity. Livestock monitoring would occur to avoid soil compaction and displacement in high and moderate burn severity areas.

Eliminating livestock grazing for 1-3 growing seasons or until vegetation is established would also help restore compacted soils. Livestock grazing would be assessed using a Post-fire Vegetation Recovery Assessment for Livestock Grazing (Appendix H).

Weed control would occur along roads and in noxious weed areas (Chapter 3 – Invasive species). Removing weeds would allow native plants to become established and stabilize soils.
The Tripod Fire Salvage does not propose any new permanent roads and no future proposals for road construction are planned.
Firewood gathering has no cumulative effects to soils as impacts are spread out and only small areas would be impacted by this activity.
BAER treatments are discussed above. Any treatments that overlap harvest units would benefit soils by slowing erosion with mulch or promoting vegetation growth by seeding or fertilizing.

Figure 3.4-6a shows the cumulative effect summaries for only the ground based portions of the proposed units. The estimated post project detrimental soil acres will be within the 15% allowable soil threshold. Figures in Soil Appendix E have tables for each proposed action alternative.

Figure 3.4-7 is a cumulative effect summary of all harvest units by alternatives.

Figure 3.4-6a Harvest Units, Ground Based only, Cumulative Effect Summary

Harvest Unit	Acres	Estimated Existing Detrimental soil acres	Estimated Additional Potential Detrimental Soil Acres (summer logging only	Estimated Active Restoration soil acres (summer logging only)	Estimated Post Project Detrimental Soil Acres (summer logging only)
BL02	9	.5	1	0	1.5
B002	21	2	2	1	3
B003	11	2	1	1	2
B004	40	4	2	1	5
B006	40	6	3	3	6
B007	13	2	1	1	2

Harvest Unit	Acres	Estimated Existing Detrimental soil acres	Estimated Additional Potential Detrimental Soil Acres (summer logging only	Estimated Active Restoration soil acres (summer logging only)	Estimated Post Project Detrimental Soil Acres (summer logging only)
B008	57	9	6	6	9
B009	31	3	2	1	4
B010	74	7	3	2	8
BR02	10	.5	1	.5	1
BR04	18	.5	2	1	1.5
BR05	9	.5	1	.5	1
BR10	6	.5	.5	.5	.5
BR12	11	2	1	1	2
BR16	16	.5	2	.5	2
BR19	11	2	1	1	2
BR22	16	3	2	2	3
BR26	16	3	2	2	3
BR27	9	2	1	1	2
BR28	2	.5	.5	.5	.5
BR31	19	1	.5	.5	1
CA01	3	.5	.5	.5	.5
CA02	4	.5	.5	.5	.5
CA03	12	1	1	.5	1.5
CE01	34	1	3	1	3
CE02	41	8	4	4	8
CE03	87	17	8	8	3
CE08	8	.5	1	.5	5
CE11	27	5	2	2	5
GA01	51	5	5	3	7
GA02	52	5	5	3	7
GA03	45	5	4	2	7
GA04	8	1	1	.5	1.5
GA05	44	6	4	2	8
GA06	12	1	1	1	1
GA07	67	6	6	4	8
GA08	74	7	7	4	10
GA09	55	5	5	3	7

Harvest Unit	Acres	Estimated Existing Detrimental soil acres	Estimated Additional Potential Detrimental Soil Acres (summer logging only	Estimated Active Restoration soil acres (summer logging only)	Estimated Post Project Detrimental Soil Acres (summer logging only)
HA01	30	3	3	2	4
HA02	20	2	2	1	3
HA03	10	1	1	.5	1.5
HA04	19	2	2	1	3
HA05	44	3	4	2	5
HA08	14	1	1	.5	1.5
JU04	8	1	1	.5	1.5
JU08	6	.5	.5	.5	.5
JU18	8	2	1	.5	2.5
LI01	4	0	.5	0	1
LI39	17	2	1	.5	2.5
LI46	22	.5	2	.5	2
LI50	5	.5	.5	.5	.5
LI54	16	.5	1	.5	1
MK01	15	1	1	.5	1.5
MK02	18	1	2	1	2
MK03	10	.5	1	.5	1
MK04	22	1	2	1	2
MK06	10	.5	1	.5	1
MK07	22	1	2	1	2
MK08	27	1	2	1	2
PE01	14	2	1	.5	2.5
PE02	10	2	1	.5	2.5
PE03	14	1	1	.5	1.5
PE04	28	1	2	1	2
RA02	132	15	13	10	18
RA04	37	4	4	2	6
RA05	34	3	3	2	4
RA06	181	18	18	12	24
RA07	32	3	3	1	5
RA09	62	12	6	4	14
RA11	46	5	5	3	7

Harvest Unit	Acres	Estimated Existing Detrimental soil acres	Estimated Additional Potential Detrimental Soil Acres (summer logging only	Estimated Active Restoration soil acres (summer logging only)	Estimated Post Project Detrimental Soil Acres (summer logging only)
RA13	20	2	2	1	2
RA14	31	3	3	2	4
RA15	78	12	8	6	14
RA16	12	2	1	.5	2.5
RA17	18	3	2	1	4
Totals	**2,156**	**239.5**	**198.5**	**129.5**	**308.5.5**

Figure 3.4-7 Cumulative Effect Summary

Proposed Actions	Alt. A Acres	Alt. B And E Acres	Alt. C Acres	Alt. D Acres
Ground Based	0	2,156	1,896	2,156
Landings	0	54-90	47-79	54-90
Estimated Existing Detrimental Soil Acres on Ground Based	0	239.5	218	239.5
Estimated Additional Detrimental Soil Acres on Ground based units (summer logging)	0	198.5	165	198.5
Estimated Active Restoration on ground based units (summer logging)	0	129.5	116.5	129.5
Skyline	0	591	351	716
Estimated Existing Detrimental Soil Acres on Skyline	0	35.5	25	65
Estimated Additional Detrimental Soil Acres on Skyline	0	24	12	27.5
Helicopter	0	0	0	532
Estimated Existing Detrimental Soil Acres on Helicopter	0	0	0	29
Estimated Post Project Detrimental Soil acres	**0**	**368**	**303.5**	**429.5**

CONSISTENCY FINDING

All alternatives would be consistent with Regional policy and Forest Plan standards and guidelines for achieving soil quality objectives. Action alternatives have design criteria and mitigations that would keep harvest units within the 15% allowable detrimental soil as described by the Okanogan Forest Plan. Existing areas of detrimental soil

disturbance would be reused (example- old landings), and additional detrimental soil disturbance from proposed activity, would be mitigated with active restoration such as decompaction treatments and passive restoration such as seeding. This would show a net improvement for soils disturbed in harvest units.

3.5 Forest Vegetation

REGULATORY FRAMEWORK

Direction for managing forest resources within the Tripod Fire Salvage Project area is provided by the *Land and Resource Management Plan, Okanogan National Forest* (Forest Plan) (USDA Forest Service 1989a). Brief descriptions of Management Area Allocations within the project area can be reviewed in Chapter 1, Figure 1-5.

The Forest Plan provides the following Forest-wide standards and guidelines for reforestation activities in all management areas where timber harvest is scheduled:

Natural regeneration shall be the preferred reforestation method in the Lodgepole Pine and Low Productive Working Groups. Where practicable, natural regeneration shall be used in the Mixed Conifer Working Group.

Where adequate natural regeneration has not occurred by the fifth year stocking survey, stands in the Mixed Conifer and Lodgepole Pine Working Groups should be prepared and planted.

To the extent practicable, management should foster stands with mixed species composition.

Additional Forest Plan direction for reforestation activities in Management Areas 12, 14, and 26 are provided in the following standards and guidelines:

MA12-20F. No type conversion from lodgepole pine to other species shall be permitted in the Lodgepole Pine Working Group.

MA14-20F and MA26-20H. Western larch composition in stands to be managed for cover should not exceed 20 percent.

The National Forest Management Act of 1976 (NFMA), as codified by the Code of Federal Regulations, states that “when trees are cut to achieve timber production objectives, the cuttings shall be made in such a way as to assure that the technology and knowledge exists to adequately restock the lands within five years after final harvest.”

USDA Forest Service Pacific Northwest Regional Office policy on reforestation requirements following salvage harvest is provided in a letter addressed to Forest Supervisors (USDA Forest Service 2002b). Reforestation of deforested lands that are suitable for timber production is required where salvage harvest occurs. Reforestation of deforested salvage harvested lands should be attained within five years of harvest completion.

ANALYSIS METHOD

The area analyzed for forest vegetation includes all National Forest System (NFS) lands contained within the Tripod Fire Salvage project area. The forest vegetation analysis area includes approximately 38,000 acres of NFS lands. Private, State, and other non-NFS lands within the project area were excluded from the analysis area.

Effects will be measured using forestland condition, including the re-establishment of forest vegetation, and will be assessed for two time periods: 10 years post-fire (when

the salvage harvest and reforestation proposed actions will have been completed) and 30 years post-fire.

Data sources used in this analysis to describe existing forest vegetation conditions and predict vegetation response to fire and salvage logging include plant association models, interpreted satellite imagery data, aerial photographs, forest inventory plot data, and field reconnaissance. These data sources, in addition to an extensive literature review, utilized the best available information and science. A plant association model developed by the Forest Service Pacific Northwest Region area ecology program was used to define the forest vegetation types in the analysis area. Accuracy of the plant association data ranges between 60 to 75 percent and is best used to describe large scale trends for plant communities. Satellite imagery data collected in 1994 and Continuous Vegetation Survey (CVS) forest inventory data collected in 1994 and 1997 were used to describe project area pre-fire forest vegetation conditions. Landsat satellite imagery data were collected for the fire area on September 11, 2006. The satellite imagery data were interpreted by the Remote Sensing Application Center (RSAC) to produce a Burned Area Reflectance Classification (BARC) map that displays post-fire vegetation conditions. A burn severity map for the fire area was developed from the BARC map and field verified by the Burned Area Emergency Response (BAER) team. Tree mortality and tree crown and bole scorch levels within the BARC post-fire condition classes were field verified by Methow Valley Ranger District employees and a map of estimated overstory tree mortality immediately after the fire was created based on these observations.

Proposed salvage harvest units were originally identified, based upon tree mortality maps and field verified by on-site visits during the months of September, October, November, and December 2006. Site conditions including road access, burn severity, slope, tree mortality levels, and tree species composition and size classes, were observed during the field review process. Conifer seed source availability was estimated for all proposed salvage harvest units using tree mortality maps and field observation to determine natural regeneration potential. Areas where vigorous and disease-free conifers survived the fire at a minimum rate of five to ten trees per acre were considered to have a residual seed source that would be adequate to ensure natural regeneration. Burned areas where dead lodgepole pines with serotinous cones (cones that open with fire) were present at a minimum rate of 30 uniformly distributed trees per acre also were considered to have an adequate residual seed source for natural regeneration. All other burned areas were considered to have low natural regeneration potential and tree planting is the recommended reforestation method.

AFFECTED ENVIRONMENT

Affected environment is defined as that portion of the Tripod Fire Salvage project area that could potentially be affected by salvage timber harvest and reforestation forest vegetation treatments included in Alternatives B, C, D, and E. Alternative D proposes the maximum amount of forest vegetation treatments and comprises an estimated 3,404 acres. All proposed treatment units in Alternatives B, C, and E are included in Alternative D. This section describes forest vegetation conditions in the Tripod Fire Salvage project area that would potentially be affected by implementation of the action alternatives.

Forest Types

Forest vegetation within the affected environment was grouped into three primary forest types for the purpose of analyzing the effects of the proposed forest vegetation treatments. The three primary forest vegetation types that occur in the Tripod Fire Salvage project area are shown in Figure 3.5-1 and approximate locations are displayed on the Forest Habitats map in Appendix A. Slight differences between Forest Type and Forest Habitat designations are present because Forest Habitat mapping incorporates lynx habitat needs and Forest Type is based solely on plant associations. Figure 3.5-2 displays the estimated area of each forest type in Alternatives B, C, D, and E. A detailed list of the forested plant association groups and plant associations found in the primary forest types can be found in the Forest Types and Plant Association Groups Figure in Appendix F. The distribution of each forest type is shown below.

Figure 3.5-1: Primary Forest Types in the Tripod Fire Salvage Project Area

Forest Type	Estimated Area	Portion of Project Area
Dry Forest	4,160 acres	11%
Mixed Conifer Forest	11,230 acres	30%
Montane Forest	22,390 acres	59%

Figure 3.5-2: Forest Types in the Forest Vegetation Affected Environment

Forest Type	Alternatives B & E		Alternative C		Alternative D	
	Acres	Portion of Alt. B & E	Acres	Portion of Alt. C	Acres	Portion of Alt. D
Dry Forest	580	21%	580	26%	629	18%
Mixed Conifer Forest	1,510	55%	1,359	60%	1,805	53%
Montane Forest	658	24%	308	14%	970	29%
totals	2,748		2,247		3,404	

Dry Forest

The dry forest type can be described as the hot dry ponderosa pine and the hot dry, warm dry and warm mesic Douglas-fir forested plant associations that occur on the Okanogan and Wenatchee National Forests (Lillybridge et al. 1995). Dry forest vegetation occurs primarily on the warmest and driest sites in the project area with an approximate elevation range of 2,000 to 5,000 feet. Forest vegetation growing on mesic sites, including drainage bottoms and other moist areas, surrounded by hot dry and warm dry sites are included in the dry forest type.

Douglas-fir and ponderosa pine are common dry forest tree species, and based on forest inventory plot data comprised an estimated 64 percent and 25 percent respectively of dry forest overstory tree stocking prior to the fire. Ponderosa pine is the climax tree species on the hottest and driest sites that are capable of supporting forest cover, and Douglas-fir is the climax tree species for the majority of plant communities in the dry forest type. Lodgepole pine and western larch occur primarily on the coolest sites which typically are located near the upper elevation range of the dry forest type. Aspen is considerably less common than conifer species, comprising less than one percent of the dry forest cover, and occurs primarily on the moister sites in this forest type. Understory vegetation is comprised primarily of herbs and shrubs including

bluebunch wheatgrass, pinegrass, bitterbrush, bearberry, snowbrush ceanothus, and common snowberry.

The predominant historical natural fire regime in the dry forest type is Fire Regime I (Hardy et al. 2001, Schmidt et al. 2002). The historical fire frequency in Fire Regime I is zero to 35 years with low (surface fires most common) to mixed severity (less than 75 percent of dominant overstory vegetation replaced). The Fire Regime map is available in Appendix A. Post-fire vegetation recovery occurs primarily from surviving plants. Early seral tree species which typically regenerate following fire include ponderosa pine and aspen. Conifer seedlings, including Douglas-fir, become established primarily from seed produced by live trees remaining after a fire. Aspen post-fire regeneration is primarily vegetative from suckers that sprout from the root systems of fire killed trees. Additional information about aspen regeneration and shrub re-establishment can be found in Chapter 3.6 Plant Communities.

Mixed Conifer Forest

The mixed conifer forest type is comprised of the cool dry Douglas-fir forested plant associations and cool mesic Douglas-fir forested plant associations below 5,000 feet elevation (Lillybridge et al. 1995). Mixed conifer forest vegetation occurs primarily on sites where environmental conditions are cooler and sometimes moister than dry forest sites. The elevation range of mixed conifer forest in the project area is approximately 2,500 to 5,500 feet. Douglas-fir is the climax tree species for all forested plant communities in this forest type. Douglas-fir and ponderosa pine are common tree species throughout the mixed conifer forest type comprising an estimated 55 percent and 12 percent respectively of overstory tree stocking prior to the fire. Lodgepole pine and western larch are common primarily on the cooler and moister sites supporting the mixed conifer forest type comprising an estimated 15 percent and 19 percent respectively of overstory tree stocking prior to the fire. Aspen is considerably less common than conifer species, comprising less than one percent of the mixed conifer forest cover, and occurs primarily on moist sites in this forest type. Understory vegetation is comprised primarily of herbs and shrubs including pinegrass, pachistima, shiny leaf spirea, service berry, and several huckleberry species.

Fire Regime III is the predominant historic natural fire regime in the mixed conifer forest type (Hardy et al. 2001, Schmidt et al. 2002). The historic fire frequency in Fire Regime III is 35 to 100+ years with mixed fire severity (typically less than 75 percent of dominant overstory vegetation replaced). Fire Regime 1 also is well represented in this forest type, occurring primarily at the lower elevations and on drier sites in this forest type. The historic fire frequency in Fire Regime I is zero to 35 years with low (surface fires most common) to mixed severity.

Post-fire mixed conifer vegetation recovery occurs primarily from surviving plants. Seed produced by colonizing species that disperses into burned areas and residual on-site seed are secondary sources of post-fire vegetation recovery. Early seral tree species which typically regenerate following fire include ponderosa pine, western larch, lodgepole pine, and aspen. Natural regeneration of Douglas-fir, ponderosa pine, and western larch is dependent on seed produced by live trees remaining after a fire. Lodgepole pine is adapted to stand replacement burning and has the ability to regenerate from seed stored in serotinous cones which are opened by fire or making contact with the forest floor. Aspen post-fire regeneration is primarily vegetative from suckers that sprout from the root systems of fire killed trees. Additional information

about aspen, shrub and grass re-establishment can be found in Chapter 3.6 Plant Communities.

Montane Forest
The montane forest type includes all subalpine fir plant associations in the project area (Lillybridge, et al. 1995). Environmental conditions that support montane forest vegetation are cooler than mixed conifer vegetation and moisture regimes range from dry to very moist. The elevation range of montane forest cover in the project area is approximately 4,500 to 6,500 feet. Subalpine fir or Engelmann spruce are the climax tree species for subalpine fir plant communities in this forest type.

Subalpine fir, Douglas-fir and lodgepole pine are common tree species throughout the montane forest type comprising an estimated 17 percent, nine percent, and 35 percent respectively of overstory tree stocking prior to the fire. Engelmann spruce is common primarily on moist sites throughout this forest type comprising an estimated 34 percent of overstory tree stocking prior to the fire. Western larch is common where this forest type occurs on northerly or easterly aspects in the Volstead, Lightning, Beaver, Cabin, Cedar, Granite, McKay, and Pelican Creek drainages. Ponderosa pine occurs only on the warmest and driest sites in this forest type. Aspen is considerably less common than conifers, comprising less than one percent of montane forest cover, and occurs primarily on moist sites in this forest type. Understory vegetation is comprised primarily of herbs and shrubs including pinegrass, lupines, pachistima, and several huckleberry species.

The primary historical natural fire regime in the montane forest type is Fire Regime IV (Hardy et al. 2001, Schmidt et al. 2002). The historic fire frequency in Fire Regime IV is 35 to 100+ years with high severity (stand replacement fires are common).

Post-fire montane forest vegetation recovery occurs primarily from surviving plants, seed produced by colonizing species that disperses into burned areas, and residual on-site seed. Early and mid seral tree species which typically regenerate following fire include lodgepole pine, western larch, Douglas-fir, Engelmann spruce, and to a much lesser extent ponderosa pine and aspen. Natural regeneration of the majority of montane forest conifer species is dependent on seed produced by live trees remaining after a fire. Lodgepole pine is adapted to stand replacement burning and has the ability to regenerate from seed stored in serotinous cones which are opened by fire or making contact with the forest floor. Aspen post-fire regeneration is primarily from suckers that sprout from the root systems of fire killed trees. Additional information about aspen, shrub, forb and grass re-establishment can be found in the 3-6 Plant Communities section. Montane forest vegetation recovery rates typically are slower than other forest types due to higher elevations, cooler temperatures, and shorter growing season.

Burn Severity

Soil burn severity describes fire-caused changes to soil in terms of the amount of surface fuel and duff consumption. Burn severity is not the same as tree mortality. A burn severity map for the fire area was developed as described under the Analysis Method. Burn severity is classified as high, moderate, low or unburned to very low based on descriptions from Forest Service Handbook (FSH) 2509.13. Severity level definitions can be found in the 3.4 Soils section of this chapter and in the Glossary.

Burn severity within forest vegetation types follows a pattern that is predictable based on the predominant fire regimes for these forest types. Dry forest experienced the lowest proportion of high severity burning and the highest proportion of unburned to low severity burning in the project area. Burn severity in mixed conifer forest ranges in between dry forest and montane forest with regard to high and low severity burning. The montane forest experienced the highest proportion of high severity burning and the lowest proportion of unburned to low severity burning in the project area. Appendix A contains the Burn Severity Levels map. Figure 3.5-3 displays the proportion of burn severity for each forest type within the Tripod Fire Salvage project area. Figure 3.5-4 displays the proportion of burn severity for each forest type in Alternatives B, C, D, and E.

Figure 3.5-3: Burn Severity in the Tripod Fire Salvage Project Area

Forest Type	Burn Severity			
	Unburned to Very Low	Low	Moderate	High
Dry Forest	18%	50%	27%	5%
Mixed Conifer Forest	15%	36%	37%	12%
Montane Forest	9%	23%	41%	27%

Figure 3.5-4: Forest Type Burn Severity in the Forest Vegetation Affected Environment

Forest Type	Burn Severity	Alternatives B and E	Alternative C	Alternative D
Dry Forest	Unburned to Very Low	19%	19%	18%
	Low	37%	37%	38%
	Moderate	38%	38%	38%
	High	6%	6%	6%
Mixed Conifer Forest	Unburned to Very Low	11%	11%	9%
	Low	36%	37%	36%
	Moderate	46%	46%	47%
	High	7%	6%	8%
Montane Forest	Unburned to Very Low	10%	15%	8%
	Low	26%	35%	25%
	Moderate	36%	40%	36%
	High	28%	10%	31%

Burn severity is an indicator of post-fire ground cover condition and post-fire vegetation response. Further information about severity levels within each forest type is available in Chapter 3.6 Plant Communities.

Tree Mortality

Tree mortality levels vary widely in the project area and are associated with forest vegetation type and burn severity. An overstory tree mortality map was developed as described in under Analysis Methods (Appendix A, Tree Mortality Levels Map). Overstory trees in the project area range in size from five inches DBH and larger in young timber stands to ten inches DBH and larger in more mature timber stands. Tree

mortality levels are estimated as high, moderate, low or little or none detected and are described as follows:

High – all trees in the overstory canopy layer are dead or dying.

Moderate – approximately two-thirds of the overstory trees are dead or dying. (Estimated tree mortality ranges between more than 50% and less than 100%).

Low - approximately one-third of the overstory trees are dead or dying. (Estimated tree mortality ranges between more than a few trees and less than 50%).

Little or none detected – very few or no overstory trees are dead or dying.

Figure 3.5-5 displays proportions of estimated tree mortality levels immediately after the fire within each forest type of the Tripod Fire Salvage project area. Tree mortality follows a pattern that is consistent with the predominant fire regimes for each forest type. The dry forest type had the highest proportion of low and little or no tree mortality in the project area. The dry forest type also experienced the lowest proportion of moderate and high tree mortality combined. Estimated tree mortality levels in mixed conifer forest range in between dry forest and montane forest types. The montane forest type experienced the highest proportion of moderate and high tree mortality combined and the lowest proportion of low and little or no mortality in the project area.

Figure 3.5-5: Tree Mortality Levels in the Tripod Fire Salvage Project Area

	Overstory Tree Mortality			
Forest Type	**Little or None**	**Low**	**Moderate**	**High**
Dry Forest	23%	34%	32%	11%
Mixed Conifer Forest	21%	27%	33%	19%
Montane Forest	13%	18%	28%	41%
All types combined	17%	22%	30%	31%

Figure 3.5-6 displays the proportion of tree mortality immediately after the fire for each forest type in Alternatives B, C, D, and E. Displayed tree mortality levels are estimates and mapping errors may have occurred. By design, proposed salvage harvest units would be located primarily in areas where actual tree mortality is at the moderate or high level. Estimated tree mortality levels in Alternatives B, C, D, and E appear to be higher than tree mortality levels for the project area as a whole. The proportion of high and moderate tree mortality categories combined for Alternatives B, C, D, and E is greater than the same estimate for the project area. Conversely, the proportion of low and little or no tree mortality categories combined for Alternatives B, C, D, and E is less than the same estimate for the project area.

Figure 3.5-6 Tree Mortality Levels in the Forest Vegetation Affected Environment

Forest Type	Estimated Overstory Tree Mortality	Alternatives B and E	Alternative C	Alternative D
Dry Forest	Little or None	23%	23%	22%
	Low	26%	26%	27%
	Moderate	34%	34%	35%
	High	17%	17%	16%
Mixed Conifer Forest	Little or None	15%	15%	13%
	Low	25%	26%	25%
	Moderate	36%	37%	37%
	High	24%	22%	25%
Montane Forest	Little or None	13%	19%	11%
	Low	18%	23%	17%
	Moderate	26%	32%	26%
	High	43%	26%	46%

Additional tree mortality caused by delayed effects of fire injury and post-fire insect attacks is expected to occur in and adjacent to the project area. Trees that survived the Tripod Fire will be susceptible to stem girdling by fire and attack by tree-killing bark beetles for a period of about four to five years after the fire (Rasmussen et al. 1996). Survival of conifers following fire depends on the type and degree of injuries sustained, initial tree vigor, post-fire weather, and insect population dynamics. The probability of bark beetle attack following fire initially is low for lightly scorched trees, increases with moderate and heavy levels of crown scorch, and decreases to almost zero with complete crown scorch (Amman and Ryan 1991). Infestation of fire-injured trees by bark beetles also is closely related to the amount of basal tree bole circumference killed. The likelihood of beetle attack and tree mortality increases as the proportion of basal girdling by fire increases, and this relationship varies by tree species (Rasmussen et al. 1996 and Scott et al. 2002, 2003, 2006). Tree species most likely to be killed by post-fire beetle attacks include Douglas-fir, ponderosa pine, lodgepole pine, and Engelmann spruce (Mehmel 2007).

Areas with moderate and low levels of tree mortality immediately after the fire are expected to experience the highest levels of post-fire tree mortality in the project area. These areas have relatively high numbers of trees that survived the fire yet sustained moderate or higher levels of crown scorch and basal tree bole damage which increase susceptibility to bark beetle attacks. Post-fire research conducted on three fires in the northern Rocky Mountains (Montana and Wyoming) demonstrated that delayed mortality of fire injured trees caused by bark beetle attacks can be substantial. Sixty three percent of sampled Douglas-firs that were alive following wildfires had died within four years after the fires occurred. The majority of trees died within two years after the fires, although similar numbers of trees died in the first and fourth post-fire years (Hood and Bentz 2007). Surveys conducted up to four years after the 1988 fires in the Greater Yellowstone Area, which are similar to the mixed conifer and montane forest types in the Tripod Fire, showed post-fire tree mortality rates of 32 percent, 41 percent, 52 percent, and 63 percent respectively for Douglas-fir, Engelmann spruce, lodgepole pine ,and subalpine fir. Delayed mortality attributed to fire injury accounted for a larger portion of

post-fire mortality than insect attacks in this instance, and both types of tree mortality combined altered the original fire-killed and green tree mosaics that were present immediately after the fire (Rasmussen et al. 1996)

Tree mortality levels can affect the rate of post-fire forest stand establishment. Natural regeneration of most conifer species that occur in the affected environment is dependent on dispersal of seed from live trees. Dry forest and mixed conifer forest stands with moderate or high levels of tree mortality immediately after the fire, most likely will not have an adequate seed source to ensure adequate and timely regeneration following salvage harvest. Lodgepole pine natural regeneration levels however, are dependent on the amount of on-site seed stored in serotinous cones and site conditions created by burning. Lodgepole pine natural regeneration is enhanced by mineral soil exposure and increased sunlight levels on the forest floor which occur where tree mortality levels are moderate or high and burn severity is moderate or high.

ENVIRONMENTAL CONSEQUENCES

Alternative A (No Action)

Direct and Indirect Effects
Alternative A proposes no reforestation treatment.

Natural Reforestation
Natural reforestation would establish forest cover on the entire project area. Approximately 79 percent of the project area (approximately 38,000 acres total) would be expected to attain minimum acceptable stocking levels and be considered reforested within 10 years after the fire. The remaining 21 percent would be expected to attain minimum acceptable stocking levels and be considered reforested within 20 to 30 years after the fire. Refer to Appendix F, Forest Vegetation Minimum Tree Stocking Standards for a description of minimum acceptable stocking levels.

Natural reforestation rates would vary by forest type, burn severity, and residual seed source availability (which are dependent on overstory tree mortality levels). Areas with little or low levels of tree mortality in all forest types would be reforested within 10 years after the fire. The majority of dry and mixed conifer forest areas with high tree mortality levels would not attain minimum acceptable tree stocking levels within 10 years after the fire, but would be naturally reforested to minimum tree stocking levels within 20 to 30 years after the fire. Dry and mixed conifer forest areas with moderate tree mortality levels on southerly aspects also would not be reforested within 10 years after the fire but would be expected to attain minimum acceptable tree stocking levels within 20 to 30 years after the fire. Dry and mixed conifer forest areas with moderate tree mortality levels on northerly aspects, however, would be naturally reforested within 10 years after the fire. The majority of mixed conifer and montane forest areas with moderate tree mortality levels are expected to attain minimum acceptable tree stocking levels within 10 years after the fire. The majority of montane forest areas with high tree mortality levels also would attain minimum acceptable tree stocking levels within 10 years after the fire primarily due to residual lodgepole pine seed expected to germinate.

Dry Forest
In Alternative A, approximately 65 percent of the dry forest type would be naturally reforested to acceptable stocking levels within 10 years after the fire. Approximately 2,700 acres in the project area would attain tree stocking levels at or above 50 to 100 vigorous trees per acre at this time. The remaining 35 percent of dry forest type area would be expected to attain minimum acceptable stocking levels and be naturally reforested within 20 to 30 years after the fire.

Natural reforestation under Alternative A would influence tree species composition in dry forest areas. Dry forest natural regeneration following the fire would consist primarily of Douglas-fir seedlings, which would comprise about 60 percent of all established seedlings. Ponderosa pine seedlings would make up approximately 30 percent of all expected regeneration and lodgepole pine and western larch combined would comprise about 10 percent. Estimated species composition on the majority of dry forest type natural regeneration acres would not meet the desired future condition where ponderosa pine is the predominant tree species at the time of stand establishment.

Mixed Conifer Forest
In Alternative A, approximately 75 percent of the mixed conifer forest type would be naturally reforested to acceptable stocking levels within 10 years after the fire. Approximately 8,400 acres in the project area would attain tree stocking levels at or above 80 to 100 vigorous trees per acre during this time. The remaining 25 percent of mixed conifer forest type area would be expected to attain minimum acceptable stocking levels and be naturally reforested within 20 years after the fire.

Natural reforestation under Alternative A would influence tree species composition in mixed conifer forest areas. Douglas-fir seedlings would comprise about 50 percent of all natural regeneration established in the mixed conifer forest type following the fire. Ponderosa pine and western larch seedlings combined would make up approximately 30 percent of all expected regeneration and lodgepole pine would comprise about 20 percent. Estimated species composition on the majority of mixed conifer forest natural regeneration acres would not meet the desired future condition where ponderosa pine, western larch, and lodgepole pine to a lesser extent are the predominant tree species at the time of stand establishment.

Montane Forest
In Alternative A, approximately 85 percent of the montane forest type would be naturally reforested within 10 years after the fire. Approximately 19,000 acres would attain tree stocking levels of 200 or more vigorous trees per acre during this time. The remaining 15 percent of montane forest type would attain minimum acceptable stocking levels and be naturally reforested within 20 to 30 years after the fire.

Natural regeneration in the montane forest type following the fire would consist primarily of lodgepole pine seedlings, which would comprise about 70 percent of all established seedlings. The remaining 30 percent of expected regeneration would be comprised of Engelmann spruce, Douglas-fir, western larch, and subalpine fir seedlings. Estimated species composition on the majority of montane forest type natural regeneration acres would meet the desired condition for montane forest re-establishment.

Alternative B – Proposed Action

Direct and Indirect Effects
If Alternative B is selected for implementation, the following forest vegetation management activities would occur on the proposed action affected environment:

Salvage timber harvest: 2,748 acres
Tree planting: 1,659 acres
Natural reforestation: 1,089 acres

Salvage Harvest
Alternative B would salvage harvest 2,748 acres using tractor and skyline logging systems in three forest types. Salvage timber harvest and tree planting would affect forest vegetation recovery in the affected environment. Figure 3.5-7 displays the amount of area salvage harvested and reforested by Alternative B within the three primary forest types. Alternative B would treat approximately seven percent of the total Tripod Fire Salvage project area and 14 percent of the dry forest type in the project area. Alternative B would treat approximately 9 percent of total dry forest type area on NFS lands within the Tripod Fire.

Figure 3.5-7: Forest Types Affected By Alternatives B and E Forest Vegetation Treatments

Forest Type	Total Amount in Project Area (acres)	Salvage Harvest (acres)	Portion of Forest Type in Project Area Treated	Tree Planting (acres)	Natural Reforestation (acres)
Dry Forest	4,157	580	14%	550	30
Mixed Conifer	11,231	1,510	13%	855	655
Montane	22,389	658	3%	254	404
totals	37,777	2,748	7%	1,659	1,089

Tree Planting
Alternative B would plant conifer seedlings following salvage harvest on 1,659 acres to ensure that timely reforestation of desired conifer species would occur. Although Beschta, et al. (2004) recommended no tree planting following wildfire, the National Forest Management Act requires that salvage harvest units be adequately reforested five years after harvest. This cannot be assured without tree planting in the units planned for planting. Seedlings grown from locally adapted seed would be hand planted to control the species composition of regeneration and achieve the desired conditions for dry, mixed conifer, and montane forest stand re-establishment. Estimated seedling survival rates would range between 50 to 70 percent with the lowest survival rates expected in portions of the dry forest type. Survival rates in mixed conifer and montane forest areas typically would be higher than in the dry forest. Seedling survival and tree stocking levels would be monitored following tree planting. Replanting would occur where seedling establishment is inadequate to ensure that all units attain or exceed minimum acceptable stocking levels and are reforested within five years of the completion of harvest activities. Refer to Appendix F, Forest Vegetation Minimum Tree Stocking Standards and Tree Planting Recommendations.

Ponderosa pine seedlings would be planted on 550 acres in the dry forest type. Douglas-fir natural regeneration would become established in dry forest tree planting units to enhance tree species diversity. Primarily ponderosa pine and western larch seedlings would be planted on 855 acres of mixed conifer forest type. Douglas-fir and lodgepole pine natural regeneration would become established in mixed conifer forest tree planting units to enhance tree species diversity. Primarily Douglas-fir and Engelmann spruce seedlings would be planted on 254 acres in the montane forest type. Lodgepole pine, subalpine fir, and western larch natural regeneration would become established in montane forest tree planting units over time to enhance tree species diversity. Forest regeneration in harvested montane forest areas would be similar to comparable unharvested areas within approximately 20 years after the Tripod Fire.

Natural Reforestation

Alternative B would rely on natural reforestation to re-establish forest cover on 1,089 acres of harvest units in the project area. Natural regeneration would become established at or exceed minimum acceptable stocking levels following salvage logging where there is an adequate residual seed source. Stands that supported substantial amounts of lodgepole pine prior to the fire (primarily in the montane and mixed conifer forest types) with moderate or high levels of tree mortality in particular are expected to naturally regenerate rapidly following salvage harvest. The probability of natural reforestation success following salvage logging is very high based on over thirty years of observation in fires that have occurred on the Methow Valley and Tonasket Ranger Districts. Natural regeneration stocking levels following post-fire salvage logging on the Forks, Mitchell Creek, Barker Mountain, Bannon, Poorman, Whiteface, and Thunder Mountain fires have been prolific, exceeding minimum acceptable levels, in the mixed conifer and montane forest types (Townsley 2007).

Salvage logging would have little or no effect on the residual conifer seed source in harvest units because only dead trees and fire-injured trees expected to die within one year after the onset of logging would be removed. Monitoring on the Bitteroot Fires in Montana, revealed no difference in conifer seedling abundance on salvage logged and unlogged areas (Kolb 2006). Natural conifer regeneration of Montana Douglas-fir plant communities similar to portions of the mixed conifer and montane forest types in the affected environment was closely correlated to the occurrence of a seed source. The majority of lodgepole pine seed production would be retained in salvage harvest units because all trees (live or dead) less than 10 inches DBH would not be harvested. All trees less than 12 inches DBH would be retained in harvest units within lynx habitat currently in an unsuitable condition, increasing the likelihood that lodgepole pine seed is retained on site and natural regeneration would occur.

Salvage harvest activities would disturb soils where logging equipment operates and logs are dragged across the ground. Salvage harvest operations would be completed within two years after the fire and there would be little or no logging damage to post-fire natural regeneration (McIver and Starr 2001). Soil disturbed by logging would provide favorable conditions for the establishment of natural regeneration because disturbed mineral soil generally produces the best germination and seedling survival for all conifer species that would re-establish after the fire (Lotan and Perry 1983, Burns and Honkala 1990). Soil disturbance attributed to salvage logging is not expected to impede natural regeneration establishment because seedling stocking on skid trails often reaches higher levels than on adjacent undisturbed areas (Smith and Wass 1976).

Seedling re-establishment in all prescribed natural reforestation units would be monitored following harvest. Tree planting of desired conifer species would occur in areas where seedling re-establishment is inadequate to ensure that all units are reforested within five years of the completion of harvest activities. All salvage harvest units with prescribed natural regeneration treatments would attain or exceed minimum acceptable stocking levels within five years after harvest and be reforested within 10 years after the fire.

Dry Forest

Approximately 30 acres of dry forest type would be naturally reforested within 10 years after the fire. Ponderosa pine and Douglas-fir seedlings would become established following harvest to attain stocking levels at or above 50 to 100 vigorous trees per acre. Species composition of tree seedlings established on the majority of prescribed natural regeneration acres would meet the desired condition for dry forest re-establishment.

Mixed Conifer Forest

Approximately 655 acres of mixed conifer forest type would be naturally reforested within 10 years after the fire. Tree stocking levels at or above 80 to 100 vigorous trees per acre would be attained during this time. Douglas-fir seedlings would make up an estimated 50 percent of stocking re-established in natural regeneration units. Ponderosa pine and western larch seedlings combined would make up an estimated 30 percent of expected regeneration and lodgepole pine would comprise about 20 percent of expected stocking. Species composition of tree seedlings established on the majority of prescribed natural regeneration acres would not meet the desired condition for mixed conifer forest re-establishment due to the relatively high proportion of Douglas-fir stocking.

Montane Forest

Approximately 404 acres of montane forest type would be naturally reforested within 10 years after the fire. Tree stocking levels of 200 or more vigorous trees per acre would be attained during this time. Lodgepole pine seedlings would make up an estimated 70 percent of stocking re-established in natural regeneration units. Engelmann spruce, Douglas-fir, western larch, and subalpine fir seedlings would make up an estimated 30 percent of expected stocking. Species composition of tree seedlings established on the majority of prescribed natural regeneration acres would meet the desired condition for montane forest re-establishment. Stand development in harvested montane forest areas would be similar to comparable unharvested areas within approximately 20 years after the Tripod Fire.

Soil Disturbance

Salvage logging would cause soil disturbance that is detrimental to the growth of tree seedlings on some areas where logging equipment operates and log skidding occurs. Soil compaction can reduce soil productivity, and growth of natural and planted seedlings that would become established following logging could be adversely affected. Research conducted in the south-central Cascade Mountains of Washington 23 years after logging found that soil compaction reduced height and diameter growth on young ponderosa pines by five percent and eight percent respectively. Height and diameter growth of young lodgepole pines 14 years after logging however, was not affected by soil compaction (Froehlich et al. 1986). Height growth of regeneration growing on tractor skid trails 16 to 18 years after post-fire salvage logging was monitored in central and southeastern British Columbia. Engelmann spruce, western larch, and Douglas-fir height growth on skid trails was reduced by a range of two to 15 percent (Smith and

Wass 1980). Lodgepole pine height growth on skid trails however, was 4 percent higher than areas not disturbed by skid trails. Both studies suggest that lodgepole pine seedlings and saplings, which would comprise the majority of montane forest natural regeneration, are less sensitive to soil compaction than other conifer species in the affected environment. Tree growth in salvage harvest areas could be affected by soil compaction for a period of 35 to 40 years following logging. Natural recovery of compacted soils would be expected to occur during this time (Froehlich 1980, Froehlich and McNabb 1984).

The majority of detrimental soil disturbance affecting seedling growth would occur on tractor skid trails, log landings, temporary roads, and skyline corridors. All temporary roads would be decommissioned following logging and detrimentally compacted and displaced soils would be treated to restore soil productivity. Additional post-harvest soil restoration treatments would be implemented where needed to reduce the amount of detrimentally disturbed soil to 15 percent or less of the area in each salvage harvest unit. Refer to Chapter 2 Soils Mitigation Measures and Design Criteria for details on logging operation requirements to minimize soil disturbance and restoration treatments to facilitate the recovery of disturbed soils. Soil restoration treatments would restore soil productivity and improve soil conditions for seedling growth. Figure 3.5-8 displays the estimated area of disturbed soil that would affect tree seedling growth following the completion of logging and post-harvest soil restoration treatments in Alternative B harvest units.

Figure 3.5-8: Detrimental Soil Disturbance Affecting Forest Regeneration in Alternatives B and E Harvest Units

Reforestation Method	Acres Reforested	Area Affected by Detrimental Soil Disturbance (acres)	Portion of Total Area Reforested
Tree planting	1,659	238	14%
Natural reforestation	1,089	130	12%
totals	2,748	368	13%

Alternative C

Direct and Indirect Effects

If Alternative C is selected for implementation, the following forest vegetation management activities would occur on the affected environment for Alternative C:

Salvage timber harvest: 2,247 acres
Tree planting: 1,533 acres
Natural reforestation: 714 acres

Salvage Harvest

Alternative C would salvage harvest 2,247 acres using tractor and skyline logging systems in three forest types. Salvage timber harvest and tree planting would affect forest vegetation recovery in the affected environment. Figure 3.6-10 displays the amount of area salvage harvested and reforested by Alternative C within the three primary forest types. Alternative C would treat approximately six percent of the total Tripod Fire Salvage project area and 14 percent of the dry forest type in the project area. Alternative C would treat approximately 9% of total dry forest type within the Tripod Fire area.

Figure 3.5-9: Forest Types Affected By Alternative C Forest Vegetation Treatments

Forest Type	Total Amount in Project Area (acres)	Salvage Harvest (acres)	Portion of Forest Type in Project Area Treated	Tree Planting (acres)	Natural Reforestation (acres)
Dry Forest	4,157	580	14%	550	30
Mixed Conifer	11,231	1,359	12%	807	552
Montane	22,389	308	1%	176	132
totals	37,777	2,247	6%	1,533	714

Tree Planting

Alternative C would plant conifer seedlings following salvage harvest on 1,533 acres to ensure that timely reforestation of desired conifer species would occur. Seedlings grown from locally adapted seed would be hand planted to control the species composition of regeneration and achieve the desired conditions for dry, mixed conifer, and montane forest stand re-establishment. Seedling survival and tree stocking levels would be monitored following tree planting. Replanting would occur where seedling establishment is inadequate to ensure that all units attain or exceed minimum acceptable stocking levels and are reforested within five years of the completion of harvest activities.

Ponderosa pine seedlings would be planted on 550 acres in the dry forest type. Douglas-fir natural regeneration would become established in dry forest tree planting units to enhance tree species diversity. Primarily ponderosa pine and western larch seedlings would be planted on 807 acres in the mixed conifer forest type. Douglas-fir and lodgepole pine natural regeneration would become established in mixed conifer forest tree planting units to enhance tree species diversity. Primarily Douglas-fir and Engelmann spruce seedlings would be planted on 176 acres in the montane forest type. Lodgepole pine, subalpine fir, and western larch natural regeneration would become established in montane forest tree planting units over time to enhance tree species diversity. Forest regeneration in harvested montane forest areas would be similar to comparable unharvested areas within approximately 20 years after the Tripod Fire.

Natural Reforestation

Alternative C would rely on natural reforestation to re-establish forest cover on 714 acres of harvest units in the project area. Seedling re-establishment in all prescribed natural reforestation units would be monitored following harvest. Tree planting of desired conifer species would occur in areas where seedling re-establishment is inadequate to ensure that all units are reforested within five years of the completion of harvest activities. All salvage harvest units with prescribed natural regeneration treatments would attain or exceed minimum acceptable stocking levels within five years after harvest and be reforested within 10 years after the fire.

Dry Forest

Approximately 30 acres in the dry forest type would be naturally reforested within five years after harvest and ten years after the fire. Ponderosa pine and Douglas-fir seedlings would become established following harvest to attain stocking levels at or above 50 to 100 vigorous trees per acre. Species composition of tree seedlings

established on the majority of prescribed natural regeneration acres would meet the desired condition for dry forest re-establishment.

Mixed Conifer Forest

Approximately 552 acres in the mixed conifer forest type would be naturally reforested within five years after harvest and ten years after the fire. Tree stocking levels at or above 80 to 100 vigorous trees per acre would be attained during this time. Douglas-fir seedlings would make up an estimated 50 percent of stocking re-established in natural regeneration units. Ponderosa pine and western larch seedlings combined would make up an estimated 30 percent of expected regeneration and lodgepole pine would comprise about 20 percent of expected stocking. Species composition of tree seedlings established on the majority of prescribed natural regeneration acres would not meet the desired condition for mixed conifer forest re-establishment due to the high proportion of Douglas-fir stocking.

Montane Forest

Approximately 132 acres in the montane forest type would be naturally reforested within 10 years after the fire. Tree stocking levels of 200 or more vigorous trees per acre would be attained during this time. Lodgepole pine seedlings would make up an estimated 70 percent of stocking re-established in natural regeneration units. Engelmann spruce, Douglas-fir, western larch, and subalpine fir seedlings would make up an estimated 30 percent of expected stocking. Species composition of tree seedlings established on the majority of prescribed natural regeneration acres would meet the desired condition for montane forest re-establishment. Stand development in harvested montane forest areas would be similar to comparable unharvested areas within approximately 20 years after the Tripod Fire.

Soil Disturbance

Salvage logging would cause soil compaction and displacement that is detrimental to the growth of tree seedlings on some areas where logging equipment operates and log skidding occurs as described under Alternative B. Post-harvest soil restoration treatments would be implemented where needed to reduce the amount of detrimentally disturbed soil to 15 percent or less of the area in each salvage harvest unit. Refer to Chapter 2 Soil Mitigation Measures and Design Criteria for details on logging operation requirements to minimize soil disturbance and restoration treatments to facilitate the recovery of disturbed soils. Soil restoration treatments would restore soil productivity and improve soil conditions for seedling growth. Figure 3.5-10 displays the estimated area of disturbed soil that would affect tree seedling growth following the completion of logging and post-harvest soil restoration treatments in Alternative C harvest units.

Figure 3.5-10: Detrimental Soil Disturbance Affecting Forest Regeneration in Alternative C Harvest Units

Reforestation Method	Acres Reforested	Area Affected by Detrimental Soil Disturbance (acres)	Portion of Total Area Reforested
Tree planting	1,533	218	14%
Natural reforestation	714	86	12%
totals	2,247	304	14%

Alternative D

Direct and Indirect Effects
If Alternative D is selected for implementation, the following forest vegetation management activities would occur on the affected environment for Alternative D:

Salvage timber harvest: 3,404 acres
Tree planting: 1,930 acres
Natural reforestation: 1,474 acres

Salvage Harvest
Alternative D would salvage harvest 3,404 acres using tractor, skyline, and helicopter logging systems in three forest types. Salvage timber harvest and tree planting would affect forest vegetation recovery in the affected environment. Figure 3.5-11 displays the amount of area salvage harvested and reforested by Alternative D within the three primary forest types. Alternative D would treat approximately nine percent of the total Tripod Fire Salvage project area and 15 percent of the dry forest type present in the project area. It would treat approximately 10% of the total dry forest type on NFS lands within the Tripod Fire.

Figure 3.5-11: Forest Types Affected By Alternative D Forest Vegetation Treatments

Forest Types	Total Amount in Project Area (acres)	Salvage Harvest (acres)	Portion of Forest Type in Project Area Treated	Tree Planting (acres)	Natural Reforestation (acres)
Dry Forest	4,157	629	15%	599	30
Mixed Conifer	11,231	1,805	16%	1,044	761
Montane	22,389	970	4%	287	683
totals	37,777	3,404	9%	1,930	1,474

Tree Planting
Alternative D would plant conifer seedlings following salvage harvest on 1,044 acres to ensure that timely reforestation of desired conifer species would occur. Seedlings grown from locally adapted seed would be hand planted to control the species composition of regeneration and achieve the desired conditions for dry, mixed conifer, and montane forest stand re-establishment. Seedling survival and tree stocking levels would be monitored following tree planting. Replanting would occur where seedling establishment is inadequate to ensure that all units attain or exceed minimum acceptable stocking levels and are reforested within five years of the completion of harvest activities.

Ponderosa pine seedlings would be planted on 599 acres in the dry forest type. Douglas-fir natural regeneration would become established in dry forest tree planting units to enhance tree species diversity. Primarily ponderosa pine and western larch seedlings would be planted on 1,044 acres of mixed conifer forest type. Douglas-fir and lodgepole pine natural regeneration would become established in mixed conifer forest tree planting units to enhance tree species diversity. Primarily Douglas-fir and Engelmann spruce seedlings would be planted on 287 acres of montane forest type. Lodgepole pine, subalpine fir, and western larch natural regeneration would become established in montane forest tree planting units over time to enhance tree species

diversity. Forest regeneration in harvested montane forest areas would be similar to comparable unharvested areas within approximately 20 years after the Tripod Fire.

Natural Reforestation

Alternative D would rely on natural reforestation to re-establish forest cover on 1,474 acres of harvest units in the project area. Seedling re-establishment in all prescribed natural reforestation units would be monitored following harvest. Tree planting of desired conifer species would occur in areas where seedling re-establishment is inadequate to ensure that all units are reforested within five years of the completion of harvest activities. All salvage harvest units with prescribed natural regeneration treatments would attain or exceed minimum acceptable stocking levels within five years after harvest and be reforested within 10 years after the fire.

Dry Forest

Approximately 30 acres in the dry forest type would be naturally reforested within five years after harvest and ten years after the fire. Ponderosa pine and Douglas-fir seedlings would become established following harvest to attain stocking levels at or above 50 to 100 vigorous trees per acre. Species composition of tree seedlings established on the majority of prescribed natural regeneration acres would meet the desired condition for dry forest re-establishment.

Mixed Conifer Forest

Approximately 761 acres in the mixed conifer forest type would be naturally reforested within five years after harvest and ten years after the fire. Tree stocking levels at or above 80 to 100 vigorous trees per acre would be attained during this time. Douglas-fir seedlings would make up an estimated 50 percent of stocking re-established in natural regeneration units. Ponderosa pine and western larch seedlings combined would make up an estimated 30 percent of expected regeneration and lodgepole pine would comprise about 20 percent of expected stocking. Species composition of tree seedlings established on the majority of prescribed natural regeneration acres would not meet the desired condition for mixed conifer forest re-establishment due to the high proportion of Douglas-fir stocking.

Montane Forest

Approximately 683 acres in the montane forest type would be naturally reforested within five years after harvest and ten years after the fire. Tree stocking levels of 200 or more vigorous trees per acre would be attained during this time. Lodgepole pine seedlings would make up an estimated 70 percent of stocking re-established in natural regeneration units. Engelmann spruce, Douglas-fir, western larch, and subalpine fir seedlings would make up an estimated 30 percent of expected stocking. Species composition of tree seedlings established on the majority of prescribed natural regeneration acres would meet the desired condition for montane forest re-establishment. Stand development in harvested montane forest areas would be similar to comparable unharvested areas within approximately 20 years after the Tripod Fire.

Soil Disturbance

Salvage logging would cause soil compaction and displacement that is detrimental to the growth of tree seedlings on some areas where logging equipment operates and log skidding occurs. Post-harvest soil restoration treatments would be implemented where needed to reduce the amount of detrimentally disturbed soil to 15 percent or less of the area in each salvage harvest unit. Refer to Chapter 2 Soil Mitigation Measures and

Design Criteria for details on logging operation requirements to minimize soil disturbance and restoration treatments to facilitate the recovery of disturbed soils. Soil restoration treatments would restore soil productivity and improve soil conditions for seedling growth. Figure 3.5-12 displays the estimated area of disturbed soil that would affect tree seedling growth following the completion of logging and post-harvest soil restoration treatments in Alternative D harvest units.

Figure 3.5-12: Detrimental Soil Disturbance Affecting Forest Regeneration in Alternative D Harvest Units

Reforestation Method	Acres Reforested	Area Affected by Detrimental Soil Disturbance (acres)	Portion of Total Area Reforested
Tree planting	1,930	272	14%
Natural reforestation	1,474	158	11%
Totals	3,404	430	13%

Alternative E

Direct and Indirect Effects

Alternative E is identical to Alternative B, the proposed action, with the exception that dead trees and trees expected to die within one year of project implementation greater than or equal to 21 inches DBH would not be harvested in Alternative E. If Alternative E is selected for implementation, the following forest vegetation management activities would occur on the affected environment for Alternative E:

Salvage timber harvest: 2,748 acres
Tree planting: 1,659 acres
Natural reforestation: 1,089 acres

Salvage Harvest

Alternative E would harvest the same acres as Alternative B with the same logging systems. Figure 3.5-7 displays the forest types that would be affected by proposed forest vegetation management activities. The measurable effects on live tree stocking levels in Alternative E would be the same as Alternative B because only dead trees and fire-injured trees expected to die would be removed in both alternatives.

Tree Planting and Natural Reforestation

Alternative E would implement the same reforestation treatments on the same acres as Alternative B. Reforestation establishment in Alternative E would be the same as Alternative B. Approximately 2.2 more trees per acre that are dead or expected to die would be left standing in Alternative E. Because they do not represent a viable seed source, natural reforestation rates would not be affected. A slightly increased number of microsites would be available when those 2.2 trees per acre fall, but, because of the diameter size (greater than or equal to 21” DBH), they would not be expected to fall until after adequate reforestation has already occurred through natural regeneration or by tree planting.

Soil Disturbance

The measurable effects of soil disturbance that would affect forest regeneration in Alternative E would be the same as Alternative B. Figure 3.5-8 displays the amount of

detrimental soil disturbance that would affect forest regeneration that becomes established following salvage harvesting.

Refer to the discussion of direct and indirect effects of Alternative B provided earlier in this chapter for a detailed description of the direct and indirect effects of Alternative E on forest vegetation.

Cumulative Effects

The spatial boundary for discussion of cumulative effects on forest vegetation conditions is the approximately 38,000 acre Tripod Fire Salvage Project Area. The temporal boundary for cumulative effects on forest vegetation conditions would span from approximately 45 years in the past to approximately ten years into the future when all reforestation activities would be completed in areas deforested by the Tripod Fire. A complete list of past, present, and reasonably foreseeable future actions in the project area is listed at the beginning of this chapter. Only those activities that have or would affect forest vegetation in the project area including timber sales, fuels treatments, the Tripod Fire, Tripod Fire suppression actions, tree planting, and timber stand improvement are considered in this analysis. Other activities mentioned on the complete list would not have measurable effects on the condition of forest vegetation in the project area.

Past Actions

Forest vegetation establishment in areas deforested by the Tripod Fire would not be cumulatively affected by any of the action alternatives of the Tripod Fire Salvage Project. Salvage harvest would affect only dead trees and trees expected to die within one year after the onset of salvage logging, so the seed source for forest re-vegetation would not be affected.

Timber sales and associated fuels and reforestation treatments implemented over the past 45 years have affected forest vegetation in the project area. Timber harvest activities conducted during the 1960s, 1970s, and 1980s focused on the removal of larger diameter trees including ponderosa pines, Douglas-firs, and western larch primarily in the dry and mixed conifer forest types. These partial cut harvest treatments favored the establishment and growth of shade tolerant Douglas-fir understory trees. Stands of small diameter trees with high stocking levels developed on many of these sites following harvest. The Tripod Fire altered the stand structure on former partial cut harvest areas where high and moderate levels of tree mortality were common after the fire. Many timber stands that developed following partial cut harvesting completed during this time period were deforested by the Tripod Fire.

Regeneration timber harvest treatments primarily in the mixed conifer and montane forest types were initiated in the 1980s, became very common by the 1990s, and were implemented at reduced levels during the current decade. Regeneration harvest activities removed the majority of overstory trees in treated stands, and slash burning for fire hazard reduction and reforestation site preparation purposes usually was conducted after logging. Stands of early seral tree species including ponderosa pine, western larch, and lodgepole pine typically were re-established by tree planting or natural seeding in dry and mixed conifer forest type regeneration harvest units. Stands of early and mid seral tree species including Douglas-fir, Engelmann spruce, lodgepole pine, and western larch typically were re-established by tree planting or natural seeding in montane forest type regeneration harvest units. Many plantations of young trees

survived the Tripod Fire, and tree mortality caused by the fire was greatly reduced in regeneration harvest units where fuels had been effectively reduced by slash disposal treatments.

Timber harvest objectives in the project area changed during the 1990s as regeneration treatment levels decreased and partial cutting harvest treatments changed in response to a desire to manage stands of smaller size classes of trees. Partial cutting treatments shifted toward cutting smaller trees primarily in dry and mixed conifer forest stands to improve the health of forest stands and maintain larger trees. Commercial thinning harvest treatments in stands of smaller diameter trees were initially implemented during the late 1990s and have constituted a major portion of project area timber harvesting during the current decade. Commercial thinning treatments reduced tree stocking levels in overstocked stands, maintained larger fire resistant trees, and increased the proportion of desirable early seral tree species including ponderosa pine and western larch in treated stands.

Post-harvest timber stand improvement thinning treatments were implemented in many partial cut and commercial thinning harvest units during the 1990s and the current decade. Post-harvest thinning reduced stocking levels of nonmerchantable small diameter understory trees, including shade tolerant Douglas-firs, to maintain larger overstory trees and increase the proportion of desirable tree species in the understory of treated stands. Post-harvest fuels disposal treatments also were completed on a large portion of logged stands during this time period to reduce wildfire hazards and further restore elements of desired historic stand conditions. A high proportion of harvested and thinned stands that received post-harvest fuels disposal treatments survived the Tripod Fire. Tree mortality was greatly reduced where fuels had been effectively treated by mechanical thinning and slash disposal treatments, including prescribed burning, prior to the fire.

Landscape-scale natural fuels burns completed during the 1990s and this decade affected forest vegetation in the mixed conifer and dry forest types. Prescribed burning affected stand structures by reducing the stocking levels of small diameter understory trees, including shade tolerant species like Douglas-fir. Larger diameter fire resistant trees, including ponderosa pines and Douglas-firs, were maintained in treated stands where competition with understory trees was reduced. Tree mortality attributed to wildfire was reduced in many areas where landscape-scale natural fuels burns had been completed prior to the Tripod Fire.

Tripod Fire suppression activities that affected forest vegetation in the project area include dozer fireline, safety zone, and staging area construction. These actions removed vegetation with heavy equipment and disturbed soil where vegetation was growing prior to the fire. Post-fire rehabilitation treatments were implemented on these areas to restore soil productivity and provide favorable conditions for forest vegetation re-establishment. Forest vegetation on the majority of these affected areas would be naturally regenerated within 10 years after the fire. Tree species composition of natural regeneration would be determined primarily by residual seed sources including seeds remaining on-site after the fire and adjacent live trees.

Present Actions

Previously planned reforestation activities are being conducted on approximately 126 acres of the Methow Valley Ranger District in 2007. Conifer seedlings will be planted in

areas harvested prior to the fire. Portions of these tree planting areas were affected by the Tripod Fire. Pondersoa pine and Douglas-fir seedlings will be planted to re-establish mixed conifer forest stands with the desired tree species mix and maintain ponderosa pines in the project area.

Fuels treatments in the Bear Timber Sale area are planned for 2007 to dispose of slash created by timber harvest activities. These units will be burned for fire hazard reduction and to prepare these areas for reforestation. Lodgepole pine seedlings are expected to regenerate following burning and ponderosa pine seedlings will eventually be planted on these sites to re-establish mixed conifer and dry forest stands with the desired mix of tree species and maintain ponderosa pines in the project area.

A landscape-scale fuels treatment is being conducted in the Ramsey Peak area in 2007 to reduce fuels that have naturally accumulated in mixed conifer and dry forest stands that have not been actively managed for several decades. Prescribed burning will be applied to reduce the likelihood of high severity, stand replacement wildfire in treated stands. Prescribed burning will affect stand structure development by reducing stocking levels of primarily small diameter understory trees that are not fire resistant, including shade tolerant species like Douglas-fir. Fire resistant trees, including larger diameter ponderosa pines and Douglas-firs will remain following prescribed burning. Early seral, fire dependent plant species like ponderosa pine will regenerate in forest canopy openings created by burning. Forest vegetation will acquire elements of long term desired stand conditions and become more resilient to natural disturbance following prescribed burning.

Reasonably Foreseeable Future Actions

Approximately 1,200 acres of timber stand improvement thinning would occur in the project area during the next ten years. Post-harvest thinning of non-commercial sized trees would occur in harvest units treated by the Conger, Danny, and Mutton Timber Sales. Stocking levels of small diameter trees would be reduced to promote the growth and vigor of residual trees in mixed conifer and dry forest timber stands. Stands would be thinned to increase the proportion of ponderosa pine and western larch stocking and maintain or improve the growth of residual trees. Thinning would reduce susceptibility to stress-related tree mortality and promote development of desired future stand conditions including larger trees that are resilient to natural disturbances including, insects, diseases, and wildfire.

The Tripod Fire burned a very large area, creating a substantial effect on forest insect habitat in the fire and project areas. Bark beetle populations affecting lodgepole pine, ponderosa pine, and Engelmann spruce were at outbreak levels for several years prior to fire. Trees that survived the fire will be susceptible to attack by tree-killing bark beetles for up to four years after the fire. Damaged trees that survived the fire provide potential breeding habitat for tree-killing bark beetles. Surveys conducted after the 1988 fires in Yellowstone suggest that bark beetle population levels can increase in fire-injured trees and then spread into uninjured trees (Amman and Ryan 1991 and Rasmussen et al. 1996). Douglas-fir beetle populations in the Tripod Fire and project areas have the greatest potential for buildup in fire-injured trees and subsequent attack and population expansion in adjacent unburned areas (Mehmel 2007). Susceptible host trees in unburned areas located within one quarter to two miles of bark beetle infestations in the fire area could potentially be attacked. Due to the very large size of the Tripod Fire, none of the alternatives or any amount of salvage harvest that could be

practically applied would reduce the likelihood of bark beetle attacks in unburned adjacent forest stands.

Previously planned reforestation activities would be conducted on approximately 317 acres in the Danny and Conger II Timber Sale areas on the Tonasket Ranger District from 2008 to 2010. Ponderosa pine seedlings would be planted to re-establish mixed conifer forest stands with the desired tree species mix and maintain ponderosa pines in the project area. Approximately 7,500 acres of tree planting in deforested areas outside of proposed salvage harvest units would occur over a five year period beginning in 2007 and ending in 2011. Tree planting would occur on an estimated 1,100 acres of dry forest, 3,300 acres of mixed conifer forest, and 3,100 acres of the montane forest type located outside of salvage harvest units where the residual seed source is not adequate to naturally reforest these areas within ten years after the fire. Planting these areas would ensure that desired tree species, including ponderosa pine, western larch, Engelmann spruce, Douglas-fir, and lodgepole pine, would become established at seedling stocking levels needed to attain desired forest vegetation conditions following the fire.

Summary

Other past, present and reasonably foreseeable future actions listed at the beginning of Chapter 3 do not affect forest vegetation. The cumulative effects of Alternatives B, C, D and E and the effects of all past, present, and reasonably foreseeable future actions discussed above (particularly the Tripod Fire) would be the re-establishment of adequate forest vegetation within the project area. Tree planting would be implemented on approximately 9,800 acres of land affected by the Tripod Fire. Tree planting would ensure that forest vegetation is re-established within ten years after the fire on approximately 26 percent of the Tripod Fire Salvage Project Area. Forest vegetation on the remaining 74 percent of the project area would be left to naturally recover following the fire. Tree planting would affect tree species composition and stocking levels of reforested areas, greatly increasing the likelihood that desired forest stand conditions would develop following the fire. Approximately 1,700 acres in the dry forest type would be reforested by tree planting to establish the desired tree species mix (primarily ponderosa pine) for stand re-establishment. This figure represents about 40 percent of the dry forest type in the project area. Approximately 4,700 acres of mixed conifer forest would be reforested by tree planting to establish the desired mix of predominantly early seral tree species (ponderosa pine and western larch) for stand re-establishment. This figure represents about 42 percent of the mixed conifer forest type in the project area. Approximately 3,400 acres of montane forest would be reforested by tree planting to establish the desired mix of early and mid seral tree species (Douglas-fir, Engelmann spruce, western larch, and lodgepole pine where needed) for stand re-establishment. This figure represents about 15 percent of the montane forest type in the project area. The remainder of the project area either would not require reforestation or would be naturally reforested.

CONSISTENCY FINDING

Forest vegetation management activities proposed in all action alternatives including salvage harvest and reforestation are consistent with the Forest Plan and the National Forest Management Act 1976. This salvage project is not subject to the Eastside Screens Interim Ecosystem Standards because it is located outside of currently maped

old growth. This project is consistent with the Regional Forest Amendment #2 (Eastside Screens) Interim wildlife Standard, Scenario A,1) because the Tripod Fire Salvage project is not located in stands with LOS. The project is consistent with Interim Wildlife Standard, Scenario A, 2c, because reforestation stocking survival would be similar to natural regeneration, allowing open, park-like stand to develop where this condition occurred historically.

Salvage timber harvest is a silvicultural activity that is authorized by the National Forest Management Act 1976 (NFMA), including its amendments to the Forest and Rangeland Renewable Resources Planning Act of 1976, as one permitted response to “natural uncharacteristic conditions such as fire, insect and disease attack, or windstorm”.

The Forest Plan permits salvage timber harvest in seven of the eight management areas in the Tripod Fire Salvage Project Area. Salvage harvest would occur only where it is permitted without conditions, including Management Areas 5-Roaded Recreation, 12-Lynx Habitat, 14-Wildlife Habitat, 25-Timber and Range, and 26-Deer Winter Range. Salvage timber harvest would not occur in Management Areas 4-Unroaded Recreation, 8-Research Natural Area, 17-Developed Recreation, or PACFISH Riparian Habitat Conservation Areas.

The NFMA states that when trees are cut to achieve timber production objectives, the cuttings shall be made in such a way that “there is assurance that such lands can be adequately restocked within five years after harvest”. U.S. Forest Service Northwest Regional Office direction also includes this standard. All proposed salvage timber harvest units where there is not an adequate residual seed source for natural regeneration would be planted to ensure that they would be adequately restocked within five years after harvest. All proposed salvage timber harvest units where natural reforestation is the prescribed treatment to re-establish forest cover would be monitored to ensure that adequate restocking is achieved within five years after harvest. Tree planting would be conducted as needed in prescribed natural reforestation units to ensure that adequate stocking is achieved within five years after harvest.

Reforestation proposals for tree planting and natural reforestation would be consistent with Forest Plan standards and guidelines for reforestation activities in all management areas where timber harvest is permitted. Natural regeneration would be the reforestation method employed in areas where lodgepole pine was present prior to the fire. Natural regeneration would used in the Mixed Conifer Working Group where there is an adequate seed source to achieve adequate and timely reforestation. In harvest units where natural reforestation is the prescribed treatment, areas where natural regeneration has not become established within five years after harvest would be planted. Natural reforestation and tree planting treatments would provide for the establishment of mixed species stands.

Proposed reforestation treatments would be consistent with Forest Plan standards and guidelines for Management Areas 12-Lynx Habitat, 14-Wildlife Habitat, and 26-Deer Winter Range. Reforestation activities in MA12 would not convert lodgepole pine stands to other tree species. Reforestation activities in MA14 and MA26 would be designed to establish stands of forest vegetation where western larch comprises 20 percent or less of total stocking.

3.6. Plant Communities

The section below is a summary of the Plant Community Fire Response Report (Ohlson 2007a) available in the project analysis file.

REGULATORY FRAMEWORK

The objective of Forest Service Manual (FSM) 2620.2 habitat planning and evaluation is to provide habitats to meet goals and objectives for wildlife and fish, including endangered, threatened, and sensitive animal and plant species set forth in land and resource management plans. Specific to this objective is to: 1) Integrate habitat planning into land management and project plans to meet National, Regional, and local objectives for wildlife and fish, including threatened, and endangered and sensitive animal and plant species; 2) Provide a sound base of information to support management decision-making affecting wildlife and fish, including endangered, threatened, and sensitive animal and plant species, and their habitats; 3) Identify opportunities and management strategies to maintain and improve habitats throughout the National Forest System.

Under FSM 2670 the Secretary of Agriculture's Policy on Fish and Wildlife Departmental Regulation 9500-4 directs the Forest Service to manage habitats for all existing native and desired nonnative plants, fish, and wildlife species in order to maintain at least viable populations of such species. The Secretary's policy also requires the Forest Service to assist in identification and recovery of Threatened and Endangered plant and animal species and avoid actions which may cause a species to become listed.

In 1995 the Forest Service established the *Regional Forester's Forest Plan Amendment #2, Interim Management Direction Establishing Riparian, Ecosystem and Wildlife Standards for Timber Sales* (USDA Forest Service 1995a). This amendment is otherwise known as the Eastside Screens. It was established to ensure projects within a given biophysical environment were within their historical range of variability and proposed activities would maintain or encourage historical vegetation patterns and species viability. Fire salvage activities are not subject to the ecosystem standard, but they are required to meet the wildlife standards. Information on those standards is given in the wildlife section earlier in this chapter.

ANALYSIS METHOD

Data used in this analysis are derived from the Pacific Northwest, Region Six, Area Ecology programs plant association modeling, 1994 satellite imagery classification, and previous project field surveys, local knowledge of the ground and post-fire site visits. These sources, in addition to an extensive literature review, utilize the best available information and science. Accuracy of the modeled data is between 60 percent and 75 percent. These data are best used for large scale trends because they are unable to accurately depict fine scale differences across a landscape setting and are not intended for making site specific recommendations. It is the best available data that can provide comparisons of existing conditions across the Tripod Fire area. The Area Ecology data were aggregated into forest types to facilitate analysis. A list of these forest types and associated plant association groups can be found in Appendix F and Lillybridge et al.

1995. Because of imperfections in the GIS analysis process, the acres displayed may be slightly different than what are reported elsewhere, but the ability to infer trends will not be affected by these slight differences. The slight changes that may have occurred in some proposed units are typically reductions, so this analysis will be conservative in assessing vegetative recovery throughout the project area.

Burn severity, as used in this analysis, is derived from satellite imagery taken on September 11, 2006 and classified based on Burned Area Reflectance Classification (BARC) technology with field validation. Initial studies have found the BARC products to be much more indicative of post-fire vegetation conditions than soil conditions. Overall accuracy of this classification is between 50 percent and 60 percent with a tendency to slightly over estimate high severity burn areas (Bobbe et al. 2001, Hudak et al. 2004). This tendency to over estimate high severity burn areas was also observed in the field (personal observation of the author). The BARC map had four severity classifications while the Burned Area Emergency Response (BAER) map was condensed to three. Definitions of severity levels, as used in this analysis, are derived from the BAER assessment and can be found in the glossary and section 3.4 Soils. The BARC "Low to Very Low" severity category includes unburned areas. For this analysis it is included in with the "Low" severity definition defined in BAER. Combining these two severities creates a more conservative definition of post-burn conditions.

Wetland data were derived from the US Fish & Wildlife and Dept. of Interior publication *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et al. 1979). This publication is the basis for the wetland classification found in the Forest GIS library that was used in this analysis. Past use of these data has proven to be accurate and is likely the most reliable data being used in this analysis.

This analysis will address effects on the 163,669 acres burned by the Tripod Fire on National Forest System lands, with a focus on the approximately 38,278 acres constituting the project area. Recovery over the next 30 to 50 years will be assessed. For a list of the scientific and common names used in this document, refer to Appendix F Scientific and Common Plant Names.

AFFECTED ENVIRONMENT

Successional Processes

Approximately 85 percent of the project area is classified as forested type using the 1994 satellite imagery cover type classification. All of the proposed activities would occur within this area, which represents 22 percent of the entire fire area. Figure 3.6-1 shows the distribution of fire severity within each forest type. Dry Forest types historically experienced the lightest severity burns. With increasing elevation there is typically an increase in moisture, so fire return intervals become longer, fuel loads become higher, and fires increase in severity. This results in an increase in the amount of higher severity fire effects seen across the landscape as the forest habitat transitions from Dry to Mixed Conifer Forest and then into the Montane Forest. The fire severity observed within each forest type is not unexpected, given the fire regimes for these areas (Chapter 3.10 Fuels). However, the size of the fire is different from the natural variation within these fire regimes. Prior to effective fire suppression around 1900, fires burned with similar severity, as described above, but typically were much smaller in size.

In the dry forest and mixed forest types in the Twentymile Planning area, the mean pre-fire suppression era (1660-1889) fire size was 1,502 acres (Schellhaas et al. 2003). The largest fire recorded during this period was 6,749 acres. In the subalpine forests, fires were stand replacement in nature and typically ranged in sizes from a few acres to well over 7,000 acres. Prior to the fire suppression era, it is suspected a mosaic landscape structure was maintained mainly by the smaller fire events.

With effective fire suppression, forest succession led to more complex forest structure with an increased homogeneity in forest cover. This in turn has led to the increased potential for larger fires when they occur. Smaller fires provide fuel breaks for subsequent fires for at least 30 years, as well as provide a potential seed source to recolonize adjacent burned areas. This was evident when the Tripod fire reached the old burns such as the 1970s Forks Fire, Thirtymile Fire, Thunder Fire, and Isabel Fire. Young clearcuts, and wet meadows were effective in slowing or stopping fire spread in the moist Douglas-fir and subalpine habitats. These areas made up the largest percent of the unburned islands left in the Tripod fire area (personal observation by author).

Post-fire conditions appear to be within the natural range of variability. When a plant community is within its natural range of variability, post-fire conditions would allow a predicable successional sequence of community development to take place. However the large scale of the fire may have created less of a mosaic pattern that may slow post-fire vegetative recovery. Conifers, in particular, would likely be slower to recover to pre-burn conditions where seed sources are limiting and burn severities are highest. In the Bitterroot Mountains, natural conifer seedling regeneration was very poor following fire, unless live seed bearing trees were within 200-300 feet of an area. Lodgepole pine was an exception and showed adequate natural regeneration across 75 percent of its pre-burn area and in Yellowstone adequate seedlings were established in 5 to 6 years post fire to replace the lodgepole stands (Kolb 2007, Baskin 1999).

In the Tripod Fire, 23 percent of the area was classified as High severity. In the project area, 18 percent was classified as High severity. High severity burn areas will be the slowest to recover, taking several years longer, sometime nearly a decade or more, for re-establishment of herbaceous perennials and possibly decades for the woody species to re-appear compared to the Low and Moderate severity burn areas.

Most plants found in the fire area have some adaptation to survive fire. Plant community development (succession) following fire disturbance is dependent on a plants adaptation to be a survivor, residual species that return from on-site seed, or colonizers from off-site sources. Post-fire survivors are the most important species for achieving community recovery. On the Sundance Fire in Idaho, nearly half of the first year post-fire flora was comprised of survivors, followed by off-site colonizers, then residual seed sources. Even in severe burn areas nearly 60 percent of the species composition originated within the burn. After 10 years, survivors still made up the largest group of species (Stickney 1986). Most species in the fire area have at least a low to moderate resistance to fire, however they will readily recover in all but the highest severity burns. The dominant species found in the fire area that are susceptible or easily killed by fire are: twinflower, lodgepole pine, spruce, and subalpine fir (Powell 2000a, Volland and Dell 1981).

In a forested community the tree layer is the most dominant ecologically across all fire regimes. As the understory shrub composition increases within a forested plant association, there is usually a corresponding increase in the fire return interval for the

site. The grass-forb dominated ponderosa pine forests have the most frequent fire return intervals and support the least amount of shrub cover, while forests with the longer fire return intervals have a well developed shrub component such as seen in the Douglas-fir/Cascade azalea plant association. After a high severity fire, succession restarts from bare ground with a flush of herbaceous growth that can dominate the site for 20 or more years. This is because longer fire free periods are needed for a well developed shrub layer to establish. With higher severity burns it can take between 15 and 30 years for the shrub layer to re-establish to pre-fire levels. Spring and fall burning conditions stimulate shrub recovery, but the more severe summer fires will restrict shrub development leading to longer recovery times (Noste and Bushey 1987). Most conifers begin to re-gain dominance in the overstory at about 30 years and will remain the dominant species until the next disturbance event. All species establish at approximately the same time after disturbance in this initial floristics pattern of succession.

Forest structure and plant community development is directly related to how well individuals can capitalize on the post-disturbance environment (Powell 2000a). When a site is successfully revegetated the plants will also provide soil protection. A site is considered fully recovered when there negligible soil loss which corresponds to at least 60 percent plant and litter cover (Robichaud et al. 2000). In a northeastern Oregon study, nearly all plant communities examined, had at least a 25 percent plant cover within 5 years of a high severity fire for all plant associations. Bryophytes also appear to play an important role in post-fire landscapes and will often be the first thing to colonize a site, particularly after higher severity burn events (Johnson 1998). Bryophytes, such as mosses, lichens, and liverworts, are an important contributor to the development of soil cover, and can quickly develop and become widespread even when uncommon immediately after a fire and will persist for at least four years. Successful natural recovery of native grasses and forbs can occur across the post-fire landscape with as few as one or two surviving plants per square meter (Evers 2005). In nearly all forest types there would be an increase in species richness early on as shade intolerant species take advantage of the increased sunlight. These sun-loving species were either dormant on-site species or immigrated from off-site during the herbaceous phase of succession. Hollingsworth (2005) suggests fire exclusion has created homogenous landscapes with reduced species diversity, which may also substantially affect post-fire vegetation recovery following severe fires. Tiedemann and Woodard (2002) found pre-burn plant community composition could not be used accurately to predict the post-burn vegetative community immediately after a burn. Forest type, stand condition, elevation, aspect, and burn severity all influence the post-fire recovery rate and species composition resulting in several years to several decades to achieve complete recovery. Available soil moisture during the first few post-fire years will influence seedling survival and will also determine the overall success of recovery.

In harsh, nutrient poor environments, ectomycorrhiza (EM) fungi play a substantial role in post-fire recovery. Ectomycorrhiza fungi create symbiotic relationships with plants that can reduce plant competition for resources, promote forest recovery, and influence the pattern of plant succession. Disturbances, particularly those that result in the loss of organic matter or introductions of non-ectomycorrhiza host species can greatly limit plant community recovery (Amaranthus and Perry 1994). Surface litter and organic matter in the top 5 centimeters of soil is where 62 percent of the ectomycorrhiza fungi are found in dry mixed conifer forests (Smith et al. 2005). The highest number of ectomycorrhizal roots are generally found in organic substrates, particularly in decayed wood or soil mixtures containing decayed wood and organic matter. When surface organic matter is

removed, remaining decaying logs likely aid in the transition between the previous stand and pioneering vegetation because this coarse wood can contain 25 times more moisture than surrounding soils (Amaranthus and Perry 1994). On dry harsh sites, coarse woody debris and decayed wood are particularly important because these substrates hold moisture during summer dry periods keeping the ectomycorrhiza fungi alive (Wiensczyk et al. 2002).

Many ectomycorrhiza fungi are not host specific and will colonize roots of several species within a community. As a result, the greatest diversity of EM fungi appears to be associated with forest communities with the richest diversity of plant species. Communities with greater species diversity, particularly with mixed tree species, sustain higher species diversity of EM fungi because more plant hosts support a richer diversity of fungi species. Higher fungal diversity is important for tree growth because different fungi species exhibit different characteristics and provide different benefits to the host tree. Ectomycorrhiza communities typically consist of a few dominant species and a relatively large number of infrequent species. So, plant species capable of forming EM fungi associations are important for conifer growth and become vital in post disturbance conifer regeneration. These species are called “refugia” plants or “reservoir host” plants and include: bearberry, Sitka alder, willow, paper birch and quaking aspen. Of these, bearberry could be important in providing necessary inoculum for re-establishing conifers. Research has shown that three years following conifer removal, bearberry maintained a mycorrhizal fungi community similar to that found on Douglas-fir in an undisturbed forest (Wiensczyk et al. 2002).

In addition to “reservoir host” plants, spore production is especially important after a fire that is severe enough to burn organic soil horizons. In ponderosa pine there is an eight fold reduction in ectomycorrhizal biomass when the litter/organic layer is destroyed. Loss of EM fungi resulting from complete consumption of duff also results in poor tree survival and slow forest recovery (Stendell et al. 1999, Smith et al. 2005). Amaranthus and Perry (1994) found 90 percent fewer EM fungi and 44 percent less basal area growth on seedlings grown in clearcut and severely burned soils. Recovery of EM fungi to pre-burn levels is dependent on the surviving “reservoir host” species, colonization of residual species and safe sites by spores. In high severity burn sites in a mixed ponderosa pine/Douglas-fir forest in the Blue Mountains, substantial reductions in EM fungi species richness were still found at a 10 centimeter depth two years after a fire and after three years only 18% of the common pre-burn/harvest species had recovered (Smith et al. 2004, 2005).

Dry Forest Type

Approximately 11 percent of the Tripod Fire Salvage Project area is within Dry Forest type (Figure 3.6-1). Dry forest type can be described as the hot dry Douglas-fir forest plant associations with a dominant ponderosa pine overstory maintained by fire return interval of 5 to 6 years (Schellhaas et al. 2003). Ohlson (1996) determined a similar fire return interval ranging between 7.5 and 7.7 years for the Ponderosa pine - Douglas-fir/Beardless bluebunch wheatgrass plant association on the Methow Valley Ranger District. Douglas-fir is a co-dominant in these forest types and frequent fire events historically maintained an understory dominated by herbaceous species. High frequency and low intensity, low severity fires shaped these open forests by burning the understory and maintained mature ponderosa pine in the overstory. Post-fire vegetative recovery is primarily from surviving plants. Understory vegetation is diverse where stands are open.

Most species are shade intolerant and respond favorably to low intensity burns. Rapid recovery is expected in the low severity burn areas due to residual fire tolerant seeds, resprouting of shrubs, and perennial herbaceous species (residual survivors). Bitterbrush is an important component of most Dry Forest plant associations and will resprout or be killed by fire depending on its age. Young plants readily resprout from root buds when fire severity is light. As bitterbrush ages it accumulates dead basal wood around the root crown, so the older the plant is, the more likely it would be killed by fire. When killed by fire, re-establishment of bitterbrush is from rodent caches and recovery of the shrub layer can take between 15 and 30 years.

In a low intensity burn, sites remain fully occupied. If the soil substrate remains undisturbed, there is little opportunity for invasive or exotic species to establish. Moderate and High severity burn areas experience varying degrees of mortality within the perennial species, increasing the risk for invasive species establishment and off-site species migration. The higher the burn severity the slower the recover to pre-burn conditions may be. Where fire exclusion has resulted in a dense canopy, the understory species composition may have been quite sparse prior to the fire. In these situations, a Moderate severity fire will likely create just the reverse response resulting in a rich composition of sun-loving understory species found commonly in the more open adjacent stands. Moderate and High severity burns create the most favorable conditions for conifer seedling establishment post-fire as well as invasive species establishment.

In the Dry Forest type, 64 percent and 68 percent was Low to Very Low severity in the Tripod Fire and Tripod Fire Salvage project area respectively. Species should respond immediately and favorably to the post-fire conditions (Figure 3.6-1). Moderate severity burn areas should also respond favorably. Very little of the area is classified as High severity, 5 percent and 6 percent for the project and fire areas respectively. These areas will likely be slower to recover to pre-burn species composition as annuals and herbaceous species will play a more important role and longer role in the initial post-fire vegetation re-establishment. Shrub re-establishment will be from seed migration and may take 15 to 20 years (Powell 2000a).

Deciduous Habitat

Aspen

Aspen provide important wildlife habitat, landscape diversity and frequently provide habitat for R6 Sensitive plants, such as *Botrychium ascendens, Botrychium crenulatum. Botrychium lineare*, and *Botrychium penduculosum*. Aspen habitat is uncommon throughout the fire area. On the Forest, it is estimated aspen makes up less than 1 percent of the landscape (Hadfield and Magelssen 2004). In the Tripod Fire aspen and deciduous habitat makes up about 0.3 percent of the fire area and 0.5 percent of the project area (Figure 3.6-2). Even in the greater Yellowstone area where aspen is a key habitat component, aspen only makes up 1.4 percent of the landscape. Throughout the west, aspen is declining due to fire exclusion, long-term ungulate browsing and conifer or shrub encroachment. The cause of this decline is not fully understood.

On the Methow Valley Ranger District, most of the aspen stands are between 2 and 4 acres in size with a small percent of stands being greater than 10 acres. On the Tonasket Ranger District, aspen stands are typically greater than 10 acres. On both districts the majority of the aspen stands are experiencing a moderate degree of conifer competition, stands are retreating in size, with about 20 percent mortality within the

stands, and 100 percent of the stand's suckers are browsed. The small size of many of the aspen stands puts them at risk of being lost, especially from conifer competition. Stands less than one acre are at the greatest risk (Hadfield and Magelssen 2004). The Tripod fire may help to reverse some of these effects because it has eliminated conifer and other vegetative competition in most of the aspen stands.

The Mixed Conifer type, particularly the Douglas-fir/pachistima/pinegrass and Douglas-fir/pinegrass plant associations, was identified as having the highest percent (44 percent) of deciduous habitat in the fire area followed by plant associations mainly on the dry end of the Montane Forest (32 percent), and Dry Forest (14 percent). Seven percent of the aspen was in Alpine Krummholz habitat and another 3 percent was in Wet Spruce/horsetail habitat.

Within the fire area 59 percent of the deciduous habitat shows a Low to Very Low severity burn and in the project area it is 69 percent. Understory recovery in these Low severity burn areas should be rapid providing the overstory aspen canopy has been killed and competing understory vegetation is reduced. Aspen stands experienced Moderate severity burns in 26 percent and 35 percent of the project and fire areas respectively. These areas likely will have the greatest potential for successful and rapid regeneration because the areas burned with sufficient severity to kill the overstory aspen and reduced more of the competing vegetation than in a lower severity burn. Six percent of deciduous habitat in both the project and fire areas experienced a high severity burn. This will initially slow aspen recovery if there has been damage to residual root buds, but surviving roots will respond with a longer period of post-fire sucker production. Vegetative competition could slow, reduce density, or eliminate aspen recovery, particularly if pinegrass is a common understory associate (Bartos et al. 1994, Peterson and Peterson 1995). Post-fire pinegrass recovery of a northeast Oregon Douglas-fir/pinegrass plant association experienced a 50 percent increase in pinegrass cover over pre-burn conditions five years following a moderate severity fire (Johnson 1998). If this increase in pinegrass occurs within recovering aspen stands, full recovery of the stand could be compromised.

Changes in species composition within aspen stands also drive changes in soil properties which increases the risk of stand loss. With increase in conifers there is a decrease in aspen leaf litter which leads to decrease in the organic matter accumulation, decrease in soil water holding capacity, and a decrease in soil pH. The loss of soil water holding capacity reduces the available water for existing plant growth thus shifting the plant community composition to one more tolerant of the changed soil chemistry and drier soil conditions (Bartos and Amacher 1998).

In the post-burn landscape aspen stands are likely to respond vigorously to the reduced vegetative competition and increased soil temperatures. Aspen roots are found within the top 7 to 12 centimeter of soil and lateral roots can extend 30 or more meters from the parent stem. When fire-blackened soil surfaces cause soil temperatures to exceed 15° C, aspen suckering is enhanced (Peterson and Peterson 1995). Expansion of existing clones is the likely result, especially if all the overstory aspen are fire-killed and no apical dominance remains to suppress suckering. Where fuel loads are high resulting in higher burn severities, substantial damage to stand roots can occur due to the shallow nature of aspen roots. However, Bartos et al. (1994) found that moderate to high severity burns initially resulted in lower sucker production but were better at stimulating sucker production for long periods. The higher severity burns are also less favorable for

grass, forb, and shrub recovery. It is the reduced post-fire competition that appears to favor aspen suckering.

The rate at which aspen clones recover from disturbance is dependent on the time it takes to regain clone vigor, root bud stimulation, and reallocation of energy to clone growth. Removal of mature aspen trees provides 1 to 3 years of carbohydrate root reserves for sucker recruitment and it takes 3 to 9 years for sufficient sucker densities to be reached to ensure stand establishment. By year 4 a typical aspen clone will have reached a height of 1.4 meters in height.

Expansion of existing clones after disturbance can be substantial if the lateral roots are present. Shepperd (2001) found after removing the competing conifers from two individual trees in close proximity, the clone expanded to 0.1 hectare in size within 4 years. Similar expansion rates could be expected in the Tripod post-fire landscape where lateral roots are already present and moisture is sufficient for growth. However, expansion would likely be limited if the lateral roots are not already established (Hadfield 2007)

Aspen produce seed, but establishment of new clones is rare. Burned sites provide two of three factors critical for seedling establishment: a suitable blackened soil substrate and an area lacking competition. The third and most critical factor is cool moist summer weather during germination. Unless the four to six summers following the Tripod Fire are unseasonably cool and moist, establishment of new aspen stands from seed is unlikely. As a result of this, in combination with expected warming climate trends and declining aspen levels on the Okanogan and Wenatchee National Forests and throughout North American, the importance of protecting aspen clones and enhancing aspen recovery is heightened.

Cottonwood and Alder

Cottonwood and alder are also grouped with aspen in the satellite imagery, although aspen is the dominant deciduous species found across a wider variety of habitats. Cottonwood and alder are only found in riparian areas with the major concentrations of cottonwood being found along major rivers in the valley bottoms.

Cottonwood and alder are commonly associated with aspen as the transition habitat between water's edge and drier uplands. Cottonwood seed establishment potential increases with increased soil moisture along floodplains; fresh alluvial bar deposits of fine sands and silts increase seedling establishment. Like aspen, cottonwood is intolerant of fire and is killed easily. However, unlike aspen, cottonwood rarely sprouts from residual roots post-fire and early to mid seral stages of cottonwood in areas with high water tables do allow some basal sprouting (Kovalchik and Clausnitzer 2004). Cottonwood is a minor component of upland riparian areas and found mainly along major drainages such as the Chewuch and the main stem of Boulder Creek. Seedling recruitment is the main mechanism for regeneration. The seed is small and easily transported by the wind and water for long distances. The increased in-channel water flows that will be triggered by the lack of upland vegetation evapotransporation should provide a good seedbed for cottonwood germination.

Alder is commonly found along stream edges and is usually not the dominant overstory species in riparian communities. It is a vigorous basal sprouter following disturbance and will likely respond favorably to fire disturbance.

Mixed Conifer Forest Type

Approximately 46 percent of the Tripod Fire Salvage Project area is in Mixed Conifer forest type. Conifer forests are transitional between the Dry Forest habitat with its high frequency, low intensity, low severity fire regime dominated by ponderosa pine and the Montane Forest habitat with its dense canopy subalpine fir and lodgepole forests that experience long fire-free periods and stand replacement fires. Mixed Conifer forest types are typically found mid-slope and fires are of mixed severity. The post-fire landscape is typically a complex mix of patches of different severity burns, including low severity underburns, moderate severity burns where one-third to two-thirds of the vegetation is killed, and high severity where almost all the vegetation is killed (Agee 2004). The variations driving this mix are forest composition, elevation, aspect, slope, and landscape structure. Lower elevation forests and south aspects experience the lightest severity fires with shortest fire return intervals. Higher elevations and north aspects have higher severity fires with longer fire free periods. Taylor (2004) reported fire return intervals ranging from 41 to 70 years in mixed forest habitats and Schellhaas et al. (2003) reported a fire return interval of 43.4 years for the North Twentymile area in similar Mixed Conifer types.

The Mixed Conifer Forest type showed nearly equal amounts of Low and Moderate severity burn across the landscape demonstrating the Tripod fire burned in a similar complex pattern as work presented by Agee (2004) and Taylor (2004) (Figure 3.6-1) and the post-fire landscape is within the natural variation expected for this forest type . Mixed Conifer forests include the cool dry to cool mesic Douglas-fir plant associations (Lillybridge et al. 1995). More shade tolerant species dominate the understory and the shrub layer is typically more diverse than in the Dry Forest types. Pinegrass is typically the dominant grass species. It is rhizomatous and well adapted to fire disturbance and typically only sets seed after a fire disturbance. Shiny leaf spirea is also a prominent species in the Mixed Conifer forests. It is highly resistant to fire due to its fibrous roots and rhizomes that are located below the mineral soil surface which provides extra insulation from fires' heat. Post fire resprouting is usually prolific with shiny leaf spirea. Pachistima resprouts from the root crown and has a deep tap root drawing resources from deep in the soil profile to aid in rapid recovery of the species. Douglas-fir, western larch, and ponderosa pine are also highly adapted to survive fire and typically survive low to moderate severity fires. Those individuals that survived past fire events are typically scattered, tall, old relicts that tower over a younger, even aged canopy.

At the cool mesic end of the Mixed Conifer forest types, huckleberry becomes the dominant understory species depicting the transition into a cooler moister habitat. Along with the shift in understory species to huckleberry, there is an increase in lodgepole pine as elevations increase and aspects shift. Fire return intervals lengthen which favors early seral lodgepole pine. This adds to the complex burn severity seen in this forest habitat as fuel type, aspect and elevation create important environmental and fuel gradients that influence fire frequency and behavior (Taylor 2004).

Along with pinegrass, both dwarf and low huckleberry are rhizomatous and will typically respond favorably by resprouting from underground roots after low and moderate severity burns. On higher severity burns, recovery can be slow often exceeding 10 to 14 years to reach pre-burn levels, while under low severity burn conditions, pre-burn biomass of huckleberry can quickly exceed pre-burn levels (Tirmenstein 1990). In

Douglas-fir forest types in the Bitterroot NF, vegetation recovery was highly variable but high severity burn patches still had less than 20 percent cover three seasons post-fire, suggesting high severity sites require more time to recover than lesser severity burn sites (Hollingsworth 2005).

Montane Forest Type

Approximately 43 percent of the Tripod Fire Salvage Project area is in Montane forest type. Montane Forest types include the moister plant associations in the cool mesic Douglas-fir and all the Subalpine fir plant associations. These associations are primarily found on cooler north aspects and at higher elevations. Lodgepole pine is the dominant early seral species on most sites. At lower elevations and drier aspects Douglas-fir, western larch, and occasionally ponderosa pine are often the early seral species. Fire return intervals are longer and burn severities higher than for the Mixed Conifer forest type and mainly stand replacing in nature. Fire severity patterns vary with pre-burn cover type and the greatest proportion of moderate and high severity burns are associated with lodgepole pine cover types (Taylor 2004).

Those associations with a dominant component of grouse huckleberry (*Vaccinium scoparium*) represent the coldest, harshest sites to revegetate and those with pachistima (*Pachistima myrsinities*) represent the warmest and driest associations where ponderosa pine can be co-dominant in the stand (Lillybridge et al. 1995).

The highest percent of Moderate and High severity burn is in the Montane Forest type. In addition to the higher severity burn effects on vegetation, recovery rates would likely be slowest in these forested plant associations due to the higher elevations and shorter growing season.

Lodgepole pine plays a key role in post disturbance succession in Montane forest types. After the 1988 Yellowstone fires, lodgepole pine seed was sufficient to establish enough seedlings to replace the stands at even the highest elevations within 5 to 6 years. Similar results are expected throughout suitable lodgepole pine habitat in the Tripod Fire, even though much of the existing lodgepole pine was beetle-killed prior to the fire. This is because lodgepole pine will retain serotinous cones for up to 40 years and stored seed will remain viable for 50 to 75 years. Serotiny is also highest in stands between 70 and 300 years old. Schellhaas et al. 2001 established fire return intervals for subalpine fir forests within the fire area to range between 28 and 107 years. Most plant associations in the Montane Forest types rarely had stands over 200 years old, supporting evidence of a fire regime that favors lodgepole pine with high serotiny. The only exceptions to these nearly pure stands of lodgepole pine are the occasional older relict conifers that escaped previous fire events (Lillybridge et al. 1995, Baskin 1999, Turner et al. 2003a).

In general, recovery is rapid and is attributed to surviving perennial forbs, graminoids, and shrubs even where fires were large and severe. Baskin (1999) and Turner et al. (2003b) found mean soil char depth in the severe surface and crown fire areas was less than 14 millimeters, suggesting deeper roots and rhizomes survived the fire. However, 14 years after fire, the effects of post-fire recovery can still be detected. Higher severity burn sites, after 14 years, still had the lowest percent cover of shrubs, forbs, and graminoids, in spite of the fact most of the higher severity burn sites were within 50 to 200 meters of non-burned or low severity burn areas capable of providing a seed source for recolonization.

In central Washington, Tiedemann and Woodard (2002) found something very different in their 1975 fire study. They looked at two successional stages within the subalpine fir forest series. One was a lodgepole thicket about 100 years old and the other was a mature stand about 300 years where subalpine fir and spruce were codominants in the overstory with lodgepole. Their first year post-burn results showed 90 percent of the plots had no plant growth. By the fifth growing season the herbaceous layer showed some signs of establishing. They found as fire severity increased, species diversity decreased and that fewer individuals survived either fire. They believed most of the site recovery was attributed to immigration of seed from adjacent areas and the resulting recovery was slower than anticipated. There were few understory species present prior to the burn (<35 species). Most of the area in this study had grouse huckleberry as a major component of the plant association. Grouse huckleberry depicts the coldest, harshest sites for recovery and is the most susceptible to fire of the major huckleberry species found in subalpine fir forests.

Weather may have played a role in the post-fire recovery differences between the eastern Washington study and the 1988 Yellowstone fires. The years following the Yellowstone fires were thought to be wetter than the historical norm given the abundance of aspen seedling establishment (Baskin 1999). The years following the central Washington study were very dry across all of eastern Washington and this may have influenced post fire recovery (Ohlson 1996). The central Washington sites were also harsher site conditions over all.

Huckleberry species are an important component in the Montane Forest plant associations. Grouse huckleberry is the most prominent species along with big, and dwarf huckleberries in the Tripod Fire. Both big and dwarf huckleberry have low to moderate resistance to fire and are thought to respond favorably to low and moderate severity fires. They are survivors which recover post-burn via rhizome and axillary root buds. Their resistance to fire is a function of the depth of their rhizome. Grouse huckleberry rhizomes are shallow and located between the duff and mineral soil layer. It is easily killed following moderate to high severity burns where duff consumption is high. Initial declines in cover are typical and where rhizomes survive a fire event, grouse huckleberry can recover in as little as 5 years.

Underground rhizomes of dwarf huckleberry generally survive all but the most severe fires. Rhizomes of dwarf huckleberry can resprout from depths of 0.24 to 1.2 inches. Underground portions of dwarf huckleberry can survive most light to moderate fires. The relatively shallow rhizomes may be killed by hot duff-reducing fires and recovery may take more than 14 years for dwarf huckleberry to recover. However, the widespread representation of dwarf huckleberry in many post-fire communities suggests that it is capable of surviving many, if not most, fires (Tirmenstein 1990).

Big huckleberry has both shallow and deep rhizomes. Following high severity fire, it can sprout from rhizomes at depths of 3.5 to 6 inches giving it the best adaptation to survive higher severity fire events. In general, big huckleberry is slow to recover from moderate to high severity fire but is more likely to survive higher severity fire events due to the depth of its rhizomes. Big huckleberry typically takes 3 to 7 years to recover from low to moderate severity fire. After high severity fires, it takes much longer with little recovery seen after 4 years and 15 to 20 years before species re-establishes to post fire levels (Simonin 2000).

Gucker (2005) looked at revegetation after logging and fire in central British Columbia in a subalpine fir/Sitka valerian-oak fern (*Abies lasiocarpa*/*Valeriana sitchensis*-*Gymnocarpium dryopteris*) plant association. This is a cool wet plant association not found in our area, but may share some post-fire recovery similarities with riparian areas in the Montane Forest habitats. Many of the associated species in this study are also common in the Montane Forest plant associations. Gucker's research suggested that subalpine fir forest vegetation tolerates logging and fire, but recovery rates are slow for many species. Multiple disturbances created herb-dominated communities initially, but by the 11th post disturbance year woody vegetation increased in importance. Species richness increased following fire in this area, suggesting that fire may be important to maintaining diversity in the area. Big huckleberry dominated the shrub regrowth on burned sites. If the wet sites in the Montane Forest habitats respond similarly, species recovery is likely to be achieved within the decade.

Engelmann Spruce and Wetland Habitats

Approximately 5 percent of the project area includes Engelmann Spruce forest, wetlands and subalpine fir/Cascade azalea plant association. Engelmann spruce forests and spruce wetlands typically experienced moderate to high severity fire due to the heavy fuels and abundant standing beetle killed overstory conifer. Spruce is easily killed by fire due to its thin bark and shallow roots. Vast acreages burned with little live mosaic pattern to provide a seed source for the recovering landscape. A natural seed source will be a problem due to the expansive nature of the fire and the amount of beetle killed trees in the pre-fire area. Post fire establishment is via wind-dispersed seeds and squirrel caches. Engelmann spruce seed dispersal is typically 300' from the parent tree. This leaves large areas without a potential seed source to recolonize post-burn sites. Seedlings that do become established will begin seed production around 15 to 20 years of age. Spruce is indicative of cool moist sites. Young seedlings are easily damaged by excess solar radiation and require shade and moisture to do well (Kovalchik and Clausnitzer 2004). These sites would be slow to recover due to the limited seed availability within the burn area.

Designated wetlands typically would not burn or would experience a low to very low severity burn because of their high moisture content. Standing bug-killed spruce and lodgepole were abundant throughout the fire area, even in association with the wetlands. The fire conditions, during the Tripod Fire, were sufficient to burn the standing dead and live trees within the wetlands in many cases but left the understory vegetation only singed. In other instances, only the wetland margins burned with occasional single tree ignitions in the interior of the wetlands (personal observation by author). Where tree involvement was low, a Low to Very Low severity burn classification would be expected. In the Tripod Fire, 46 percent of the wetlands experienced a Low to Very Low severity burn. Another 46 percent of the wetlands within the fire area experienced a Moderate severity burn and these areas a greater percent of the conifers would have burned. In a Moderate severity burn, there was entire or nearly entire consumption of all above ground vegetation. But because of the wet nature of the soil, underground plant parts were typically not damaged and immediately began to resprout (personal observation of the author). Full and rapid recovery of these habitats is expected.

The Subalpine fir/Cascade azalea plant association is often associated with wet, frosty sites. Spruce is a long-lived seral dominant on these sites. With conifer removal these

sites can convert to wetlands on the gentler, wetter microsites. On the drier portions of the habitat, shrub recovery can compete strongly with tree regeneration where burn severity is moderate to low. Following fire, Cascade azalea and grouse huckleberry are slow to recover, particularly on higher severity burn areas resulting in slower recovery to pre-burn composition (Lillybridge et al. 1995).

Alpine Habitat

Alpine habitats generally occur above treeline, but can support a few trees frequently scattered in small islands across a mostly alpine meadow habitat. Alpine parkland habitats are treeless habitats. The Alpine Krummholz habitat includes the near-treeline forests comprised of whitepark pine, subalpine larch and subalpine fir or a mix of these species and are generally open forest habitats. These forested plant associations are shaped by mixed severity fire events (Siderius and Murray 2004). Krummholz conifers grow in dense islands at treeline in an otherwise open habitat so when these islands do burn it results in a high severity burn patch. They are often “Krummholz” in growth form when occurring at or above treeline. Except for the forested plant associations, most of the habitat is comprised of open meadows that do not support heavy fuel loads. These high elevation cold habitats typically do not support high severity fires, except where there are dense pockets of trees interspersed with or bordering alpine habitats. In northeast Oregon, whitebark pine and mixed whitebark pine subalpine fir plant communities were revisited six growing seasons post-fire. Moderate to high severity burns were experienced on 6 of the 7 plots where nearly all the trees were killed. Shrubs had resprouted only weakly after six growing seasons and herbaceous vegetation still dominated. Most species present were part of the community before the fires with the exception of off-site colonizers such as fireweed. Few conifer seedlings were observed. Where sites experienced low severity or were only lightly burned the main effect was a loss of younger trees in the community (Johnson 2007). Even though most of these plants have adaptations to survive fire, full recovery will be slow due to the harsh environment associated with these habitats. Clark’s nutcracker seed caches are the primary mechanism for seed dispersion of whitebark pine. These birds will cache seeds up to 25 km from a seed source, however, full recovery may well exceed 75 years since whitebark pine does not reach reproductive age until around 75 years.

Figure 3.6-1: Fire Severity within Forest Types by Fire Area and Project Area

Forest Type	Tripod Project Area Percent Burn Severity				Forest Type	Tripod Fire Area Percent Fire Severity			
	Very Low	Low	Mod	High		Very Low	Low	Mod	High
Dry Forest 11%	18	50	27	5	Dry Forest 4%	14	50	30	6
Mixed Conifer 46%	15	36	37	12	Mixed Conifer 27%	14	31	37	18
Montane Forest 43%	9	23	41	27	Montane Forest 59%	14	19	39	28
Alpine Krummholz Trace%	12	13	62	13	Alpine Krummholtz 10%	15	18	53	14
Alpine Parkland 0%	0	0	0	0	Alpine Parkland Trace %	75	14	11	0
Total Ac	**38,378**				**Total Ac**	**163,669**			

Figure 3.6-2: Unique Habitats And Potential Post-fire Habitat Changes

Unique Forest Type	Tripod Project Area Acres	Tripod Fire Area Acres	ALT B & E Acres	ALT C Acres	ALT D Acres
Designated Wetlands	234	1796	0	0	0
**Spruce-Horsetail wetlands	341	1309	5	0	24
**Engelmann Spruce Forest	394	1922	22	17	28
*Deciduous & Deciduous Conifer Mixed Forest	195	471	15	15	15
**Subalpine fir/Cascade azalea Plant Association w/ Potential for Wetland Conversion w/ Conifer Removal	998	11345	1	0	2

*Deciduous represents aspen, cottonwood, alder, or a combination of these species.
** These types of habitat may have existed prior to the fire or may develop as a result of the fire. This Table shows the likelihood of encountering acres within proposed units by alternative. Any wetlands or wetland conversion areas would be excluded from treatment using PACFISH RHCA buffer widths.

Figure 3.6-3: Alternative Comparison of Percent Burn Severity by Forest Type

	ALT B & E	ALT C	ALT D
Dry Forest	**22% (605 ac)**	**26% (584 ac)**	**18% (613 ac)**
Very Low	19% | 115 ac	19% | 111 ac	18% |110 ac
Low	37% | 224 ac	37% | 216 ac	38% | 233 ac
Moderate	38% | 230 ac	38% | 222 ac	38% | 233 ac
High	6% | 36 ac	6% | 35 ac	6% | 37 ac
Mixed Conifer Forest	**54% (1484 ac)**	**60% (1348 ac)**	**53% (1804 ac)**
Very Low	11% | 163 ac	11% | 148 ac	9% | 162 ac
Low	36% | 534 ac	37% | 499 ac	36% | 649 ac
Moderate	46% | 683 ac	46% | 620 ac	47% | 849 ac
High	7% | 104 ac	6% | 81 ac	8% | 144 ac
Montane Forest	**24% (659 ac)**	**14% (315 ac)**	**29% (987 ac)**
Very Low	10% | 66 ac	15% | 47 ac	8% | 79 ac
Low	26% | 171 ac	35% | 110 ac	25% | 247 ac
Moderate	36% | 237 ac	40% | 126 ac	36% | 355 ac
High	28% | 185 ac	10% | 32 ac	31% | 306 ac
Alpine Krummholz	**0%**	**0%**	**0%**
Alpine Parkland	**0%**	**0%**	**0%**
Alternative Acres	**2748**	**2247**	**3404**

ENVIRONMENTAL CONSEQUENCES

Direct and Indirect Effects

Alternative A – No Action

Under the No Action Alternative there would be no direct effects to the natural vegetative recovery. Species compositions and rates of recovery would pattern historical post-burn recovery rates within a given fire severity and habitat. Most areas would have a full complement of pre-burn species within 5 to 15 years with the conifer component beginning to dominate the vegetative expression within 30 years. Given the size of the Tripod fire, available conifer seed sources to recolonize vast acres of burn may be limiting, particularly for conifers other than lodgepole. Where live seed-producing conifers are greater than 200 to 300 feet from a site, natural regeneration will likely be poor (Kolb 2007). This would result in a longer period dominated by the herbaceous and shrub stages of succession. These forest communities recovered successfully for hundreds of years following similar fire events but are now faced with a wide array of introduced species. Once established, introduced species can displace natives within the community for decades or even indefinitely. An indirect affect to the successful recovery of this fire area, would be the introduction, and further expansion of invasive species. High severity burn areas would be the most vulnerable next to Moderate severity burn areas to off site colonization of invasives and lower elevation habitats are also more susceptible than higher elevation habitats. The vectors of spread would be primarily livestock, off road vehicles, and road corridors (Chapter 3.7 Invasive Species).

All Action Alternatives

Effects of harvest activities in all action alternatives on vegetative recovery over the entire fire area would be minor given the size of this fire. All action alternatives are proposing to harvest less than 2 percent of the fire area: Alternatives B and E, 1.7

percent; Alternative C, 1.3 percent; and Alternative D, 1.9 percent (Figures 3. 6-1 and 3.6-3). At the site level, the higher the burn severity, the longer it will take for vegetation to recover to pre-burn species composition and length of time to full recovery will also increase with increasing elevation. Site-specific effects of harvest activities on floristic recovery result from changes in microclimate and mechanical damage to regenerating plants and soil. In general summer ground-based logging would result in the greatest alteration of these factors, followed by skidding over snow, skyline and helicopter yarding. The lowest amount of damage to vegetation recovery and natural conifer establishment would occur when harvest activities occur soon after fire occurrence (McIver and Starr 2001). Hollingsworth (2005) found no substantial differences in vegetative recovery between unharvested and harvested areas within three years following the fire. Tripod Salvage harvest activities are expected to be completed within a three year period, which would minimize the overall effect to vegetation recovery.

Where harvest activities occur over snow, the floristic recovery of proposed harvest units is expected to be slightly different than documented in the Hollingworth study. The differences in recovery would be primarily associated with skid roads and skyline corridors where repeated disturbance to residual vegetation is likely. Set back in recovery would be localized to these areas. When these activities are considered in the context of landscape recovery, there would be no long-term ecological effect on plant community recovery from the Tripod Fire.

The most High severity burn acres identified for harvest are in the Montane Forest types, which typically experience the highest severity burns. This is followed by the Mixed Conifer Forest type and the Dry Forest type with the least. Where harvest activities overlap with High severity burn acres, floristic recovery would be slower than in either the Moderate or Low severity burn areas. This is because High severity burns will naturally recover more slowly due to greater loss of post-fire survivors and further disturbance of these sites would reduce the overall recovery rate. The rate of recovery on High severity ground would be affected the most by ground-based or tractor systems, followed by skyline, and then helicopter which would have the least effect. Proposed activities in Alternative D would have the greatest effect on recovering vegetation because this alternative proposes harvest of the most acres and more High severity acres compared to the other two action alternatives. Alternative D also proposes the most acres of harvest in the Montane Forest habitat. Nearly 500 acres of High severity ground is identified for harvest in Alternative D of which 300 acres is High severity Montane Forest type. For Alternatives B and E, there are about 325 acres of High severity ground being proposed for harvest and nearly 200 acres is in the Montane Forest type. Alternative C proposes the least amount of harvest in High severity areas with less than150 acres and less than 50 acres are Montane Forest (Figure 3.6-3).

Figures 3.6-4, 3.6-5 and 3.6-6 show a comparison of the amount of High severity ground likely to be included in each alternative. Ground-based operations show the fewest acres of High severity ground being harvested across all alternatives. Alternatives B and D propose harvesting the same number of acres using ground-based equipment and Alternative C the least. Alternative D proposes harvesting the greatest number of acres using skyline operations and Alternative C the least. Alternatives B and E, however, show a greater percent of the skyline acres being classified as High severity despite the overall lower number of acres involved. Alternative D is the only alternative with proposed helicopter units and over 25 percent of these acres are classified as High severity.

Ground-based yarding has the potential to retard vegetation recovery across all burn severities, with skyline logging systems causing a lesser effect. Helicopter has the least effect and would not detrimentally affect floristic recovery even on High severity acres in the short-term. However, the short-term lag in recovery rates across all burn severities and logging systems, when compared to the unlogged areas in the fire, would be minor or undetectable in the long-term. Harvest is expected to be completed within three years post-fire, which would further reduce the potential differences between logged and unlogged areas in the short-term. Within 30 to 50 years no difference in plant community composition between logged and unlogged areas is expected following implementation of any action alternative.

There would be only minor effects to the floristic recovery within any one salvage harvest unit because of the small overall number of acres and small percent of High severity burn within most units. Only four ground-based harvest units show High severity acres covering over half the unit. Eleven skyline units indicate at least half the area is High severity and five helicopter units show at least half the area is High severity (Figures 3.6-4, 5, and 6). Where there are units showing greater than half the ground as High severity, there is a likelihood that recovery could be slower than the adjacent unlogged area in the short-term, perhaps increasing the recovery time to 20 or 30 years. However, the choice of logging systems would help to moderate some of these affects since units with greater amounts of High severity ground would be utilizing skyline or helicopter methods that are less disturbing overall than ground based systems. In the long-term there would likely be no difference seen in floristic recovery between the different logging systems

Figure 3.6-4: Comparison of High Severity Burn Acres Using Ground-based Logging Methods.

Ground-based Units	Unit Acres	Alt. B & E High Severity Acres	Alt. C High Severity Acres	Alt. D High Severity Acres
BL02	9.4	1.5	1.5	1.5
BO08	56.8	7.7	7.7	7.7
BO10	74.0	0.2		0.2
BR02	9.9	5.3		5.3
BR04	18.2	14.6		14.6
BR05	8.5	0.5		0.5
BR10	5.8	3.3		3.3
BR12	11.0	5.5	5.5	5.5
CE01	34.4	3.7	3.7	3.7
CE03	86.5	2.0	2.0	2.0
CE11	26.7	4.0	4.0	4.0
GAQ01	50.6	0.1	0.1	0.1
GA05	44.4	0.1	0.1	0.1
GA06	12.4	0.5	0.5	0.5
HA02	20.1	0.7		0.7
HA04	19.2	0.9		0.9
HA05	44.2	6.4		6.4
HA08	13.7	1.1		1.1
JU08	6.0	4.1		4.1
PE01	13.8	3.8		3.8
PE02	10.3	3.6		3.6
PE04	27.7	6.5		6.5
RA02	131.6	38.3		38.3
RA07	32.1	2.2		2.2
RA09	62.2	14.6		14.6
RA11	46.5	2.4		2.4
RA13	19.7	1.8		1.8
RA15	77.6	9.4		9.4
		145 ac	25 ac	145 ac
Alternatives B & E Ground-based acres = 2,156 7% is High Severity				
Alternative C Ground-based acres = 1,896 1% is High Severity				
Alternative D Ground-based acres = 2,156 7% is High Severity				

Figure 3.6-5: Comparison of High Severity Burn Acres Using Skyline Logging Methods.

Skyline Units	Unit Acres	Alt. B & E High Severity Acres	Alt. C High Severity Acres	Alt. D High Severity Acres
B011	39.4			1.6
BO19	46.3	3.8	3.8	3.8
BR03	7.3	4.9		4.9
BR07	13.9	13.8		13.8
BR09	43.7	36.1		36.1
BR11	8.7	4.6		4.6
BR14	9.1	0.4	0.4	0.4
BR21	8.6			0.1
BR29	10.8	1.9	1.9	1.9
BR30	12.3	8.8	8.8	8.8
CE04	41.7	31.3	31.3	31.3
JU07	45.9	1.7	1.7	1.7
JU11	24.6	1.0		1.0
LI08	8.0	8.0		8.0
LI09	10.8	10.8		10.8
LI10	33.4	28.7		28.7
LI17	5.9	5.0		5.0
LI18	6.5	1.0		1.0
LI19	29.5	9.4		9.4
LI25	21.3	1.3		1.3
LI32	9.7	0.7		0.7
PE05	23.5	0.5		0.5
RA01	66.6	9.2		9.2
RA10	61.6	3.5		3.5
RA18	18.7			1.4
B011	39.4			1.6
BO19	46.3	3.8	3.8	3.8
BR03	7.3	4.9		4.9
BR07	13.9	13.8		13.8
		209 ac	52 ac	214 ac
Alternatives B & E Skyline acres = 591		35% is High Severity		
Alternative C Skyline acres = 351		15% is High Severity		
Alternative D Skyline acres = 716		27% is High Severity		

Figure 3.6-6: Comparison of High Severity Burn Acres Using Helicopter Logging Methods.

Helicopter Units	Unit Acres	Alt. B & E High Severity Acres	Alt. C High Severity Acres	Alt. D High Severity Acres
BR01	31.9			11.3
BR06	14.6			13.6
BR08	29.6			8.2
JU09	77.8			31.6
JU10	10.3			1.0
LI02	52.7			20.2
LI03	18.4			11.9
LI04	9.1			0.1
LI07	7.7			trace
LI16	23.2			20.5
LI20	12.1			8.3
LI24	9.6			0.8
LI47	13.2			7.6
LI48	25.0			2.8
LI49	7.8			1.0
LI54	15.6			2.0
		0 ac	0 ac	144 ac
Alternatives B & E Helicopter acres = 0				
Alternative C Helicopter acres = 0				
Alternative D Helicopter acres = 532			27% is High Severity	

Because Alternative D proposes harvest over the greatest number of acres, involves the most Montane Forest habitat, and High severity harvest acres, there would be the greatest effect to post-fire recovery if this alternative were implemented. However, the differences in effect between Alternative D, Alternative B and Alternative E would be minor because most of the high severity logging areas in Alternative D would be done by helicopter, a low-impact harvest method. Alternative C would have the least effect because it proposes harvest over the smallest number of acres overall and the fewest acres of Montane Forest and High severity acres. Alternative B would treat 354 acres with ground-based or skyline logging methods in high severity burn areas, Alternative C would harvest 77 acres and Alternative D would harvest 359 acres.

Forest Recovery

If harvest activities and post-harvest planting can be accomplished within three growing seasons, sufficient residual ectomycorrhizae should be available to optimize conifer seedling success. If not, wind blown spores from adjacent undisturbed areas should provide sufficient inoculum for post-harvest recovery, but recovery may be slower. Where harvest is proposed in high severity areas, where heat influx into the soil was greater than 5 centimeters, reservoir host plants are limited, and coarse woody debris is reduced in all action alternatives, so recovery would likely be slowest particularly for conifer re-establishment.

All action alternatives would include planting conifers in areas with a low probability of natural conifer establishment. Even in the Low and Moderate severity burn areas conifer establishment may be difficult if harvest and reforestation efforts are prolonged. Without the presence of a “reservoir host” plant, once the host conifer are gone, the

ectomycorrhizae remaining in the soil appear to take 1-2 years to die. If planting occurs more than 5 years post-fire, total inoculum levels would likely be below the threshold for complete colonization resulting in poor growth and survival of conifers (Wiensczyk et al. 2002). Salvage harvest is expected to be completed within three years of the Tripod Fire and planting within 5 years, so little loss of growth or establishment is expected.

A positive direct effect of all action alternatives would be an improved rate of recovery of plant communities to pre-fire condition by planting seedlings where natural conifer establishment would be poor. This would substantially increase the rate of recovery because reproductive ages are as young as 7 years for ponderosa, 5 to 10 years for lodgepole, and 12 to 15 years for Douglas-fir (Burns and Honkala 1990) and planted conifers could then substantial contribute to the seed source available for recolonization within 20 to 30 years.

Species Diversity

Hollingsworth (2005) examined fire effects and salvage harvest post-fire vegetation recovery in the cool/dry, warm/dry Douglas-fir forest types on the Bitterroot National Forest. She concluded harvesting 2 to 3 seasons post-fire did not create a substantial difference in species diversity between the unlogged and logged sites within different burn severities. The number of species were the same at each site, however, salvaged areas were dominated by a few species and on unmanaged areas dominance was equally split between a greater number of species. Colonization of off-site species was common and accounted for a substantial increase in plant cover for the first 2 post-fire years in both salvaged and unmanaged sites with the greatest increase of off-site colonizers occurring on the higher severity burn areas. Initially, understory cover decreased with increasing overstory burn severity, but within three growing seasons there was no substantial difference between any of the logged and unlogged sites. Similar floristic expression and development is expected within the Tripod harvest units within 3 to 5 years. Slightly longer recovery response would be expected if summer harvesting occurred instead of harvest over snow as was experienced in the study. Given the above study results, neither short-term nor long-term post-harvest changes in species diversity between logged and unlogged areas would be expected to occur within any of the Tripod Fire Salvage ground-based, skyline or helicopter logging units.

Soil compaction, displacement, and damage to recovering vegetation post-harvest activity would be localized to skid trails and landings so overall recovery of species diversity would not be affected. Even though native species recovery would be slower on the skid trails and landings due to disturbance and grass seeding, within 30 to 50 years differences would be negligible when compared to adjacent areas (Chapter 3.4, Soils).

Snags and Coarse Woody Debris

Snags and coarse wood provide protection for establishing seedlings by providing shade, trapping water, and protecting seedlings from wind and cold. Within salvage harvest units, there is a reduced potential for protective microsite niche development that is often needed on harsh sites for successful species establishment. Within three years after a fire in northeast Oregon, 10 percent of the standing dead had already fallen within unlogged areas. In the same study, fall and decay rate simulations showed differences between logged and unlogged woody debris accumulation to be greatest within the first 10 years with no substantial difference by Year 20 (McIver and Ottmar 2007). Louisa Evers (2005) cited research showing most small-diameter fire-killed

ponderosa pine would fall within 9 to 14 years and that in the Sleeping Child Fire in Idaho, 93 percent of snags fell over a 21 year period. In the short-term, there may be some delays in the floristic development on logged sites as a result of the temporary loss of protective niche habitat. However, the collapse of residual trees would create an adequate amount of suitable microsites for plant establishment. In the long-term, site recovery is expected to be similar to unharvested areas in all action alternatives.

Stem density would be reduced the most on salvage harvest units where removal of 10 inches DBH up to and including 28 inches DBH snags would be allowed in Alternatives B, C and D. Alternative E would harvest only snags from 10 inches DBH to less than 21 inches DBH in those same units. This would result in a slightly greater number of snags being retained within some units. This may enhance the short-term vegetative recovery compared to Alternatives B. However, in the long-term there would likely be no difference in recovery between Alternatives B and E. Slightly more stems would remain on approximately 300 acres of salvage harvest units on the Tonasket Ranger District where 10 inches DBH to 18 inches DBH stems would be removed. In the short-term, Alternative C would have the least effect on post-fire development of suitable microsites since the lowest number of acres are proposed for salvage harvest, Alternative D would have the most. No harvest alternatives would have any long-term effects on floristic recovery.

Livestock Grazing

With all the action alternatives, salvage harvesting of dead trees would allow for better dispersal and forage utilization by cattle because harvest would reduce the amount of future coarse woody debris on the forest floor that would deter cattle movement. An indirect effect to sensitive plant habitats, aspen groves, springs, seeps, wetlands, and riparian areas would be an increased opportunity for cattle to find entry into these habitats at least for the first 10 years when differences between logged and unlogged areas are the greatest (McIver and Ottmar 2007). This time period is also the most critical period for post-fire floristic recovery. In addition, these unharvested habitats would recover more quickly and remain green longer into the summer than the surrounding uplands further increasing the attraction for cattle. Part of the Post-Fire Vegetation Recovery Assessment (Appendix H) would consider the potential for entry into sensitive habitats, mitigating potential long-term loss of floristic recovery. With time the differences between logged and unlogged areas would diminish and within 10 to 20 years there would be no detectable difference between managed and unmanaged areas as discussed under Snags and Coarse Woody Debris above.

Cattle and/or ungulate browsing of aspen suckers can jeopardize re-establishment success if suckers are not allowed to exceed 1.5 meters in height and 2.5 centimeters DBH growth within 4 years. Research shows that if ungulate browse is sufficient to prevent suckers from exceeding 0.5 meters height by stand age of 12, the clone re-establishment will likely fail (Bartos et al. 1994, Jones et al. 2005). If grazing were reintroduced within 4 growing seasons or browse keeps sucker heights below 0.5 meters, full re-establishment of the aspen stand would likely fail. Cattle browse on recovering aspen would have the greatest effect to aspen stand recovery within salvage harvest units, especially where use patterns were established prior to the fire. The Post-fire Vegetation Recovery Assessment (Appendix H) would provide for evaluation of the recovery status of aspen within salvage harvest units, minimizing the potential for unwanted browse damage to occur.

Wetlands
Salvage harvest is not proposed in any wetlands or areas with a high potential to convert to wetlands. There are no designated wetlands in any of the proposed harvest units. Spruce-associated wetland habitats and any wetland conversion areas encountered during unit layout (Figure 3.6-2) would be sufficiently buffered using PACFISH RHCAs, from treatment to protect the integrity of the developing habitat. In all alternatives, GIS analysis showed there may be some of these habitats in the following units: BO08, BO19, BR30, BR31, CA02, CE01, CE04, CE11, GA05, GA07, GA08, GA09, JU04, JU18, LI39, MK03, RA01, RA02, RA06, RA09, RA11, RA15, RA16. In addition Alternatives B and E include the following units: BR09, BR10, BR19, HA01, HA02, HA04, HA05, LI01, LI09, LI25, PE02, PE03, PE04, and PE05. Alternative D includes all the above plus the following units: BO05, BO11, BR01, BR13, BR24, JU09, JU10, LI02, LI07, LI16, LI17, LI22, LI23, PE06. Alternative D has 54 acres, Alternatives B and E have 28 acres, and Alternative C has 17 acres of potential habitat suitable for wetland conversion in the early seral stages of succession (Figure 3.6-2).

Aspen and Deciduous Habitats
Of the 471 acres identified as deciduous habitat within the Tripod Fire and 195 acres within the project boundary, only 15 acres are identified within harvest units in all action alternatives (Figure 3.6-2). The potential for stand expansion within the units is expected to be as much as 50 feet from the edge of the pre-burn clone. All harvest activities would provide an opportunity to enhance aspen recovery by not allowing conifer planting in any aspen stand one-tenth acre or larger and protecting stands that are half acre or larger from any harvest activities. In all alternatives GIS analysis indicated there are an estimated 15 acres of deciduous habitat; the units with inclusions are: BL02, BO10, BO11, CA03, CE02, CE03, CE04, CE11, GA01, GA02, GA05, MK01, MK02, MK03, MK04, MK06, and MK07. However, field visits to proposed units indicated that the amount of aspen depicted in the GIS analysis is low. Additional units were field verified as having aspen inclusions are: BO09, BO05, BO06, BR14, HA03, HA04, HA05, RA04, RA05, and RA06. Adjacent to unit HA04, a large aspen stand borders the unit that was not detected in the GIS analysis. Units with aspen that were both field-verified and shown as having aspen in the GIS analysis are BO09, RA06, and RA09. Of the units surveyed, all but BO05, BR14, and RA06 had evidence of cattle use pre-fire. This pattern of use is expected to re-occur after the cattle are turned back onto the allotments. The biggest risk of loss will be to aspen stands with a pre-fire history of cattle use within the proposed units as well as throughout the Tripod Fire area.

There is no harvest planned in any alpine habitats (Figure 3.6-3). The alpine habitat identified in the project area (Figure 3.6-1) is within the road corridor identified for danger tree felling along Road 39. There are no expected effects to vegetative recovery within the Alpine habitats as a result of danger tree felling.

Summary
Ecologically, the fire resistance and resiliency of most of the plant species should respond favorably to the post-burn environment. The Tripod Fire burn severities are not outside the natural variation experienced by plant communities historically, so it is unlikely there would be any long-term effect to the native plant communities. Where harvest, particularly ground-based or skyline, are proposed in High severity burn areas, there may be a short-term delay in the floristic recovery but any differences between harvest and unmanaged areas would be negligible in the long-term (30 to 50 years).

Cumulative Effects

A complete list of past present and future activities is outlined at the beginning of this chapter. Only those activities such as past harvest, livestock grazing, fire suppression activities such as firelines, and BAER rehabilitation would likely affect plant community recovery in this analysis. These activities are discussed below. Other past, present and future activities would not affect plant recovery because they are not ground disturbing or because their effects are no longer measurable. The geographic boundary of this analysis is the approximately 38,000 acre Tripod Fire Salvage project area. The temporal boundary for this analysis is from approximately ten years in the past to twenty years in the future.

Past Harvest Activities

Where past harvest and burn activities have occurred within the last 6 years and overlap with proposed harvest occurs, there could be a delay in the recovery rate on these acres. This is because it takes about five seasons of growth for full recovery to occur on most sites and fire severities and re-introduction of disturbance would set recovery back particularly for shrub species. Those units with more than an acre of overlap are: CE02, CE03, BR19, BR22, JU18, RA06, RA05, RA04, RA11, RA17, and RA15 in all action alternatives and BR21 only in Alternative D. However, in the long-term the differences between logged and unlogged areas are expected to be negligible, as explained in the Direct and Indirect Effects section.

Livestock Grazing

Within the salvage harvest units, as well as throughout the Tripod Fire area, cattle grazing was a past, is a present, and will be a future activity that could influence post-harvest recovery in the long-term. Given the burn severity mosaic and the variable rates of recovery associated with each forest type, it would be difficult to provide the necessary rest for adequate recovery on all acres and within all habitats. Research shows that in most habitats and burn severities, post-fire species composition should be recovered within 5 growing seasons, except in the higher severity burn areas which may take 8 to 10 years or more to recover (Johnson,. 1998 and 2007, Powell 2000a, Robichaud et al. 2000). A Post-Fire Vegetation Assessment (Appendix H) would be conducted to determine when recovery is adequate for cattle re-introduction. These assessments would determine if recovery is sufficient for cattle re-introduction within the first 5 growing seasons or whether a longer period of rest is needed in some areas.

Fire Suppression Rehabilitation and BAER Treatments

Suppression activities occurred in 2006 and BAER rehabilitation treatments began in 2006 and will continue through the 2007 field season. There would be some overlap between the harvest units and BAER seeding, and mulching. Alternative D would have the greatest interface with these activities, followed by Alternatives B and E, with Alternative C the least. Cumulative effects of activities are addressed below.

Grass Seeding

Suppression rehabilitation and BAER project grass seeding within the fire area was restricted to highly disturbed sites such as roadsides, dozer lines, safety zones, and other suppression-related disturbances. Seeding was mainly in areas where the native flora were removed during suppression efforts or the risk of invasive spread is high. Seeding in these localized areas will establish vegetation quickly to help stabilize soils and reduce potential colonization of invasives. Seed mixes used included some non-

local native species designed to be non-invasive to surrounding areas. Seeding is also proposed on landings, skid roads and temporary roads within all action alternatives of the Tripod Fire Salvage Project. Invasion or dominance of non-mycorrhizal plants can suppress the growth of plants with ectomycorrhizal (EM) fungi, especially if the site has been altered substantially. Dramatic changes in plant community composition can occur with heavy grass seeding, overgrazing, or invasion by exotic species, which may weaken the ectomycorrhizal linkages between old and new stands (Wiensczyk et al. 2002). Cumulative effects to native species from all of the seeding projects would be small in scale, localized, and would not adversely affect post-harvest recovery because of the small localized areas being seeded. At the landscape level, grass seeding would not inhibit migration of seed over short distances or wind born spores which are important for post-disturbance recovery across the Tripod Fire.

Wheat Seeding

There were 6,778 acres of winter wheat seeded across the Tripod Fire in high severity burn areas as part of the BAER treatments in the fall of 2006. Winter wheat seeding has been shown to reduce species richness and greatly alter dominance-diversity patterns. Keeley (2003) found a loss of species richness on wheat seeded sites with 152 species documented on unseeded sites and 104 species on seeded. The loss of species richness was associated mainly with early post-fire species. One benefit was a substantial reduction in the number of invasive species present on the seeded sites. This study applied more than twice the lbs/ac of wheat used on the Tripod Fire so the effects to species richness would likely be much less. Those units that were wheat seeded all or in part in all action alternatives are: BO19, BR06, and BR07. In addition, Alternative D includes: LI16, LI17, LI18, LI19, and LI20. Since the winter wheat seeding only persists one season there should be no short- term or long-term effects to the EM fungi associations or loss of species richness,.

Straw Mulching

Approximately 13,767 acres of straw mulching was completed as part of BAER treatments during the fall of 2006 and spring of 2007.. It is not known if any of the wheat was treated with Clopyralid, a long-lasting herbicide used to control broadleaf weeds during crop propagation. If the wheat was treated with, the herbicide, post-fire recovery of at least some species of plants may be inhibited. It has been found to harm certain broadleaf ornamentals and vegetables when straw contaminated with this herbicide is used in compost (WSDA 2002). If the straw is contaminated with Clopyralid, plant growth and germination could be reduced where ever it was applied. Harvest units potentially affected are identified in the paragraph below.

The straw mulch was field inspected to be free of State listed noxious weeds. Because these inspections are not an exact measure of occurrence, species on the State noxious weed list, other non-native species or garden weeds could be missed during field inspections, given timing of inspection, visibility or phenology of a target species. As a result, some weed species could accidentally be introduced with this activity. A benefit to logging over previously mulched ground would be a reduction in overall soil disturbance. Those units being mulched all or in part found in all alternatives are: BO19, BR30, RA01, RA02, RA11, and RA15. In addition, Alternatives B, D and E include the following units.: BR03, BR04, BR05, BR07, BR09, BR10, and PE04. Those units only associated with Alternative D are: BR08, L108, LI09, LI10, LI16, and RA18.

Across the Tripod Fire landscape the short-term (3 to 5 years) vegetation recovery would be variable due to the site-specific conditions, forest type, surviving vegetation, available seed sources, and burn severity experienced. Species composition would be dominated by herbaceous species from 3 to 20 years depending on the above conditions associated with an area. Between 5 and 20 years, pre-burn species composition would redevelop and early seral herbaceous colonizers would begin to diminish and woody species begin to increase. The timing of this phase of succession would still be driven by the same variables as above. However, in the long-term (30 to 50 years), recovery would be predictable due to the stability of these ecosystems to recover from similar past fire events and disturbance. A full recovery is expected for all species, under all fire severities over the long-term.

CONSISTENCY FINDINGS

Implementation of this project would not result in a loss of species viability or habitats and it would integrate the protection and enhancement of unique habitats into the project design. These project design measures meet the intent of objectives outlined in Forest Service Manual Direction 2620.2 and 2670. The fire effects across the Tripod Fire landscape are in the normal expected range for the biophysical environments and the native species response to the fire will be within the natural range of variability for these ecosystems. In all alternatives, the long-term vegetative recovery would follow a similar successional trajectory as is expected for the remainder of the Tripod Fire area. Implementation of this project is within the guidelines of the Eastside Screens. No HRV analysis is required because this project meets the exception from the Ecosystem standard as a salvage sale with incidental green located outside of old growth. No areas currently providing LOS habitat would be harvested.

3.7 Invasive Plants

REGULATORY FRAMEWORK

This analysis conforms to the requirements of *Pacific Northwest Invasive Plant Program Final Environmental Impact Statement, Record of Decision* (USDA Forest Service 2005b), hereafter referred to as the 2005 PNW ROD. This project is intended to comply with the *Okanogan and Wenatchee National Forests Weed Management and Prevention Strategy and Best Management Practices* (USDA Forest Service 2001c and 2002a), the *Guide to Noxious Weed Prevention Practices* (USDA Forest Service 2001d) supporting the February 3, 1999 Executive Order on Invasive Species (Clinton 1999), and the *National Strategy and Implementation Plan for Invasive Species Management* (USDA Forest Service 2004b).

This analysis also addresses the Direction of the *Region 6 FEIS for Managing Competing and Unwanted Vegetation*, hereafter referred to as the 1988 R6 FEIS, as supplemented by the Mediated Agreement (Northwest Coalition for Alternatives to Pesticides, *et al.* v. Clayton Yeutter 1989).

The portions applicable to Tripod Salvage Project include the standards set forth by the new 2005 PNW ROD (Appendix G, Pertinent Standards for Invasive Species Prevention), and prevention standards of the Mediated Agreement (Appendix G, Prevention Analysis for Tripod Fire Salvage Project). A crosswalk entitled “Invasive Plants Crosswalk between the Old Direction and the New Direction” (Appendix G) lists the differences and similarities between the new direction provided by the new 2005 PNW ROD and the old direction provided by the 1988 R6 FEIS and the associated Mediated Agreement.

Both FS National and PNW Region Noxious Weed Strategies use the term “noxious weeds” to broadly encompass all invasive, aggressive, or harmful non-indigenous species. The more recent term used by the Forest Service is “Invasive Plants”, which are defined as nonnative plants likely to cause economic harm, environmental harm or harm to human health (Executive Order 13112, 1999). The terms “invasive plant species”, “noxious weeds” and “weeds” are used interchangeably in this document.

The Okanogan National Forest Land and Resource Management Plan requires a prevention emphasis on noxious weed control (Forestwide Standard and Guideline 12-3).

ANALYSIS METHODS

Spread of invasive plants is generally proportional to the amount of area disturbed. The spatial boundary used for this analysis is the salvage project boundary and the roads immediately leading into the project boundary. The temporal boundary is the time during project activity and the invasive plant treatments following project activities, which could last up to three years. Invasive plant treatments could last for three years following project activity. For the purposes of this analysis, acres disturbed will be calculated by measuring the following:

Acres of detrimental soil disturbance by type of logging systems;

Acres of current known infestations that intersect proposed project activities;
Closed roads that will be reopened and miles of temporary road construction and decommissioning;
Acres of burn severity by logging systems.

Acres of high, moderate and low potential for spread will be calculated depending on the activity and the location of activities in relation to existing invasive plant populations. The underlying premise is that areas closest to existing invasive plant populations and undergoing the most soil disturbance will be at the highest risk for supporting invasive plant spread.

Acres of detrimental soil disturbance by type of logging system
When calculating acres of risk potential as it corresponds to detrimental soil disturbance by type of logging system, project units using a ground -based logging system will be categorized as having the highest risk of invasive spread. Skyline logging units will be given a moderate rating for risk of spread, and helicopter units will be given a low rating for potential risk of invasive plant spread. Acres in ground-based logging units will be calculated by assuming that 15% of the units will have detrimental soil disturbance. Acres in skyline units will be calculated by assuming that 3% of the total acres in a unit will have detrimental soil disturbance, and acres in helicopter units will be calculated by assuming that 0% of the total acres will have detrimental soil disturbance (Chapter 3.4 Soils). Helicopter landings located outside unit boundaries have potential for weed invasion and would be mitigated.

Acres of current known infestations and relative location of proposed project activities
Acres of current known infestations that intersect units are categorized as high, moderate or low potential for spread depending on the type of logging system. Invasive plant populations intersecting ground-based logging units will be given the highest risk for invasive spread. To model this effect, buffer areas of high risk are calculated around known invasive populations. Ground-based logging units that intersect invasive plant populations will have a 1000 ft. buffer, and the acres within that buffer will be calculated as acres of high risk potential for spread. Acres with moderate risk for spread are skyline units that intersect invasive plant populations. Skyline units intersecting invasive populations are given a 500 ft. buffer and acres within the buffer are calculated as moderate risk for spread potential. Skyline yarding can create disturbed ground by dragging one end of logs during in-haul. Units with helicopter logging system will be classified as low risk for spread potential and will not have a risk potential buffer. With helicopter yarding the logs are simply lifted off the ground, creating a negligible amount of ground disturbance (Klock 1975).

Miles of closed roads that will be reopened and miles of temporary road construction and decommissioning
Miles of closed roads that will be reopened and miles of temporary road construction and decommissioning associated with invasive plant populations will be given a high risk for potential of spread. Miles of closed roads reopened or miles of temporary road construction and decommissioning not associated with invasive plant populations will be given a moderate risk of potential of spread.

Acres of burn severity and corresponding logging systems within units
Project units logged with ground-based systems in unburned to very low and low burned acres are considered to have a low risk of invasive spread potential. Ground-based units that burned at moderate severity have a moderate risk of spread potential. Units that burned at high severity are considered to have a high risk of invasive spread potential. Units logged using skyline logging systems in low and moderate severity burned acres have a low risk of spread potential, and skyline units in high severity burned acres are considered to have a moderate risk of spread potential. Helicopter units will be rated as having a low risk of spread potential as they would have a negligible amount of detrimental soil disturbance and effect on invasive plant spread and establishment.

GIS (Geographic Information System) is used in this analysis to make estimations on disturbance acres, miles of road construction and decommissioning, risk of potential for invasive spread, and burn severity. NRIS (Natural Resource Information System) inventory database is used to make estimation on acres of invasive plants occurrences. Data entered into the NRIS database is at a large scale, therefore data is not completely accurate with what is found on the ground.

AFFECTED ENVIRONMENT

Invasive plant populations are present in the Tripod Salvage project area, and fall into three primary categories. These categories are used to prioritize invasive species on the Forest list for treating and inventorying:

1. "Potential Invaders" are invasives that occur on lands adjacent to the project area but have not been documented on lands administrated by the Forest. However, the potential for infestation is imminent as described in the *Okanogan National Forest Integrated Weed Management Environmental Assessments* (USDA Forest Service1997, 1999 and 2000), hereafter referred to as 1997, 1999 and 2000 Weed EAs;
2. "New Invaders" are invasive plant species that occur sporadically on the Forest and that may be controlled by preventing seed production and early treatment;
3. "Established Invaders" are those species whose population levels and distribution are such that seed production cannot be prevented.

This project area contains a moderate potential for spread of Potential and New Invaders from adjacent private and state lands. Potential and New Invaders are present on private and state lands, and because of their proximity to the project area there is a moderate risk of spread through transport vectors. The Methow Wildlife Area, administered by Washington Department of Fish and Wildlife has two populations of *Linaria dalmatica* spp*. dalmatica* (Dalmatian toadflax), adjacent to the western project boundary. Toadflax is a difficult species to treat and manage. Its waxy leaves and deep root systems are difficult to control with herbicides and its capacity to re-sprout from root remnants also makes control by hand-pulling or mechanical means impractical. Adjacent state land is home to the largest mule deer herd in the state. Deer could act as transport vectors into the burned area, contributing to the introduction of a New Invader into the project area. A population of *Cynoglossum officinale* (houndstongue) is also located on the Methow State Game Range and could potentially spread into the project area. Houndstongue produces seeds that have a hard, spiny, husk with barbs which can easily cling to clothes and animals. *Cardaria draba* (whitetop) could also spread onto

the Forest and project area from adjacent state and private lands. Whitetop is especially of concern because of its aggressive nature and adverse effects on native plant communities. It is a long-lived perennial species that spreads underground by vigorous rhizomes, besides producing new plants by seed. It is common in hay pastures and croplands due to its preference of moist soils. It is sometimes introduced to National Forest land in hay fed to horses at dispersed campsites. Populations of *Acroptilon repens* (Russian knapweed) are present on state and private lands outside the Forest boundary but have the potential to spread onto the Forest. Russian knapweed typically invades degraded areas, dominating the plant community and desirable plants (e.g. perennial grasses). The weed forms dense, single species stands over time due to competition and allelopathy (biochemicals it produces that inhibit the growth of other plants) (Beck 2003). State land near the Forest boundary on the Tonasket District and adjacent to the project boundary has small populations of *Hypericum perforatum (*St. Johnswort).

There are six Established Invaders, *Bromus tectorum* (cheatgrass), *Centaurea diffusa* (diffuse knapweed), *Cirsium arvense* (Canada thistle), *Cirsium vulgare* (bull thistle), *Verbascum thapsus* (common mullein), and *Taraxacum officinale* (dandelion), that occur throughout the project area. Common mullein and bull thistle are less invasive and persistent than New Invaders and generally give way to or do not out-compete most desirable vegetation. Diffuse knapweed occurs along road corridors throughout the project area. Dandelion is well-established on some of the roadsides and skid trails. Cheatgrass is present in patches throughout the project area and there are a few small Canada thistle sites. Diffuse knapweed is considered a New Invader on the Tonasket District and will be treated with herbicide under a separate Decision Notice (see below). All known sites would be in inventoried and prioritized for treatment in the project area and along access roads under existing noxious weed decisions. New infestations, particularly new invaders, would have the first priority for eradication.

No new sites of herbicide treatment will be proposed within this EIS. All existing and ongoing treatments have been approved under the 1997, 1999 or 2000 Weed EA Decision Notices and will continue to be treated with herbicide as needed.

Figure 3.7-1: Invasive Species Classification and Strategy for Treatment.

Forest Service Classification	State and County Classification	Strategy for Treatment
New Invader or Potential Invader:	“A”	Prevention, Early treatment and eradication
New Invader:	Class B, “B-designate”	Prevention, Early treatment and Correction
Established Invader:	“B” and “C”	Prevention, Containment, Maintenance, Correction, No Action

Figure 3.7-2: Established New and Potential Invaders Found Within or Adjacent to the Tripod Salvage Project Area.

Established Invaders:	**New Invaders:**	**Potential Invaders** (not recorded in project area)**:**
Diffuse knapweed **(Methow Valley Ranger District)**	Diffuse knapweed **(Tonasket Ranger District)**	Russian knapweed
Common mullein	Sulfur cinquefoil	Dalmation toadflax
Dandelion	Orange hawkweed	Whitetop
Cheatgrass	Musk thistle	Houndestongue
Canada thistle	Spotted knapweed	Japanese knotweed
Bull thistle	St. Johnswort	

Information currently in the NRIS (Natural Resource Information System) inventory database shows 6 species occurring singly or in combination at 40 sites within the project area, for a total of 1398 acres. All invasive plant sites within the project area were inventoried in the in the last three years. Some sites on the Tonasket District were last inventoried in 1996.

Most of the invasive plant populations associated with project units that occur in the Lower Chewuch River Watershed on the Methow Valley District have been approved for herbicide use under the1997 and 2000 Weed EA Decision Notices. The remainder is subject to manual control treatments. All populations associated with project units documented on the Tonasket Ranger District have been approved for herbicide use under the 1997, 1999 and 2002 Weed EA decisions. Sites have been treated since 1998 with spot applications of Picloram and Glyphosate. None of the populations have warranted using biocontrol agents and hand pulling was done early on as a follow up to spraying.

Burned Area Emergency Response (BAER)

In order to address the threat and impacts of invasive plants spread following the Tripod fire, the BAER report (USDA Forest Service 2006), hereafter referred to as the Burned-Area Report, addressed the presence of invasive plant species at a landscape scale. The BAER team reported that “invasive species are found and are well established throughout all the elevation ranges and habitats” (USDA Forest Service 2006). The team also reported that the transportation system will be the greatest transport vector for invasives to spread in the burned area. “The roaded areas are concentrated along the perimeter of the fire in the lower elevations (below 5,000 ft.) and where invasive populations are most abundant. Invasive species are well established on adjacent state lands, and the burn was accessed by roads through these lands” (USDA Forest Service 2006). These roads are Road 4225, which access the Beaver Creek drainage, including Blue Buck and Lightning Creek; and Road 5009-100 which accesses Ramsey Creek. These roads would be used during project activity.

Seeding of the highest risk areas with *Triticum aestivum* (soft white winter wheat) was done between 2800 and 7400 feet elevation, as a combined emergency measure to help prevent both erosion and invasive plant spread in areas of high severity burn. The total number of acres burned within the analysis area was approximately 38,096 acres. High severity burned areas (approximately 6,658 acres) that have lost all soil protection are

most susceptible to establishment of invasive species, although moderate severity area (approximately 14,313 acres) also have an increased risk where native plant communities have been changed or damaged. Burn severity ratings categorized fire-caused damage to the soil and are estimated as high, moderate, low, and unburned to low, using satellite imagery. The imagery was used to compile a (Burned Area Reflective Classification) BARC map. The Tripod Fire Salvage Project Burn Severity Map (Appendix A) is based on BARC data and has been used for the invasive plant analysis.

Upon inspection of straw bales used for soil stabilization, some common weeds were found. One of the weeds found was *Salsola iberica* (Russian thistle) which is an annual that doesn't do well in a competitive setting. It would not likely compete well in the burned area when vegetation begins to establish, but it could establish along road corridors. Timing of straw baling was investigated and it is likely that straw was baled prior to viable Russian thistle seed production and this species does not produce vegetatively. Additionally, monitoring of BAER treatments will include conducting weed surveys where straw mulch was applied.

Closures associated with fire and post-fire activity extended late into fall 2006, and did not allow access into much of the fire area. Other means of invasive plant treatments and additional seeding to prevent the spread and establishment within the salvage harvest area will continue through fall 2007.

Documented Species

Invasive species documented within the analysis area are described below.

Diffuse knapweed (*Centaurea diffusa*):

Diffuse knapweed has a tap root and can act as an annual, biennial, or short-lived perennial. It contains a chemical that suppresses growth of other native species. It is an aggressive pioneer readily colonizing disturbed sites. Vehicles, wind, and animals transport the seed. Light intensity fires typically burns the plant off at the base allowing it to tumble freely through burned areas dropping its seed along the way. Seeds in the soil readily germinate in the fall after the disturbance. Diffuse knapweed is tolerant of shade, but can colonize open areas, including intact native plant communities. It is by far the most widespread and abundant invasive species occurring in the analysis area, with the combined total of 32 known sites covering 573 acres. All the sites on the Methow Valley Ranger District were recently inventoried in the summer to early fall of 2006. Sites on the Tonasket Ranger District were inventoried in the late summer and early fall of 1996 and the summer of 2006. All the known sites of diffuse knapweed are associated with road prisms, making them accessible for treatment; however for the newly inventoried sites that have not been approved for herbicide use under existing Decision Notices, mechanical treatment is currently the only control option.

Sulfur cinquefoil (*Potentilla recta*):

Sulfur cinquefoil is reported to have a broad ecological range, and is expanding rapidly in the inland northwest; it tends to appear first in disturbed and waste areas such as roadsides and abandoned fields along with other non-native species. It out-competes even most invasives over time, including knapweeds and yellow star thistle; it has also

been found invading undisturbed native plant communities (Rice 1999). It is a perennial tap rooted species that is a prolific seeder with spreading branch roots that can be stimulated by tillage or transported on soil-moving equipment, vehicles and animals. Fire, particularly in the late summer or fall increases germination rates and decreases the effectiveness of chemical treatment methods. There are 4 inventoried occurrences of this species covering approximately 32 acres within the analysis area. The sites on the Methow Valley Ranger District were inventoried in the fall of 2004. Sites on the Tonasket Ranger District were last inventoried in the summer of 2003. Sites on the Methow District are located in the Ramsey Creek area on the Road 5009-100, the Ramsey area on Road 5009-200 and up Boulder Creek on Road 3700. One site occurs on the Tonasket Ranger District along Road 3700-400 in the Wilder Creek area.

St. Johnswort (*Hypericum perforatum*):
St. Johnswort follows disturbance and thrives mostly in open grasslands, meadows and forest openings created by logging or fires. It also grows well in road corridors due to the combination of high light availability and disturbed ground. Populations can explode on burned ground as "heat seems to stimulate germination in St. Johnswort seed, and researchers have observed flushes of St. Johnswort seedling following fire" (Zouhar 2004). It has the ability to reproduce both vegetatively and by seed. There is one inventoried occurrence of this species covering 14 acres within the analysis area. This site occurs on the Tonasket Ranger District along the Road 3700-400 in the Wilder Creek area.

Spotted knapweed (*Centaurea biebersteinii*):
Spotted knapweed and diffuse knapweed are similar in their growth habits and habitat preferences. It is a biennial or short-lived perennial that quickly colonize disturbed ground such as roadsides, gravel pits, campsites, and riparian gravel bars. Spotted knapweed is more shade and moisture tolerant than diffuse knapweed and will reproduce by root buds. Transport is mainly by rodents, livestock and vehicles. Its seed viability is similar to diffuse knapweed allowing large soil seed banks to develop where it grows. There is one inventoried occurrence of this species covering approximately 54 acres within the analysis area. This site was inventoried in the summer of 2006; it is located in the Middle Fork of Boulder Creek area.

Orange hawkweed (*Hieracium aurantiacum*):
Orange hawkweed reproduces from wind-blown seeds, root buds and stolons. Stolons are stem-like structures that bend to the ground or that grow horizontally above the ground and produce roots and stems. Production of stolons is stimulated by flowering. Flower removal by grazing or fire stimulates both stolon and root bud production, thus increasing the spread rate. Its reproductive spread rate is rapid in an area, particularly after disturbance. Once established, hawkweed quickly develops into a patch that continues to expand until it covers the site with a solid mat of rosettes. A dense mat of hawkweed plants competes with other vegetation posing a serious threat to native plant communities. There is one inventoried occurrence of this species covering approximately 723 acres within the analysis area. This site is located on the Methow Valley District, in the Blue Buck Creek area on Roads 4225-400 and its spurs.

Musk thistle (*Carduus nutans*):
Musk thistle can produce abundant seed and establish well in high light environments. Fire creates conditions that are favorable to the establishment of musk thistle (i.e. open canopy, reduced competition, areas of bare soil), so if musk thistle seeds are present

and competition minimal, musk thistle may be favored in the post-fire community. Musk thistle is capable of forming dense stands, especially on highly disturbed sites where competition is low, or in overgrazed or disturbed pastureland. Musk thistle seed dispersal over long distances is most common along travel and water corridors, and as a contaminant in crop seed and hay. Musk thistle seeds may also be distributed by birds and mammals (Zouhar 2007). There is one musk thistle site on the Methow Valley Ranger District, covering 2 acres. The site is 1 mile up Road 4225 and is between the 4225-200 and the 4225-300, in the Beaver Creek area.

Figure 3.7- 3: Invasive Species Extent within Tripod Salvage Project Boundary

Common Name	Species	Inventoried Sites	Acres
Diffuse knapweed	*Centaurea diffusa*	32	573
Sulfur cinquefoil	*Potentilla recta*	4	32
St. Johnswort	*Hypericum perforatum*	1	14
Spotted knapweed	*Centaurea biebersteinii*	1	54
Orange hawkweed	*Hieracium aurantiacum*	1	723
Musk thistle	*Carduus nutans*	1	2

Prevention and Management Strategy

The current strategy for invasive species management has 4 elements (USDA Forest Service 2004):

1. Prevention – Stop invasive plants before they arrive.
2. Early detection and rapid response – Find new infestations and eliminate them before they become established.
3. Control and management – Contain and reduce existing infestations.
4. Rehabilitation and restoration – Reclaim native habitats and ecosystems.

Each of these four prevention and management strategy elements is addressed in detail:

1. **Prevention and Risk Assessment**
   The Strategic Actions for prevention outlined in the *Okanogan and Wenatchee National Forests Weed Management and Prevention Strategy and Best Management Practices* (USDA 2002) require that risk and prevention analysis be completed for timber harvest activities. A noxious weed risk assessment was completed for the analysis area, and it was found to have a high risk. The main criterion that determined the high level of risk was that there are known infestations that occurs within or adjacent to the project area and site conditions within the project area favor invasive plant establishment due to the recent fire and salvage ground disturbing activities. When the risk assessment is high the following is directed: Implement Prevention and Management Strategy and monitor site until weed-free for 2 years. Population monitoring would be accomplished during on-going weed management activities.

2. **Early Detection and Rapid Response (EDRR)**
   The capacity for EDRR depends on three factors (Region 6 Invasive Plant EIS 2005):
   Number and distribution of people able to recognize potential new invaders.
   Regulatory noxious weed designations for new invaders of limited distribution.
   Capacity to respond quickly and effectively to new discoveries. New weed infestations are detected primarily through coordinated efforts between the District resource departments. New Invader designation is by the State and County Noxious Weed Control Boards. The most appropriate treatment response is then rapidly implemented within the limitations of budget and priority.

3. **Control and Management**
   There are five strategies to control noxious weeds. Weed strategies and relation to damage threshold are described below. The damage threshold identifies how much of what kind of weed is too much to permit meeting a site's management objective.
   Prevention - This preferred strategy would detect conditions that favor the presence of noxious weeds and change them to prevent establishment.
   Early Treatment - This strategy would control noxious weed populations before the damage threshold is reached.
   Maintenance - This strategy would support the current condition, keeping it below the damage threshold.
   Correction - This strategy would take action after the damage threshold is exceeded.
   No Action - With this strategy, no activity would be taken to interfere with natural process on the site. This would be used if noxious weed populations remain below the damage threshold.

   Prevention
   The prevention strategy is always preferred and employed as the initial strategy. However, due to the nature of invasive plants, the prevention strategy is often not adequate to ensure complete exclusion of noxious weeds.

   Active treatment of existing invasive populations of concern may occur before, during and after implementation of timber harvest, prescribed fire and post-sale activities. Treatment methods would be implemented in phases, like that described in the 1997, 1999 and 2000 Weed EAs (no weed treatments are proposed under this EIS). Phase one would use a combination of correction and early treatment strategies. The objective of this phase would be to substantially reduce the noxious weed population. Phase two would include the follow-up treatment on phase one sites with a combination of early treatment, maintenance, and prevention strategies. The objective would be to continue reducing the size of the populations, and change site conditions to minimize or eliminate additional treatment. Phase three would combine prevention and early treatment strategies. The objective would be to prevent or minimize the re-establishment of noxious weeds. All sites would be monitored by District weed crews to determine the effectiveness of treatments and ensure that weed populations do not establish in the future.

   Weed treatments within this project area are based on integrated weed management principles that may include any combination of manual and mechanical, biological, cultural,

and chemical techniques as described in the 2005 PNW ROD, and the 1997, 1999 and 2000 Weed EAs.

Manual and Mechanical Control

These treatments physically remove and destroy, disrupt the growth of, or interfere with the reproduction of invasive plants. Manual treatment would use hand pulling, digging and seed head removal. Past experience on both the Methow Valley and Tonasket districts has shown that for very small weed sites, manual treatment can be very effective. For larger weed sites, manual methods are recorded as having fair effectiveness for diffuse knapweed and St. Johnswort but poor for sulfur cinquefoil as the root system makes it difficult to effectively handpull. Manual methods work with small populations of diffuse knapweed, but are not cost effective for large populations. Youtie and Soll (1994) found that hand pulling at least three times per year are needed for effective control. Pulling would need to go on for several years to be effective (Youtie1997). Currently, hand pulling is the being conducted on the smaller New Invader sites.

Mechanical Control consists of mowing road right-of-ways and landings prior to operations and before weeds have gone to seed. This method is not very practical in a forest environment, although it might be used along roads.

Biological

The use of biological control organisms is intended to be a permanent change to the environment. Biological control agents are used when weed eradication is not possible. The agent is released to coexist with the weed while bringing the weed population down to acceptable levels. The knapweed weevil, *Larinus minutus*, has been released on diffuse knapweed in Okanogan County and has been very successful in becoming well established throughout the county. Recent monitoring of the distribution of *Larinus minutus* on the Methow Valley Ranger District has found that it is well established with some successful suppression of diffuse knapweed in some areas. Collecting this insect from known populations elsewhere on the District and releasing on to the larger populations within the project area is preferred method where herbicides are not approved. A biological control agent directed towards Dalmation toadflax, *Micinus* janthinus, has been released by the county as a corrective measure. Some of these agents could occur or eventually occur on Forest land.

Cultural

Cultural methods are generally targeted toward enhancing desirable vegetation to minimize invasion. This includes grass seeding to out-compete the noxious weeds, the addition of fertilizer/soil amendments, competitive planting, or any other cultural practice known to be useful for treating invasive plants.

Chemical

Chemical control is generally spot spray applications. There has been invasive plant control with the use of herbicides within the project area since 2002; some areas have had follow-up treatments. A majority of the invasive plant populations adjacent to salvage units within the project area have been treated. Portions of the invasive sites associated with project units are not approved for herbicide treatment. Only two herbicides are available, Picloram and Glyphosate under existing NEPA documents. Application is with hand-held nozzles attached to backpack sprayers or a tank

mounted on an ATV. Within 100 feet of fish bearing streams, only aquatic formulations of Glyphosate are used and applied with hand sprayers or wicking to minimize or eliminate the risk of toxic effects to aquatic organisms and non-target plants. All mitigation measures required for herbicide application in the 1997, 1999 and 2000 Weed EAs are followed.

4. **Rehabilitation and Restoration**
   Site restoration or revegetation is part of any long term strategy to reduce invasive plants. Determining the need for active restoration/revegetation versus passive restoration (allowing plants on site to fill in treated area) is the first choice when addressing this need. Passive restoration may be appropriate where treated sites leave only small gaps of bare ground and native vegetation on site can provide adequate seed source to fill in such gaps (Region 6 Invasive Plant EIS 2005).
   For noxious weeds, this is accomplished primarily with competitive grass seeding. native plant materials are the first choice for restoration, rehabilitation, and revegetation efforts; however, nonnative, non-invasive plant species may be used when:
   - Needed to protect basic resource values (e.g., soil stability and water quality, to prevent establishment of invasive plants)
   - As an interim, non-persistent measure designed to aid in the reestablishment of native plants (unless natural soil, water, and biotic conditions have been permanently altered)
   - Native plant species are not available.
   - In permanently altered plant communities (Region 6 Invasive Plant EIS 2005)

ENVIRONMENTAL CONSEQUENCES

Direct and Indirect Effects

Alternative A - No Action
Invasive plant introductions by project activity vehicles and equipment would not occur. The spread of invasive plants would continue due to bare ground exposed as a result of the Tripod fire and fire suppression activities. Factors such as an ideal seedbed, reduced or eliminated competition from native plants and increased nutrients released by the fire, all combine to make ideal conditions for weed seed to germinate and flourish following fire (Asher *et al*. 2002). Areas that burned at high severity are most at risk for reduction of the native species that can successfully compete with invasive plants, although regions of lower severity fire can still be susceptible if weed seed is present, especially if additional soil and vegetation disturbance occurs. No new temporary road construction or decommissioning would occur, therefore, soil disturbance from these activities would not occur.

The current level of vehicle access would likely continue with the introduction and spread of invasives by road users occurring relative to the level of traffic. Roads have been identified as a primary vector for weed invasion in the current published literature reviewed in the white paper on casual mechanisms of noxious weed spread (Kimberling *et al.* 2004).

Fire suppression rehabilitation efforts included the seeding of road stabilization and drainage enhancement work. Additional seeded areas included dozer lines and hand

lines and additional hydroseeding of roadsides in the spring of 2007. Burned Area Emergency Response weed control work will occur in the spring and summer of 2007. Longer term BAER work includes monitoring of the burned area for weed spread for up to three years after the fire to allow for early detection of new and enlarging populations. These weed control actions would lessen the threat from invasive plants to native plant communities. All of the documented weed sites within the analysis area are along road corridors. Mushroom gatherers who will be in the Tripod fire area in the spring of 2007, have the potential to spread invasive plants through vehicle travel on roads and parking in infested areas along road sides.

Direct and Indirect Effects

All Action Alternatives

All action alternatives include activities that would increase suitable habitat for invasive plants. The potential for weed establishment within each alternative is relative to the amount of disturbance, especially relative to the amount and type of logging system proposed. The greater the area disturbed, the more suitable habitat is created for weeds, and the greater risk of weed establishment and spread. All action alternatives also include design features to minimize soil disturbance to no more than needed to meet project objectives, to revegetate disturbed soil and to limit introduction and transport of noxious weed seed. The invasive plant assessment for spread and introduction conducted for this project indicated that the risk is high given the amount of known infestation that occurs within or adjacent to the project area and site conditions within the project area that favor invasive plant establishment due to the recent fire and proposed salvage ground disturbing activities (see Affected Environment section). Alternatives B and E are analyzed together for the invasive plant portion of this analysis. Both alternatives would have similar affects on invasive plants, as the acres treated and location of treatment is the same.

Soil Disturbance by Type of Logging System

Assumptions for calculating the acres of disturbed ground that pose a risk for invasion of invasive plants by each type of logging systems for these alternatives are described in the Analysis Methods section. They include the following:

- Disturbed acres in ground-based logging units will pose a high risk;
- Disturbance in skyline units will pose a moderate risk;
- Disturbance in helicopter units will pose a low risk.

The figures below show the number of acres that would be treated by each logging system and the number of acres of actual disturbance that would result from ground-based, skyline and helicopter logging activities. Alternatives B, D and E have the greatest amount of acres treated with a ground-based logging system and the most amount of detrimental soil disturbance, thus posing the highest risk for potential invasive plant spread. Alternatives B,D and E have the greatest amount of acres treated with the skyline logging system, thus posing a moderate risk potential for the spread of invasives. Alternative C has the least amount of acres treated with both ground-based and skyline logging systems, posing the lowest amount of risk for potential weed spread.

Figure 3.7-4: Alternative Comparison: Disturbance by Type of Logging System

	Alternative B and E(acres)	**Alternative C** (acres)	**Alternative D** (acres)
Logging System by Acres			
Ground-based	2,156	1,896	2,156
Projected Ground-based Actual Disturbance (Acres)	323	284	323
Skyline	591	351	716
Projected Skyline Actual Disturbance (Acres)	18	11	21
Helicopter	0	0	532
Projected Helicopter Actual Disturbance (Acres)	0	0	0
Total Salvage Harvest Acres	**2,748**	**2,247**	**3,404**

Figure 3.7-5: Alternative Comparisons: Summarization of Logging System Risk Level

Risk Level	**Alternative B and E** (acres)	**Alternative C** (acres)	**Alternative D** (acres)
Low	**0**	**0**	**0**
Moderate	**18**	**11**	**21**
High	**323**	**284**	**323**

<u>Acres of Soil Disturbance that Intersect Invasive Plant Populations</u>
The next measure analyzed is acres in project units that intersect invasive plant populations. Assumptions for calculating the unit acres with detrimental soil disturbance that fall within the risk potential for invasive spread are as follows:

Ground-based logging units that intersect invasive plant populations will have a 1000 foot risk potential buffer, and the acres within that buffer will be calculated as acres of high risk potential for spread;

Skyline units that intersect invasive plant populations will have a 500 foot risk potential buffer and acres within the buffer are calculated as moderate risk for spread potential;

Units with helicopter logging system will be classified as low risk for spread potential and will not have a risk potential buffer, as there are no helicopter units intersecting invasive plant populations.

The figures below show the acres of disturbance for each logging system that intersect an invasive plant population. Alternatives B,D and E would have the highest amount of acres with the associated potential for invasive spread. Alternative C has the least amount of acres that intersect invasive plant populations, thus the lowest amount of acres with the associated potential for invasive spread.

Figure 3.7-6: Alternative Comparisons: Disturbance Acres that Intersect Invasive Populations and Calculated Risk Potential Buffers

	Alternative B and E (acres)	**Alternative C** (acres)	**Alternative D** (acres)
Logging System by Acres			
Ground-based units intersecting invasive plant populations	99	95	99
Ground-based with 1000 foot buffer	1,853	1,629	1,853
Skyline units intersecting Invasive Populations	13	13	20
Skyline, 500 foot buffer	204	204	296
Helicopter	0	0	532
Projected Helicopter Actual Disturbance (Acres)	0	0	0
Total Salvage Unit Acres Intersecting Invasive Plants	**112**	**108**	**119**

Figure 3.7-7: Alternative Comparisons: Summarization of Soil Disturbance Acres Intersecting Invasive Populations with Risk Potential Buffers

Risk Level	**Alternative B and E** (acres)	**Alternative C** (acres)	**Alternative D** (acres)
Low	**0**	**0**	**0**
Moderate	**204**	**204**	**296**
High	**1,853**	**1,629**	**1,853**

Miles of Road Construction and Decommissioning

Another primary vector for weed spread associated with each action alternative is the miles of closed roads reopened and miles of temporary road construction and decommissioning. Roads on public lands are high-risk sites for the introduction and spread of noxious and invasive plants. Transporting seeds and plant parts by vehicles (Lonsdale and Lane 1994), and removing vegetation and mixing soil during road construction and maintenance, provide ideal conditions for the introduction, germination, and establishment of weed seeds that may be carried to other locations (Tyser and Worley 1992) or that may colonize adjacent vulnerable habits. Assumptions for calculating this risk of spread is as follows:

Miles of closed roads reopened or miles of temporary road construction and decommissioning associated with invasive plant populations will be given a high risk for spread potential;

Miles of closed roads reopened or miles of temporary road construction and decommissioning not associated with invasive plant populations will be given a moderate risk spread potential;

The figures below shows the miles of reopened roads and miles of temporary road construction and decommissioning that could contribute to the introduction and spread of invasive plants. Figure 3.7-8 shows road activities associated with Alternatives B,C and E that intersect invasive plants, having the least amount of miles planned for project road activities. Alternative D has the most amount of miles planned for project road activities that intersect invasive plant populations, thus it poses the highest risk for potential spread of invasive plants. Figure 3.7-9 shows road actions by alternatives that do not intersect invasive plant populations. Alternatives B, D and E have the most amounts of miles of road actions planned, thus posing the highest risk for invasive plant spread. Alternative C has the least amount of miles of road actions planned, and the lowest risk for potential of invasive plant spread. Figure 3.7-10 summarizes the above data to assign an overall rating for risk of spread potential. Due to potential of road construction and decommissioning to spread invasive plants, road actions not intersecting invasive plant populations are given a moderate risk of spread potential. Alternatives B,D and E have a moderate risk of spread potential, as they have the most amounts of planned road actions. Road actions intersecting invasive plants are given a high rating for potential risk of spread. Alternative D has the highest potential for the risk of invasive plant spread.

Figure 3.7-8: Alternative Comparison: Summary of Road Activities Intersecting Invasive Plant Populations

Action	Total Miles		
	Alt B and E	Alt C	Alt D
Closed system road to be opened then closed post project intersecting invasive plants.	0	0	0
Currently open system road that would be closed post project intersecting invasive plants.	0	0	0
Previously decommissioned or unauthorized roads to be used then decommissioned post project intersecting invasive plants.	0	0	0
Temporary road to be constructed then decommissioned post project intersecting invasive plants.	0	0	0
Total Miles Intersecting Invasive Plants	**8.3**	**8.3**	**10.6**

Figure 3.7- 9: Alternative Comparisons: Summary of Road Actions

Action	Total Miles		
	Alt B and E	Alt C	Alt D
Closed system road to be opened then closed post project.	22.7	13.4	23.7
Currently open system road that would be closed post project (Previous NEPA decision).	7.0	4.9	7.0
Previously decommissioned or unauthorized roads to be used then decommissioned post project.	3.7	3.6	3.7
Temporary road to be constructed then decommissioned post project.	3	2	3
Total Miles	36.4	23.9	37.4
Totals Miles That Don't Intersect Invasive Plant Populations	**29.01**	**16.46**	**27.71**

Figure 3.7-10: Alternative Comparisons: Summary of Road Actions and Risk of Spread Potential

Risk Level	**Alternative B and E** (miles)	**Alternative C** (miles)	**Alternative D** (miles)
Low	**0**	**0**	**0**
Moderate	**37.31**	**24.76**	**38.31**
High	**8.3**	**8.3**	**10.6**

Acres of Burn Severity by Type of Logging System

Fires can stimulate native vegetation growth and colonization by increasing the availability of nutrients, space, light and water. These same attributes can also encourage establishment of invasive plants that may be better suited to occupy niches in fire areas that have burned too severely for natives to resprout or recolonize. Post-fire recovery of native species is determined by colonizers that seed into disturbed areas and survivors that resprout following fires. If there are insufficient native seed sources and resprouting, invasives can establish. Major disturbances such as fire can reduce community complexity and may provide opportunities for new plant species to invade (Brooks and Pike 2001). Fire severity can be judged as the effect of fire on tree canopy, understory vegetation, soil surface organic debris, and mineral soil and includes three general categories of classification: low or light severity, moderate or mixed severity, and high severity (DeBano et al. 1998). Invasive plant species respond differently to increasing levels of fire severity. Invasive plant survival through viable seed varies among species depth of burial, and burn severity. In a study plot in Montana on the Bitterroot National Forest, cover of *Centaurea maculosa* (spotted knapweed) decreased with increasing overstory and understory severity levels. Although this noxious weed appears as a component of the vegetation on most transects, it appears it most successfully colonizes lower severity levels (Hollingsworth 2005). Most invasive rhizomatous plants (Canada thistle, Dalmation toadflax, leafy spurge, Russian knapweed, whitetop, etc.) have high survival regardless of burn severity given that even

the most severe fires typically damage roots only to four inches below the soil (Goodwin et al. 2001). Assumptions for calculating the risk of spread based on burn severity is as follows:

Acres logged in ground-based units that burned at high severity will pose a high risk of spread potential;

Acres logged in ground-based units that burned at moderate severity, and skyline units that burned at high severity will pose a moderate risk of spread potential;

Acres logged in ground-based units with unburned to very low and low severity burns, and acres in skyline units with unburned to very low, low and moderate severity will pose a low risk. All helicopter units will be rated as having a low risk of spread potential.

The figures below show the degree of burn severity in the different logging systems. Ground-based and skyline units in high and moderate severity burns could contribute to the establishment of invasive plants. Alternative C shows the least amount of ground-based and skyline logging systems within high and moderate severity burned areas, thus the least amount of high risk potential of invasive plant spread and establishment. Alternatives B, D and E have the second lowest number of ground-based and skyline logging acres in moderate and high severity burned areas. Alternative D would have the highest amount of low risk potential due to the inclusion of helicopter units whose detrimental soil disturbance is negligible, thus minimally contributing to the spread of invasives.

Figure 3.7-11: Alternative Comparisons: Salvage Harvest by Burn Severity Level and Logging System

Burn Severity	**Alternative B and E** Acres	**Alternative C** Acres	**Alternative D** Acres
Ground-based Logging System			
Unburned to Very Low Severity	353	330	353
Low Severity	837	767	837
Moderate Severity	813	697	813
High Severity	144	93	144
Skyline Logging System			
Unburned to Very Low Severity	6	2	8
Low Severity	77	49	140
Moderate Severity	330	247	387
High Severity	178	53	181
Helicopter Logging System			
Unburned to Very Low Severity	0	0	24
Low Severity	0	0	152
Moderate Severity	0	0	216
High Severity	0	0	139

Figure 3.7-12: Alternative Comparisons: Summary of Acres for Risk Level by Alternative

Risk Level	Alternative B and E (acres)	Alternative C (acres)	Alternative D (acres)
Low	1,603	1,395	2,256
Moderate	991	750	994
High	144	93	144

Invasive Plant Populations in Relation to Tree Planting and Danger Tree Removal
Tree planting creates a small amount of soil disturbance. However, if roads that have been closed after salvage harvest activities are reopened to access tree planting sites, a higher potential of invasive spread would result. In the long run, the revegetation of canopy cover can be expected to limit potential habitat for invasive plant species, most of which require high light environments to grow and reproduce. Therefore, the larger proportion of the ground that is actively reforested, the less weed habitat is expected in the future.

Periodic danger tree removal along Forest Service roads would create minimal conditions for introduction and spread of invasive plants. These sites are all easily accessible and treatable. Monitoring and design criteria are included in the proposed project specifically to reduce invasive species spread.

Mitigation Measures and Design Features
Opportunities for weed spread from project activities associated with logging, road opening and temporary road construction and decommissioning would be reduced by the Mitigation Measures and Design Criteria listed in Chapter 2 and the Noxious Weed Prevention Plan. Requiring the washing of off-road equipment would prevent the introduction of new species in the area. Revegetating disturbed soil with certified seed and native material where feasible would reduce the potential of additional soil erosion caused by invasive plants establishment. Landings, skid trails and road treatments would be seeded after project activity. Roads and turn-outs used as landing for skyline logging systems would be actively restored to help reduce the potential of invasive plant establishment. Seeding these disturbed areas would allow native plants to re-establish by temporarily competing with invasive plant species. Using gravel, fill, sand, and rock that is weed free would help reduce the chance of invasive plant introduction and spread. In addition, weed seed production would be greatly reduced during the first year of salvage logging as a result of BAER weed control work in the area.

The above analysis shows that Alternative D has the highest number of acres that would be treated during salvage activities and the highest number of miles of road actions planned for project activities. Therefore, Alternative D poses the highest risk for potential invasive plant spread, establishment and introduction. Alternative C has the lowest number of acres to be treated by salvage activities and the lowest number of miles of road actions planned, thus the lowest risk for potential of invasive plant spread, establishment and introduction. Alternative B and E has fewer acres to be treated and fewer miles of road actions planned for project activities than Alternative D, but more acres to be treated and miles of road actions than Alternative C. The effects of project activities would be reduced through following the Design Criteria and Mitigation Measures listed in Chapter 2 for invasive plants.

Cumulative Effects

Alternatives B, C, D, and E

Past, present and reasonably foreseeable future actions are listed at the beginning of Chapter 3. Actions which could have a cumulative effect on the introduction, spread and establishment of invasive plants are: Loomis State Forest DNR salvage sales; transportation systems; mushroom gathering; recreational use; livestock grazing; tree planting within the project area outside of Tripod salvage harvest units; fuels treatments; firewood cutting; timber sales; Tripod Fire suppression actions; and wildfires and fire suppression. These actions could cumulatively effect the introduction, spread and establishment of invasive plants due to the ground disturbance they would create. Actions that probably would not have a cumulative effect on invasive plants are as follows: suppression rehabilitation and BAER implementation activities; Tripod Fire suppression rehabilitation and BAER implementation activities; restoration activities; Washington Department of Fish and Wildlife (WDFW) Methow Wildlife Management Area; heritage resources; and tree planting within project area outside of salvage harvest units. These actions would cause little ground disturbance and would help restore disturbed areas, thus reducing the affect of invasive plants on native plant communities.

This cumulative effects analysis considers effects of past, present and reasonably foreseeable future actions within the Tripod Fire Salvage Project area and lands adjacent to it, from ten years in the past to ten years in the future. In all action alternatives, the risk of invasive plant spread would be increased due to additional disturbed, open areas created by project activities. Cumulative effects to invasive plants in the Tripod Fire Salvage Project area would increase from a combination of project activities, current weed infestations on federal, state and private land, the Tripod Fire, road use, fire suppression activities, BAER roadwork, cattle grazing, mushroom picking and recreational use of user trails created by hikers, OHV riding, and mountain bikers.

Past Actions

Fire suppression efforts involved construction of 122 miles of dozer line, 118 miles of hand line and about 131 acres of drop points, safety zones, staging area, helispots, and helibases (assumes that drop points, safety zones, staging areas, helibases, and helispots average one acre in size). These numbers include federal, state and private lands in the area since weeds spread without regard to property ownerships. Dozer line is much wider and involves the use of heavy equipment but both hand and dozer lines clear vegetation down to mineral soil. All of this work was done while the fire was burning from August to September, prime seed production time for invasive plants known to occur in the fire area. The combination of fire, an already existing weed seed bank, miles of dozer and hand line created at prime weed seed production time all add up to high potential for invasive plant spread and eventual displacement of native plant communities in these disturbed areas. Past livestock grazing has probably contributed to the spread of invasive plants. However, past weed treatments has helped to reduce the spread and establishment in grazing areas.

Present and Ongoing Actions

Mushroom gathering has the potential of spreading noxious weeds due to increased vehicle travel along roads within the Tripod Fire area. Roads have been identified as the primary vectors for weed invasion and spread.

Cattle grazing could also contribute to the spread of invasive plant species. Currently, many areas grazed by livestock have higher densities of invasive annual plants than ungrazed areas (Webb and Stielstra 1979, Brooks 1995, 1999a, 2000c). Livestock grazing management will continue on 5 of the 6 cattle allotments within the project area. Grazing strategies will be implemented to rest pastures within the Tripod Fire to provide for vegetation recovery. The three Tonasket allotments within the project area will be used as permitted with completed scheduled improvements and increase compliance checks. Modifications to permitted use will be made and specific mitigation measures will be in place on the Methow and Tonasket allotments. This will allow better competition from native species which will allow native vegetation recovery. In response to changes in resource conditions, specific mitigations to permitted head months, season of use, and grazing systems are detailed in Figure 3.13-2.

All types of recreation would continue to be vectors for disturbance and weed spread in the project and fire area, including, but not limited to, camping in campgrounds, dispersed camping, pleasure driving, firewood gathering, OHV riding, mountain biking, and snowmobiling.

Loomis State Forest DNR Salvage Sales could expose adjacent Forest Service areas burned in the Tripod Fire to invasive plants by creating conditions that favor introduction, spread and establishment of invasive plants. Such conditions include: creating more disturbed areas from sale activities, opening up the canopy, and increased road travel.

Several weed sites outside the project area have potential to spread though vehicle traffic to newly disturbed soil within project units. State, county and private lands adjacent to the fire area on the Methow Valley Ranger District are infested with species which rank as high risk for spread potential into burned areas. Species with high risk of spread potential include: Dalmatian toadflax, whitetop, Russian knapweed, and oxeye daisy. Loup Loup Campground was treated for oxeye daisy before the campground was used as a satellite base camp during the Tripod Fire. Although the area was treated, there is potential that the species could spread by motor vehicles. Orange hawkweed spreads by wind blown seeds, and is not found in any project units but is located inside the project boundary and poses a minimal risk of spread potential. This species is located on Road 4225-400 and spurs. Populations of Dalmation toadflax exist on Road 4200-400 outside the project area, on the Tonasket District. It has treated and will be inventoried in the summer 2007 and should not be a threat to the project area unless birds have transported seed from the infested area to the project area. St. Johnswort and knapweed occur on bordering state and private lands on the Tonasket District. These species pose a high risk of spread potential onto adjacent Forest land and potentially into the Tripod fire area.

Invasive plant treatments with herbicides especially in Salmon Creek, is an ongoing activity that will continue through May, June and July of 2007. Herbicide treatment will decrease the potential effects of additional soil disturbance activities on invasive plants. Thus, the potential for introduction, spread and establishment would decrease. The application of herbicides will follow design criteria and mitigation measures in the Integrated Weed Management EAs.

Ongoing road maintenance would contribute to the introduction, spread and establishment of invasive plants by providing a disturbed soil seedbed suitable for weed

germination and transporting seeds and vegetative fragments in the soil at infested sites to areas that may not be infested.

Reasonably Foreseeable Future Actions

A Forest-Wide EA will be completed in 2008 and will cover a majority of the Tripod Salvage Project area that is not currently covered by a decision document for herbicide treatments. The actions allowed by the new EA will help control the spread and establishment of invasive plants in the project area.

Periodic danger tree removal along Forest Service roads would create minimal disturbance that could introduce and spread invasive plants. These sites are all easily accessible and treatable. Monitoring and design criteria are included in the proposed project specifically to reduce invasive species spread.

Loomis State Forest DNR Salvage Sales could expose adjacent Forest Service areas burned in the Tripod Fire by creating conditions that favor introduction, spread and establishment of invasive plants. Such conditions include: creating more disturbed areas from sale activities, opening up the canopy, and increased road travel. These areas will be monitored to assess the spread of invasive plants and treatment of infested areas.

Summary of Cumulative Effects and Alternative Comparisons

Past actions could increase the risk of invasive plant spread due to Tripod Fire suppression activities that disturbed the soil and created open areas which are conducive to invasive plant spread and establishment. However, actions were taken following the Tripod Fire to prevent the spread of noxious weeds. Fire suppression rehabilitation efforts included the seeding of dozer lines and hand lines. A competitive grass seed mix was used in order to fill the freshly opened niche with the hope of out-competing the weeds. The Burned Area Emergency Response (BAER) weed control work will begin in spring of 2007 with spot application of herbicide to noxious weeds along roads and release of biological control agents on diffuse knapweed. A biological control agent directed towards Dalmation toadflax has been released by the county as a corrective measure. Some of these agents could occur or eventually occur on Forest land. In addition, BAER funds will also be used to hydro-seed roadsides and newly bladed ground on the side of roads and there will be additional seeding of hand and dozer lines.

The cumulative effects of present and ongoing actions are the same for each action alternative, except road actions planned for project activities. Alternative D has slightly more miles of road actions planned for project activities, thus in combination with past and present actions poses a slightly higher risk for the potential of invasive plant spread. Integrated Weed Management would continue in the New Invader weed infestations on roads used during salvage harvest activities and off roads in areas where treatment activities may spread weeds. Integrated Weed Management (IWM) would be accomplished through implementing the mitigation measures in this analysis and a combination of all the control methods available with emphasis on early detection of new infestations, rapid treatment response, and prompt revegetation.

The cumulative effect of reasonably foreseeable future actions is the same for each action alternatives.

As mentioned above, the risk of invasive plant introduction and spread would be reduced through an Integrated Weed Management approach, implementation of mitigation measures in this analysis and BAER weed control treatments. A Forest-wide EA will be completed in 2008 and would cover a majority of the Tripod Salvage Project area that is not currently covered by existing NEPA decisions for herbicide treatments. The NEPA decision granted by the new EA would likely help to control the spread and establishment of invasive plants present in the project area. The combination of herbicide, manual, and cultural treatments together would provide effective control of small populations. Treatments would be conducted by the District Weed program with herbicide treatments authorized under the1997, 1999 and 2000 Weed EA Decision Notices. With implementation of mitigation measures and on-going weed management, weed populations would be reduced. The combination of these actions would lessen the threat of invasive plants and as a result of salvage activities to native plant communities in the project area.

In summary the effects of past, present and reasonably foreseeable future actions when considered with salvage activities would contribute to short term increases in the amounts of Established Invaders and slight increases in the amount of New Invaders. However, these increases would be mitigated by an integrated weed management approach and implementation of mitigation measures in this analysis.

CONSISTENCY FINDINGS

The proposed Tripod Salvage Project is consistent with the Okanogan Forest Plan management direction for invasive species because it focuses on the prevention strategy and with all management direction described in Appendix G. Compliance with the pertinent Prevention Standards listed in the R6 FEIS 2005, are addressed in the discussions above of existing conditions, the mechanisms of invasive species spread, the prevention measures listed as design criteria, and the risks that remain after implementation of the prevention measures.

3.8. Recreation

REGULATORY FRAMEWORK

Forest Plan direction within the project area is to provide recreation and trail opportunities for a variety of activities, including those that occur in winter, consistent with the goals and recreational opportunity setting for the area. The importance of existing trails shall be considered in project planning. Management area (MA) direction states that roaded natural (MA-5) and roaded modified (MA-12, -14, and -25) recreation shall be provided. Forest-wide standard and guideline 17-6 states that certain roads (e.g. Forest roads 37 and 39) shall not be snowplowed. Forest-wide standard and guideline 17-8 states that certain paired roads (e.g. Forest roads 51 and 5010 north to Camp 4) are not to be snowplowed in the same year to provide for a groomed snowmobile route.

ANALYSIS METHOD

The analysis area is the Tripod Salvage Project area and public access corridors on Forest Roads 37 and 39 within the boundary of the Tripod Fire. The effects on recreation are described in terms of acres of National Forest System land and miles of roads that would have some type of restriction to public activity or access during project implementation.

AFFECTED ENVIRONMENT

A variety of recreation activities occur across the project area. Approximately 6,000 people come to the area each year to enjoy the recreational opportunities found there. The most popular forms of recreation include: snowmobiling, hunting, camping in dispersed camping spots, camping in developed campgrounds, riding off-highway vehicles (OHVs), riding mountain bikes, hiking, mushroom picking, and driving for pleasure.

Snowmobiling is popular, even though most of the area is closed to off-trail riding. There are approximately 96.3 miles of groomed snowmobile routes within the project area. There are also designated non-groomed trails in the project area and some unrestricted areas around the meadows along the 39 road. Figure 3.8-1lists the groomed route name, road number, and miles in the project area.

Figure 3.8-1: Groomed Snowmobile Routes by Road Number and Miles on FS Roads

Route Name	Location	FS Road Number	Route Miles on FS roads
Baldy Pass	Boulder Creek SnoPark to Peacock Meadows SnoPark	37	33
Thirtymile Meadows	Intersection with road 37 to Intersection with road 39-300 at Long Swamp	39	29.6
East Chewuch	Intersection with road 37 to Intersection with road 51	5010	10.7
Starvation Mountain	Intersection with road 42 to end of road	4235	11.6
Buck Pass	North Summit SnoPark to Peacock Meadows SnoPark	42	15.6

The Boulder Creek, Baldy Pass, and Thirtymile Meadow trails lead to "The Meadows". This is a popular snowmobile area with approximately 1,949 visits annually. Starvation Mountain is another popular snowmobile destination, with riders traveling from both the North Summit and Peacock Meadows SnoParks. There are approximately 1,128 snowmobile visits yearly on each of these routes. The East Chewuch Trail is part of a loop from the Eightmile SnoPark that follows the east and west banks of the Chewuch River. Assuming that half of the use from the Eightmile SnoPark is along this route, there are approximately 420 snowmobile visits on this route each year (USDA Forest Service 2002c).

Deer hunting during general firearm mule deer season in October brings the highest number of people to the project area at one time. Most hunters come to the area three to five days before the season begins to set up camp. Many stay throughout the two to three week season; some stay just for weekends; some leave after getting a deer, and others come to the project area to hunt and stay elsewhere. The hunters drive the roads, walk cross-country, or use OHVs to canvas the area.

Some people who camp in the project area prefer to pull off one of the roads and set up dispersed camps. Hunters look for a place where everyone in their party can camp together throughout the hunting season. Most of these campers stay in some sort of recreational vehicle, though some stay in tents.

ENVIRONMENTAL CONSEQUENCES

Direct and Indirect Effects

Alternative A – No Action

This alternative would have no direct effect on developed campgrounds, riding OHVs, riding mountain bikes, hiking, mushroom picking, or driving for pleasure. No timber harvest would occur in or around developed campgrounds or dispersed campsites. There would be no changes in the road system. Existing opportunities to drive for pleasure and otherwise use roads for recreational access would continue, however danger trees along many open roads would not be felled thus leading to a potential

safety risk and subsequent road closures. Danger tree felling along roads where BAER activities are planned would improve safety for personnel operating in these locations.

All Action Alternatives

For all action alternatives the measures listed in Chapter 2 (pages 2-28 and 2-29) would be highly effective in mitigating project effects in terms of public access and safe use of roads as these methods have been used successfully on the Methow Valley and Tonasket Ranger Districts. For each of the action alternatives, danger trees would be felled along about 47.2 miles of roads open to the public within the Tripod Salvage project boundary. The average width of the area for this activity is about 200 feet on either side of roads. This would improve safety for all road users.

For each of the action alternatives, snowmobiling, hunting, dispersed camping, mushroom picking, and other recreational access via roads would be restricted by proposed activities, to provide for public safety. In the project area there are no trails (motorized or non-motorized) within proposed harvest units, however timber harvest activity including timber hauling within the project area would require restrictions to trail access for safety. If winter operations occur, roads would be snow-plowed, and subsequent snowmobile trail grooming and use of portions of roads 37, 39, 42, and 5010 would be restricted for public safety (Figures 3.8-1 and 3.8-2). These restrictions would depend on which units are being harvested. They would not all occur at the same time or may not occur at all if harvest occurs in other seasons. This resulted in a project-specific, non-significant amendment (see Chapter 2) to allow snowplowing and motorized use of designated groomed snowmobile routes. If winter operations occur, the following roads would need to be snowplowed and opened for project motorized activities from December 1 to April 1:

Road 37 from the junction with Road 5010 to the junction with Road 39

Road 42 from the SnoPark in section 23, T35N, R24E, to the junction with Road 4235.

Figure 3.8-2: Potential Snowmobile Route Restriction Mileage by Alternative

Route Name	Route Number	Alternative			
		A	B & E	C	D
Baldy Pass	37	None	12.9	9.4	12.9
Thirtymile Meadows	39	None	None	None	None
East Chewuch	5010	None	7.8	7.8	7.8
Starvation Mountain	4235	None	8.6	1.6	8.6
Buck Pass	42	None	3.2	3.2	3.2
Total		None	32.5	22	32.5

Even with restrictions on the 5010 (East Chewuch) road, snowmobile access to the Chewuch River area would still be available via the 51 (West Chewuch) road, since this is part of a paired trail system (Forest-wide Standard and Guideline 17-8, USDA Forest Service 1989a:4-51). Access to 'The Meadows' would be restricted from the Methow side, though available from the north and east via Forest road 39.

Each of the action alternatives has a slightly different mix of unit locations (Appendix A – Alternative Maps) and road restrictions (Appendix J, Transportation Management Plan). During salvage operations, roads may be restricted to public use in order to complete the work safely. For example, logging equipment may need to cross roads or occupy the road. Log haul may be so heavy on narrow roads that it cannot be completed safely with public traffic. Helicopter yarding in Alternative D would necessitate closing the salvage area because of the danger of falling debris; this would include connected haul roads as well. Access restrictions could affect entire areas proposed for salvage, likely spread out over a two year timeframe (2007 to 2008). The entire area would not be closed at one time, as operations would be staged across the various roads and geographic areas. For example, operations (and related area and road restrictions) could concentrate in the Ramsey Creek area, before moving to Boulder Creek. Since the project area includes only dispersed recreation uses, effects by alternative are difficult to determine based on potential road restrictions. In essence, the effects would also be dispersed and would again depend on the sequence of active logging units and roads. In terms of area of potential impact, Alternatives B and E harvest 2,748 acres, Alternative C harvests 2,247 acres and Alternative D harvests over 3,404 acres, where road restrictions could occur.

Hunting would not be affected, except through road access restrictions related to timber harvest areas. Alternatives B/E, and D have the most timber harvest units proposed (2,748 and 3,404 acres respectively), and thus greater potential to disrupt public travel. Alternative C would harvest over about 2,247 acres, so impacts would be lower. During hunting season some dispersed camping sites within the project area would not be available either through road access restrictions or proximity to timber harvest operations. This limitation would cause extra competition for dispersed and developed camping locations outside of the project area. In the Ramsey Creek area, the Forest Travel Plan contains a non-motorized hunting area which restricts access from October 1 through November 30. In this area timber harvest and haul activity would be allowed, however existing gates would be kept closed to the public. Personnel associated with timber harvest activity would not be allowed to hunt within the non-motorized hunting area. For each of the action alternatives, non-motorized hunting areas would be impacted by timber harvest units BO19, RA01, RA07, RA09, RA10, RA11, RA13, RA14, RA15, RA16, and RA17 (a total of about 474 acres) if harvest activity occurs from October 1 through November 30.

There are nine recreation residences under term special use permits in the Brevicomis Tract and seven residences in the North Fork Salmon Tract adjacent to the Tripod Salvage project area. All residences are away from any planned timber harvest unit, though timber haul routes exist along Roads 5010 and 38 that are used for access to the recreation residences. Timber haul creates sound and dust during the dry season, which may indirectly affect these residences. For the Brevicomis Tract, Alternatives B and E would have about 55 truckloads of timber hauled along Road 5010 (which accesses the residences). By comparison, Alternative C would have about 52 truckloads hauled and Alternative D would have about 110 truckloads hauled. For the North Salmon Tract, Alternatives B and E would have about 45 truckloads hauled along road 38. By comparison, Alternative C would have no added haul traffic and Alternative D would have about 54 truckloads hauled. Other than the effects of timber hauling, there would be no other effect on these recreation residences.

Cumulative Effects

All Action Alternatives
Past, present, and reasonably foreseeable future actions in or near the project area are listed in the first part of this chapter. Those actions affecting the recreation resource are discussed below. The geographic setting for cumulative effects analysis includes the project area and portions of Forest Roads 37 and 39 within the boundary of the Tripod fire; effects are considered five years into the future. All fire- and BAER-related road and area restrictions have been lifted. Recreation use of the project area is primarily via roads which were developed in conjunction with past timber harvest activities. No new road building is planned, and the public continues to recreate using the existing road system for various seasonal activities. A large increase in the number of commercial mushroom pickers occurred the first spring and summer following the fire within the burn area and portions of the project area. The Forest organized a team to coordinate mushroom picking and provide an informational mushroom guide. As the result of the Tripod Fire, a number of actions were accomplished in the fall of 2006 and summer of 2007 under the authority of the Burned Area Emergency Response (BAER) on portions of the project area. This included fire-line rehabilitation, some danger tree felling, roadwork, and some seeding and mulching (Appendix L). Following the fire these actions enhanced access for recreational activities through updated road maintenance and danger tree felling along roads. Also due to the fire, an emergency closure was implemented in Spring 2007 for off-route motorized traffic within the burned area, to reduce soil disturbance. Roads and trails open to motorized use (vehicles and OHVs) were designated, while all other off-route travel was prohibited. This closure does not apply to snowmobiles; motorized winter recreation traffic is still based on the Forest Travel Plan. Other than the current proposal, the only foreseeable future activity affecting recreation would be the Forest OHV Plan. This is an analysis to determine specific trails and roads where off-highway vehicles will be allowed to operate. At this time not enough is known to describe specific elements of the plan, though the public will have the opportunity to provide input and comments. In summary, the cumulative effects of past, present, and reasonably foreseeable future actions with proposed salvage harvest activities would have some short-term impacts on project area recreation use during implementation however over the long-term there would be little to no change in overall project area recreational opportunities and use.

CONSISTENCY FINDING

For public safety and to facilitate timely removal of potential salvage timber, the project would not be consistent with Forest-wide standard and guideline 17-6. This resulted in a project-specific, non-significant amendment (see Chapter 2) to allow snowplowing and motorized use of designated groomed snowmobile routes. Since the west portion of the Chewuch River paired road system would be available for a groomed snowmobile route, project activity would be consistent with Forest-wide standard and guideline 17-8. In terms of recreation, with the exception of the project-specific Forest Plan amendment, all alternatives and all proposed actions would maintain dispersed recreation opportunities during and after salvage operations are complete and are consistent with Okanogan Forest Plan direction.

3.9. Inventoried Roadless Areas / Areas with Undeveloped Character

REGULATORY FRAMEWORK

The Tripod Fire burned 73,342 acres of land within Inventoried Roadless Areas and 23,177 acres of adjacent land with undeveloped character, for a total of 96,519 acres. Inventoried Roadless Areas (IRA) were identified and evaluated in the Okanogan Forest Plan (USDA Forest Service 1989a). Portions of the Granite Mountain, Tiffany, and Long Swamp Inventoried Roadless Areas (IRA) were burned by the Tripod Fire (Appendix A – Inventoried Roadless Area and Areas with Undeveloped Character Map). The description of each IRA is in Appendix C of the Forest Plan; Granite Mountain (page C-57), Tiffany (page C-66), and Long Swamp (page C-91). The IRAs are based on areas studied in the Roadless Area Review and Evaluation (RARE II), but not selected for inclusion in the Washington State Wilderness Act of 1984 (PL 98-339). The Wilderness Act stated that the Forest Service was not required to review the wilderness option for the remaining RARE II areas or areas less than 5,000 acres in size. Since existing roadless areas are the most likely source of any future wilderness designation, the Act did however provide that areas still in an unroaded and undeveloped condition when the Forest Plan is revised shall be reviewed with wilderness as an option. This EIS will analyze the effects of the Tripod Fire Salvage Project on the undeveloped character of the IRAs. In addition, areas adjacent to each of the IRAs that have undeveloped character will also be analyzed, since these areas could be considered for wilderness designation when the current Forest Plan is revised. The principle elements of undeveloped character include: natural integrity, appearance and surroundings, and opportunity for solitude, primitive recreation, and challenge.

Current Forest Service policy direction under the Roadless Area Conservation Rule (USDA Forest Service 2001a) and Interim Directive 1920-2006-1 prohibits new road construction and prohibits cutting, sale, and removal of timber in IRAs with some exceptions. None of the exceptions are applicable to the proposed actions for the Tripod Salvage Project.

ANALYSIS METHOD

In addition to the IRAs, the area with undeveloped character surrounding each IRA was delineated based on local Ranger District knowledge of existing roads and recent timber harvest units. Locations of roads and harvest areas were based on a combination of GIS mapping, aerial photo interpretation, and field reconnaissance. The combined acreage of the existing IRAs plus the surrounding areas with undeveloped character will be referred to as the Granite Mountain, Tiffany, and Long Swamp Undeveloped Areas for this analysis. Figure 3.9.1 shows the total number of acres in each IRA and adjacent undeveloped area. The effects on roadless and undeveloped character areas are described in terms of acres of National Forest that would have some type of activity or access during project implementation.

Figure 3.9-1: IRA and Areas with Undeveloped Character burned by the Tripod Fire

Inventoried Roadless Area	Total IRA Acres	IRA Within Tripod Fire (acres)	Adjacent Areas with Undeveloped Character within Tripod Fire (acres)	Total Undeveloped Area within Tripod Fire (acres) (includes IRAs & Adjacent Areas with Undeveloped Character)
Granite Mountain	27,439	23,101	11,443	34,544
Tiffany	22,055	12,531	1,171	13,702
Long Swamp	66,366	37,710	10,563	45,273
Total	115,860	73,342	23,177	96,519

AFFECTED ENVIRONMENT

The Tripod Fire burned over much of the area included within the boundary of the Granite Mountain, Tiffany, and Long Swamp IRAs. The burn perimeter also includes nearly all of the surrounding land with undeveloped character. Areas spared by the fire included portions of past fires (Forks, Thunder Mountain, Thirtymile, Farewell, and Isabel) which burned within the IRA boundaries. A brief summary for each of the IRAs is provided.

Granite Mountain: This area is east of Winthrop and south of the Middle Salmon Boulder Creek road (37). The area is characterized by broad rounded ridges and V-shaped valleys with elevation ranging from 2,600 feet to 7,850 feet. Prior impact to natural integrity was from the control efforts and timber harvest due to the1970 Forks Fire. The area has moderate opportunity for solitude and challenge, though primitive recreation is lacking due to the fact that no portion of the area is more than three miles from existing roads.

Tiffany: This area is northeast of Winthrop and north of the Middle Salmon Boulder Creek road (37). The area is characterized by seven mountain peaks with elevations above 7,000 feet. The peaks exhibit alpine characteristics mostly void of trees with vegetation primarily of grass and heather. Elevation ranges from 4,000 feet near Salmon Meadows to about 8,250 feet on Tiffany Mountain. Impacts to natural integrity and appearance include past mining and range fences. Solitude is limited by the openness of the area, opportunity for challenge is moderate, and primitive recreation is lacking due to the fact that no portion of the area is more than three miles from existing roads.

Long Swamp: This area straddles the upper Chewuch River north of Winthrop, east of Tonasket, and south of the Pasayten Wilderness. Topography varies from steep canyons, mountain peaks, and gentle ridges adjacent to meadows. Elevation ranges from 2,000 feet along the upper Chewuch River to about 7,450 feet on North Twentymile Peak. The major impacts to natural integrity include control efforts from the Thunder Mountain, Thirtymile, and Farewell Fires, as well as limited timber harvest in the Thunder

Mountain Fire area. Evidence of trails and short drift fences are apparent in meadow areas. Opportunities for challenge and solitude range from low to moderate. Primitive recreation is limited since only a small area is more than three miles from existing roads.

ENVIRONMENTAL CONSEQUENCES

Generally, that portion of the undeveloped area that is within one-half mile of activities described in the proposed action is subject to the sights and sounds of that activity as well as other ongoing activities such as livestock grazing and motorized recreation.

Direct and Indirect Effects

All Alternatives
Much of the Granite Mountain, Tiffany, and Long Swamp Undeveloped Areas burned in the Tripod Fire. None of the alternatives includes any salvage harvest within any of the IRAs, nor in any areas with undeveloped character. Therefore, none of the alternatives in the Tripod Salvage Project would change the amount of acres suitable for inclusion in the Granite Mountain, Tiffany, and Long Swamp Undeveloped Areas. As a result of the proposed action, the Recreation Opportunity Spectrum classes would not change and the Undeveloped Areas would continue to provide recreation in an unroaded and undeveloped setting. Undeveloped character which includes natural integrity, natural appearance, opportunity for solitude, opportunity for primitive recreation, and challenging experience would not change as a direct result of the proposed action. Indirectly, in the short term, due to the removal of tree cover with salvage and opening of some roads in portions of the project area during implementation of the proposed action, sights and sounds from outside the Undeveloped Areas may be more noticeable during salvage operations. Re-opened roads would not be open to recreational traffic, and would be closed after salvage operations are complete, minimizing any increase in recreation access. There would be some short-term loss in opportunity for solitude in the Undeveloped Areas from fugitive noise, dust, and smoke resulting from some of the proposed actions would have a minimal short-term effect on the Undeveloped Areas. These effects would be only noticed in portions of the Undeveloped Areas immediately adjacent to opened roads and salvage activity. If timber harvest occurs in winter, dust would not be generated.

Cumulative Effects

Past, present, and reasonably foreseeable future actions are listed in the first part of this chapter. Those actions affecting the Inventoried Roadless Areas and areas with undeveloped character are discussed below. The geographic setting for cumulative effects analysis includes the Granite Mountain, Tiffany, and Long Swamp Undeveloped Areas (the IRAs plus surrounding area with undeveloped character); effects are considered five years into the future. Boundaries of the Undeveloped Areas are largely the result of past timber harvest and road construction activities; there are no foreseeable future projects planned in the undeveloped analysis area to alter these boundaries. As the result of the Tripod Fire, a number of actions were accomplished in the fall of 2006 under the authority of the Burned Area Emergency Response (BAER) on portions of the undeveloped analysis area. This work included fireline and spot rehabilitation (Figure 3.9-2), and some seeding and mulching (Appendix A, BAER Map and Appendix L, narrative). Spot rehabilitation locations include heli-spots, safety zones,

cargo drop points, and weather station/repeater locations. Some of the seeding and mulching continued into spring/summer 2007. Work moved firelines and other disturbed areas to a more natural appearance and stabilized soils. All other actions listed as past, present, and reasonably foreseeable would not have effects on Inventoried Roadless Areas and areas with undeveloped character.

Figure 3.9-2: BAER work in IRAs accomplished in 2006.

Inventoried Roadless Area	Completed Dozer Fireline Rehab (miles)	Completed Hand Fireline Rehab (miles)	Completed Spot Rehab (each)
Granite Mountain	4.3	0.5	5
Tiffany	2.7	13.4	2
Long Swamp	0.2	2.2	3

CONSISTENCY FINDING

In terms of roadless and undeveloped character, all alternatives are consistent with Okanogan Forest Plan direction as well as current Forest Service policy and the 'roadless area conservation rule' because no road construction or salvage harvest are proposed in the Inventoried Roadless Areas. Danger tree felling along Forest Road 39 would only occur 200 feet either side of the road, and outside of the Inventoried Roadless Areas as described in the Roadless Area Conservation Rule.

3.10 Fuels And Fire Behavior

The section below is a summary of the Fuels and Fire Report which is available in the project analysis file (Trebon 2007a).

REGULATORY FRAMEWORK

Forest Plan Direction

Nine management areas lie within the analysis area. Activities are proposed in five of these areas as listed below. The following fuels standards and guidelines apply to the project area as indicated (USDA Forest Service 1989b).

Forest-wide Standards and Guidelines

19-4: Prescribed fire (planned and unplanned ignitions) may be used as a management tool to meet management area goals.

19-6: Cost-effective fuel treatment methods shall be used to achieve management goals. The desired fuel profile and fuel treatments necessary to achieve that profile shall be determined. Treatment methods shall be selected based upon appropriate analysis, which includes long-term site productivity considerations, for all management activities or where natural fuel accumulations create a fuel profile that poses an unacceptable impediment to current or future protection and management.

19-7: Woody debris shall be left on the forest floor for wildlife habitat, long-term site productivity, soil fertility, and where necessary, for microsite protection and seed. A sufficient amount of this debris shall be uncharred to provide for terrestrial wildlife, long-term soil productivity, and other purposes.

Standards Applicable to Management Areas with Scheduled Timber Harvest

Reforestation

20-21: When practicable, accomplish site preparation objectives concurrently with fuels management objectives.

20-26: Where planting is prescribed, site preparation should be completed within two years following harvest. Firewood availability shall be considered in site preparation planning.

Standards and Guidelines by Management Area

Management Area 5:

MA5-19C: Use of prescribed fire should meet the visual quality objective within three years of application.

MA5-19D: Recreation, visual, and wildlife values shall be key considerations in determining overall fuel treatment level and methods.

Management Area 14:

MA14-19C: Treat fuels to reduce the risk of wildfires to acceptable levels. A level of fuel treatment will be prescribed to protect timber stands, wildlife values, and other resources from unacceptable losses caused by wildfire.

MA14-D: Place fire-tolerant stands on a prescribed burning schedule where cost-effective to meet management goals.

Management Area 12:

MA12-19C: Prescribed fire (planned and unplanned ignitions) may be used as a management tool to meet management area goals.

MA12-19D: Fuels treatment, including the use of prescribed fire, shall provide, where practicable, for the retention of key wildlife habitat and shall be consistent with silvicultural objectives.

Management Area 14:

MA14-19C: Treat fuels to reduce the risk of wildfires to acceptable levels. A level of fuel treatment will be prescribed to protect timber stands, wildlife values, and other resources from unacceptable losses caused by wildfire.

MA14-D: Place fire-tolerant stands on a prescribed burning schedule where cost-effective to meet management goals.

Management Area 25:

MA25-19C: Treat fuels to reduce risk of wildfire to acceptable levels while maintaining long-term site productivity.

MA25-19D: Prescribe a level of treatment for natural and activity-created fuels to protect timber stands and other resources from unacceptable losses caused by wildfire.

MA25-19E: Place fire-tolerant stands on a prescribed burning schedule where cost-effective to meet management goals.

Management Area 26:

MA26-19C: Fuel treatment, including the use of prescribed fire, shall provide, where practicable, for the retention and/or enhancement of key wildlife habitat.

The Strategy for Management of Dry Forest Vegetation (USDA Forest Service 2000d), referred to in this analysis as the Dry Forest Strategy, describes management goals for protecting, maintaining, or enhancing forest health on dry forests. The following fuels objectives apply to dry forests within the Tripod Fire Salvage Project area:

Reduce fuel loads to conditions consistent with pre-settlement fire regimes.

Maintain desired fuel levels consistent with inherent fire regimes.

ANALYSIS METHOD

Scale of Analysis

This analysis covers the Tripod Fire Salvage Project area over the next 30 years. The indicators for fire hazard risk used to compare alternatives in this analysis are:

Percent of project with large woody fuel loadings above, within, and below recommended ranges in thirty years, averaged across the project area or the in the salvage harvest units.

Percent of project with resistance-to-control rating of extreme or high in thirty years.

Terminology

Throughout this analysis, the terms “coarse woody debris” and “large woody fuels” refer to dead down woody pieces larger than three inches in diameter (Harmon et al. 1986).

Models Used

Fire regimes for this analysis came from the Landscape Fire and Resource Management Planning Tools Project, also called the LANDFIRE Project (Rollins and Frame 2006). Data used to model pre-fire vegetation and fuels profiles came from Current Vegetation Survey (CVS) plots surveyed in the mid-1990s. Plots in this survey occur at 3/4-mile intervals across National Forest System lands, and those selected for this analysis are either within the Tripod Fire area or within one-half mile of it. For this analysis, each forest type (dry, mixed-conifer, and montane) is represented by seven to nine plots of small, medium, or large tree structure in the same forest type. The plots for each forest type were averaged using the Forest Vegetation Simulator with Fire and Fuels Extension (FVS-FFE) running under the East Cascades variant, creating one representative stand for each forest type. The vegetation structure within these representative stands was validated by district silviculturists. The ground fuels were validated by the forest fire ecologist and Tonasket and Methow Valley district fuels specialists. Further verification of ground fuels occurred by comparing the quantities within each averaged stand in FVS to fuels transects taken in the Chewuch River vicinity and to photo series (Maxwell and Ward 1976, 1980).

To simulate the fire effects on fuels in the Tripod Fire Salvage Project area for this analysis, areas that experienced “very low” and “low” tree mortality are represented by the low intensity/low mortality modeling done in FVS-FFE. “Moderate” and “high” tree morality areas are represented by the high-intensity/high-mortality fire modeling in FVS-FFE. These two intensity/mortality levels were applied to the three representative forest types in FVS-FFE, using protocols agreed on by the IDT and detailed in the project file (Trebon 2007a). The general parameters used for modeling low and high levels of fire intensity and tree mortality are described below. Using the East Cascade variant, FVS-FFE simulated tree growth for existing and surviving trees, and planted and naturally-regenerated seedlings. FFE also modeled snag collapse and decay rates, fuel loadings, parameters affecting fire behavior, and fuels accumulation and decay specific to the eastern slope of the Cascade Range (Dixon 2002, Smith-Mateja 2004).

Modeling with FVS-FFE removed 90% of the dead trees from 10-28” diameter at breast height (dbh) to simulate salvage harvest, with the remaining 10% consisting of unsound or heavily burned trees. Modeling did not consider that, in each proposed unit, some snags from 10-28” dbh would remain standing as wildlife trees, providing future benefits for wildlife (see Wildlife section). The effects of these wildlife trees on predicted fuel loads will be discussed under the action alternatives.

Low Intensity Fire, Low Tree Mortality
Modeling the effects of low burn intensity and tree mortality incorporated low to moderate fire intensity and fire effects, with 50% - 100% consumption of existing small woody debris (0-3” diameter) and 35% to 75% consumption of existing large woody fuels ($\geq$ 3” diameter) depending on size class. Trees up to 10” dbh experienced up to 75% mortality depending on forest type, and about 33% mortality above 10” dbh.

High Intensity Fire, High Tree mortality
Modeling the effects of high burn intensity and tree mortality incorporated moderate to high fire intensity and fire effects, with 90-100% consumption of existing small woody debris and 80%-90% consumption of existing large woody fuels depending on size class. Only small amounts of the largest woody fuels (6” diameter and greater)

remained partially intact. To model conservative conditions for snags and the large woody fuels loads they would create in the future, trees in all size classes experienced 100% mortality.

Consideration and use of the aforementioned material, along with the contacts, studies, and publications referred to in this analysis, was a consideration of the best available science. A final note on modeling with FVS-FFE: without actual pre-fire and post-fire stand and fuel loading data, the representative stands created from CVS plots only provide the basis for modeling trends in fuel loadings after the Tripod Fire and proposed salvage harvest. The value of this modeling is in showing relative variations in fuel profiles in different forest types after wildfire with or without salvage logging. Actual fuel loadings in the Tripod Fire Salvage Project area will depend on forest type, stand density, fire intensity, and fire severity.

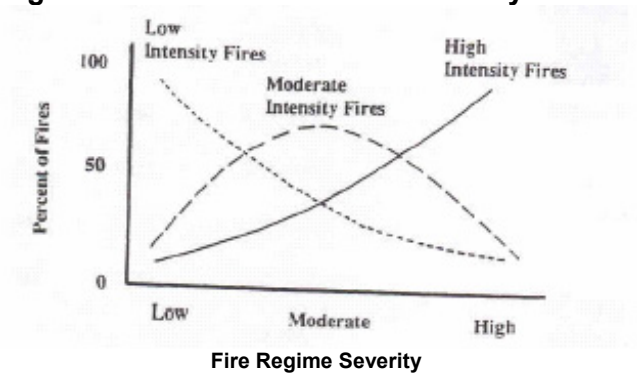
AFFECTED ENVIRONMENT

Fire Regimes

Natural Fire Regimes

Natural fire regimes characterize the role fire would generally play across a landscape in the absence of modern human intervention, though they do include the influence of aboriginal burning (Agee 1993, Brown 1995). Natural fire regimes describe the historical fire conditions that developed and maintained the structure and composition of vegetative communities, considering such attributes as the fire intensity, frequency, season, size, and extent that create particular fire effects in a biogeographical region. In high-severity fire regimes that include montane forests, fire effects usually included stand replacement. In low-severity fire regimes that include dry forests, the typical fire had mild impacts on dominant vegetation across much of the area it burned, while moderate-severity fire regimes that include mixed-conifer forests had a complex mix of severity levels (Agee 1998). Figure 3.10-1 compares historical fire intensity and associated effects by fire regime.

Figure 3.10-1: Historical fire intensity and associated effects varied by fire regime.



Sources/Notes: From Agee 1998 (see Agee's Figure 1B).

Hardy et al. (2001) and Schmidt et al. (2002) developed coarse scale definitions for natural (historical) fire regimes, and Hann and Strohm (2001) interpreted them for fire and fuels management. The five natural regimes characterize the historical fire intensity/severity and frequency for an area 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 fire regime groups are described in Figure 3.10-2 with the corresponding forest type used in this analysis (refer to Chapter 3.5 for further description and Appendix A map of these forest types) and the percentage of the Tripod Fire Salvage Project in this regime.

Figure 3.10-2: Tripod Fire Salvage Project Natural Fire Regime Groups and Corresponding Forest Types

Fire Regime Group	Fire Return Frequency	Fire Intensity	Severity	Forest Type (Percentage of Project Area)
I	0-35 years	Surface fires most common, with less than 75% of overstory vegetation replaced	Low	**Dry** (24%)
II	0-35 years	Stand replacement, with greater than 75% of the dominant overstory vegetation replaced	High	(0%)
III	35-100+ years	Mixed intensity fires, with less than 75% of overstory vegetation replaced	Mixed	**Mixed Conifer** (17%)
IV	35-100+ years	Stand replacement, with greater than 75% of dominant overstory vegetation replaced	High	**Montane** (59%)
V	>200 years	Stand replacement, with greater than 75% of dominant overstory vegetation replaced	High	(0%)

Sources/Notes: Fire regimes from Landfire GIS data (January 2007). Fire regime descriptions from www.frcc.gov (accessed 1/11/07).

Fire Regimes I though IV exist in the Tripod Fire Salvage Project area, as shown in Figure 3.10-3 (Appendix A Fire Regime map). This analysis focuses on Fire Regimes I, III, and IV as the dominant landscape natural fire regime groups in the Tripod Fire Salvage Project area.

Figure 3.10-3: See Appendix A - Fire Regimes Within Tripod Fire Salvage Project Area Map

Historic Fire Frequency

Before organized fire suppression in the early twentieth century, frequent fires of varying intensities characterized the dry and mixed-conifer terrain within the Tripod Fire Salvage Project. Schellhaas et al. (2003) show that along the east slope of the Chewuch River (including portions of Twentymile, Leroy, North Fork Boulder, Brevicomis, Junior, and Bromas Creeks), the mean fire return interval ranged from 9 to 16 years below 4,500' elevation. Fire scars found here reveal many fires from 1660 - 1889, with an average size of about 1,500 acres. These fires were usually low-intensity surface fires, but when topography, fuels, and weather were aligned, higher-intensity fire could develop and carry into the higher-elevation forest. About 41% of the Tripod Fire Salvage Project area

(the portions in dry and mixed-conifer forests) historically experienced frequent low-severity fires that maintained open forest structures, and mixed-severity fires which created a mosaic of post-fire openings, early to mid-seral forest structural stages, and shrub- or herb- dominated patches. According to district records, about 10% of the dry and 15% of the mixed-conifer forests within the Tripod Fire Salvage Project area experienced wildfire between 1911 and 2005, leaving about 90% of dry forest and 85% of mixed-conifer forest outside of the historical fire return frequency.

Schellhaas et al. (2001) also assessed historical fire disturbance effects in higher-elevation, or montane, forests that burned during the Tripod fire. Survey data taken from the area including Beaver Creek, Starvation Mountain, Pearrygin Peak, Clark Creek, Tiffany Meadows, and Middle Fork Toats Coulee Creek demonstrated that, between 4,500' to 6,800' elevation, widespread lodgepole pine and Engelmann spruce forests generally experienced very high fire severity, with a mean fire return interval of 28-107 years. These fires replaced stands by directly killing the trees with fire and heat, or indirectly killing them by lowering their resistance to insects and disease. Large fires of 1,000 acres or more were common in the subalpine areas where fewer topographic barriers exist to limit the spread of fire, a description applicable to much of the 59% of the Tripod Fire Salvage Project area in montane forests. According to district records, about 32% of the montane forest within the Tripod Fire Salvage Project area experienced wildfire between 1911 and 2005.

Changes in Fire Regimes

Some of the fire regimes in the project area have been altered by fire exclusion and land management practices such as grazing and logging (Agee 1993, Lehmkuhl et al. 1994, USDA Forest Service 2000d). Before the Tripod fire, dry and mixed-conifer stands within the Tripod Fire Salvage Project area that historically experienced high-frequency, low-intensity fires had dense forest structures, abundant surface and ladder fuels, and low canopy base heights. During the severe fire weather conditions of July and August 2006, these changes in stand structure and down woody fuel loadings in the dry and mixed-conifer forest helped shift fire behavior from historical norms to fast-moving, high-intensity, crown-replacement and mixed-severity fires.

Reburn Hazard

The moderate to high mortality caused by the Tripod Fire in parts of the dry and mixed-conifer forests has the potential to cause an even greater shift in fire regimes in the event of a reburn. This term specifically refers to wildfire in burned forests where heavy loads of fallen snags contribute notably to fire behavior and fire effects of the next fire (Brown et al. 2003). High fuel loading and the associated reburn hazard in the near future was a relatively rare occurrence on dry-forest sites (Fire Regime I) with a properly functioning fire regime (Agee 1993, 1998). A reburn in dry and mixed-conifer forests in the Tripod Fire Salvage project area could cause uncharacteristically severe fire effects in direct proportion to the number of fire-killed snags available to contribute to the fuel loading. The likelihood of a reburn in these forest types is higher than in montane forests because of the factors that influence the production and flammability of fuels (Bekker et al. 2001):

> Fine fuel production rates are higher in low-elevation forests than in higher-elevation montane fir-dominated forests. Consequently, fires can reburn in a low-elevation mixed-conifer forest sooner than in higher elevations.

Fuel beds of long pine needles (i.e. ponderosa pine) are also less dense than those composed of short-needled species (i.e. lodgepole pine), and fire spread and intensity are greater in low-density fuel beds.

Finally, the period fuels are dry enough to burn each year is longer on warmer low-elevation sites than on cooler, moister high-elevation sites.

Twentieth-century fire suppression policy has had little impact on landscape structure in the montane forests because of the fairly long fire-return intervals historically experienced in this forest type (Agee 1993). Montane areas of the Tripod Fire Salvage Project experienced stand-replacing effects similar to those caused by historic Fire Regime IV fires.

Wildland Urban Interface

The zone where homes and other structures meet wildlands is known as the wildland urban interface (WUI). The current definition for WUI used for this analysis includes private lands within 1.5 miles of national forest system lands. In the Tripod Fire Salvage Project area, the WUI includes the Ramsey Creek area on the Methow Valley Ranger District. From 1995 – 2006, this area had several hazardous fuels treatments around Ramsey Peak and within the Ramsey Creek basin adjacent to state and private lands. The treated areas were successfully used as primary fireline during the Pearrygin (2005) and Tripod (2006) wildfires, providing defensible space for firefighters and nearby residents. The Bear Timber Sale contained several thinning units within Ramsey Creek, some of which were used as direct fireline during suppression efforts during the Tripod fire. Before the Tripod Fire, most of these treated areas had fuel loadings similar to historical conditions, although forested stands were still dense in some areas. The Ramsey WUI experienced moderate to very high fire mortality during the Tripod Fire, creating a high number of snags. Although nearby ongoing fuels treatments scheduled in about 900 acres adjoining the project area will lower the fire hazard next to this area, they will not change how wildfire acts inside of the WUI in Ramsey Creek. Future maintenance fuels treatments would need to occur to reduce fuel loadings in this portion of the project area without placing the developing stand and the adjacent urban interface at risk.

Fire Hazard and Fire Severity

Fire hazard generally refers to the difficulty of controlling potential wildfire. Dependent on the biophysical conditions of an area that contribute to fire spread (like fuels, topography, etc.), fire hazard is commonly described by fire behavior characteristics such as rate-of-spread, intensity, torching, crowning, spotting, fire persistence, and resistance-to-control (Brown et al. 2003). Resistance-to-control incorporates many of these factors, and will use fuel loading to assess fire hazard in this analysis.

Fire severity (the effects of fire on the ecosystem) is another element of fire hazard that directly influences ecosystem resiliency, or recovery, after disturbance, especially within altered fire regimes that experience uncharacteristically severe fire effects. Fire severity depends on fuel loading, fuel consumption, and heat flux into all living components, including the soil (Brown et al. 2003). Large woody fuel ($\geq$3” diameter) loading is closely linked to fire severity, and will be used to gauge fire severity in this analysis.

Fuel Loading

Fuelbeds are composed of everything on the ground that can burn, from duff to large logs. They are structurally complex and vary widely in their physical attributes, potential

fire behavior and effects (Sandberg et al. 2001, Ottmar et al. 2003). In FVS-FFE modeling done for this analysis, breaking and falling snags are added to the appropriate fuelbeds where further decay modeling occurs. The components of fuelbeds that most influence fire hazard and fire severity are small and large woody fuels.

Small Woody Fuels

Small woody fuels include downed woody debris on the forest floor between 0-3" diameter. These fuels contribute differently to fire hazard, substantially influencing spread rate and intensity of surface fires and associated torching and crowning (Brown et al. 2003). Widely-accepted fire behavior models estimate the effect of this fuel (Andrews 1986, Andrews et al. 2005, Rothermel 1983). In the Tripod Fire Salvage Project area, almost all of the small woody fuel was consumed by both low- and high-intensity fires, depending on forest type.

Large Woody Fuels (Coarse Woody Debris)

Large woody fuels, or coarse woody debris (CWD), includes woody debris on the forest floor 3" in diameter or greater. These fuels add substantially to surface fire heat release. Accumulations of this fuel beneath a forest canopy contribute to torching, crowning, and spotting, and large fire growth. If the large woody fuel is decayed and broken up, it increases intensity considerably, similar to fire in heavy slash. The contribution of large woody fuel to surface fire intensity is likely underestimated in fire behavior models, which treat large woody pieces as smooth cylinders. An assumption of a smooth surface disregards the finely textured nature of bark-covered and weathered pieces (Brown et al. 2003), which means more surface area available to affect fire behavior and fire effects.

Large woody fuels are also an important component in the structure and functioning of ecosystems. Dead trees contribute toward many ecological processes both as standing snags and fallen woody material lying on and in the soil (Chapters 3.2 and 3.4). The recommended quantity of large woody fuels remaining after a fire provides desirable biological benefits to soil productivity, soil protection, and wildlife without creating an unacceptable fire hazard or potential for high-severity reburn (Brown et al. 2003). Considering the contributions of CWD and the historical dynamics of this material on the Okanogan-Wenatchee National Forests, its recommended range is estimated at about 5-10 tons/acre in dry forests; 10-18 tons/acre in the mixed conifer forests; and 7-15 tons/acre in the montane forests (Harrod 2007, USDA Forest Service 2000d).

Current CWD loadings in the project area are likely very low because the Tripod fire probably consumed most or all of it, especially in the dry and mixed-conifer forests. The estimated and recommended ranges of CWD loading in the Tripod Fire Salvage Project area are based on FVS modeling and are shown in Figure 3.10-4. The range of numbers in the post-fire column shows the wide variation of CWD likely consumed by high-intensity and low-intensity fires. The lower value in these ranges describes the CWD fuel loading likely remaining after high-intensity fire consumed more of this material.

Figure 3.10-4: Estimated Post-fire and Recommended CWD Loadings

Forest Type (Fire Regime)	**Post-fire (2007) CWD Fuel Loading (tons/acre)**	**Recommended Range of CWD (tons/acre)**
Dry Forest (Fire Regime I)	0.5 - 2	5 - 10
Mixed Conifer Forest (Fire Regime III)	0.5 - 3	7 – 15
Montane Forest (Fire Regime IV)	1 - 7	10 - 18

Sources/Notes: Estimated fuel loading modeled in FVS-FFE using CVS plot data and validated by fuels transect surveys and photo series (Maxell and Ward 1976, 1980). Future modeling to 2037 done with FVS-FFE (ver. 1.19A). Recommended ranges of CWD from Brown et al. (2003) and Harrod (2007).

Resistance-To-Control

Resistance-to-control is generally viewed as an estimate of the suppression force required for controlling a unit of fire perimeter. Resistance-to-control ratings in the High and Extreme range translate into higher fire hazard and require more suppression resources. Resistance-to-control ratings can consider accessibility, slope, fuel model, small and large woody fuel loading, and other factors. The rating used for this analysis was developed by the USDA Forest Service Pacific Southwest Region, and is based on difficulty of fireline construction and inventory of down woody fuel loadings by size classes (Brown et al. 2003). The combinations of small woody debris and large woody debris from 3-10" diameter that create high and extreme resistance-to-control ratings are shown in Figure 3.10-5. This resistance-to-control ratings does not consider large woody fuels greater than 10"-diameter. Currently, resistance-to-control in the project area is non-existent to very low.

Figure 3.10-5: Resistance-To-Control Rating Scheme

Small Woody Fuels (tons/acre)	**Large Woody Fuels 3-10" diameter (tons/acre)**	
	HIGH	**EXTREME**
5	25	40
10	15	25
15	5	15

Sources/Notes: Table from Brown et al. (2003), p. 4.

ENVIRONMENTAL CONSEQUENCES

Alternative A – No Action

If this alternative is selected for implementation, no management actions would affect future fire behavior in the Tripod Fire Salvage Project area. Ongoing hazardous fuels management activities on National Forest system lands adjacent to the project area would reduce fire hazard on treated lands, but would not affect the fire hazard within the project area. Salvage harvest treatments on state lands near the project area on the Tonasket Ranger District would have no effect on the fire hazard risk on National Forest system lands within the project area. However, both types of treatment would reduce

the resistance-to-control for potential wildfires near the project area, reducing the risk of newly-developing stands experiencing high-intensity wildfires that ignite outside of the project area and move into it.

Direct/Indirect Effects

Fuel Loading

Small Dead Woody Fuels (0 to 3" diameter)

Modeling in FVS-FFE showed that most changes in small woody fuel loading would happen 5 to 10 years after the Tripod fire. Branches from snags would accumulate in quantities depending on the amount of tree mortality in an area. Grasses and shrubs would re-establish themselves within the first 1-2 years and would add to the fine fuel (0 to 1/4" diameter) loading over time, with grass loading peaking in about three years (Harrod 2007). In low-mortality areas, small woody debris would slowly, continually increase over the next several decades because the surviving overstory would continue to contribute twigs and small branches over the long-term. In high-mortality areas, small woody debris would initially increase for about five years as snags lost most of their branchwood, and then slowly decline as decay occurred faster than accumulation for several decades.

As forests increase in elevation within the project area (dry to mixed-conifer to montane), the small woody debris loading would peak at higher levels because greater numbers of dead trees would have increasingly more branchwood to contribute to this fuelbed. Once snags in high-mortality areas had fallen, though, this fuelbed would continue to slowly shrink over the next several decades until the overstory re-established and began contributing to this fuelbed again.

Large Woody Fuels (CWD, ≥3" diameter)

Modeling this fuelbed in FVS-FFE showed that large woody fuel loads increased at various rates in each forest type depending on pre-fire stand density and the amount of post-fire tree mortality. Most snags would drop during the first 15 years. Decay modeling in FVS-FFE predicted that the large woody fuels would persist on the landscape for several decades post-fire because of slow decay rates, especially in the drier portions of the Tripod Fire Salvage Project area (Reinhardt and Crookson 2003). In low-mortality areas, modeling showed that large woody fuel would increase slowly and steadily for several decades in all forest types as overstory trees continued to die and fall slightly faster than the large fuels could decay. In all forest types that experienced high-intensity, high-mortality fire, large woody fuels would increase faster than in low-intensity, low-mortality fire areas because of the greater number of snags available to fall in these areas. Large woody fuels in these areas would increase to peak levels about 40-50 years post-fire, and then slowly decline for at least another 40-50 years as decay outpaced the regeneration of the new stand that would contribute to this fuel size. With increased elevation within the project area (dry to mixed-conifer to montane forests), the large woody fuel loading would peak at higher levels because greater numbers of dead trees would add increasingly more bole wood to this fuelbed.

Recall that the recommended level of large woody fuels (CWD) (Brown et al. 2003) on the Okanogan-Wenatchee National Forests is estimated at about 5-10 tons/acre in dry forests; 10-18 tons/acre in the mixed conifer forests; and 7-15 tons/acre in the montane forests (Harrod 2007). Figure 3.10-8 shows estimated time frames needed for each forest type to reach the minimum or exceed the maximum of these ranges over a 30-

year period without any management action and with salvage harvest. Modeling indicated that CWD levels in all forest types with moderate to high mortality (about 64% of the project area) would exceed these recommended ranges in 1 to 11 years without treatment, and would stay well outside the recommended range for the several decades past the Tripod Fire. Excluding salvage harvest, especially in the frequent fire regimes that include the dry and mixed-conifer forests, would mean accepting an uncharacteristically high amount of down fuel for up to another century, barring further disturbance.

Reburn Hazard

Future fire behavior and severity in the Tripod Fire area, including reburn hazard, will depend on a number of interacting factors including pre-fire vegetation, species adaptations to fire, fire severity experienced during the Tripod Fire, environmental conditions, and elapsed time since the Tripod Fire. With these factors in mind, some general statements about future fire behavior and severity during high to extreme burning conditions with low fuel moistures can be made (Brown et al. 2003):

0 to 10 years post-fire - High-severity fire is unlikely because duff and downed woody fuels that support prolonged burning would be absent or minimal. Large woody fuels would still be accumulating through fall-down and would not have decayed enough to support smoldering combustion. Surviving onsite herbs and shrubs should dominate the recovering vegetation. Newly established trees that regenerate by producing seeds could be lost. Even seedlings of species having sprouting capability could die if their root systems are not well established.

10 to 30 years post-fire - Downed CWD would exhibit some decay and support a longer period of burning. A duff layer, however, would not be well established and would be unable to contribute to soil heating. Thus, high burn severity would primarily occur where large woody material was lying on or near the soil surface. High-severity fire could be substantial where a large proportion of the soil surface was directly overlain by large woody material, which could accumulate from fall down of a large amount of tree basal area. A limited amount of conifer regeneration might be possible from young cone-bearing trees established onsite after the previous fire.

30 to 60 years post-fire - Large woody pieces would probably exhibit considerable decay, and a forest floor of litter and duff would be established to a variable extent depending on the density of overstory conifers. Burnout of large woody pieces and duff is assisted by the interaction of these two components (Brown et al. 1991). Higher-severity burning than would typically occur during earlier periods is possible depending on the extent of soil coverage by large woody pieces. If a conifer overstory exists, crowning coupled with duff burnout could amplify the burn severity.

Fuel Loading Summary

Implementing Alternative A would allow ground fuels to increase to abnormally high levels in dry and mixed-conifer forests throughout the project area, making maintenance fuels treatments like low-intensity prescribed burns difficult to implement in these areas as long as unusually high large woody fuel loads persisted. As trees regenerate and mature throughout the project area, they will be vulnerable to fire for at least 20 years whether salvage occurs or not because bark thickness has not developed enough to withstand even low-intensity fire and lower branches common to young trees readily carry fire throughout the tree canopy. When fire-resistant species like ponderosa pine, Douglas-fir, and western larch reach 10-12” dbh, though, their bark becomes thick enough to tolerate heat exposure similar to that produced by low-intensity prescribed fire. With no salvage treatment, prescribed fire treatment would likely kill even these

larger trees through scorch and soil heating because higher large woody fuel loads would create high flame lengths and more radiant heat, and transfer more heat into the soil.

The inability to use low-cost prescribed fire treatments could affect the WUI near Ramsey Creek, since this treatment could not be used effectively to maintain low fuel loading there without damaging surviving or re-establishing trees. Expensive, non-commercial fuel reduction treatments such as hand-piling would be needed to help move the project area toward recommended CWD loading. Future funding for high-cost fuel-reduction projects is uncertain.

Under this alternative, a reburn involving recommended quantities of CWD should not lead to unusually severe fire effects because mortality caused by soil heating would be minimal. Historically, fires probably often occurred in the understory and mixed fire regime types when large downed woody fuels were in the recommended range (Brown et al. 2003). According to field-verified mortality levels, however, about 62% of the project area would exceed this recommended range by 2017. As new vegetation grows along with increased fuel loads, the likelihood for reburns causing severe effects would increase. In all forest types, reburn could more severely affect recovering soils because the greater large woody fuel loadings would contribute to high-severity fire effects as this debris would take longer to consume, possibly transferring high amounts of heat to the soil for extended periods of time.

Resistance-To-Control

The small woody and non-woody debris that most easily catches and carries fire would increase over the next 3-5 years as branches drop, needle-cast blankets the area, and grasses and shrubs are re-established. This small woody debris, along with large woody fuels from 3-10” diameter, contributes to the resistance-to-control rating. Modeling representative stands with FVS-FFE indicates that, without management action, this portion of the large woody fuel load would increase considerably over the next 5-15 years as snags created by the Tripod fire collapse. Throughout the dry and mixed-conifer forests in the project area, even where the small woody debris load would be low, abnormally high loads of large woody fuels from 3-10” diameter would create high fire hazard within 5-15 years that would persist for several decades. Very-low and low mortality areas in all forest types (about 38% of the project area) would experience low to moderate resistance-to-control for at least the next 30 years because fewer dead trees would be available to fall. Moderate- and high-mortality areas in all forest types (about 62% of the project area) would have heavy fuel loads with high to extreme resistance-to-control over this same period.

The Resistance-To-Control Rating Scheme (Figure 3.10-5) provides the basis for evaluating fire hazard created by small woody debris and portions of the large woody fuel loadings (3-10” diameter). FVS-FFE projected fuel loads that would exist in these categories with no management action and salvage harvest, resulting in predicted Resistance-to-Control ratings shown in Figure 3.10-9. With higher resistance-to-control ratings predicted for moderate to high-mortality areas within the project boundary, the WUI near Ramsey Creek would be more vulnerable to uncontrolled wildfire coming off National Forest System lands before it could be suppressed unless future fuel treatments were planned in this area.

Alternatives B, C, D, and E
Fuel treatments were determined in an interdisciplinary fashion to minimize fire hazard, meet Forest Plan standards and guidelines and Dry Forest Strategy for fuel loading, and retain recommended amounts of CWD for biological benefits of wildlife, soils, and ecosystem productivity (Brown et al. 2003, Harrod 2007). Where ground-based logging systems are used and trees are removed to landings, fuels at the landings would be treated by pile burning in all action alternatives. In this scenario, tops up to 9"-diameter would be removed to landings, collected into piles, and later burned after firewood utilization. Where ground-based logging systems are used and trees are felled by hand, and where skyline or helicopter-based logging systems are used, debris created by salvage harvest would remain within the units. Effects caused by each action alternative would vary by the amount of harvest occurring with ground-based logging systems that removed tops to landings, compared to ground, skyline, or helicopter logging systems where hand-felling occurred. In all proposed units, some snags would remain standing as wildlife trees (Chapter 3.2). In Alternative E, effects would differ from Alternatives B, C, and D because of the smaller range of tree diameters available for harvesting (10-21").

Monitoring would occur throughout project implementation to assess fire hazard and large woody fuel loadings. Fuel treatments would be adjusted as needed to prevent excessive accumulation of hazard fuels or unacceptable loss of adequate remaining coarse woody debris. Some units may be intensively monitored following the Methow Valley Ranger District or Tonasket Ranger District Prescribed Fire Program Monitoring Plans.

Direct/Indirect Effects

Fuel Loading
Small Woody Fuels (0-3" diameter)
Most slash from harvest activities consists of small woody fuels. The slash hazard created by salvage harvest in the Tripod Fire Salvage Project would be less than what normally accumulates during harvest operations because trees that would be harvested have fewer needles and branches remaining after the fire to deposit on the ground. Accumulations of small woody fuels that normally lay in proposed salvage harvest areas were mostly consumed by the Tripod Fire. Where hand-felling occurred in all action alternatives, small woody fuel loading would increase one to three years faster with salvage logging operations than in Alternative A because branchwood would break off on impact during tree-felling operations and remain in the units, rather than falling off as it decays on the snag. There would likely be very little difference in small woody fuel loadings between harvest systems because felling and any associated processing within the unit would leave most of the branches within the unit. Where ground-based logging systems are used and tops are removed to landings, very little small woody fuel would leave the unit because there would be almost none left on the bole of the tree after it was felled. Modeling indicates that small woody fuels created by salvage harvest in all of the action alternatives would be at levels similar to those in non-salvaged areas within about five years, and decay within about 10-20 years.

Alternative D would create more small woody debris across the project area than Alternatives B, C, and E because it would include 656 more harvest acres. Alternative C would create less small woody debris than Alternatives B, D, and E because it would harvest 500 acres less than Alternatives B and E, and 1,157 acres less than Alternative

D. In comparison to the other action alternatives, Alternatives B and E would create similar amounts of small woody fuel loading across the project area, with Alternative E creating slightly less per acre than Alternative B because it would harvest fewer trees from the same acres.

Grasses and shrubs would re-establish in burned areas in the next 1-2 years and would contribute to this fuel load in quantities similar to Alternative A. Planting and natural regeneration would occur as described in the vegetation section; modeling done with FVS-FFE indicates that the regenerating stand would contribute little to the small woody fuel loading during the first ten years except for small quantities of needle cast.

Large Woody Fuels (CWD, ≥3" diameter)
Modeling in FVS-FFE indicates that differences in large woody fuel loadings created by each action alternative would come from the type of logging system used and the amount of mortality experienced in each unit. Salvage in moderate to high mortality forests, where more snags are available for harvest, would create more debris than in low to moderate-mortality forests. Ground-based whole-tree-yarding would leave little CWD in units in comparison to other logging methods, removing 9"-diameter tops at landings and leaving them in piles for later burning. Skyline or helicopter logging systems would leave 9"-diameter tops in the units and high-mortality areas would have more snags to harvest, the large woody debris loads would increase in these areas by about 2 tons/acre. Figure 3.10-6 shows the types of logging system that would be used in each alternative and assumes that ground-based logging would most likely remove 9"-diameter tops with the logs.

In all action alternatives, salvage harvest would initially increase large woody fuel loadings slightly faster than Alternative A over the first five years in areas harvested with any logging system that left 9" tops in the units to contribute to large woody debris loading. Since Alternative D would treat the most acres with skyline or helicopter-based logging systems, it would leave large woody fuel across 3% more of the project area than Alternative A, and 2% more of the project area than Alternatives B, C, and E. Of the action alternatives, Alternative E would create the least large woody fuel loading during salvage because the reduced diameter range proposed for harvesting would result in fewer trees harvested.

Figure 3.10-6: Tripod Fire Salvage Harvest Systems by Alternative

Alternative	Acres Treated	Acres with Tractor-based Harvest	% of Project Area	Acres with Skyline or Helicopter-based Harvest	% of Project Area
B, E	2,748	2,133	6	615	1
C	2,247	1,831	5	416	1
D	3,404	2,122	6	1,282	3

Changes in large woody fuels were modeled with FVS-FFE for all alternatives for existing (2007), 5-year (2012), 15-year (2022), and 30-year (2037) stages in dry, mixed-conifer, and montane forests. Figure 3-10.7 compares the resulting fuel loads. The range of fuel loading at each interval is affected by low-to-high ranges of fuel consumption and tree mortality modeled for each forest type. Low-intensity, low-mortality fire in each forest type would result in the low values in each range because

less of the existing woody debris load would have been consumed by the Tripod fire and fewer snags would have been created to add to it. High-intensity, high-mortality fire would result in the high values in each range because the Tripod fire would have consumed more large woody debris, and would have created more snags to add to this fuel load over time. For Alternatives B, C, and D, FVS-FFE modeling predicted that at 15 and 30 years post-salvage, large woody fuel loads in each forest type would be less than half of those remaining from no management action because the number of available snags would have been reduced by salvage activities. For Alternative E, modeling indicated that at these same intervals, large woody fuel loads in each forest type would be about half to one-third of those in Alternative A because Alternative E would not salvage trees greater than 21" dbh, and these would be available to contribute to CWD loads.

Large woody fuel load modeling (as shown in Figures 3.10-7 and 3.10-8) did not consider that on average 4 snags per acre from 10-28" dbh would remain in each proposed unit to provide wildlife benefits, which would cause future predicted fuel loading to differ from actual fuel loading by up to about five tons/acre when these wildlife snags fell. This would have the greatest affect in dry forests, where the recommended CWD load could be exceeded in about 15 years when these snags fell. The portion of the dry forest where fuel loads are most critical to control is within the WUI near Ramsey Creek; refer to Resistance-to-Control discussion in this section for effects on the WUI.

A portion of the proposed salvage in Alternatives B, C, D, and E on the Tonasket Ranger District would harvest trees from 10–18" dbh. Changes to large woody fuels in these areas would be very similar to the estimates modeled for Alternative E, which would harvest trees between 10-21" DBH across the rest of the salvage area. Lowering the top DBH by another 3" in these areas on the Tonasket Ranger District would lower large woody fuel loadings in areas where tops were left in units by less than 1 ton/acre, leaving a one to two more large-diameter trees per acre to provide future CWD.

Figure 3.10-7: Estimated Current and Future Large Woody Fuel Loadings (tons/acre), 2007 – 2037

Forest Type	Alternative	Current (2007)	5 Years Post-fire (2012)	15 Years Post-fire (2022)	30 Years Post-fire (2037)
Dry	A	0.5 – 3.3	1 – 10	5 – 20	6 – 26
	B, C, D		4 – 6	5 – 8	6 - 11
	E		4 – 9	7 – 16	8 - 20
Mixed Conifer	A	1.8 – 3.2	4 – 12	7 – 23	9 - 31
	B, C, D		4 – 8	5 – 12	6 - 11
	E		4 – 12	5 – 16	6 - 20
Montane	A	2.8 – 6.1	9 – 18	12 – 31	12 – 38
	B, C, D		7 – 11	7 – 15	7 – 17
	E		4 – 16	6 – 23	7 - 26

Sources/Notes: Existing fuel loading is based on CVS plot data and validated by fuels transect surveys and photo series (Maxell and Ward 1976, 1980). Future modeling to 2037 done with FVS-FFE (ver. 1.19A).

The trends in fuel loading shown in this figure indicate that implementing Alternative A would not reduce large woody fuel loadings, leaving all snags to contribute to CWD and exceeding recommended CWD loads (as described in Figure 3.10-4) within 15-30 years. Implementing Alternatives B, C, or D would remove about half or more of the available CWD that snags would contribute in treated areas so that, within 15-30 years, areas in all forest types would have CWD loadings similar to those recommended in Figure 3.10-4. Implementing Alternative E would leave about two to three snags per acre more than Alternatives B, C, or D. When these snags fell within 15 to 30 years, areas in the dry forest would likely exceed recommended CWD levels, while treated areas in the mixed-conifer and montane forests would have CWD levels similar to those recommended in Figure 3.10-4.

Reducing unusually high fuel loads in these forest types would minimize the risk of uncharacteristically intense, high-severity, stand-replacement wildfire in treated areas to the extent that planted or naturally regenerated trees have grown enough to become fire resistant, and to the extent that continuing vegetation and fuels management treatments occur in the future. Removing large-diameter woody material while it is still valuable would help prevent excess accumulation of ground fuels that would require costly, labor-intensive treatments (such as hand-piling) to reduce fire hazard over the next 30 years. Reducing large woody fuel levels would allow use of less expensive fuel maintenance treatments, such as low-intensity prescribed fire, as soon as seedlings were able to sustain this treatment (after about 20 years); prescribed fire in turn would help prevent small woody debris within the developing stand from creating a future fire hazard. Any use of prescribed fire would have to consider the potential for direct mortality from char and scorch, and indirect mortality caused by soil heating.

Recommended Range of CWD
Figure 3.10-8 shows FVS-based estimates of if and when each forest type would reach or exceed the recommended CWD ranges, as described by Brown et al. (2003) and modified for the Okanogan-Wenatchee National Forests by Harrod (2007), from 2007 – 2037. Modeling showed that Alternatives B, C, D, and E reached the minimum CWD range for each forest type within eleven years of Alternative A. CWD would accumulate faster in Alternative E than in Alternatives B, C, or D because larger trees from 21-28" dbh would remain in the salvaged units (at the estimated number of 1-2 trees per acre) and would be available to provide downed material.

The following list summarizes the trends shown in Figure 3.10-8:

Dry forests have the lowest recommended range of CWD in the project area. In dry forests modeled with very low to low mortality, Alternatives B, C, or D would meet recommended CWD ranges one to eight years sooner (depending on logging system used and debris remaining) than Alternative A. Alternative E would meet recommended CWD ranges 11 years sooner than Alternative A (2-10 years faster than Alternatives B, C, or D). In the 30-year period modeled for this analysis, no alternative exceeds the maximum CWD recommended for this forest type. The faster increase in CWD during salvage is likely due to branchwood left by salvaged trees, and by leaving 9"-diameter tops in units logged with skyline or helicopter systems.

Where dry forests experienced moderate to high mortality, Alternatives B, C, or D would reach recommended CWD range within about 4 years of Alternative A, and would stay within this range up to 20 years longer than in Alternative A. Alternative E would reach recommended CWD range within one year of Alternative A (up to three years faster than Alternatives B, C, or D), and would exceed the range two to five years after Alternative A (6-13 years before Alternatives B, C, or D).

Mixed-conifer forests have a slightly higher recommended range for large woody debris than dry forests. Alternatives A, B, C, and D do not meet or exceed the recommended CWD range within 30 years in low to moderate-mortality areas because of the low proportion of post-fire CWD in the model, the Tripod fire would have created fewer snags to contribute to this fuel load, and because these alternatives remove all dead trees from 10-28" dbh during modeling. These areas would essentially have to start from nothing to build up a higher CWD load to be within the recommended range. Alternative E meets this range in 25 years only where skyline logging would occur; more large-diameter snags left throughout these units would combine with materials left on-site to eventually create this CWD load. This alternative does not exceed the recommended range. Actual salvage implementation in Alternatives B, C, D, or E would leave selected wildlife trees to help reach these recommended CWD ranges as previously described.

In mixed-conifer forests with moderate to high mortality, Alternatives B, C, or D would reach recommended CWD range about 4-9 years later than in Alternative A. Alternative A would exceed the maximum range of CWD within about 10 years, while areas salvaged under Alternatives B, C, and D would not exceed the range during the 30-year modeling period. Alternative E would meet the

minimum CWD range within one year of Alternative A (4-8 years faster than Alternatives B, C, or D), and would exceed it 4-8 years after Alternative A (Alternatives B, C, or D would not exceed recommended CWD levels during the modeling period).

The recommended range of CWD for montane forests is about twice that of dry forests. In montane forests with very low to low mortality, areas that are salvaged with ground-based methods under Alternatives B, C, D, or E would not meet or exceed the recommended CWD range within 30 years because most CWD would have been consumed by the Tripod Fire and salvage logging with ground-based methods would leave little CWD behind. Those areas salvaged with skyline or helicopter methods under Alternatives B, C, or D would meet the recommended CWD range about seven years sooner than Alternative A because logging would leave tops less than 9” diameter in the units to contribute to CWD faster than snag fall-down rates would allow in Alternative A. Where these logging methods are used in Alternative E, CWD range would be met about three years later than in Alternative A, and about 10 years later than skyline- or helicopter-salvaged areas in Alternatives B, C, or D. Alternative E would not exceed the recommended CWD range where skyline or helicopter salvage occurred in the time period modeled.

Where moderate to high mortality occurred in the montane forests, salvaged areas would reach recommended CWD range one to six years later in Alternatives B, C, or D than in Alternative A, depending on harvest method used and the amount of CWD it left behind. Alternative E would reach this range one

Figure 3.10-8: Comparing Estimated Attainment of Recommended CWD Ranges (2007 – 2037)

	Alternative & Harvest Method		Dry Forest (5-10 tons/acre)		Mixed-Conifer Forest (7 - 15 tons/acre)		Montane Forest (10-18 tons/acre)	
			Low Mortality	High Mortality	Low Mortality	High Mortality	Low Mortality	High Mortality
Matches Minimum of CWD Range	Alternative A		2021	2009	*Does not meet minimum	2011	2015	2009
	Alts B C D	Ground	2020	2013	*Does not meet minimum	2020	*Does not meet minimum	2015
		Skyline or Helicopter	2012	2008	*Does not meet minimum	2016	2008	2008
	Alt E	Ground	2010	2010	*Does not meet minimum	2012	*Does not meet minimum	2011
		Skyline or Helicopter	2010	2008	2032	2010	2018	2010
Exceeds Maximum of CWD Range	Alternative A		Does not exceed maximum	2012	*Does not meet minimum	2017	Does not exceed maximum	2013
	Alts B C D	Ground	Does not exceed maximum	2030	*Does not meet minimum	Does not exceed maximum	Does not exceed maximum	Does not exceed maximum
		Skyline or Helicopter		2020				2008
	Alt E	Ground	Does not exceed maximum	2017	Does not exceed maximum	2025	Does not exceed maximum	2019
		Skyline or Helicopter		2014		2021		2016

Sources/Notes: Existing fuel loading is based on CVS plot data and validated by fuels transect surveys and photo series (Maxwell and Ward 1976, 1980). Future CWD modeled to 2037 with FVS-FFE (ver. 1.19A).
*Does not meet minimum of CWD range because in modeling, fire consumed existing CWD, but did not create enough snags to replace what was lost. Modeled estimates do not include selected wildlife trees left in salvaged areas, which would provide up to 5 tons/acre of additional CWD.

to two years later than Alternative A, and four to five years sooner than Alternatives B, C, or D, because of the larger-diameter snags that would remain in each unit. Where ground-based salvage occurred in Alternatives B, C, or D, CWD would not exceed the recommended range in the time period modeled. Where this method was used in Alternative E, CWD range would be exceeded about six years later than in Alternative A. Skyline or helicopter-based salvage in Alternatives B, C, or D would exceed CWD range about five years faster than in Alternative A. These same logging methods in Alternative E would exceed recommended CWD range three years later than in Alternative A, or eight years later than in Alternatives B, C, or D.

Reburn Hazard

Modeling wildfire in FVS-FFE for this project indicates that a reburn occurring within 15-20 years in areas salvaged in Alternatives B, C, D, or E would have the same impacts on the developing stand as in Alternative A. Burn severity during this period would increase in salvaged units that are replanted as well as in non-salvaged areas where trees regenerated naturally. Similarities in tree re-establishment (by planting or natural regeneration), fine fuels (i.e. grasses, needle-cast), and small woody fuel loads within and outside salvaged areas during this time frame would likely result in similar fire behavior (i.e. high-intensity fire) and fire effects (i.e. high mortality of young trees) regardless of salvage. No matter how re-establishment occurred, species like Douglas-fir, ponderosa pine, and western larch would be vulnerable to wildfire until they grew large enough to resist fire (i.e. with raised canopy-base-heights and thick bark). Thin-barked tree species like lodgepole pine and Engelmann spruce would remain vulnerable to fire even when larger.

No studies have been done locally on reburn hazard in past salvaged and unsalvaged areas. McIver and Ottmar (2007) studied a post-fire salvage operation in central Oregon and made some general conclusions regarding reburn risk that appear similar to the trends modeled by FVS-FFE for the Tripod Fire Salvage Project area. In the case of post-fire logging, protecting the developing stand from wildfire is very desirable, whether the stand originates from planting or natural regeneration. Donato et al. (2005) argue that the substantial increase in slash fuels (small woody fuels up to 3” diameter) generated by logging after the 2002 Biscuit fire in southwest Oregon created an undesirable fire hazard for the developing stand. As McIver and Ottmar found at salvage operations after the Summit Fire, the projected risk of greater mass of slash fuels in logged stands was likely no higher than for the unlogged stands for two reasons. First, because slash decays so quickly, the period of time during which unlogged and logged units have meaningfully different slash fuel masses is short, somewhat less than 20 years [FVS-FFE decay modeling shows similar rates of differences in slash accumulation and decay for the Tripod Fire Salvage Project area for non-salvage and salvage scenarios]. A wildfire would have to re-occur at the same place during this relatively short period of time in order for the difference between logged and unlogged stands to be expressed in terms of tree mortality. Secondly, the developing stand that is at risk in the short-term would initially be composed of very small trees, many of which would not survive even a relatively light-intensity fire, let alone a moderate wildfire [also applicable to the developing stands that would exist in the Tripod Fire Salvage Project area in both salvage and non-salvaged areas].

Another recent study by Thompson et al. (2007a) assessed an area in SW Oregon that had burned in 1987, was salvage-logged and replanted, then reburned during the 2002 Biscuit fire. This study suggests, based on limited management records, that in this particular place and time, post-fire management did not lower risk of high-severity fire, and in fact may have increased it. The findings from this study suggest that young forests are susceptible to recurring severe fires whether they are planted or naturally regenerated. The hypothesis that salvage logging followed by replanting reduces re-burn severity is not supported by this study. The FVS-FFE modeling done for the Tripod Fire Salvage Project produced results that are consistent with this study. Reducing connectivity of surface fuels at landscape scales is likely the only way to decrease the size and severity of reburns until vertical diversification and fire resistance is achieved (Thompson et al. 2007a). In further clarification, the authors of this study specify that they are not asserting that managers should not log and plant after fires. As stated in the paper, the management decision to log and plant after fires depends on many factors including long-term fire risk, reduction of hazards to firefighters, timber revenue, and conservation of biodiversity. Depending on objectives and consideration of tradeoffs, managers may choose to let nature take its course or to actively manage (Spies et al. 2007). As described in the tree planting recommendations in Figure F-3, planting after salvage would be about 40% less than historical levels, in part to reduce continuity in the developing canopy.

Reburn ignition sources would include lightning and human causes, including the slight possibility that logging equipment would ignite wildfires. However, salvage operations would occur in the next few years before the trees lose commercial value, when fine fuels (grasses, needle-cast) would still be minimal and would likely contribute little to fire spread. Consumption of duff and most of the ladder fuels by the Tripod Fire would also likely minimize wildfire spread for the near future. Other activities or uses that may occur in the project area, such as mushroom picking, would bring people into the area with an accompanying risk of human-caused ignition. However, road access would not increase as a result of any action alternatives because any re-opened roads would not be open during operations and would be closed when salvage operations have been completed.

Resistance-To-Control

As described above, modeling indicates that implementing any of the action alternatives would cause a short-term increase in small woody fuels in the next 3-5 years in treated areas, and a long-term decrease in large woody fuel loading by 50% or more over the next 30 years in treated areas. For each alternative, the amounts of small woody fuels and large woody fuels from 3.1-10” diameter modeled for each forest type were compared to Figure 3.10-5 (resistance-to-control ratings) to assess 5-year (2012), 15-year (2022), and 30-year (2037) ratings. The resulting changes in resistance-to-control ratings for the project area for all alternatives are shown in Figure 3.10-9.

Figure 3.10-9: Changes in Estimated Resistance-to-Control Ratings (2012 – 2037)

	2012 Rating by % of Project Area				2022 Rating by % of Project Area				2037 Rating by % of Project Area			
	Low	Mod	High	Ext	Low	Mod	High	Ext	Low	Mod	High	Ext
Alt A (Project Area)	39%	16%	39%	6%	39%	16%	39%	6%	39%	16%	39%	6%
Alt B (7% of project area)	39%	16%	39%	6%	39%	20%	35%	6%	43%	16%	35%	6%
Alt C (6% of project area)	39%	16%	39%	6%	39%	19%	36%	6%	42%	16%	36%	6%
Alt D (9% of project area)	39%	16%	39%	6%	39%	22%	33%	6%	44%	16%	36%	6%
Alt E (7% of project area)	39%	16%	37%	8%	39%	16%	38%	7%	39%	19%	36%	6%

Sources/Notes: Resistance-to-control rating based on all small woody fuels + large woody fuels 3-10” diameter; the process used for this analysis does not include large woody fuels beyond 10” diameter. Existing fuel loading is based on CVS plot data and validated by fuels transect surveys and photo series (Maxwell and Ward 1976, 1980). Future CWD modeling to 2037 done with FVS-FFE (ver. 1.19A).

Where low-mortality locations occurred, resistance-to-control would stay low at the 5-year, 15-year, and 30-year projections under all alternatives. Where high-mortality locations occurred, resistance-to-control in Alternatives A and E would rank high to extreme at the 5-year and 15-year projections, dropping to moderate to high at the 30-year projection. Where high-mortality locations occurred under Alternatives B, C, or D, resistance-to-control would rank high at the 5-year projection, moderate at the 15-year projection, and low by the 30-year projection.

Alternative D would lower resistance-to-control in about 3% more of the Tripod Fire Salvage Project area than Alternatives B, C, or E because it treats about 3% more of the project area. However, the additional area this alternative would treat is mostly within montane forests surrounded by sizeable high-mortality portions of the Tripod Fire that have no management actions proposed. These untreated areas will have higher resistance-to-control ratings than treated areas in 5-15 years as herbaceous materials become established and contribute to the small-diameter fuel loading, and the higher numbers of falling snags increase large woody fuel loading. According to decay modeling in FVS-FFE, high to extreme resistance-to-control ratings in Alternative A will endure for at least 30 years. Considering the continuity of untreated, high-mortality forest within the center of the Tripod Fire; the high-intensity, high-mortality fire behavior historically experienced by this forest type; and the discontinuous arrangement of small treatment

units proposed by the Tripod Fire Salvage Project, Alternative D does not substantially improve resistance-to-control compared to Alternatives B, C, or E.

In comparison to Alternatives B, C, or D, Alternative E would increase resistance-to-control in all forest types where high-mortality fire occurred because it would leave more snags per acre from 21-28" dbh than Alternatives B, C, or D. When these snags fell, the higher CWD loadings would combine with small woody debris and fine fuels such as grasses to increase initial and subsequent resistance-to-control ratings.

Alternatives B, C, D, or E would have very little influence on resistance-to-control at the landscape level in most areas because most proposed salvage units are small and scattered over a wide area with little ability to decrease fire hazard or provide a base for suppression efforts at this scale. Where proposed salvage units are larger and more continuous, such as in the Ramsey Creek area, low resistance-to-control ratings could have a beneficial affect on the landscape. This area contains the only WUI in the project, and a lowered resistance-to-control over a broader area here is more likely to provide an effective barrier to wildfire on the landscape level. Alternatives B, C, and D reach the same low resistance-to-control rating within the same time period for this area in both low-mortality and high-mortality areas. Alternatives A and E would lower the resistance-to-control in the WUI less than Alternatives B, C, or D, with rankings from low to high at the 30-year projection. In the Ramsey Creek WUI, lowering resistance-to-control more quickly would allow possible use of low-intensity prescribed fire, when re-establishing trees become more fire-tolerant, to maintain low fuel loads in this frequent fire ecosystem.

Cumulative Effects

Alternatives B, C, D, and E

The area considered for cumulative effects for fuels and fire behavior consists of the Tripod Fire Salvage Project area. The time period for considering cumulative effects consists of a 30-year period. A complete list of past, present, and future activities is listed at the beginning of this chapter. Only activities that affect fuel loadings, such as hazard tree falling, timber harvest, non-commercial thinning, and fuels reduction treatments, will be included in this cumulative effects analysis. Other activities from the list above do not threaten or have an effect on fuel loading because they do not create or reduce fuels. Of the past activities that reduced fuel loading, created open stand structure, and reduced subsequent fire behavior, generally only those completed in the past 30 years would reduce future fire behavior in the project area; similar activities more than 30 years ago would have lost their affect without repeated vegetation and fuel reduction treatments by the time the Tripod Fire occurred. The temporal boundary for this analysis spans from thirty years in the past to thirty years in the future.

Within the project area, the Tripod Fire created a full range of fire effects in areas that received vegetation and fuels treatments within the last 30 years. These locations burned with low to severe intensity, with a wide variety of tree mortality and severity, depending on topography, whether subsequent fuels treatments had been completed, and on the weather and fire behavior during ignition. In several cases, both in 15-year old plantations and newly thinned-from-below stands, the treatments performed in these areas contributed to reduced fire behavior and fire effects during the Tripod Fire and lowered resistance-to-control. Very few of these treated areas align with areas proposed for salvage, and where overlap exists, ground fuels have been mostly eliminated by the

Tripod Fire. The combination of these treatments and the wide-spread coverage of the Tripod Fire reduced fuels across the landscape in the short-term, but as snags created by the wildfire collapse, fuel loadings will increase as indicated in Alternative A (Direct and Indirect Effects) and create unusually high fuel loadings in the dry and mixed-conifer forests. Fuel loads created by salvage activities would be monitored as described in Chapter 2. In addition, a management experiment to study fuels in burned areas that are salvaged and unsalvaged would occur during any salvage alternative, providing more site-specific information on how salvage affects fuel loading.

Where hazard trees are felled, either by Burned Area Emergency Rehabilitation (BAER) or as proposed by this project, fuel loadings would increase. These fuel loadings would likely be reduced by firewood gathering wherever roads remain open and where the felled tree is accessible and has value as firewood. Where hazard trees are felled by Alternatives B, C, D, or E near landings, large-diameter wood from hazard trees would likely be added to landing piles to minimize fuel loadings in these areas.

Salvage harvest treatments on State lands near the Tripod Fire Salvage Project area would have no effect on the fire hazard risk on national forest system lands. However, they would reduce the resistance-to-control for potential wildfires near national forest system lands, reducing the risk of wildfire entering newly-developing stands in the project area for about 30 years. Likewise, salvage harvest in the Ramsey Creek WUI would not affect fire hazard on nearby state or private lands, but for the next 15-30 years it would reduce resistance-to-control for potential wildfires that start within these salvaged areas.

Other proposed and reasonably foreseeable future projects such as road decommissioning, culvert replacement, noxious weed control, grazing, and prescribed burning would have no effect on fuel loadings or fire behavior within the Tripod Fire Salvage Project area. Prescribed fire projects adjacent to the project area, however, would help reduce the resistance-to-control for potential wildfires as described above.

In summary, the cumulative effect of past, present, and reasonable foreseeable future actions and Alternatives B, C, D, or E on fuels and fire behavior would include decreased levels of large woody fuels in salvaged areas. Areas salvaged by the Tripod Fire would lower resistance-to-control on a small-scale, unit-by-unit basis; where units are located closer together and are more sizeable, lowered resistance-to-control ratings resulting from salvage would have more influence on controlling larger wildfires.

CONSISTENCY FINDING

Implementing Alternative B, C, D, or E would be consistent with the goals and objectives, and standards and guidelines of the Forest Plan by using cost-effective fuel treatments where necessary, and allowing for woody debris on the forest floor to benefit wildlife and soils. Currently, CWD in the dry and mixed-conifer forests is below recommended ranges as advised by Brown et al. (2003), modified for the local area by Harrod (2007) because these fuels were consumed by the Tripod Fire. Modeled trends indicate when CWD would meet minimum levels in salvaged areas (Figures 3.10-7, 3.10-8); snags selected to remain within each salvaged area would also contribute to CWD levels. Firewood availability would be considered before landing piles would be burned. Fuels would be at an acceptable level in treated areas without increasing threat of wildfire during the 30-year study period. Appropriate management response to wildfires would continue throughout

the project area during project implementation and into the future. No potential opportunities to implement future fuels treatments or prescribed fire projects would be eliminated.

3.11. Air Quality

This section is a summary of the Air Quality Report which is available in the project analysis file (Trebon 2007b).

REGULATORY FRAMEWORK

Forest Plan Direction

Forest-wide Standard and Guideline 14-1 requires that management activities within the Forest shall be planned to maintain air quality at a level adequate for the protection and use of forest resources produced on the Okanogan-Wenatchee National Forests, and shall meet or exceed applicable Federal and State standards and regulations.

Clean Air Act

The Clean Air Act (Public Law 95-95, as amended in 1977 and 1990) is a legal mandate designed to protect public human health and welfare from air pollution. The act defines National Ambient Air Quality Standards (NAAQS) as levels of pollutant above which detrimental effects on human health and welfare could occur. Particulate Matter (PM), the major pollutant of concern from wildfires and prescribed fires, includes any airborne finely-divided solid or liquid material with an aerodynamic diameter smaller than 100 micrometers (microns).

The Clean Air Act and its amendments define responsibility for air quality. The Environmental Protection Agency (EPA) has the responsibility to develop the NAAQS, while individual states are responsible for developing a Smoke Implementation Plan (SIP), including a smoke management program, in order to meet or exceed these standards. Since 1997, the EPA has identified PM10 and PM2.5 particle sizes as the standards for evaluating emissions and their effect on human health because of the potential for these particles to cause adverse human health effects. PM10 (coarse) particles are less than 10 microns in size, and PM2.5 (fine) particles are less than 2.5 microns in size.

The Clean Air Act established Class I air quality designations, where little air quality deterioration allowed over baseline levels is allowed. The Pasayten Wilderness is the only Class I area near the Tripod Fire Salvage project, approximately seven miles northwest of the project area. The current Washington State Smoke Implementation Plan contains provisions to avoid impacting Class I airsheds with smoke from prescribed burning.

Smoke Management Program

Washington State's smoke management program is administered by the state Department of Natural Resources (WA-DNR) according to the current SIP. The goals of this program include:

- Minimizing or preventing smoke from prescribed burning or wildfires on forest lands from carrying to or accumulating in designated areas or other areas sensitive to smoke;
- Providing maximum opportunity for essential forest land burning while minimizing emissions;
- Coordinating with state smoke management programs;
- Conforming with state and federal air quality and visibility requirements;
- Protecting public health;

Encouraging the reduction of emissions.

Smoke management programs require that all pertinent smoke management plans, directives, and instructions be implemented with strict compliance. Cost-effective use of forest residues to reduce burning and smoke resulting from wildfires is also encouraged.

ANALYSIS METHOD

On the Methow Valley Ranger District, this analysis covers the upper Methow Valley area (north and east of Winthrop, northeast of Twisp) over the approximate two weeks when air quality may be affected by burning landing piles created by the Tripod Fire Salvage Project. On the Tonasket Ranger District, this analysis covers the Salmon Creek drainage, including Conconully.

The indicators for short-term air quality impacts for comparison purposes are

Number of tons of particulate matter released by each alternative.

Potential effects of the Tripod Fire Salvage project on air quality were analyzed using Consume 3.0, which determines emissions created by burning woody debris. The process used to assign debris quantities is outlined below under Direct and Indirect Effects, Alternatives B, C, D, and E. Consideration of the best available science regarding this resource occurred through using the latest version of Consume to model smoke particulates, and by using the resources listed as references within this report. Further information on this section is available in the Air Quality Specialist's report in the analysis file.

AFFECTED ENVIRONMENT

Historical and Current Condition

Before European settlement in the 1800s, air quality in the Interior Columbia Basin was not pristine due to natural and anthropogenic sources of fire. Levels of smoke have declined as fire was excluded from forests, particularly after the advent of organized fire suppression in the 1930s (USDA & USDI Forest Service,1997a). Over the past few centuries, an average of 326,172 acres per year burned by wildfire in Washington (Agee 1993), an amount certain to emit high levels of particulate matter.

Wildfires impact air resources by degrading ambient air quality and impairing visibility. Both wildfire and prescribed fire emit PM and other pollutants which can impact public health and visibility. Wildfires have more potential than any other air pollution source in the country for exposing the public to extremely high short-term fine particulate concentrations. The wildfire regime is substantially different than it was historically because of increased fuel loading throughout the fuel strata, which contributes to fires burning more intensely with more fuel consumption, smoldering, and pollutants expelled into the air. The 1994 wildfires near Wenatchee, Washington, for example, produced 24-hour concentrations of PM that were more than double the federal health standards, and these conditions persisted for days (USDA & USDI Forest Service 1997a). Anecdotal evidence indicates that the Tripod Fire produced air quality problems for residents of the Salmon Creek and Methow River valleys very similar to those experienced in 1994. Summer inversions in Eastern Washington increase the impact of wildfires on ambient air quality.

In the Methow River and Salmon Creek valleys, air quality is considered high. Past air quality impacts from wild or prescribed fires have been relatively short-term and have left no lingering residues. Prescribed fires allow the potential to reduce smoke quantity and control the direction and timing of smoke flow. Prescribed burn projects are usually accomplished with minimum impacts to nearby communities. Wildfires generally produce two to four times more smoke per acre than prescribed fires because they occur during periods of drier weather when more fuel is consumed. In addition, there is no way to control where the smoke goes or when it will occur (Ottmar, pers. comm. 2004). While increased levels of prescribed fire can have temporary negative impacts on air quality, in the long term acute impacts to air quality from wildfires can be reduced (Schaaf 1996).

Air Quality Management Considerations

The characteristics, sources, and potential health effects of PM10 and PM2.5 are very different. Coarse PM10 generally come from sources such as windblown dust from the desert or fields and dust kicked up by vehicular use on dirt roads. Fine PM2.5 are generally emitted from activities such as industrial and residential combustion and vehicle exhaust, as well as when gases such as sulphur dioxide, nitrogen oxides, and volatile organic compounds, emitted by combustion activities or burning, are transformed by chemical reactions in the air. Both sizes of PM can be generated from wood smoke production.

As inhalable particulates, PM10 and PM2.5 can cause respiratory problems, especially in smoke-sensitive people such as the young, elderly, or those predisposed to respiratory ailments. Coarse particles can accumulate in the respiratory system and aggravate health problems such as asthma. Fine particles are more likely to contribute to the health effects associated with hospital admissions than coarse particles because they penetrate deeply into the lungs and are more difficult to filter.

Community studies led the EPA to establish new standards for particulate matter under the NAAQS to protect public health and the environment. As of September 1997, the annual 24-hour PM10 standard is retained at 50 micrograms per cubic meter (mg/m^3) and a 24-hour standard set at 150 mg/m^3. The annual PM2.5 standard is set at 15 mg/m^3 while the 24-hour PM2.5 standard is set at 65 mg/m^3.

Management and minimization of smoke is an important goal during the prescribed fire planning process. Multiple environmental factors are carefully examined before ignition to minimize potential air quality impacts from prescribed fire. WA-DNR, which implements the SIP, receives and processes requests for burn approval from land managers throughout the State. This coordination minimizes smoke from prescribed fires from carrying to or accumulating in areas sensitive to smoke. The combination of these state and local planning efforts results in a very small percentage of prescribed fires causing an air quality problem in the state of Washington.

ENVIRONMENTAL CONSEQUENCES

Direct and Indirect Effects

Alternative A – No Action

The high air quality found in the Methow River and Salmon Creek drainages would remain unaffected in Alternative A since prescribed burning would not occur in the project area. However, increased fuel loads would be very likely across the project area, causing a future

wildfire within the project area to burn intensely and produce more smoke emissions in a potentially uncontrolled burning environment.

Alternatives B, C, D, and E

Human Health and Welfare

Tree tops and un-utilized bole wood would be piled on the landings during salvage harvest operations. The public would be given the opportunity to utilize the unmerchantable material for firewood before the landing piles are burned. When the piles are burned, smoke may be visible to nearby residents in the Winthrop/Twisp and Conconully areas, and could cause potential short-term and long-term health effects to forest workers, forest visitors, and nearby residents if they expose themselves to smoke for extended periods of time. Air quality would be minimally affected from the small amount of un-merchantable tops and limbs left in landing piles to be burned. The various components of wood smoke are known, but the quantities produced could vary considerably depending on fire temperatures and fuel moistures. The hazards include particulate matter, gases, and chemicals that may enter the lungs attached to particulate matter. Low levels of smoke may have a local, transitory effect on air quality. Members of the public who are sensitive to smoke may experience some form of irritation to eyes, nose, throat and lungs if they are exposed to this smoke over time. Occasional brief exposure of the general public to low concentrations of drift smoke from prescribed fires is generally more of a temporary inconvenience or nuisance rather than a health risk.

As described previously, the state Smoke Management program includes provisions to minimize smoke impacts to the public. In addition, fuels managers on the Methow Valley and Tonasket Ranger Districts use a Prescribed Fire Public Information Action Plan that details several levels of public and private contacts made before every burn season, and in some cases before every burn. Personal contacts are routinely made to nearby residents, adjacent landowners and/or any other people who could be adversely affected from smoke. These contacts include discussing the possible hazards associated with prescribed burning, and mitigation measures to reduce these impacts. Following the Washington State SIP would minimize impacts of prescribed burning on forest workers, forest visitors, and nearby residents.

Burning in general presents combined hazards of fire and smoke to ground crews on the site. Some components of smoke, benzo-apyrene and aldehydes, are carcinogenic; these compounds are most likely to affect forest workers who receive lengthy or high exposures at the burn site. Fire management personnel who are exposed to high smoke concentrations often suffer eye and respiratory system irritation; under some circumstances, continued exposure to high concentrations of carbon monoxide can result in impaired alertness and judgment. The probability of this occurring on a prescribed fire is very low, providing the standards and guidelines documented in the prescribed burn plan are followed. Exposure levels are monitored visually during prescribed fire operations, with emphasis on personnel avoiding smoke exposure.

Particulate Emissions by Alternative

After determining existing and post-thinning fuel loading, PM10 and PM2.5 emissions were calculated using the CONSUME software (Prichard et al. 2006), which estimates smoke emissions. To estimate the maximum amount of debris at landing piles, this analysis assumes that all ground-based logging systems would yard logs with tops attached. The tops of these logs less than 9”-diameter would be removed at landing piles, with no firewood removal simulated in the emissions modeling. Figure 3.11-1 displays emissions that would occur under the action alternatives. There would be about 15% less particulate emissions in Alternatives B and C than in Alternative D because Alternative D would have a higher number of piles burned. Alternative

E would produce the least emissions of all action alternatives. While this alternative would burn the same number of piles as Alternative B, these piles would contain slightly less materials than Alternatives B, C, and D because about three trees per acre between 21”-28” dbh would be harvested and contribute tops to the landing piles.

Figure 3.11-1: Tripod Fire Salvage Particulate Matter by Alternative

Alternative	Number of Piles	PM 10 (Total Tons)	PM 2.5 (Total Tons)
A	0	0	0
B	122	61	53
C	135	68	58
D	143	72	62
E	122	59	51

The actual emissions for a given day would be far less than the totals shown in Figure 3.11-1. Fuels treatments would be staggered over the course of about two to three years, taking that long to produce the total number of particulates. In addition, fuel treatments would be delayed until firewood utilization has been completed (where consistent with management direction). Burning would occur in the fall of the year over the course of several days, diminishing particulate release within any given 24-hour period. The concentration of materials in landing piles retains enough heat to consume more materials more quickly and with less smoldering than underburning. Burning landing piles produces a very effective transport column of heat that quickly lofts the smoke column high into the atmosphere. Smoke dispersal conditions would be monitored during ignition to ensure that the number of piles ignited would not produce enough smoke to violate standards. Approval for burning from the WA-DNR would depend on projected emissions at the time of implementation, which would be based on actual fuel loading and fuel moistures.

Pile burning during the mule deer buck general hunting season would avoid igniting landing piles next to hunting camps to limit smoke impacts to those users, although some smoke may still linger the first few days after burning.

The only Class I airshed that could be affected by prescribed burning would be the Pasayten Wilderness. The current Washington State Smoke Implementation Plan contains provisions to avoid impacting Class I airsheds with smoke from prescribed burning. Settling or drifting smoke that moved into this airshed would soon completely dissipate after ignition as air currents flowed through the area, having minimal effect on air quality and visibility.

Cumulative Effects

Effects Common to All Action Alternative

The area considered for cumulative effects for air quality consists of the upper Methow Valley basin from Twisp to Winthrop, the Chewuch River basin, and the Salmon Creek basin. The time period for considering cumulative effects consists of a two-week period. No past actions currently affect air quality in this analysis area since any smoke produced from past actions has already dissipated. On the Methow Valley Ranger District, one prescribed burning project is planned for 2007 near the Tripod Fire Salvage area in a 50-acre unit in the Bear Timber Sale (about 5 miles NE of Winthrop). Other future projects on this district that could affect air quality in the upper

Methow Valley drainage include underburns in the Burgett, Eightmile, TPR, and Leecher Thin timber sale and natural fuels units in the Eightmile Creek drainage.

On the Tonasket Ranger District, two ongoing projects include prescribed burning. The Conger Integrated Resource Project (IRP) lies in the West Fork of Salmon Creek (about five miles west of Conconully), and has approximately 4,000 acres scheduled for ladder fuel reduction and underburning in the next five years. The Mutton IRP lies in the North Fork Salmon Creek, about one mile north of Conconully; this project has 9,322 acres scheduled for treatment with thinning and prescribed fire activities. Any smoke drifting or settling in the Methow River or Salmon Creek valleys from these activities would dissipate completely within a few days with no lingering evidence.

Future prescribed burning that could impact air quality in the upper Methow Valley or in the Salmon Creek drainages include underburns within the Fawn timber sale, about 12 miles west of the Tripod Fire Salvage Project area. Burning in this area could start in about 2008. The Washington State Department of Fish and Game plans to underburn about 600 acres in the Sinlaheiken Wildfire Area, about 4.5 miles north and east of Conconully. The Washington Department of Natural Resources plans to sanitize and thin about 770 acres adjacent to National Forest lands about three miles from Conconully; these activities would produce roughly 50 landing piles that would require pile burning.

Air quality would be minimally affected by pile burning because of the small amount of unmerchantable tops and limbs that would be left in landing piles to be burned. Any smoke drifting or settling in the Methow River or Salmon Creek drainages would dissipate completely over a short time with no lingering evidence. Wildfires are likely to continue to occur in the Methow River and Salmon Creek drainages, as well as in surrounding areas, with full suppression efforts likely used outside of the Pasayten Wilderness. Smoke from wildfires may linger for days or weeks, depending on the size of the fire, but would dissipate completely after the fire is out. Because WA-DNR controls how much burning is done on any give day, any cumulative effects would still meet air quality standards. It's also unlikely that WA-DNR would give permission for prescribed burning at the same time any substantial smoke is being produced by wildfire.

Potential changes in the physical and chemical nature of the earth's climate are likely to have impacts on the Nation's agriculture, forests and related ecosystems. The extent and magnitude of these changes are uncertain at this time. There is a lack of sufficient information to predict and detect changes in health, diversity and productivity of these systems due to global climate change. Although climate and ecosystem forecast models have significantly improved, they cannot produce highly accurate local projections. The USDA is committed to a long term research effort. At the scale of a national forest, the direction and magnitude of these changes are much less clear. It is difficult to distinguish the effects due to climate change (e.g. wildfire severity/acreage trends, vegetation trends, insect and disease trends) from other disturbance processes. Until research removes scientific uncertainties, NEPA disclosure documents such as this EIS are not the appropriate means for addressing global change issues. Evaluation of global change effects at the project level would be speculative and would not provide meaningful information for the decision maker. The amount and effects of carbon emitted by the Tripod Fire Salvage project operations would be very minor compared to the amount and effects of carbon emissions throughout Okanogan County.

In summary, the cumulative effect of past, present, and reasonable foreseeable future actions and Alternatives B, C, D, or E on air quality would include settling or drifting smoke that would soon completely dissipate after ignition as air currents flowed through the area. Monitoring and mitigations listed in Chapter 2 would keep impacts low and brief.

CONSISTENCY FINDING

Implementing Alternative B, C, D, or E would be consistent with the goals and objectives, and standards and guidelines of the Forest Plan applicable to air quality, including visibility in wilderness and other Class One airsheds by meeting Clean Air Act standards and is consistent with the Washington State SIP.

3.12 Transportation

REGULATORY FRAMEWORK

Travel Analysis

A Travel Analysis (formerly known as “Roads Analysis”) is a science-based approach to transportation planning that integrates ecological, social, and economic considerations to address existing and future road management options. The Responsible Official has the discretion to determine if a Travel Analysis is needed at the project scale and the degree of detail that is appropriate (Forest Service Manual 7712.13c).

Road Density

Forest Plan direction sets desired open road density levels for some Management Areas (MAs) on the Forest to minimize impacts on wildlife. These standards also apply to discrete Management Areas (geographically isolated areas that have the same MA designation). The goal of each project is to stay within those standards. Where open road densities exceed the Forest Plan standards, efforts are made to achieve them or move closer to the desired condition.

Road Maintenance

Forest Plan direction states that roads will be designated open, closed, or restricted to motorized use to meet management goals. Consistent with road management objectives (Forest Service Handbook 7709.58), each road is given an operational and objective Maintenance Level (1 through 5), which determines the type and frequency of maintenance. Maintenance Level definitions can be found in the Glossary.

Roadside Safety

Direction and guidance for managing danger trees along National Forest System roads is detailed in Forest Service Manual 7733. Safe operation and use of the transportation system is the predominant consideration in the assessment of danger trees.

ANALYSIS METHOD

Travel Analysis

Given the purpose, need and timing of the project, a Travel Analysis of all roads in the project area was not conducted. The Travel Analysis included only roads that may be used in any of the action alternatives (B, C, D or E), and only those roads that were either unauthorized, already closed, or previously planned to be closed to vehicular traffic. Eighteen roads were considered in the analysis, nine of which were unauthorized roads. All eighteen roads that would be used under any action alternative (B, C, D or E) would either be returned to the operational Maintenance Level that existed before the fire occurred (its historical condition) or would be closed under previous decisions that were already documented through a public NEPA process. Determinations were made on each unauthorized road as to its need for long term use and either recommended to convert to

a system road or decommission after use for the project. Further information is available in the Tripod Fire Salvage Travel Analysis in the Analysis File.

Road Density

There are twelve discrete Management Areas that intersect or are within the project area that have forest plan standards for open road densities (Appendix A – Management Allocation Map).

Open road densities were calculated for each alternative in three categories; before the fire occurred, during the project, and post project (after all road work has been completed). Unlike the travel analysis described above, the road density analysis included all open system roads and all known open unauthorized roads for each discrete Management Area that occurs within, or partially within, the project area. The "pre-fire" data came from calculations done in July of 2006. Data shown for "during the project" assumes that all roads used for the project would be open at the same time. The "post-project" figures take into account all actions recommended by the Travel Analysis and the assumption that all roads that are opened for use by the project would be closed after use.

Road Maintenance

Proper road maintenance is important for the protection of the road itself and for the prevention of environmental damage. It protects the road from deteriorating and helps prevent sediment from migrating into unwanted areas. Consideration was given to the type and cost of maintenance that would be needed before and throughout the project when determining which routes would be used for the project. Appendix J displays haul routes and mileages that would be used for each alternative both inside and outside the project area.

Roadside Safety

It was assumed that all open roads (Maintenance Level 2-5), as well as roads that will be temporarily open for the project, that have not already been treated through Burn Area Emergency Rehabilitation (BAER) activities would require danger tree removal. As mentioned in Chapter 2 Mitigation Measures & Design Criteria #82, danger tree selection would follow the *Field Guide for Danger Tree Identification and Response* (USDA and USDI 2005a).

AFFECTED ENVIRONMENT

There are approximately 210 miles of system road within the project area (Appendix A – Transportation Map). Currently 70 miles are maintained for passenger car use and 65 miles are maintained for high clearance vehicles. The remaining 75 miles are closed to vehicular traffic. In addition to the system roads there are nearly 22 miles of inventoried unauthorized roads. These include unplanned (e.g. user-built) roads, abandoned travel-ways, and roads that were not decommissioned upon the termination of a permit or other authorization. Of these 22 miles one mile is known to be open and 7 miles are known to be closed. Since some of these roads were identified through aerial photo interpretation and have not been field-verified the accessibility of 14 miles is unknown, and they are conservatively assumed to be open.

Open road densities for the twelve discrete Management Areas associated with this project are shown below in figure 3.12-1. For purposes of this analysis the 14 miles of unauthorized roads for which the accessibility is unknown were assumed to be open.

Figure 3.12-1: Current Open Road Density

Management Area (MA)	Area (square miles)	Open Roads (miles)	Road Density (miles/ square mile)	Forest Plan Standard[1] (miles/ square mile)
5-09	83.9	69.9	0.8	3
5-11	10.2	9.5	0.9	3
12-01	95.8	40.5	0.4	1
12-03	13.4	1.1	0.1	1
14-05	10.7	24.9	2.3	2
14-06	31.5	52.5	1.7	2
25-04	4.2	3.8	0.9	3
25-06	15.3	22.5	1.5	3
25-07	1.3	0.7	0.5	3
25-08	92.8	115.5	1.2	3
26-02	1.9	0.3	0.2	1
26-04	21.2	32.3	1.5	1

[1] Forest Plan Standard is a maximum density.

As shown in the figure above MA 14-05 and 26-04 currently do not meet the Forest Plan standards.

On average 100 miles of road are maintained to some degree in this area annually. Due to reductions in road maintenance budgets over the years many roads have not been maintained fully to the standard that has been established resulting in a back log of deferred maintenance.

With the recent BAER restoration activities many roads received repairs and maintenance in order to prevent potential resource damage. This work has eliminated some of the backlog of deferred maintenance that existed prior to the fire.

In addition to maintenance activities approximately 170 miles of road in the project and surrounding burned area were cleared of imminent danger trees through BAER.

ENVIRONMENTAL CONSEQUENCES

Direct and Indirect

Alternative A – No Action

Currently closed roads would not be opened; roads that were closed prior to the fire but remained open after the fire would be closed through BAER activities. Open road densities would not change and maintenance levels would remain the same.

Road densities within Management Area 14-05 would not be brought into compliance with the Forest Plan standard through this project. Funding to implement road closure decisions documented in the South 20 Mile EA that were not previously implemented would need to come from other sources.

BAER activities would continue with the upgrading of 12 large culverts and the replacement of numerous smaller ditch relief culverts. Roads would not receive salvage associated road maintenance.

Roadside safety would still be a concern and danger trees would be removed where BAER activities are planned. On open roads (Maintenance Level 2-5) where no BAER activities are planned (47 miles) danger trees would either be removed through routine maintenance when a safety hazard is identified or the road would be closed to traffic.

All Action Alternatives

Under any action alternative there would be no change after the project to the status of roads that were either open or closed prior to the fire, with the exception of the implementation of decisions that were already documented in the South Twentymile EA (USDA Forest Service 1997d) and the Conger EA (USDA Forest Service 2003). These EAs made the decision to close roads that were currently open. Aside from the exception noted, no roads that were previously closed would be left open, and no roads that were previously open would be closed.

The following figure displays a summary of the miles of road affected and the road actions that would be implemented by each alternative.

Figure 3.12-2 Summary of Road Actions by Alternative

Action	Roads Used (miles)		
	Alternative B, E	Alternative C	Alternative D
Open system road to be used.	155.4	123.0	155.5
Closed system road to be opened then closed post-project.	22.7	13.4	23.7
Currently open system road that would be closed post-project (Previous NEPA decision).	7.0	4.9	7.0
Previously decommissioned or unauthorized roads to be used then decommissioned post-project.	3.7	3.6	3.7
Unauthorized roads to be converted to system road that would be closed post-project.	2.5	2.5	2.5
Unauthorized roads to be converted to system road that would be open post-project.	0.7	0.7	0.7
Temporary road to be constructed then decommissioned post-project.	3.0	2.0	3.0

Figure 3.12-3 below is a comparison of open road densities (miles/square mile) between alternatives before, during and after project.

Figure 3.12-3: Road Density Comparison Between Alternatives

Management Area	Forest Plan Standard	Road Density (miles/square mile)						
		Alternative						
		A	B, E		C		D	
		No Action (Pre-Fire)	During	Post-Project	During	Post-Project	During	Post-Project
5-09	3	0.8	0.9	0.8	0.9	0.8	0.9	0.8
5-11	3	0.9	0.9	0.9	0.9	0.9	0.9	0.9
12-01	1	0.4	0.5	0.4	0.4	0.4	0.5	0.4
12-03	1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
14-05	2	2.3	2.6	2.0	2.6	2.0	2.6	2.0
14-06	2	1.7	1.7	1.7	1.7	1.7	1.7	1.7
25-04	3	0.9	1.0	0.1	1.0	0.1	1.0	0.9
25-06	3	1.5	1.6	1.5	1.5	1.5	1.6	1.5
25-07	3	0.5	0.5	0.5	0.5	0.5	0.5	0.5
25-08	3	1.2	1.4	1.2	1.3	1.2	1.4	1.2
26-02	1	0.2	0.2	0.2	0.2	0.2	0.2	0.2
26-04	1	1.5	1.7	1.5	1.7	1.5	1.7	1.5

As shown in the above figure, road densities which already exceed Forest Plan standards in MAs 14-05 and 26-04 would be temporarily increased in all action alternatives. These temporary increases would be partially mitigated by allowing only project-associated use. Following the project MA 26-04 would be returned to the pre-fire road density, but MA 14-05 would be brought into compliance with the Forest Plan standard through the implementation of road closure decisions already documented in the South Twentymile EA (USDA Forest Service 1997d). The wildlife biologist for the Tripod Salvage project has determined that no Forest Plan amendment for road density is necessary for these exceedances because the goals of the management areas can be met in accordance with Standard and Guidelines MA14-17A and MA26-17B by restricting use of these roads to timber sale operations only.

Between 135 and 180 miles of road would receive maintenance that may not have otherwise occurred due to funding constraints, improving safety and decreasing the risk of environmental damage.

Danger trees would be felled and/or removed from all open roads (Maintenance Level 2-5) within the project area, as well as from all closed roads that are temporarily opened for the project, improving public safety. This represents approximately 47 miles of open road for each action alternative.

Cumulative Effects

Cumulative effects for the transportation system were considered for the vicinity of the project area to approximately 10 years into the future.

The existing road system was constructed over the last 70 years, primarily as a means to access timber resources and the existing road densities are the aggregate of that past construction. The most recent timber sales occurred in 2003 and in the late 1990s and constructed less than 2 miles of new system road.

The existing road system is larger than needed for current management, and larger than the ability of available and expected future funding to maintain. Therefore, in the future, road maintenance on many roads will be reduced from past levels. Some roads will be allowed to deteriorate and may eventually become un-drivable or need to be closed if they become unsafe or if they present a risk of environmental damage. Such closures would have the effect of decreasing road densities. Maintenance performed under this project would extend the life of the affected roads. Planned BAER activities for the next 3 years would further improve safe access with the elimination of danger trees.

There are no other known ongoing or reasonably foreseeable future actions in or near the project area on private or public lands that would alter road densities or otherwise affect the transportation system.

CONSISTENCY FINDINGS

All alternatives return the status of all roads (e.g. open or closed to vehicular traffic) to their pre-fire condition with the exception of decisions that had already been made through a previous NEPA process (South Twentymile EA).

As described in the Environmental Consequences section all action alternatives would temporarily increase road densities in 2 MAs that already exceed Forest Plan standards, but would return one to its pre-fire density and the other to within the FP standard. The project wildlife biologist has determined the temporary increases meet the standard exception.

Road maintenance to be performed is consistent with road management objectives for each road and with the goals and objectives of the Management Areas therefore consistent with the Forest Plan (Forestwide Standards and Guidelines 17-1, 17-3; USDA Forest Service 1989c:4-70)

Danger tree falling and/or removal would meet Region 6 direction to provide safe access to open roads (Forest Service Manual 7733). Danger trees would be felled in MA 4 (Unroaded Recreation) where the allocation boundary lies on open roads. This tree falling/removal is based on specific criteria (Chapter 2, Mitigation Measures & Design Criteria # 82-84) in order to allow recreational access to occur safely.

3.13 Range

The section below summarizes the regulatory framework, analysis methods, affected environment and environmental consequences from the Tripod Fire Salvage Project, as analyzed in *Tripod Fire Salvage Project Range—Permitted Livestock and Grazing Management r*eport (McFetridge 2007), available in the project analysis file.

REGULATORY FRAMEWORK

The Okanogan National Forest Land and Resource Management Plan (USDA Forest Service 1989a) established Forest management goals. The most pertinent goals to Range management are found in Management Area 25 to intensively manage the range resources to achieve a high level of range outputs while protecting the basic productivity of the land and providing for the production of wildlife, recreation opportunities, and other resources (Management Area 25, Page 4-103) and in the Forest-wide standards and guidelines to increase transitory forage outputs to reduce grazing impacts to other areas (Page 4-27) and promote rapid reforestation of harvested areas, and seed to comply with resource objectives of the management area (page 4-54). Specifically, with respect to the Tripod Fire Salvage project, the range management objective is to protect resources and continue the management of the six grazing allotments (designated area to graze) in a manner similar to that which had occurred prior to the Tripod Fire.

ANALYSIS METHODS

The geographic boundary for this analysis is the entire Tripod Fire burned area plus the entire area of all the grazing allotments that overlap the Tripod Fire Project. The temporal boundary is the period of time from the 1960s through approximately 15 years post Tripod Salvage Project.

The effect of the proposed Tripod Fire Salvage project on six cattle grazing allotments is assessed. Forage response, permittee access, and livestock distribution will be used as the general categories to describe the direct, indirect and cumulative effects of the proposal. More specific indicators that will be used:

- Number of salvage harvest acres within each pasture
- Number of acres of salvage harvest disturbance by alternative within the affected grazing allotments
- Number of acres of capable rangeland (land with the potential to produce accessible, available forage; see Glossary) within salvage harvest units for each pasture
- Qualitative discussion of proximity of salvage harvest units to RHCAs and range allotment boundaries
- Miles of natural livestock drift barriers, created by dense timber stands, removed by salvage harvest operations

AFFECTED ENVIRONMENT

Introduction

Portions of six permitted livestock allotments on the Okanogan National Forest are within the Tripod Fire Salvage Project analysis area. Three allotments are on the Tonasket Ranger District (Ryan, Salmon Basin, and Clark) and three are on the Methow Valley Ranger District (Beaver, East Chewack, and Ramsey) (Appendix A - Grazing Allotment map). A Ranger District decision was made to allow limited grazing on the allotments in 2007 with reductions to permitted use and/or specific vegetation recovery measures where necessary.

Range Vegetation

The primary forage type within these allotments is transitory range (a temporary increase in available forage). Much of the rangeland within the allotments is dominated by pinegrass under a conifer overstory. Fescue is mixed in with the more open forest pinegrass habitat and on the margins of the bluebunch wheatgrass habitat. Bluebunch wheatgrass is found primarily on the drier south and west facing slopes. Upland dry sedge species and needlegrass are also scattered or in small patches throughout the range. Non-native seeded grass species are common in revegetated roadsides and in past timber harvest areas. Transitory range scattered throughout the allotments provide important temporary forage and continues to fluctuate as the forest canopy opens and closes depending on the level of timber harvest, fuels treatments, and wildfire. Vegetation composition may change in response to the Tripod Fire.

Methow Valley Ranger District allotments:
There is a wide range of associated vegetation. All three allotments include mixed conifer stands, dry-site Douglas fir/ponderosa pine/snow berry communities, and open bitterbrush/bluebunch wheatgrass community types. The Beaver allotment includes mid-elevation sedge and willow meadows.

Tonasket Ranger District allotments:
The vegetation is primarily composed of mixed-conifer/pinegrass/shrub, bitterbrush/bluebunch wheatgrass plant community types with some seeded Kentucky bluegrass-dominated areas. Aspen stands are scattered throughout the area ranging from seral aspen clones encroached by conifers, to open higher elevation aspen stands.

Grazing Permit Analysis

The purpose of this project, as described in the purpose and need statement, does not include analysis related to permitted livestock grazing. These decisions as a result of change in resource condition have been made as described in the Current Management section of this report. The schedule for completion of Grazing Permit Analysis is in compliance with the Rescission Bill of 1995. NEPA analysis for the revision of Allotment Management Plans (AMP, see glossary) has recently been completed for all allotments within the Tripod fire salvage analysis area. Where fish listed under the Endangered Species Act (ESA) are present, reinitiation of ESA consultation will take place to determine if there are changes to the anticipated effects on listed fish as a result of the Tripod Fire.

Permitted Use

The statutory authorities to protect, manage and administer the National Forests and other lands under the Forest Service administration for range management purposes, as well as the regulatory authorities and administrative orders pertaining to range resources and permitted livestock grazing, are summarized in Forest Service Manual 2200 and are found at 36 CFR 222.1. Use as permitted through Term Grazing Permits issued under these authorities, for allotments within the project area, is summarized in Table 3.13-1. All of the allotments within the analysis area are managed at a C Range Resource Management Level (see glossary). Livestock movement and grazing management is facilitated by utilizing fences, water developments, corrals, and stock driveways. Range management practices such as salt distribution, riding, and grazing rotations are implemented through annual coordination between the District Rangeland Management Specialists and the permittee (rancher). Existing locations of allotments and associated range improvements (for example stock drives, fences, and water developments) within the analysis are shown on the Tripod Fire Salvage Range Map in Appendix A.

Methow Valley Ranger District Allotments

In response to changes in resource conditions caused by the Tripod Fire and the need to protect BAER treatments, the following livestock grazing systems will need to be adjusted until resource conditions have recovered. Adjustments are discussed in the Cumulative Effects - Present and On-going Actions section of this report.

Beaver Allotment is 44,064 acres with 4 pastures (separated grazing areas). The grazing system is a deferred-rest rotation. Currently the permit allows 140 cow/calf pairs to graze from 5/10-9/30, which equals 887 animal unit months (AUM, see Glossary). This system utilizes two early season grazing pastures (Burns Canyon and Cougar) grazed and rested on alternating years, one mid season unit (Volstead) and one mid-late season unit (Middle Fork). The Loup Loup and Wolf units within the Frazer allotment are grazed in conjunction with the Beaver allotment as needed to allow flexibility in grazing strategies and/or providing for more rest for units in both allotments. Burns Canyon Unit and all of the Frazer allotment are outside the fire perimeter. The pastures are mainly divided by natural barriers.

East Chewack allotment is 33,186 acres with 3 pastures. Currently the permit allows 155 cow/calf pairs to graze from 6/1-9/30, which equals 832 AUMs. The allotment is divided into 3 pasture units, the Bromas, Brevicomis, and the Spur Peak/Forks Burn Units. The allotment is grazed under a deferred rotation system (a grazing system that provides for a systematic rotation of the deferment among pastures). The pastures are mainly divided by natural barriers.

Ramsey allotment is 12,312 acres with 3 pastures. Currently the permit allows 63 cow/calf pairs from 6/1-9/30, which equals 338 AUMs. Although permitted use dates are from 6/1-9/30, the pastures are used in an early season grazing system to limit use in the hot dry late season grazing which has less water and palatable forage. Typically 76 cow/calf pairs and 14 yearlings graze from 6/1-8/31. The grazing system prescribed for the allotment is a deferred rest-rotation system (a grazing system that provides for a systematic rotation of the rest among pastures) using three pastures: Ramsey, Pearrygin and Bear units. Each unit receives a period of early summer grazing, followed by a year of rest, followed by a

year of deferment where the unit is grazed in late summer in the third year. Each pasture is grazed for approximately 45 days. The pastures are mainly divided by natural barriers.

Tonasket Ranger District Allotments

Ryan allotment is 8,088 acres with 2 pastures. Currently the permit allows 130 cow/calf pairs from 6/21-9/30, which equals 578 AUMs. The Allotment is divided by fence into two pastures, the North and South Units. The South Unit is outside the fire perimeter. The allotment has not been stocked to full numbers for the past several years.

Salmon Basin allotment is 21,911 acres with 3 pastures. It is grazed under a deferred rotation system. Currently the permit allows 210 cow/calf pairs from 6/21-9/30, which equals 956 AUMs. The pastures are Rusty, Conger, and Cabin Units. Division fences separate the Rusty, Conger, and Cabin pastures approximately half the distance across each boundary. They tie into natural barriers from the eastern boundary to Little Granite Mountain, and the ridge from the National Forest boundary toward McDaniel Mountain. These pastures are mainly divided by natural barriers.

Clark allotment is 10,684 acres with 3 pastures. It is grazed under a deferred rotation system. The pastures are Pelican, Lower and Upper Buckhorn units. Currently the permit allows 168 cow/calf pairs from 6/21-10/10, which equals 821 AUMs.

Figure 3.13-1: Permitted Use on Allotments that Overlap the Project Area

Allotment	Size (acres)	Permitted use				*Grazing System
		Number (c/c pair)	Season of Use	Head Months	AUMs	
Beaver	44,064	140	5/10 to 9/30	672	887	DRR
East Chewack	33,186	155	6/1 to 9/30	630	832	DR
Ramsey	12,312	60	6/1 to 9/30	256	338	DRR
Ryan	8,088	130	6/21 to 9/30	438	578	DR
Salmon Basin	21,911	210	6/21 to 9/30	724	956	DR
Clark	10,684	168	6/21 to 10/10	622	821	DR

*DRR (deferred-rest rotation), DR (deferred rotation)

The number under AUMs permitted shows number of AUMs that are currently permitted on each allotment. The Season of Use is when livestock can be on the allotments on most years. For years with early or late springs, livestock may be turned on two weeks earlier or later than the on-date shown; during drought years, livestock may be brought off the allotments before the turn-off dates.
A Ranger District decision was made to allow limited grazing on the allotments in 2007 with reductions to permitted use and/or specific vegetation recovery measures where necessary.

Burned Areas within Affected Allotments

Approximately 59,531 (47%) acres of the six affected allotments are outside the Tripod Fire perimeter. These acres were used for cumulative effects analysis as well as for decisions made outside this analysis on grazing for the 2007 season.

Fire severity mapping was completed as part of the Burned Area Emergency Response (BAER) efforts in the project area. There were three levels of severity mapped: unburned and low, moderate and high. The burn ranged in a mosaic of low to high severity. High elevation drainages that held pre-existing stands of dead and dying trees burned hotter than the lower elevation mixed conifer basins where the bulk of the suitable livestock forage is located. High severity areas are primarily in steep, timbered canyons.

On both the Methow Valley and Tonasket Ranger Districts, the areas of high severity burn occurred primarily in areas where cattle could not previously access, or would be unlikely to access post-fire and management activities. Post-fire grazing systems are designed to avoid or exclude the higher severity burn areas from use. Vegetative drift barriers between allotments and pastures have been affected where high severity fire burned through the barriers. Approximately 11 miles of drift barrier on the boundaries of the affected pastures fall within high severity burned areas. Most of the 11 miles follow ridge lines and the steep rugged terrain will continue to prohibit most of the potential livestock drift across the boundaries.

Figure 3.13-2 and 3.13-3 provide a summary of the burned acres by pasture, the salvage harvest unit acres within each pasture, and the acres of capable rangeland within the salvage harvest units. A detailed description of the rangeland affected by the Tripod fire and the effect of the fire on the normal operation of the six allotments can be found in the Range Analysis File.

Acreages within each allotment that are within the boundary of the Tripod fire are listed in Figure 3.13-2. Only the pastures that are within the fire boundary are listed. This table shows that only 11% of the total pasture acres were severely burned, 16% were moderately burned, and 25% were in low severity or unburned categories.

Figure 3.13-2: Allotments and Pastures within Tripod Fire Perimeter

Allotment	Pastures (with acres inside fire perimeter)	Total Acres	% Acres within Tripod Fire	Allotment Acres by Burn Severity			
				*High	Mod.	Low	Unburned (within fire perimeter)
Beaver	Cougar	3,097	3%	18	2	68	
	Middle Fork	23,472	34%	2,298	1,281	4,429	
	Volstead	16,034	77%	5,568	4,294	2,473	
East Chewack	Brevicomis	11,679	69%	1,760	2,183	4,027	
	Bromas	15,946	54%	1,151	3,609	3,889	38
	Forks Burn	5,548	100%	192	1,862	687	2,807
Ramsey	Bear	3,973	48%	202	16	1,676	
	Pearrygin	3,520	39%	179	516	672	
	Ramsey	4,815	76%	703	1,296	1,663	
Ryan	North	6,402	69%	582	1,230	2,331	257
Salmon Basin	Cabin	5,919	20%	1	25	1,184	
	Conger	5,733	72%	337	466	3,323	
	Rusty	10,259	57%	688	275	4,806	
Clark	Buckhorn	6,277	6%	123	131	137	
	Pelican	4,407	45%	552	702	751	
Totals		127,081	53%	14,354 11%	20,745 16%	29,259 23%	3,102 2%
				Total: 67,460 / 53%			

*Field reconnaissance verified that most of the Burn Severity was High-Moderate severity rather than High, therefore the amount of High Severity acreage may be slightly less than shown in this figure.

Compliance Checks and Monitoring

To ensure management direction as outlined in the Annual Operating Instructions (AOI - annual management instructions to the permittee), are followed, range management staff conducts allotment inspections throughout the grazing season. The inspections allow for verification that the instructions are being followed. Allotment resource condition monitoring takes place throughout the grazing season. This day-to-day monitoring allows for adjustments to the instructions, if necessary, as a response to a change in resource conditions. End-of-season monitoring is completed on allotments as a measure of compliance with the allowable forage use standards and is also an indicator of successful management. Allotment inspections, resource condition and end of season monitoring will be conducted on the allotments/pastures included in the analysis area at the end of the 2007 grazing season.

Riparian Areas

Riparian areas (interface between stream and upland) are currently meeting PACFISH grazing standards. Localized livestock impacts may exceed standards, but at the stream reach scale and at the watershed scale, PACFISH standards are being met (see Fisheries/Hydrology report under Existing Project Area Conditions for more related information). Localized high use areas have been addressed in the on-going range analysis and riparian conditions at these sites are currently improving with existing

management under the new allotment management plans. Monitoring is conducted in areas of highest use. Percent streambank alteration (see glossary) by livestock is determined using the Streambank Alteration method (Cowley et al. 2006), which was developed for PACFISH. Monitoring is conducted within established Designated Monitoring Areas (DMA, see glossary).

Upland Areas
The upland forage within the allotments is meeting Forest Plan utilization standards on all capable range with the exception of a few spots where these localized high use areas may exceed 60 percent. These areas are typically seeded domestic grasses. Road placement, past timber harvest activities, and fence locations combined with water access and steep topography can result in the virtually unavoidable concentration of animals. These infrequent hotspots occur in spite of Forest Service range managers and permittees effort to implement best management practices and the terms of the AOI. A good portion of the native bunchgrass and pinegrass range within the allotments typically receives light to moderate use or may not be grazed at all. This is primarily due to the relative distance from water, the timing of grazing and the narrow window of palatability of these forage species.

ENVIRONMENTAL CONSEQUENCES

Direct and Indirect Effects

All Alternatives
The Tripod Fire burned 67,460 acres (53 percent) of a total of 127,081 acres within the grazing allotment pastures affected by the fire. The level of fire disturbance on the forage vegetation is relative to the level of burn severity. There are 14,354 acres of high severity and 20,745 acres of moderated severity burned area within the affected allotments. The effects of the fire on the six allotments will require modifying grazing systems or resting pastures until the forage vegetation has recovered. The total capable range acres within the maximum salvage harvest acres alternative is only 1,904 acres. The effect of the Tripod Salvage project in addition to the effects of Tripod Fire on the forage response and the management of the allotments would be relatively small.

Regardless of the alternative chosen, an increase in transitory range is expected as result from a decrease in canopy cover and early seral conditions in forested plant communities post fire. This availability would be from a combination of existing graminoid plants becoming more palatable post-fire and new plants become established. The total amount of transitory range resulting from any of the alternatives would be limited in its availability to livestock depending on other factors such as slope and distance to water.

Alternative A – No Action
Forage Response
This alternative would result in an increase of grass, forb and shrub production and a subsequent increase in available forage in areas directly affected by the fire. The effects of the fire on forest understory and intermingled shrub and grassland communities would vary based on prior species composition and adaptive strategies of individual species (Crane 1983, Agee 1994c). Vegetation response is discussed in detail in 3.5 Plant Communities. The severity of the burn would largely affect the degree to which individual species respond. It is anticipated that the Tripod Fire would function to enhance the

understory vegetation relative to plant vigor, productivity, and diversity and consequently result in an increase in forage and browse available for grazing by permitted livestock within the allotments. Also there would be a slight increase in production in non-forested plant communities post fire. This increase would be due to an opening in canopy cover where tree mortality has occurred in areas where conifers were encroaching into nonforested plant communities or where shrub cover and decadent plant material has been removed.

Over time (5 -15 years), the forest understory and non-forest vegetation would develop towards a mature condition. Continued reduction in the intensity and spectral quality of the light below the forested canopy would suppress understory growth and survival of intolerant species (Freyman 1968, Solomon et al. 1976, McLaughlin 1978, Carleton 1982). Shade tolerant species would out-compete less shade tolerant forest community species. Over time (15-20 years), trees would dominate, resulting in the associated shrubs, herbs and grasses becoming less abundant due to the corresponding increase in canopy cover and associated increased shading (Naumburg and DeWald 1999, Host 1988, McConnell and Smith 1970). Downed, fire-impacted material (snags and debris) would contribute further to an increase in cover and associated shading. Correspondingly, understory productivity (forage production) and diversity would also decline (Camp 1999, Moir 1966).

There would be no reduction in post-fire forage vegetation recovery from salvage harvest activities as there would be no soil disturbance or mechanical damage to regenerating plants. However, this alternative would make the least amount of transitory range available. This would be mainly because livestock distribution caused by the accumulation of dead down trees associated with no commercial salvage (discussed further below) would be limited. Access to the increased production expected in non-forested plant communities could be diminished because of dead and down tree accumulation. No mitigation measures would be required specific to this alternative.

Permittee Access and Livestock Distribution

The No Action Alternative would have an indirect effect on permittee access and would provide current road access to pastures.

Over time (5-15 years), as snags fall and material accumulates on the ground, implementation of the No Action Alternative would result in disruption of livestock distribution and grazing patterns. Areas that are currently open due to the Tripod Fire burning natural barriers would, as a result of no salvage harvest, begin to exhibit downfall accumulations which could restrict access to watering locations or grazing areas. An increase in effort on the part of the permittees could be required to manage the allotments with the accumulation of down trees. As danger trees begin to fall and make roads unsafe, roads would be closed, which would force the permittees to drive cattle for longer distances to access pastures.

Tree planting would not occur in salvage harvest units and would therefore have no effect on livestock grazing patterns. Natural regeneration would occur as described under Forage Response above.

All Action Alternatives

Forage Response

All action alternatives propose various amounts of mechanical removal of forested overstory in areas that sustained moderate to high levels of tree mortality (50-100 percent mortality). The direct effects of removing the fire-impacted overstory would be: 1) a further decrease in shade and a corresponding increase in the intensity of direct sunlight reaching the forest understory compared to pre-fire conditions, 2) reduction in the amount of debris that would ultimately accumulate on the forest floor, and 3) mechanical damage to regenerating plants and creating additional soil disturbance with the potential of soil erosion and soil compaction, contributing to an increase in vegetation recovery time and a delay in forage production. The relatively small effect of each of these factors is discussed in more detail below.

Recent salvage harvest research found that in the short term, there was no substantial difference in vegetative recovery between salvage harvested and non-salvage harvested sites when salvage harvest occurred within three years after the fire. The species diversity and vegetative cover were similar at each site and between severity classes. The long term differences between logged and unlogged were also negligible. In post-fire unlogged areas 10% of the standing dead trees fell within three years and most small diameter fire-killed ponderosa pine fell within 9 to 14 years and 93% fell over a 21 year period (Hollingsworth 2005, McIver and Ottmar 2007, Evers 2005). With all alternatives, the forest canopy would be open and there would be an increase in light that reaches the ground. Green tree research indicates that the removal of the forest component of dry forest ecosystems results in the stimulation of the associated understory component (Clary and Folliot 1966, Carleton and Maycock 1981, Host 1988, Lieffers and Stadt 1994, Agee 1994c, Riegel et al 1995, Griffith 1996, Ricard and Messier 1996, Naumburg and DeWald 1999). In general, the research indicates that productivity of understory vegetation is inversely related to tree density and directly proportional to the amount of solar radiation that reaches the understory vegetation. The indirect effect of increased plant productivity is an increase in forage and browse that is available for grazing by livestock. Within the salvage harvested areas with the absence of large wood debris, forage would be more readily available over a longer time period compared to the non-salvage harvested areas that would limit livestock access and forage availability as the snags fall and accumulate on the ground. Conversely, in non-salvage harvested post-fire forest environments, down snags and coarse wood provide protection for establishing seedlings by providing shade, trapping water, and protecting seedlings from wind and cold. The effect of the action alternatives on forage vegetation recovery would be negligible compared to the no action alternative; however the action alternative would create corridors for better access to and distribution through the transitory range within the burned area (further discussed under Permittee Access and Livestock Distribution below). There would be a net long-term improvement to the range forage resource with the implementation of the action alternatives.

The direct effect of mechanical damage to regenerating plants and soil by salvage logging and the indirect effect on vegetation recovery and forage production would be very small in relation to the total amount of forage base currently available within the allotments. As the total area of the salvage harvest units for Alternative D would make up only 3 percent of the total area of the affected pastures (less than 3 percent for Alternatives B, C and E), it is expected that the effect of the action alternatives on the grazing allotment forage response would be relative to the amount of affected area in each pasture. Also, only 58

percent (USDA Forest Service 2005c) of the rangeland within the salvage harvest units is capable range, which would further reduce the effect of the action alternatives on the available forage (see figure 3.13-3). The successful implementation of the mitigation measures of seeding on landings and the main skid trails would be effective for revegetating disturbed soil and for providing for a more rapid livestock forage vegetation recovery. Grazing allotment inspections have shown that many landings and skid trails within past timber harvest areas on the Methow and Tonasket Ranger Districts have been successfully revegetated using similar mitigation measures and continue to provide forage. The seed mix would be a species composition of grasses that are quickly established but are not persistent and give way to native forage species over time.

Figure 3.13-3: Maximum Salvage Harvest Acres (Alternative D) for Pastures within Fire Perimeter and Capable Range Acres Within Salvage Harvest Units

Allotment	Pastures (with acres inside fire perimeter)	Total Acres	Salvage Harvest Unit Acres within Pasture / % of pasture	Capable Range Acres within Salvage Units by Pasture / % of Units
Beaver	Cougar	3,097	0	0
	Middle Fork*	23,472	494 / 2%	151 / 30%
	Volstead*	16,034	9 / .1%	8 / 88%
East Chewack	Brevicomis*	11,679	422 / 4%	151 / 36%
	Bromas*	15,946	663 / 4%	397 / 60%
	Forks Burn*	5,548	3 / .1%	3 / 100%
Ramsey	Bear	3,973	0	0
	Pearrygin	3,520	0	0
	Ramsey*	4,815	778 / 16%	388 / 50%
Ryan	North*	6,402	124 / 2%	93 / 75%
Salmon Basin	Cabin*	5,919	36 / .6%	18 / 50%
	Conger*	5,733	220 / 4%	187 / 85%
	Rusty*	10,259	408 / 4%	404 / 99%
Clark	Buckhorn*	6,277	106 / 2%	104 / 98%
	Pelican	4,407	0	0
Totals		127,081	3,263	1,904

*Pastures containing proposed salvage harvest units.

Figure 3.13-4 shows the number of acres that would be treated by each salvage harvest system and the number of acre of actual disturbance that would result from tractor, skyline, and helicopter systems. Alternative D would have the greatest number of acres treated with the greatest number of acres of ground disturbance and associated potential to retard post fire forage vegetation recovery. The acres of salvage harvest and ground disturbance are less in Alternatives B, C and E with Alternative C having the least number of acres. As explained in the paragraph above, the overall direct effect would be relatively small, given the small percentage of the pasture that lies within harvest units.

Figure 3.13-4: Estimated Disturbance Acres by Alternative and by harvest system within the affected allotments

	Alternatives B and E	Alternative C	Alternative D
Logging System by Acres			
Ground-based	2137	1868	2128
*Projected Ground-based Actual Disturbance (Acres)	320	280	319
Skyline	478	238	603
**Projected Skyline Actual Disturbance (Acres)	14	7	18
Helicopter	0	0	532
***Projected Helicopter Actual Disturbance (Acres)	0	0	0
Total Salvage Harvest Acres	**2707**	**2206**	**3263**

*Acres are calculated by assuming that 15% of the units would have detrimental soil disturbance; actual detrimental soil disturbance levels may be lower.
**Acres are calculated by assuming that 3% of the total acres in a unit would have detrimental soil disturbance.
***Acres in helicopter units are calculated by assuming that 0% of the total acres would have detrimental soil disturbance (see soils and invasive plant specialist reports).

Reforestation under Alternatives B, C, D and E would contribute to a decrease in forage production to a limited extent, as young trees develop and compete against understory vegetation for water and nutrients, as well as, generate increased shading, further limiting understory production.

Permittee Access and Livestock Distribution

Salvage harvest activities would likely have very limited direct effect on livestock distribution as the timing of the salvage harvest would likely be before vegetation recovery in the rested pastures has been reached. Most of the salvage harvest units are within rested pastures and the livestock would be in other pastures. If any of the activity occurs during the scheduled grazing periods, between June and the end of September, activity noise or vehicle haul traffic may temporarily cause cattle to move out of the immediate area. Cattle are likely to congregate in areas where they are not disturbed, and where both forage and water are available. Mitigation measures would be implemented to protect all existing structural range improvements. It would be a contract requirement that fence right-of-ways will be cleared of slash produced by salvage harvest activities and all gates remain closed while cattle are grazing in the area. The accumulation of down woody material would be minimized within stock driveways, stock trails, and within areas of traditional cattle movement. These mitigation measures have proven to be effective in the past at reducing the effect of salvage harvest on livestock management. Coordination between the Range Specialist, Sale Administrator, and grazing permittee would occur to help prevent any conflicts.

All Action Alternatives would have no effect on permittee access to the affected grazing allotments. All alternatives would re-close roads that were or would be opened for the purposes of implementing this project. Many roads currently existing within the allotment (including some closed roads) provide permittee access.

An increase in transitory range would result in increased livestock distribution through natural movement of the animals, especially when used early season. With increased salvage harvest, a more open structure in forested vegetation communities would develop and improve livestock distribution. The relative increase in transitory range would be small but would have the potential to relieve livestock grazing pressure from historical pre-fire use areas, mainly non-forested plant communities.

Mechanical removal of dead and dying trees in areas that sustained moderate to high levels of tree mortality would result in the reduction in the abundance of future downed material, which would otherwise present physical drift barriers to livestock travel and result in poor livestock distribution and forage utilization. Conversely, grazing allotment and pasture division boundaries have been established along natural drift barriers and deadfall will be critical in maintaining the barriers. The drift barriers that have been opened by the fire, as described earlier in the section under Burned Areas within Affected Allotments, would further be opened by salvage logging and increase livestock drift. Salvage harvest activities would have a small direct effect on vegetative livestock drift barriers. For Alternatives B, D and E, only 1 mile (three units – RA11, HA05, and CE11) of natural livestock drift barrier would be altered by salvage harvest operations and for Alternative C, 0.65 miles (two units – RA11 and CE11) would be altered. Alternative E would have slightly less potential to alter the livestock drift barrier as there would be no trees harvested greater than or equal to 21 inches dbh, which would be approximately 2.2 fewer trees harvested per acre. The effect is relative to approximately 11 miles of drift barrier on the boundaries of the affected pastures that fall within high intensity burned areas. It is expected that attempts to minimize the disruption of vegetative or downed wood created drift barriers within harvest units would have limited effectiveness. Coordinating management actions between the Range specialist, Sale administrator, and grazing permittees would improve the effectiveness by insuring that critical drift areas are identified and that disruption of these areas is reduced to the extent that is feasible. It is expected that the high severity burned areas would have a similar effect as the salvage harvest activities on the level of drift.

The effect of an increase in transitory range within watering distance (the distance livestock would typically travel to drink) of riparian areas would result in an increase in the occurrence of livestock using the stream which could limit riparian vegetation recovery. For Alternatives B, C, D and E, there would be salvage harvest acres within watering distance of perennial RHCAs with Alternative D having the most acres and Alternative C having the least acres within watering distance (see Figure 3.13-5).

Figure 3.13-5: Acres of Salvage Harvest Units within ¼ mile of Perennial RHCAs

Logging System	Alternatives B and E	Alternative C	Alternative D
Ground-Based	818	716	829
Skyline	42	19	55
Helicopter	0	0	34
Total	860	735	918

Most RHCAs are on headwater streams, which are typically intermittent within the Tripod project area. As these streams typically do not have water during the summer grazing season of use, livestock would not be attracted to these areas for water. The main streams lower in the watershed would have perennial water with potential for livestock access. The soil disturbed by project activities in salvage harvest units adjacent to the perennial RHCAs would be seeded with a mix that would be least attractive to cattle. A seed mix with a species composition capable of attracting cattle would be used to revegetate disturbed soils in areas best suited to help draw cattle away from perennial riparian areas. This mitigation has proven to be effective in similar seeding treatments within grazing allotments on the Methow and Tonasket Ranger Districts and would limit livestock impacts to riparian areas. No salvage harvest would occur within RHCAs, which would impede access with the accumulation of down, dead material. Any danger trees in RHCA would be left in place, further limiting livestock access to streams. Large accumulations of down dead material have led to decreased access to RHCAs in other areas on Methow Valley Ranger District and continue to be a benefit in protecting the riparian habitat.

The effects of proposed reforestation on the grazing allotments are common to all action alternatives. Reforestation under Alternatives B, C, D and E would have a minimal effect on livestock distribution for the allotments. Permittees would be made aware of current reforestation efforts through the annual operating instructions and an added protection would place salting grounds away from new plantations and would encourage riders to move livestock into adjacent areas.

Summary of Direct and Indirect Effects

The Tripod Fire burned a total of 53 percent of the total area of the affected grazing allotments. The total area of the salvage units for Alternative D would make up only 3 percent of the burned area (less than 3 percent for Alternatives B, C and E). Relative to the effect of the Tripod Fire on the affected allotments, the effects of the Tripod Fire Salvage Project would be very small.

Cumulative Effects - Action Alternatives B, C, D and E

This cumulative effects analysis considers effects of past, present, and reasonably foreseeable future actions within the Tripod Salvage project area. A complete list of past, present and reasonably foreseeable future actions is listed at the beginning of this chapter. The following activities would have a cumulative effect on Range and will be considered in this cumulative effects analysis; fire suppression facilities, timber harvest, road construction and maintenance, prescribed burning, other wildfires, BAER activities, range recovery measures, invasive plant treatments, and dispersed recreation. The other activities would not have a cumulative effect to the range resource and are not considered. The geographic boundary for this cumulative effects analysis is the entire

Tripod Fire burned area including the entire area of all the grazing allotments affected by the Tripod Fire Salvage Project, and the temporal boundary is the period of time when the activities associated with this project are occurring from the 1960s to 2014 when activities would be complete. Because effects on soils are localized, this cumulative effects analysis is limited to the immediate area surrounding the actual units.

Past Actions

Tripod Fire suppression activities in 2006 involved construction of over 100 miles of dozer line, and over 100 miles of handline with many created clearings for drop points, safety zones, staging areas, and helispots. These areas were seeded with a seed mix for weed competition and soil stabilization. There is a potential that these clearings would be beneficial to cattle movement and facilitate grazing distribution, but may be detrimental by creating new drift corridors into sensitive areas or to areas outside the permitted pasture. Livestock mitigation measures of increased riding and compliance checks along with good management practices such as proper salting and maintenance of water developments would reduce the impacts of the drift.

Intensive logging activity started in the project area in the 1960s. Secondary roads were completed from the 1960s to the 1990s in conjunction with timber sales. Road construction increased livestock access throughout the affected allotments and the timber harvest was a factor in increasing transitory range in the affected allotments. These past activities have increased the overall livestock distribution but the associated increase in improved distribution since the 1960s has remained relatively low.

Several ongoing timber harvest activities have recently occurred within this analysis area. The most recent timber sales are the Conger IRP and the Danny Timber Sales on the Tonasket District and the Solar and the Soaker Timber sales on the Methow District. These activities have contributed additional transitory forage for the livestock. This addition would increase livestock distribution throughout the allotments. Timber sales further back in the past are no longer providing transitory range because of canopy closure.

Dispersed camping activities have improved livestock access to riparian areas in Boulder Creek because of vehicle access tracks and clearing of vegetation and debris in camp sites.

Several prescribed burns have recently occurred within the analysis area that have continued to contribute to or maintain additional transitory forage. All of the following prescribed burns are within the affected grazing allotments

- Ramsey Peak Blocks 1 and 2 (2006)
- Ramsey Peak Block 3 (2005)
- Ramsey 3 (2001)
- Lower Boulder (2001)
- Ramsey 1 and 3 (1999)
- Mid-Boulder (1998)
- Boulder 1 and Ramsey 4 (1997)

Wildfires, such as Isabel have contributed to additional transitory range by removing the overstory and allowing sunlight to increase the understory. The Tripod Fire has damaged

range structural improvements and forage availability and will continue to limit livestock grazing within the affected allotments unit the forage resource has recovered.

Present and On-going Actions

In response to changes in resource conditions caused by the Tripod Fire, livestock grazing systems will be modified or grazing will be delayed where needed on all six affected allotments. When standards are met that indicate sufficient vegetation recovery has occurred (Appendix H, Post-fire Vegetation Recovery Assessment), the management of the allotments will return to that of the pre-fire grazing systems. Appendix H documents the rationale that will be used by the Ranger Districts to assess range condition to determine when to allow grazing to occur. It lists several environmental conditions and factors which interrelate. Not all these factors would be met simultaneously and are considered on a site-by-site basis. This process is not part of this EIS proposal, but is displayed here to help analyze the cumulative effects of grazing in the project area. Modifications to permitted use will be made and specific fire recovery measures will be in place before grazing continues on pastures affected by the Tripod Fire.

Specific adjustments to permitted head months (one month of use by one cow/calf pair), season of use, and grazing systems are detailed in Figure 3.13-6 for 2007 through 2009 as decided by the District Range Staff and District Ranger. Range management techniques such as numbers of livestock turned out, salting, water developments and timing of use, will continue to be used to meet riparian goals, and to obtain uniform distribution of use on the allotment. Riparian objectives include maintaining and/or increasing bank stability. These objectives would be reached through the continued use of deferred rotation grazing and maintenance of water troughs and fences.

Figure 3.13-6: Allotment Fire Recovery Measures (These are not proposals made by this EIS process but are measures the Ranger District is considering and are listed here to analyze cumulative effects)

2007 (actual HM and AUMs)			
Allotment	**Head Months (HM)**	**AUMs**	**Fire Recovery Measures**
Beaver	512* (76%)	639*	Reduce HM/AUM 24%, implement AMP grazing strategy to rest Volstead pasture, increase riding, complete reconstruction of 4 water developments, reconstruct portion of burned fence, construct electric fence to reduce drift to burned area, assess need to shift livestock to allotments in nonuse, increase compliance checks.
East Chewack	0*	0*	Rest all pastures; assess need to shift livestock to allotments in nonuse.
Ramsey	237 (93%)	301	Rest Ramsey pasture, use Pearrygin unit early and Bear unit late, reconstruct burned water developments and fences, assess need to shift livestock to allotments in nonuse, increase compliance checks.

2007 (actual HM and AUMs)			
Allotment	**Head Months (HM)**	**AUMs**	**Fire Recovery Measures**
Ryan	426 (97%)	562	Assess vegetative recovery in North pasture. If desired vegetative recovery is attained, use as permitted with completed scheduled improvements, increase compliance checks. If monitoring indicates need, move cattle to Fish Coulee allotment for end-of-season use.
Salmon Basin	721 (99%)	951	Assess vegetative recovery in all pastures. If desired vegetative recovery is attained: Use as permitted, complete scheduled improvements, increase compliance checks.
Clark	571 (91%)	754	Assess vegetative recovery in Upper Buckhorn and Pelican pastures. If desired vegetative recovery is attained: Use as permitted, continue high-level compliance checks.

2008 (proposed HM and AUMs)			
Allotment	**Head Months**	**AUMs**	**Fire Recovery Measures**
Beaver	538* (80%)	710*	Assess vegetative recovery of Volstead unit. If rest in Volstead unit is needed: reduce HM/AUM 20%, implement AMP grazing strategy to rest Volstead pasture, increase riding, complete reconstruction of 4 water developments, reconstruct portion of burned fence, construct electric fence to reduce drift to burned area, assess need to shift livestock to allotments in nonuse, increase compliance checks.
East Chewack	504* (80%)	666*	Assess vegetative recovery of allotment. If desired vegetative recovery is attained: reduce HM/AUM 20%, use unburned areas as much a possible, increase riding, reconstruction of burned water developments and fences, construct electric fence to reduce drift to burned area, assess need to shift livestock to allotments in nonuse. If desired vegetative recover is not attained: look for opportunities to shift livestock to allotments in nonuse.
Ramsey	256	338	Assess vegetative recovery of Ramsey unit. If desired vegetative recovery is attained: use Ramsey unit early and Pearrygin unit late, look for opportunities to shift livestock to allotments in nonuse, increase compliance checks. A fence may be required on the divide between Pebble and

2008 (proposed HM and AUMs)			
Allotment	**Head Months**	**AUMs**	**Fire Recovery Measures**
			Ramsey Creek to prevent drift resulting from the destruction of the natural timber barrier, ½ mile. If desired vegetative recover in Ramsey unit is not attained: conditionally use Bear unit early and Pearrygin unit late if both upland and riparian use standards are met in 2007. If standards are not met; rest Bear and Ramsey units and use Pearrygin unit early, look for opportunities to shift livestock to allotments in nonuse, increase compliance checks.
Ryan	426	562	Assess vegetative recovery in North pasture. If desired vegetative recovery is attained: Use as permitted with complete scheduled improvements, increase compliance checks. If monitoring indicates need, move cattle to Fish Coulee allotment for end of season use.
Salmon Basin	721	951	Assess vegetative recovery in all pastures. If desired vegetative recovery is attained: Use as permitted, completed scheduled improvements, increase compliance checks
Clark	571	754	Assess vegetative recovery in Upper Buckhorn and Pelican pastures. If desired vegetative recovery is attained: Use as permitted, continue high-level compliance checks

2009 (Proposed HMs and AUMs)			
Allotment	**Head Months**	**AUMs**	**Fire Recovery Measures**
Beaver	538* (80%)	710*	Assess vegetative recovery of Volstead unit. If rest in Volstead unit is needed: reduce HM/AUM 20%, implement AMP grazing strategy to rest Volstead pasture, increase riding, complete reconstruction of 4 water developments, reconstruct portion of burned fence, construct electric fence to reduce drift to burned area, assess need to shift livestock to allotments in nonuse, increase compliance checks.
East Chewack	504* (80%)	666*	Assess vegetative recovery of allotment. If desired vegetative recovery is attained: reduce HM/AUM 20%, use unburned areas as much a possible, increase riding, reconstruct burned water developments and fences, electric fence to reduce drift to burned area, look for opportunities to shift livestock to allotments in nonuse, increase compliance checks.

2009 (Proposed HMs and AUMs)			
Allotment	**Head Months**	**AUMs**	**Fire Recovery Measures**
			If desired vegetative recover is not attained: look for opportunities to shift livestock to allotments in nonuse.
Ramsey	256	338	Use as permitted, continue high level compliance checks.
Ryan	426	562	Assess vegetative recovery in North pasture. If desired vegetative recovery is attained: Use as permitted with completed scheduled improvements, increase compliance checks. If monitoring indicates need, move cattle to Fish Coulee allotment for end of season use.
Salmon Basin	721	951	Assess vegetative recovery in all pastures. If desired vegetative recovery is attained: Use as permitted, completed scheduled improvements, increase compliance checks.
Clark	571	754	Assess vegetative recovery in Upper Buckhorn and Pelican pastures. If desired vegetative recovery is attained: Use as permitted, continue high-level compliance checks.

*Modification in response to change in resource condition from Tripod Fire.

Tripod Fire suppression rehabilitation and BAER implementation activities being completed for the Tripod Fire will help revegetate and stabilize disturbed soils and reduce vegetation recovery time and providing for improved livestock distribution and a reduction in site specific impacts from grazing within the Tripod salvage harvest units.

Ongoing activities such as firewood gathering, mushroom gathering, and recreational use of ATVs may increase livestock dispersal. As this is not managed livestock dispersal, it could result in gates being left open or cattle “pushed” into the areas recovering from the Tripod fire or regeneration in Tripod Salvage. There may be a conflict between these activities and livestock management goals, which is to limit livestock exposure to these areas. Livestock AMP mitigation measures of increased riding and compliance checks would reduce the impacts of the dispersal and the area of greatest concern are areas of moderate to high fire severity which are primarily in steep, timbered canyons where accessibility for cattle is limited.

Road maintenance would continue; roads currently open would remain open except those roads planned for closure or decommissioning in the Tripod Fire Salvage project. This would continue to facilitate current cattle movement patterns.

Reasonably Foreseeable Future Actions

Actions proposed in the Mutton Timber sale and the Fuels Treatment projects of Ramsey Peak Block 4, Bear Units 28 and 17, Conger Integrated Projects, Mutton Integrated Resource project, and Cougar Natural Fuels Underburn would open the canopy and

increase forage production over a large area, providing for improved livestock distribution and a reduction in site specific impacts from grazing within the Tripod salvage harvest units. As time passes, the forage availability would be reduced as the tree canopy closes. Shade tolerant species would out-compete less shade tolerant species. Over time (20 years), trees would again dominate, resulting in the associated shrubs, herbs and grasses becoming less abundant due to the corresponding increase in canopy cover and associated increased shading (Naumburg and DeWald 1999, Host 1988, McConnell and Smith 1970).

Invasive plant treatments with herbicides will continue within the project area, under separate decision notices. Invasive plants that compete with desirable plants will be reduced providing for more rapid vegetation recovery and more available forage for livestock within the Tripod Salvage harvest units.

Conclusion

Past Actions: The cumulative effect of the Tripod Fire and associated suppression activities has temporarily reduced the availably of forage and reduced the management effectiveness of the allotments because of the loss of some of the fences and water developments. However, the Tripod suppression activities will be revegetated, fire-damaged vegetation will recover and forage production within transitory range will increase overtime.

Present Actions: The cumulative effect of implementing the Allotment Fire Recovery measures and the Tripod Salvage Project mitigation measures would ensure rapid recovery of burned area vegetation resulting in a short period of grazing deferment.

Future Actions: The cumulative effect of timber sales, prescribed burns, and invasive plant treatments would maintain or improve the range forage resource by reducing invasive plant competition and maintaining a more open forest canopy.

In summary, the effects of past, present and reasonably foreseeable future actions would contribute to a short term decrease in the production and availability of the range forage resource. However, actions proposed in the Tripod Fire Salvage Project for all action alternatives would further open the canopy and increase forage production, providing for better livestock distribution with a net benefit to the range forage resource. Alternative D would create the most transitory range and with the successful implementation of the mitigation measures would provide a slightly better net benefit to the Range resource relative to the other action alternatives.

CONSISTENCY FINDING

All action alternatives would be consistent with Forest Plan Standards and Guidelines. Transitory range was created by the Tripod Fire. Livestock grazing would be managed to limit impacts to reforestation consistent with Forest-wide Standard and Guideline 20-30 and seeding would be adjusted to meet resource concerns of the management areas, consistent with Forest-wide Standard and Guideline 20-31.

3.14 Sensitive Plants

The section below is a summary of the Sensitive Plant Report which is available in the project analysis file (Ohlson 2007b).

REGULATORY FRAMEWORK

The Okanogan National Forest Land and Resource Management Plan requires protection of sensitive plant species (Forestwide Standard and Guide 6-19).

Forest Service Manual direction 2670 requires activities be reviewed to determine their potential effect on Sensitive species and that activities avoid or minimize impacts to species whose viability has been identified as a concern. Activities will not result in loss of species viability that will result in a species becoming Threatened, Endangered, or create trends toward Federal listing.

None of the Tripod Fire is currently within the jurisdiction of the 2001 Record of Decision (ROD) for the Northwest Forest Plan (USDA and USDI 2001) and none of the Survey and Manage guidelines apply to this analysis. In 2004 the ROD was signed for the *Final Supplemental Environmental Impact Statement (FEIS) to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines* (USDA and USDI 2004) creating the Special Species Status Program, which rolled over many of the Northwest Forest Plan Survey and Manage species onto the list along with other non-vascular species of concern and expanded the geographical boundary to include all of the Okanogan-Wenatchee NF. Surveys for these species began across the forest in 2004 and have continued to date.

Research Natural Area (RNA) Forest Service Manual 4063 direction provides for research, education, and maintenance of biological diversity of National Forest lands that typify important pristine ecological areas. Okanogan Forest Plan direction for RNAs is to preserve the naturally occurring physical and biological conditions for which the RNA was established. They are to be managed to allow plant community development without human intervention and to provide representative examples of unaltered communities. Hazard tree felling is permitted along trails and roads for safety. Felled trees are required to remain in place (MA8-18B).

ANALYSIS METHOD

The analysis is based on Washington Natural Heritage Program (WNHP) Threatened, Endangered, and Sensitive (TES) plant program data, the Regional Forester's Sensitive species list and the Special Status Species Program (SSSP) list (Appendix L) and multiple years of observation, of known Sensitive plant species and their habitats, across the Tonasket and Methow Districts by District Botanists. It also includes protection of known sites on the SSSP list. Previous project survey records were reviewed and areas were walked to assess potential habitat and burn severity where harvest units were known and weather permitted during the fall of 2006. Within the project area, Blue Buck and Lightning Creeks had the least amount of pre-burn field data. Because not all areas considered for harvest had previous surveys, suitable habitat for all species of concern is considered occupied and assessed as such. No additional surveys were conducted for

this assessment because all suitable habitat is excluded from salvage harvest units. Surveys will be conducted where temporary road construction is proposed, particularly where this activity involves RHCAs. Further information on sensitive plants is available in the Analysis File.

AFFECTED ENVIRONMENT

Sensitive Vascular Plant Resources

There are no federally listed species known to occur within the fire area. There are 22 Forest Service - Pacific Northwest Region (R-6) sensitive plant species and Washington Natural Heritage Program (WNHP) listed species found in the fire area involving 77 Element Occurrences (EO). Of these, only six species and nine populations are found within the Tripod Fire Salvage project area (Appendix L). There are two WNHP State Threatened species, *Rubus acaulis* and *Mimulus patulus* found within the fire area. There are two other species in the fire area with elevated status, these are: *Botrychium paradoxum* and *Botrychium crenulatum*. *Botrychium paradoxum* is both State Threatened and a Federal Species of Concern. *Botrychium crenulatum* is a Federal Species of Concern.

The six species found within the Tripod Fire Salvage project area are *Agoseris elata, Carex heteroneura, Carex norvegica, Mimulus patulus, Salix glauca*, and *Salix tweedyi*. All but *Mimulus patulus* are associated with wet to mesic rich forb meadows, wetlands, or stream edge habitats typically in the subalpine or alpine ecosystems. These micro-site habitats burned lightly or not at all during the Tripod Fire (personal observation). All but *Mimulus patulus* are perennials that likely escaped the fire event or were lightly burned over and should all readily re-sprout. The *Mimulus patulus* is a small annual. Unless there is a residual soil seedbank, this population was likely extirpated as the habitat burned completely during the Tripod fire (personal observation).

The *Mimulus patulus* population is located in a small moist swell on a bench below the Road 540 spur in Junior Creek. When this population was discovered, there appeared to be past evidence of an old skid road across the bench. A buck and pole fence was constructed around the seep were the population grew to keep the cattle out. This fence was burned completely to the ground during the Tripod fire.

Botanically Important Area

Roger Lake RNA is the only botanically important area within the Tripod Fire Salvage project area.

The 310 acre Roger Lake RNA was completely burned over by the fire. Two of the State Threatened species, *Rubus acaulis* and *Carex tenuiflora* occur in the RNA along with five other State or R-6 Sensitive species: *Salix tweedyi, Mimulus suksdorfii, Salix glauca, Carex magellanica ssp irrigua,* and *Polytrichum strictum*. *Salix glauca* is a riparian associate and likely will respond favorably to this fire event by vigorously resprouting where fire severity is low to moderate. *Rubus acaulis* and *Carex tenuiflora* are both within the wetland habitats surrounding Roger Lake. Mostly old thatch and aerial portions of the plants burned leaving the plant roots undisturbed. Individual tree torching occurred but the wet meadow communities appeared to burn only lightly or not at all. Recovery should

be rapid and vigorous following the fire. *Mimulus suksdorfii* is an annual that appears to be located in a High severity burn area. Unless there is a residual seedbank in the rock outcrop where it is found, this population may have been extirpated. Fire severity created a mosaic ranging from High to Low with most of the area defined as Moderate Severity burn. The Tripod Fire Salvage project area does not include any salvage harvest units in the Roger Lake RNA, although danger tree felling would occur at its western boundary.

Non-Vascular Sensitive Species

Nephroma bellum is the only non-vascular species on the Special Species Status Program (SSSP) list known to occur in the fire area. Populations of *Nephroma bellum* are known to occur along Shew and Little Granite Creeks. Both populations grow on boulders within riparian areas. These areas are within the Mixed Conifer Forest Habitat and experienced a Low to Very Low burn severity. *Nephroma occulatum* and *Peltigera neckerii* have been found on the east side of the Tonasket Ranger District. These are recent range extensions to the east for these species and it is likely they may also occur in the Tripod Fire area. *Peltigera neckerii* habitat is downed logs and moist soil along the edges of creeks and wetlands. *Nephroma occulatum* is a riparian associate found in the canopies of mature Douglas-fir. Habitat for both these species occurs within the fire area.

ENVIRONMENTAL CONSEQUENCES

Direct and Indirect Effects

All Alternatives

There are no known federally listed plants within any of the proposed harvest units in any of the alternatives. The two federally listed species, *Howellia aquatilis* and *Spiranthes diluvialis* both are wetland associates. There are no designated wetlands within any of the proposed harvest units and there would be no effect to either of these federally listed species as a result of any of the proposed activities.

There are no known sensitive plants within any harvest units and salvage activities would not directly or indirectly jeopardize the viability of any known sensitive plant population. No additional surveys were conducted because suitable habitat was treated as if it were occupied and excluded from salvage harvest units. Therefore, there would be little risk to sensitive species since most are associated with RHCAs, seeps, springs, and wetlands and the habitat would be protected.

Under the No Action Alternative, natural processes would be allowed to occur within the entire fire area. Sensitive plants and their habitat's recovery under these conditions within the project area are detailed below. Fire adaptations of the sensitive species are also discussed.

Under action alternatives B, C, D, and E all harvest activities would avoid or adequately buffer seeps, springs, wetlands, and riparian areas, where the greatest potential for sensitive species occurrence is. As a result, there would be no direct or indirect effects to any known sensitive plant populations or potential sensitive plant habitat where species require riparian, seep, spring, or wetland habitats. Most sensitive plant habitats, not dependent on moist riparian habitats, are associated with higher elevation sites, in non-forested habitats, or are outside any harvest unit or proposed activity (Appendix L). Those

habitat exceptions that may be affected by harvest activities are aspen stands and rock outcrops. These habitats would be surveyed to ensure no sensitive species are present prior to layout completion.

Within the proposed harvest units, aspen stands support the only potential sensitive plant habitat that could be directly affected by harvest activities. Aspen stands are frequently associated with *Botrychium* species, particularly where red osier dogwood is present. Any aspen stand that is found to be half acre or larger is thought to provide adequate sensitive plant habitat for this analysis. All aspen stands of this size would be excluded from ground disturbance and excluded during unit layout. Deciduous habitat that was detected to be at least one-quarter acre in the following proposed harvest units prior to the fire: CE02, CE03, CE04, CE11, GA01, GA02, GA05, MK03, MK04, RA01, RA02, RA15, and BO11. During field reconnaissance units identified as having aspen present were: RA02, RA04, RAO6, RA09, HA04, BR14, BO09, and BR12. Unit BO11 is in Alternative D only. All other units are included in all the proposed harvest alternatives. Since aspen stands greater than one-half acre would be excluded from ground disturbance, there would be no effect to any potential sensitive species habitat with the implementation of any of the proposed alternatives.

Within the proposed harvest units, the only other potential habitats that may be affected by harvest activities are rock outcrop habitats. *Lycopodium dendroideum* favors large boulder outcrops. *L. dendroideum* is suspected to occur on the Okanogan National Forest. However, associated species commonly found with *L. dendroideum* indicate it favors cool moist habitats with species such as *Menziesia ferruginea*, *Vaccinium alaskaense, Gaultheria ovatifolia*, and *Acer circinatum* which would not be commonly found in the project area. The risk to *Lycopodium dendroideum* would be none to low with any of the action alternatives. *Mimulus patulus* favors vernal seeps in rocky outcrops as well as seeps and springs in the Dry Forest habitats. Since seeps would be protected during harvest activities by RHCA buffers, there is no anticipated salvage related effects to this species or its habitat (WNHP 2007).

For the *Mimulus patulus* population, use of the skid road below the Junior Creek Road 5010-540 to park vehicles, logging equipment or store materials when work is occurring in vicinity of unit JU20 or other adjacent Junior Creek units could indirectly affect the population due to physical disturbance of the site. This site would be marked, and workers would be required to avoid this site. The District Botanist would work with the Timber Sales Officer and Contracting Officer's Representatives to identify and adequately close the area off prior to initiation of any work in the area. Unit JU20 is in all alternatives and implementation of any action alternative would have the potential to indirectly damage or extirpate this population through physical disturbance. This population burned with a Moderate to High severity. If any residual seeds survived the fire and germinated, plants would be protected by marking the site and workers would be required to avoid the site. Maintaining good communication between with timber sale layout crews and the Timber Sale Officer has resulted in sufficient protection of other sensitive plant populations and is expected to have similar results in this situation.

In the event new Sensitive plant populations are discovered in any of the proposed units or project area, the sites would be buffered sufficiently to protect the integrity of the population.

A Salix glauca population is located at the southern end of the Roger Lake RNA near a non-system spur road along a portion of the perennial stream that drains the lake. There are only five known populations of *Salix glauca* in the state (Visalli 2006). Only one individual in the Roger Lake population appeared to have some active sprouting and live tissue during a visit in late September 2006. The other individuals could not be located because they were completely burned over, leaving this population at potential risk of loss. The risk of loss would increase, if the one live plant is damaged by vehicles or tree felling. To prevent this, roadside danger trees will be felled way from this population and felled trees would be left in place and not removed from the RNA. Directional danger tree felling away form the *Salix glauca* would not jeopardize the viability of the population and these activities would be coordinated with the District Botanist to further ensure population viability (Chapter 2, Mitigation Measure #93).

Mimulus patulus and *Mimulus suksdorfii* are both annual species and unless there is a residual seed bank, these populations may have been extirpated if lethal soil temperatures were reached. All the other known sensitive species within the fire area are perennial species. Grass and grass-like species such as *Agrostis borealis* and the *Carex* species, shrubs such as the *Salix* species, deep rooted forb species such as *Agoseris elata* and *Parnassia kotzebuei* and rhizominous species such as *Rubus acaulis* are the most likely to have some adaptations allowing them to survive Low to Moderate intensity burns. The *Botrychiums* and orchids such as *Spiranthes porrifolia* all have dependent fungi associations for survival and likely are less tolerant of fire because of fungi's lower tolerance to fire. None of these species are known to occur within any proposed units. If they were detected during unit layout they would not be affected by any harvest activity due to their association with riparian and wet site habitats, which are being excluded from any ground disturbing activities.

If fungi species on the SSSP list were present prior to the fire, they would likely be lost unless host trees survived or become re-established within the next 2 to 3 years, or these species can form associations with non-conifer species (Chapter 3, Plant Communities). The fungi species on the SSSP list are considered old growth and mature forest associates and it would likely take over 100 years before forest structure develops suitable habitat for the return of these species (Appendix L). Proposed harvest activities may affect once suitable habitat, particularly in the Montane Forest habitats, but given salvage harvest activities are not targeting live trees, there would be little or no risk to any of these species by implementing the action alternatives.

Lichens and bryophytes on the SSSP list are found on various substrates, mostly associated with moist riparian zones and humid forest micro-sites. The loss of canopy cover caused by the Tripod Fire has likely altered the habitat enough to eliminate these species from the site, at least temporarily (Appendix L). Given these SSSP species are riparian associates, they would be included within riparian buffers where there would be no salvage harvest. Therefore there would be no effect to these species or their habitats as a result of any proposed harvest activity in any of the alternatives. Temporary road construction with RHCAs would require surveys prior to any ground disturbance. .

Nephroma bellum is the only SSSP species known to occur within the project area and it is outside any proposed harvest activity and within a riparian area. These populations are in the riparian habitat conservation areas associated with units GA07, GA08, and GA09. These three units are included in all action alternatives and would be adequately buffered

within Riparian Habitat Conservation Areas (RHCA). Therefore, there would be no effects to these two populations as a result of any proposed activities in any of the alternatives. *Peltigera neckeri* and *Nephroma occultum* both appear to be riparian dependent species in our area. No harvest activities would be occurring in any RHCA so there would be no affect to these species or their habitats with implementation of any of the alternatives. Where temporary road construction is proposed within RHCAs surveys would be required prior to any ground disturbance. .

Danger tree felling may occur within RHCAs but no removal of the felled trees would occur. As a result there would be no loss of habitat or populations associated with this activity.

Cumulative Effects

A complete list of past present and future activities is outlined at the beginning of this chapter. Only those activities such as livestock grazing and morel harvest activities would likely affect sensitive plant recovery in this analysis. These activities are discussed below. Other activities initially described in this chapter would not affect sensitive plant recovery. The geographic boundary for this analysis is the Tripod Fire Salvage project area and the adjacent range allotments. The temporal boundary for this analysis is ten years in the past to five years in the future.

In the fire area, cattle trespass into the closed Tiffany Range Allotment from the East Chewuch Range Allotment would likely result in damage to many sensitive plants and their habitats. Prior to the Tripod Fire this area experienced some regular trespass into the Roger Lake RNA, Tiffany Botanical Area, Tiffany Meadows, Parachute Meadows, Tiffany Campground, the Twenty-mile meadow and associated wetland complex from cattle drifting up from the East Chewuch Allotment. This was a particularly difficult problem to control prior to the fire because of topography, old roads, clearcuts, use of historic stock driveways, plus breaks in the natural barriers and fences provided additional access for the animals. Harvest activities would open up areas increasing ease of movement they may result in cattle developing new travel routes into these sensitive areas. All but five of the sensitive species in the fire area are found here and most are riparian, wetland, and meadow habitat species. The Tripod Fire burned all existing fences and natural barriers, rendering them ineffective. Cattle trespass is expected to expand and increase in numbers as a result of the fire and the associated use would have the greatest effect on sensitive plant resources of any past, present, or on going activities because of the expected increase in trampling and grazing at these sites. Cattle trespass would further increase the risk of cattle introducing invasive species into these botanically sensitive areas.

The East Chewuch Allotment is planned to be rested for one growing season to allow the area to recover at which time vegetative recovery would be re-evaluated using the Post-Fire Vegetation Recovery Assessment (Appendix H). The area where trespass is most likely to occur is in the Tiffany Mountain area where sensitive plants are associated with Montane Forest wet meadow, stream side habitat, and alpine habitats. These habitats are all higher elevation habitats that will likely be slower to recover. Proposed salvage activities would be designed to minimize the disruption of vegetation or downed wood that provides barriers to cattle movement into protected or sensitive areas associated with harvest units. In addition, administration of the allotment will focus on grazing the stock in

unburned portions of the allotment. By ensuring adequate recovery has occurred and natural barriers are protected during harvest, unwanted trespass into sensitive habitats would be reduced. However, the scale of the fire disturbance and loss of natural barriers will provide ample opportunity for cattle drift to occur.

Cattle grazing will create the greatest risk to the *Mimulus patulus* population as its micro-site is a moist, flat bench within the East Chewuch Allotment that is easily accessible to cattle. Trampling of the site and introduction of invasive species will be a long term concern.

Natural and man made barriers to restrict recreational off-road vehicles out of Parachute Meadows have been destroyed by the Tripod Fire. The sensitive plants found in this meadow system are at risk to physical disturbance if barriers to off road vehicle use are not adequately rebuilt.

Morel mushroom harvesting, both commercial and private, will occur throughout the fire area. Incidental trampling of recovering sensitive plant populations over the next couple of years is possible as harvesters travel from one area to another. Harvesting in riparian habitats has the highest potential for overlap with sensitive plant resources. Morels typically fruit in early spring before soil moisture is exhausted. There will likely be enough residual soil moisture for vascular plant recovery after mushroom harvest activities are completed in the event of incidental trampling. In addition, harvest methods do not involve raking or disturbance of the soil surface that would disrupt fungal hyphae, or residual vegetation. There is not expected to be any long-term effects to sensitive plants or their habitats as a result of morel harvest.

The result of the Tripod Fire combined with proposed salvage operations would change cattle distribution and increase access throughout the fire area. Within salvage units post-harvest conditions would further open the area to cattle use. Harvest of standing dead trees would reduce the potential for those harvested snags to add woody debris to further restrict access to sensitive areas. The first 10 years post-fire would be the most open and by year 20 there would be no measurable difference in the amount of downed wood between the logged and un-logged areas (McIver and Ottmar 2007). The most vulnerable habitats for the first 10 years would be those initially protected during harvest activities and include springs, seeps, wetlands, aspen, and riparian zones. During harvest operations, natural barriers to cattle movement into sensitive areas would be protected through unit design to minimize the potential for access. These habitats are highly sought out by cattle late in the season due to the increased nutritional value of the forage and for water. They are also the first to vegetatively recover due to their increased soil moisture and likely will provide the best graze during the post-fire recovery years. These are also the habitats with the highest potential for sensitive plant occurrence. Proposed activities would be designed to minimize the disruption of vegetation or downed wood that provides barriers to cattle movement into protected or sensitive areas associated with harvest units. In addition, administration of the allotment will focus on grazing the stock in unburned portions of the allotment. However, the anticipated increased cattle use in these areas would result in trampling and grazing, which would slow the recovery of sensitive species and their habitats. There would be an increased risk of invasive species transport and establishment within these sensitive habitats if cattle use prevents plant community recovery to pre-burn levels during the 5 year post-fire recovery period.

Increased cattle grazing within regenerating aspen stands could jeopardize stand recovery and compact soils where sensitive plants may have occurred prior to the fire, preventing full recovery of the community or any sensitive plant populations. Stand recovery may not be successful if grazed suckers are kept below 1.5 meters during the first 4 years post-burn (Bartos et al. 1994 and Jones et al. 2005). Allotments will be rested for one growing season and re-evaluated at the end of the 2007 growing season to determine if additional years of rest are needed.

CONSISTENCY FINDINGS

Based on the status of past surveys, current site conditions, and site management for Special Species Status Program or Sensitive botanical species, this project complies with the provisions outlined in Forest Service Manual direction 2670 which requires activities not result in loss of species viability or would not result in a species becoming Threatened, Endangered, or create trends toward Federal listing.

Following mitigation measures would result in no adverse affect, will not contribute to a loss of viability, and would not contribute to a trend towards Threatened or Endanger or Federal listing of any TES species within the project area. This is consistent with Forest Plan Forestwide Standard and Guideline 6-19.

Proposed Danger Tree felling within the Research Natural Area complies with direction as outlined in the Okanogan Forest Plan because no felled snags would be removed from the area. The RNA's would allow continued opportunity for research, education, and maintenance of biological diversity as required for management of RNA's in Forest Service Manual 4063.

3.15 SCENIC RESOURCES

INTRODUCTION

Local residents, recreation users, and tourists all value the scenery within the Tripod Fire Salvage Project area. There are a variety of year round seasonal recreation activities that occur including dispersed camping, hiking, hunting, sightseeing, mountain biking, horseback riding, snowmobile riding, and other dispersed use. The landscape variety ranges from common landscape character typical of the Northeast Cascades and Okanogan Highlands to the spectacular scenery viewed in the high mountainous areas, the roadless areas and unique habitats located throughout the landscape. The Tripod Salvage Project area is seen as a moderately rolling to steeply dissected landform located in numerous stream lined valleys. Previous to the Tripod fire, the vegetative patterns ranged from a mostly open, coarsely textured pattern to a multi storied highly textured mosaic pattern. The area now appears as a burned landscape with the vegetation fire burn intensities ranging in a mosaic of very low to low to moderate and high severity in the foreground and middleground view from the main recreational travel routes with areas of unburned mosaic patterns intermixed in the landscape.

"Wildfire creates and alters landscape character through modification of vegetation patterns. There is convincing evidence that the immediate scenic effect of natural disasters is a reduction in the value of scenery for affected and adjacent lands. People seldom, if ever, credit a catastrophic wildfire with enhancing scenic quality. Most fire blackened trees are considered obtrusive to scenic views. However, the scenic impact of natural disturbances gradually diminishes as natural processes heal the landscape over time. Effects of natural disasters are compatible with naturally evolving and natural appearing landscape character goals, except when human intervention creates unnatural scenic deviations." (USDA Forest Service 1995:1-33).

REGULATORY FRAMEWORK

The Okanogan National Land and Resource Management Plan 1989 (Forest Plan) (USDA Forest Service 1989a) has designated the standards and guidelines and Visual Quality Objectives (VQOs) by Management Area prescription. The Chewuch is rated a Sensitivity Level 1 Viewshed. In addition, the Chewuch River is currently recommended as being part of the Wild and Scenic River designation and is in the "Nationwide Inventory of Wild and Scenic Rivers" (USDI HRCS 1982). In the project area, the Chewuch is nominated as the scenic segment from Thirtymile Campground southerly to the National Forest boundary. The Forest Plan requires that the scenic attributes within a one-fourth mile wide corridor on each side be protected. The Middle Salmon-Boulder is rated a Sensitivity Level 2 Viewshed. The Sensitivity Level 1 and 2 Viewsheds have a range of High to Moderate Visual Significance in the foreground and middleground. Most of the area in the middleground or background is prescribed as Modification and Maximum Modification VQOs with a wildlife habitat emphasis. Generally, these areas are not highly visible from the designated travel routes and viewsheds.

The Forest Plan discusses scenery in terms of Visual Quality Objective (VQO), Variety Class, Sensitivity Level, and Distance Zone. These are from the *Visual Management System* (USDA Forest Service 1974) and the National Forest Landscape Management handbooks. The following figure displays the management areas within the project area, and their corresponding VQO, Variety Class, Sensitivity Level, and Distance Zone.

Figure 3.15-1: Management Area Scenic Designations

Management Area (MA)	Visual Quality Objective (VQO)	Variety Class	Sensitivity Level	Distance Zone and Viewshed
MA 04	Retention	A B	Level 1 Level 1	All Foreground
MA 05	Retention	A B	Level 1 Level 1	All Foreground
MA 05	Partial Retention	A B C C	Level 2 & 3 Level 1 Level 2 Level 1	All Middleground & Background Foreground Foreground and Middleground
MA 08	Retention	A B	Level 1 Level 1	All Foreground
MA 12	Modification Maximum Modification		Level 1	Roads and Trails All other areas
MA 14	Modification Maximum - Modification		Level 1	Roads and Trails All other areas
MA 25	Modification Maximum Modification		Level 1	Roads and Trails All other areas
MA 26	Modification Maximum Modification		Level 1	Roads and Trails All other areas

The current land management plan was developed under the old Visual Management System (VMS) in 1974. The concept of that system was basically a visual resource snapshot-in-static-time framework and was used mostly as a mitigation tool for forest management. A 1995 update called the Scenery Management System (SMS) was developed as a dynamic framework for scenery management. The framework describes scenery as a dynamic evolving concept and integrated into ecosystem management. Ecosystems provide the environmental context for this scenery management system. In 1995, the Forest Service adopted a new method of scenery management, called Landscape Aesthetics. The method is described in detail in *Landscape Aesthetics, A Handbook for Scenery Management* (USDA Forest Service 1995b). This method includes new terminology for scenery management, but corresponds to, and incorporates the terms and direction found in the Forest Plan. In *Landscape Aesthetics*, Scenic Integrity corresponds to VQOs. Scenic Integrity is a measure of the degree to which a landscape

is visually perceived to be “complete”. The following paragraphs explain the integration of the two terms.

In areas designated as Retention VQO, all foreground landscapes shall have the visitor perception of natural appearing and will have HIGH scenic integrity. “HIGH scenic integrity refers to landscapes where the valued Landscape Character “appears” intact. Deviations may be present but must repeat the form, line, color, texture, and pattern common to the Landscape Character so completely and at such scale that they are not evident.” (USDA Forest Service 1995b:2-4).

In Partial Retention VQO areas the visitor will perceive a natural appearing to slightly altered landscape viewed in foreground and middleground areas (USDA Forest Service 1989a:4-65 to 4-66) and will have MODERATE scenic integrity. “MODERATE scenic integrity refers to landscapes where the valued Landscape Character “appears slightly altered”. Noticeable deviations must remain visually subordinate to the Landscape Character being viewed.” (USDA Forest Service 1995b:2-4).

In areas allocated to Modification VQO, human activities would be visually evident, but should blend into the landscape by utilizing naturally established form, line, color and texture of the natural landscape. Modification areas would have LOW scenic integrity. “LOW scenic integrity refers to landscapes where the valued Landscape Character “appears moderately altered”. Deviations begin to dominate the valued Landscape Character being viewed but they borrow valued attributes such as size, shape, edge effect and pattern of natural openings, vegetative type changes or architectural styles outside the landscape being viewed. They should not only appear as valued character outside the landscape being viewed but compatible or complimentary to the character within.” (USDA Forest Service 1995b:2-4).

“Salvage logging should move the damaged forest towards the adopted landscape character goal and should meet the scenic condition objectives for the area.” (USDA Forest Service 1995b:1-33). Additional information and descriptions regarding Visual Quality Objectives (VQOs) may be found in the *Landscape Aesthetics, A Handbook for Scenery Management* (USDA Forest Service 1995b) and *The Visual Management System*, a National Forest Landscape Management Handbook (USDA Forest Service 1974).

ANALYSIS METHOD

The Tripod Salvage project area is seen as foreground (views up to ½-mile distance) and middleground (views up to 4 miles distance) from several viewsheds. The project is divided four main landscape areas for scenic analysis based on landscape visibility and sensitivity levels for the scenic travel routes. The four viewsheds are the Chewuch Viewshed, the Middle Salmon-Boulder Viewshed, Methow Valley Viewshed, and the Conconully Viewshed.

Methods of Measuring Effects

Acres of skyline and ground-based salvage harvest units within the foreground visible from given viewsheds and viewpoints

Acres of skyline and ground-based salvage harvest units within middleground visible from given viewsheds and viewpoints

AFFECTED ENVIRONMENT

Existing Scenic Integrity

Scenic integrity is the amount of human caused deviation in form, line, color, and texture of a landscape. Scenic integrity serves as a frame of reference for measuring scenic integrity levels based on the valued attributes of the existing landscape character being viewed. The degrees of integrity range from VERY HIGH to VERY LOW. The following table displays the 5 scenic integrity levels and conditions associated with each level.

Figure 3.15-2: Scenic Integrity Level Conditions

Scenic Integrity Level	Condition
VERY HIGH (Preservation VQO)	Unaltered
HIGH (Retention VQO)	Appears Unaltered
MODERATE (Partial Retention VQO)	Slightly Altered
LOW (Modification VQO)	Moderately Altered
VERY LOW (Maximum Modification)	Heavily Altered

The Tripod Salvage Project area has a range of scenic integrity levels (conditions) from LOW to MODERATE to HIGH, naturally appearing to slightly altered to moderately altered based on vegetative characteristics. The scenic integrity levels meet the Forest Plan Standards and Guidelines for a natural appearing foreground to near natural middleground viewed from the designated travel routes. Some areas also meet a higher scenic integrity level of Partial Retention to Retention in areas allocated to the Modification and Maximum Modification VQO areas.

Important Interactions

When a wildfire is within the naturally occurring fire regime, the resulting patterns are aesthetically pleasing and are reflective of the Northeast Cascade and Okanogan Highlands characteristic landscape. The Tripod Fire area is within the dry-forest vegetative type with Fire Regime I (low frequency, low severity fire), mixed-conifer vegetation types with Fire Regime III (mixed severity, mixed mortality fire) and montane vegetation types Fire Regime IV (high severity, high mortality fire). In Fire Regime I, forested landscape patterns would reflect low intensity ground fires, some blackened bark and small groups of dead trees in little patches. In the shrub/steppe environment, the landscape patterns would reflect more of a stand replacing event where the shrubs are burned hot and rejuvenated through the fire activity. In Fire Regime III, landscape patterns are varied between the low and high fire severity landscape patterns and are more complex patchwork of open to closed forest types. In Fire Regime IV, landscape patterns would reflect stand-replacing fire patterns where fire burns hot and at a larger scale and the landscape has large patches of even-aged stands. See the Fuels discussion for further detail regarding fire regimes and condition classes. When the fire event becomes out of scale for the characteristic fire regime, the visual effects dominate the characteristic landscape patterns. The Tripod Fire burned over 175,000 acres, which

is partially seen from several travel routes, the communities of Methow Valley area and Conconully Valley area, and dispersed and developed recreation trails and camps. Of the acres burned, it is expected that more than half will experience high tree mortality. A Tripod Fire Salvage Project Mortality Map is available in Appendix A.

The degree of scenic altered condition depends on the amount of changes seen from Chewuch Viewshed, the Middle Salmon-Boulder Viewshed, Methow Valley Viewshed, and the Conconully Valley Viewshed and the rural interface along these areas. Altered condition in the landscape would be the greatest when most of the snags or trees are removed in a given unit or area. Consequently, the least change would occur when the existing snags or trees are not removed. Landscape character changes will occur similarly to the scenic condition. The character of the landscape would be least affected when most of the existing trees and snags are left intact. In addition, the existing scenic integrity (condition) of the landscape determines how much change a viewshed take before becoming altered.

Figure 3.15-3: Visual description of the general appearance of High, Moderate, and Low Landscape Character and Scenic Condition

Landscape Character and Scenic Condition	Visual Description
HIGH Landscape Character and Scenic Condition (Desired for all foreground and middleground areas) Retention and Partial Retention Scenic Quality Objectives (VQOs)	Mosaic landscape patterns, less uniformity. High diversity of structures and variety of spaces. Light treatment to the landscape. Minimal skyline corridors, visible roads, and little mechanical disturbances. Alterations emulate natural appearing patterns. Open spaces with variety of patterns. Areas of dense, mosaic, and clumpy arrangement of textural patterns. Interesting landscapes.
MODERATE Landscape Character and Scenic Condition (Preferred in other landscapes) Modification Scenic Quality Objective (VQO)	Combination of Mosaic and Uniform landscape pattern. Some diversity of structure. Some variety of spaces. Moderate treatment to the landscape. A variety of natural to slightly altered to altered conditions. A variation of natural pattern and interest in the landscape. Some textural patterns are retained.
LOW Landscape Character and Scenic Condition (Not desirable in any landscape) Maximum Modification Scenic Quality Objective (VQO)	Uniform landscape patterns. Low diversity of structures, little variety of spaces, sameness. Heavy treatment to the landscape. Roads, skyline corridors, and mechanical disturbances dominate scenic conditions. Alterations do not appear natural, heavily altered conditions. Natural patterns are destroyed. Uninteresting, barren and sparse landscapes.

<u>Current Landscape Character of Viewsheds</u>

In the project area, the Tripod Fire has dramatically changed the landscape scenic character. The current landscape character of the viewsheds has changed from a green, forested setting, to an area dominated by the visual evidence of wild fire. The fire intensity patterns range from low intensity to moderate intensity to high intensity viewed in both foreground and middleground of the Chewuch Viewshed, the Middle Salmon-Boulder Viewshed, Methow Valley Viewshed, and the Conconully Viewshed. The inherent diversity of landforms, rock outcrops and variety of vegetation patterns provides opportunity to blend management activities of the fire salvage activities. The resulting burn patterns

create a mosaic of intensities with the high, moderate and low or unburned patches intermixed over the landform. The higher burned areas create more form and line patterns while the low to moderate and unburned create textured and color landscape patterns.

Figure 3.15-4: View of mosaic burn pattern from Starvation Forest Road 4235

The project is divided into four main landscape areas for scenic analysis based on landscape visibility and sensitivity levels for the scenic travel routes. The four landscape areas are the Chewuch, the Middle Salmon-Boulder, Methow Valley, and the Conconully Viewsheds. The Visual Significance and Scenic Viewshed map illustrates the main viewsheds and travel routes with visual significance (Appendix A). The specific Affected Environment and Environmental Consequences for each viewshed will be discussed later in this chapter section.

GENERAL ENVIRONMENTAL CONSEQUENCES

Direct and Indirect Effects

Alternative A - No Action

Alternative A would maintain the existing range of Low to Moderate to High to Landscape Character and Scenic Integrity (condition). The No Action Alternative would retain all established patterns resulting from the wildfire. Refer to Figure 3.15-3 for the visual description of general appearance of High, Moderate and Low Landscape Character and Scenic Condition in the important interactions section. A combination of mosaic and uniform patterns of brown and black snags or trees, surrounded by green textures along the fire perimeter would dominate the landscape. The dominant scenic elements of line and color would be evident in the first 10 years. Many of the existing snags would eventually fall to the ground in 10 to 20 years. In areas of existing dense snags, the snags would fall to create a jackstraw effect. The scenic condition of the landscape would remain as a mosaic pattern of natural appearing to slightly altered and altered.

Figure 3.15-5: View of Ramsey Creek from Forest Road 5009-400, Section 5

The emergence of new green forest would begin with forbs and grasses, then eventually, shrubs and trees. Green trees would start to grow in varying patterns and heights between 5 to 10 feet high in the first 10 years. Middleground views of textured appearance would change in color appearance throughout time. Gray snags in a mosaic pattern, and diversity of snag densities, would dominate the landscape patterns, with a carpet of mosaic green forest, which would grow to 20 feet in height in approximately 20 years. Beyond 20 years, the forest would have a limited variety of large diameter silver snags throughout the landscape. A variety of green, uniform to mosaic patterns of a new forest would be dominant. The characteristics of a new forest would appear natural for scenic quality and the visual effects of a large scale wildfire would become more subdued in 5 to 10 years.

There would not be the opportunity to reduce fuels in the high tree mortality areas proposed for salvage harvest and reforest the burned area by hand planting trees where tree mortality is moderate to high.

All Action Alternatives

Snag Loss Over Time on a Landscape Scale

It is predicted that some of snags left would fall to the ground in 5 to 10 years depending on size. The textural patterns and clumps would be reduced within the first 10 years. In the short term, the mosaic textural patterns provided by the leave snags will be dominant for 5 to 10 years, as they begin to fall, a more open appearance as viewed from middleground and foreground views would become more apparent. The contrast would

be softened by green textural patterns that are established through growth of vegetation. The strong dominating color of black charred bark would soften. The larger snags that are 16-inch+ in diameter would remain standing for a longer time frame, probably 20 years or more. The structural pattern seen from middleground and foreground would be sculpture-like as they weather and turn silver white.

Salvage Harvest

Treating different areas with various degrees of leave tree or snag combinations, with the natural existing character provides diversity and variety in the landscape. Scenically, the treatment in the landscape would emulate and blend with nature. In general, the larger snags would provide a strong vertical structure, creating stronger contrast and emphasizing the character of the area. A variety of openings interwoven throughout the landscape with the mosaic arrangement of leave snags would increase spatial diversity. A combination of mosaic and uniform patterns would result. Leaving the smaller diameter ponderosa pine and Douglas-fir trees would retain texture on the landscape scale. The mosaic pattern currently existing in the landscape would allow some textural changes to blend in. Where the most open landscape areas would occur, the openness would be broken up with untreated areas of high density snags. The treatment of clumps of varying sizes mixed in with areas of no treatment would retain Moderate to High scenic quality.

Danger Tree Removal

There would be danger tree removal along the immediate foreground (up to 200 feet) of all forest roads open to the public within the project area. Generally, most of the danger trees that would be removed are classified as having an imminent potential to fail and are smaller diameter in size (<12” DBH). There would be clumps of trees left along the foreground where they exist that would help create a mosaic-textured pattern and break up the openness of tree removal. The clumps would also screen tree stumps that would be viewed in the immediate foreground. In riparian areas, danger trees would be cut and left in place, this would add to a jack-strawed effect in the short-term until riparian vegetation grows in to screen the visual effect of down trees and soften the linear lines of the tree boles. In areas outside of the riparian areas, the down trees would be available for firewood and forest products as economically feasible. This would result in a short term visual effect that would appear as unnatural until the down trees are removed or understory grows in to screen and soften the visual effect.

CHEWUCH VIEWSHED FROM FOREST ROAD 51

AFFECTED ENVIRONMENT

The Chewuch Viewshed travel route begins on National Forest System Lands near the Bounder Creek drainage, approximately six ½ miles from the community of Winthrop. The project area is predominately out of the foreground (½-mile distance) from the main travel route. There are two main areas where the project area is seen from the Chewuch Forest Road 51. The first area is a middleground viewing east of the road in the Ramsey drainage area, similar to the distance shown in the picture. The National Forest Lands are adjacent to State Department of Fish and Wildlife lands and private land in the foreground and middleground and are not highly visible from the Chewuch travel route. The landform is a rolling dissected and coarsely to densely textured landscape with several stream lined valleys breaking up the landscape. The burn patterns are predominately low to moderate intensity in the project area where treatment is prescribed along the seen areas of the viewshed.

Figure 3.15-6: View from West Chewuch during Tripod Fire

The second seen area is near the Brevicomis Summer Homes tract area (½-mile south). The fire burned through the forest and along the foreground and middleground of the viewshed in this area near the summer homes and Twentymile drainage. In areas where the landscape was treated with underburning prior to the fire, the forest was able to burn with minimal effects to the overstory. The burn patterns are predominately seen as very low to low and moderate intensities where treatment is proposed along the travel route. The foreground is highly textured with forested stands of ponderosa pine and mixed conifer stands and limited distant viewing opportunities.

Figure 3.15-7: Typical Foreground View from Brevicomis Area

ENVIRONMENTAL CONSEQUENCES

Direct and Indirect Effects

Alternative B – Proposed Action

Alternative B would maintain the existing High Landscape Character and Condition and meets the established Scenic Quality Objective of Retention foreground VQO. Refer to Figure 3.15-3 for the visual description of general appearance of High, Moderate and Low Landscape Character and Scenic Condition in the Important Interactions section. The project proposes several units in the middleground near Ramsey drainage along the State Department of Fish and Wildlife boundary. The units are spatially spread over 2 ½ miles distance and together combine to approximately 384 acres. The treatment would not be highly visible from the Chewuch travel route; it is in the distant middleground. Landscape changes would primarily be seen as a texture and form change from a burned landscape to a more open landscape pattern. With logging systems ground-based over snow; no lines would be introduced from skyline logging activities. However, the operator has the option to log during non-snow season, if that is done there would be more disturbance to the soils and ground and more short-term visual impact. There would be more stumps and down slash visible in these areas and the burned forest would appear more open and mosaic in nature than in unharvested areas . Activities would meet the Forest Plan established VQO of Retention and maintain High Scenic Integrity.

The Tripod Salvage project proposes a small unit (JU18) for treatment in the immediate foreground near Brevicomis Recreational Residences. The scale of the unit is approximately 8 acres and is proposed for tractor logging. The unit would be located away from the immediate roadside and blended into the existing forested landscape pattern. The activity would meet the Forest Plan established VQO of Retention and would maintain High Scenic Integrity.

Alternative C

The effects would be the same as Alternative B because the same salvage harvest units can be seen in the Chewuch viewshed as in Alternative B.

Alternative D

The effects would be the same as Alternative B and C because the same salvage harvest units can be seen in the Chewuch viewshed.

Alternative E

The area affected would be the same as Alternative B and C because the same salvage harvest units can be seen in the Chewuch viewshed. The visual effects would be different in Unit JU18 (an 8 acre unit discussed above in a foreground view). There would be more larger diameter trees greater than or equal to 21” left in the unit that would be more visible from the travel route. This would provide more form, line, color and texture in the landscape than the other alternatives.

MIDDLE SALMON-BOULDER CREEK VIEWSHED AND FOREST ROAD 37

AFFECTED ENVIRONMENT

The Middle Salmon-Boulder Creek Forest Road 37 is a main travel route through the mountainous landform that connects the Chewuch drainage to the Conconully area. The road is used year round and provides opportunities for driving for pleasure, hunting, dispersed uses, accessing developed recreation sites in the summer season and is a popular groomed snowmobile route in the winter. Forest Road 37 provides access to other primary or secondary travel routes along the way that access developed trails or campgrounds. A primary travel route access off Forest Road 37 is Forest Road 39 that provides access to Tiffany Springs Campground and meadows area. The foreground of both travel routes are allocated as scenic viewsheds with High to Moderate Visual Significance and is prescribed a Retention to Partial Retention foreground. (note: only the portion of the travel route from the Chewuch drainage to the area just past the intersection with Forest Road 39 is prescribed to Retention). There is no treatment proposed in the Forest Road 39 viewshed. Forest Road 37 travels through the entire spectrum of fire burn intensities from unburned/very low, to low, moderate and high burn patterns.

Figure 3.15-8: Post Fire Boulder Creek Area

ENVIRONMENTAL CONSEQUENCES

Direct and Indirect Effects

Alternative B – Proposed Action

Alternative B would maintain a range of Moderate to High Landscape Character and Condition and meets the established Scenic Quality Objective of Retention to Partial Retention. Refer to Figure 3.15-3 for the visual description of general appearance of High, Moderate and Low Landscape Character and Scenic Condition in the important interactions section. The seven treatment units are located primarily along the north side of Forest Road 37 along Boulder Creek and are interspersed over a spatial distance of approximately seven miles. They are clumped into three general areas, the most westerly is Unit BO02 which is 21 acres in size, the second area is just east of the junction with Bromas Creek Forest Road 3700-800 and is comprised of units BO07, BO08, and BO09 for a total of 101 acres; and the third is west of the intersection with Forest Road 39 and is comprised of units HA03, HA04 and HA05 for a total of 74 acres. Although the proposed units are located in the foreground of the road, there is opportunity to blend the salvage logging activity into the existing landscape due to some topography elevation differences

between the road and the units, and the flatter ground allowing tractor logging over snow to blend in with less disturbance to the ground. However, the operator has the option to log during non-snow season, if that is done there would be more disturbance to the soils and ground and more short-term visual impact. There would be more stumps and down slash visible in these areas and the burned forest would appear more open and mosaic in nature than in unharvested areas.

Alternative C
Alternative C would maintain more areas of High Landscape Character and Condition and meets or exceeds the established Scenic Quality Objectives for the project area. The visual effects are essentially the same as Alternative B with the exception that the third treatment area near intersection of Forest Road 39 comprised of units HA03, HA04 and HA05 for a total of 74 acres is dropped from treatment.

Alternative D
The effects would be the same as Alternative B because the same salvage harvest units can be seen in the Salmon-Boulder Creek viewshed as in Alternative B.

Alternative E
The area affected would be the same as Alternative B because the same salvage harvest units can be seen in the Salmon-Boulder Creek viewshed. In general, there would be more larger diameter trees greater than or equal to 21" left in harvest units that would be visible from the travel route. They would stand out more in the foreground areas of the travel route. This would provide more form, line, color and texture in the landscape than the other alternatives.

METHOW VALLEY VIEWSHED AND FOREST ROAD 4235

AFFECTED ENVIRONMENT

The view of the Tripod Fire is primarily not visible from the Methow Valley viewshed, it is a middleground to background view with a distance of over four miles. The landscape is seen as a distant backdrop with landform being the dominant feature, color and texture are noticeable, but not with any detail. The photo shows the relationship between the fire column and the Methow Valley Ranger Station, which is at a higher viewing elevation than the community of Winthrop. The main travel route with a moderate level of scenic sensitivity is Forest Road 4235 that provides access to Starvation Mountain, it is a Maintenance Level 2 road with a VQO of Partial Retention foreground and is a groomed snowmobile route in the winter. Forest Road 4225 is a main connector road from Winthrop, Beaver Creek Campground and Lightning Creek Trailhead that provides access to Forest Road 4235 and to Forest Road 42. This travel route is important for year round recreational activities.

Figure 3.15-9: View from Methow Valley Ranger Station

ENVIRONMENTAL CONSEQUENCES

Direct and Indirect Effects

Alternative B – Proposed Action

Alternative B would maintain High Landscape Character and Condition viewed as background from Methow Valley, there are no areas that are visible in foreground or middleground. Refer to Figure 3.15-3 for the visual description of general appearance of High, Moderate and Low Landscape Character and Scenic Condition in the important interactions section. Areas where treatment would be seen are along the foreground and middleground of Forest Road 4235 in the upper elevations near Lightning Creek. The proposed treatment area is approximately 1 mile up from Lightning Creek with Units LI08 and LI09 that combined total 19 acres. The proposed logging system is skyline. The skyline corridors would possibly introduce short corridor lines viewed from Forest Road 4235, but the scale is small in relation to the landscape and viewshed, and therefore, these treatments would meet the Partial Retention VQO allocated for the foreground of Forest Road 4235.

Alternative C

Effects of Alternative C would be the same as the No Action Alternative, no treatment is being proposed in this area of Lightning Creek.

Alternative D

The effects of Alternative D would be the same as Alternative B with the following addition. There would be more treatment proposed along the upper elevations of Lightning Creek Ridge with Units LI02, LI03, LI04 and LI07 for a total of 77 acres. These treatments would utilize helicopter logging systems and would not introduce any lines in the landscape as viewed from the Forest Road 4235. The proposed treatment would meet the Partial Retention VQO allocated for the foreground of Forest Road 4235.

Alternative E

The area affected would be the same as Alternative B because the same salvage harvest units are viewed as background from the Methow Valley viewshed and the same units are viewed as foreground and from Road 4235.. In general, there would be more larger diameter trees greater than or equal to 21” left in the units that would be visible from the foreground of Forest Road 4235.. They would stand out more in the foreground areas of the travel route. This would provide more form, line, color and texture in the landscape than the other alternatives.

CONCONULLY VALLEY VIEWSHED

AFFECTED ENVIRONMENT

The view of the Tripod and Spur Fires are primarily not highly visible from the Conconully Valley viewshed, it is a middleground to background view with a distance of over four miles. The landscape is seen as a distant backdrop with landform being the dominant feature; color and texture are noticeable, but not with any detail. The photo shows the relationship between the fire columns and the Conconully Valley area. The Forest Roads that are accessed from the Conconully area that have prescribed scenic concern levels are Forest Road 37, Forest Road 42 and Forest Road 4235 to Starvation Mountain, both have Moderate Visual Significance. (Partial Retention VQO foreground).

Figure 3.15-10: View of Spur and Tripod Fires from Conconully Area

ENVIRONMENTAL CONSEQUENCES

Direct and Indirect Effects

Alternative B – Proposed Action

Alternative B would maintain a range of Moderate to High Landscape Character and Condition and meets the established Scenic Quality Objective of Partial Retention in the scenic viewsheds. Refer to Figure 3.15-3 for the visual description of general appearance of High, Moderate and Low Landscape Character and Scenic Condition in the important interactions section. Most of the units are located in areas of Low Visual Significance and are blended into the rolling and dissected landform over several stream-lined valleys. The distribution of the units over the rolling hills spatially break of the scale of the total number of acres proposed for treatment. They are predominately located outside of the designated viewsheds and are not visible due to landform breaks from the community of Conconully and Conconully Lake .

Figure 3.15-11: View of Spur and Tripod Fires from Conconully Lake

Alternative C
The effects would be the same as Alternative B.

Alternative D
The effects would be the same as Alternative B and C.

Alternative E
The effects would be the same as Alternative B.

Comparison of Alternatives in All Viewsheds

Figure 3.15-12: Skyline and ground-based salvage harvest units within the foreground

Viewshed	Alternative B (acres)	Alternative C (acres)	Alternative D (acres)	Alternative E (acres)
Chewuch	8	8	8	8
Middle Salmon-Boulder	196	122	196	196
Methow Valley	0	0	0	0
Road 4235	19	0	19	19
Conconully	0	0	0	0

Figure 3.14-13: Skyline and ground-based salvage harvest units within the middleground

Viewshed	Alternative B (acres)	Alternative C (acres)	Alternative D (acres)	Alternative E (acres)
Chewuch	384	384	384	384
Middle Salmon-Boulder	0	0	0	0
Methow Valley	0	0	0	0
Road 4235	0	0	0	0
Conconully	0	0	0	0

Cumulative Effects in all Viewsheds

This cumulative effects analysis considers effects of past, present, and reasonably foreseeable future actions within the Chewuch and Middle Salmon-Boulder Creek Viewsheds and within the middleground viewed from the Conconully and Methow Valley Viewsheds. The past, present, and future actions within or near the project area are listed at the beginning of this chapter. The geographic boundary for this cumulative effects analysis is the Tripod Salvage Project Area and the temporal boundary is approximately 10 years (the amount of time needed for evidence of logging and prescribed burning to soften and blend into the landscape more completely). The actions that have a cumulative effect on scenic resource are timber sales, wildfires and fire suppression, fuels treatments, restoration projects, livestock grazing, and recreational use.

Past Actions
Vegetation management has occurred in the past in the Chewuch, Middle Salmon-Boulder viewsheds and the middleground view from Methow and Conconully Valley

viewsheds in the form of timber sales, fuels reduction treatments, watershed restoration projects, livestock grazing, recreational use (both developed and dispersed) and activities associated with Tripod Fire Suppression, rehabilitation, and BAER implementation activities. In addition, there have been several larger scale wildfires that occurred in the viewsheds in the past 10 years that resulted in the visual appearance of a recently burned landscape pattern with a mosaic of burn intensities. The wildfires have contributed to more of a landscape change as seen from the viewsheds. The more visually evident activities occurred in the Middle-Salmon Boulder foreground with danger tree removal in the past year. This has resulted in a more open appearance along the foreground with more stumps visible in places.

The activities of past management activities in total combine to maintain the moderate to high scenic integrity levels for the foreground and middleground of the designated viewsheds.

Present Actions
Actions that have a cumulative effect on scenic resource include the Tripod Decks small timber sale, firewood cutting, fuels treatments (Conger T.S. landing pile burning), livestock grazing and recreational use. Rehabilitation activities will be ongoing for the Tripod Complex Fire including removal of more danger trees along all forest roads open to the public. The danger tree removal would primarily be in the immediate foreground of the travel routes and would result in a more open appearance with stumps more visible in places.

Reasonably Foreseeable Future Actions
The Mutton Timber Sale and prescribed fire project would be implemented in the North Fork Salmon Creek area. The project was designed to meet the Forest Plan visual quality objectives of Partial Retention in the foreground. This would maintain the moderate scenic integrity level.

Periodic danger tree felling will continue as part of routine maintenance along forest roads. The danger tree removal would primarily be in the immediate foreground of the travel routes and would result in a more open appearance with stumps more visible in places. In addition, livestock grazing and recreational use would continue to occur.

Summary of Cumulative Effects
In summary, the total of all past, present, and future management actions combined with the proposed action would maintain the moderate to high scenic integrity levels for the foreground and middleground of the designated viewsheds and maintain a natural appearing to slightly altered landscape character.

CONSISTENCY FINDING

All action alternatives would maintain a range of Moderate to High Landscape Character and Scenic Integrity (Condition) and would meet the established Visual Quality Objectives of Partial Retention to Retention in Management Area 5 with Moderate and High Visual Significance (USDA Forest Service 1989a:4-65 to 4-69). In areas designated to High Visual Significance (Retention VQO), all foreground landscapes would have the visitor perception of a natural appearing environment and would have high scenic integrity. In areas designated to Partial Retention VQO the visitor would perceive a natural appearing

to slightly altered landscape viewed in foreground and middleground area and would have moderate scenic integrity. The proposed treatments would be consistent with Forest Plan Standards and Guidelines for Visual Quality.

3.16 Heritage Resources

The section below is a summary of the Heritage Report which is available in the project Analysis File (Trebon 2007c).

REGULATORY FRAMEWORK

Heritage resources on the Okanogan-Wenatchee National Forests are districts, sites, buildings, structures, and objects that contain evidence of past human activities. Traditional Cultural Properties (TCP), defined as resources of traditional cultural significance, are also included. Heritage resources are managed in accordance with the National Historic Preservation Act (NHPA) and its implementing regulation (36 CFR 800), the Archaeological Resources Protection Act (ARPA), the American Indian Religious Freedom Act (AIRFA), Native American Graves Protection and Repatriation Act (NAGPRA), and Executive Orders 11593, 13007, and 13175.

Forest Plan Direction

The following forest-wide heritage resources standards and guidelines apply to the project area (USDA Forest Service 1989b).

Forest-wide Standards and Guidelines

7-2 Inventory all areas where ground-disturbing activities are planned in order to discover all reasonably locatable cultural resources, and in accordance with an Inventory Plan as specified in the Programmatic Memorandum of Agreement (PMOA) between Region 6 and the Washington State Historic Preservation Office.

7-3 Develop a schedule to evaluate cultural resources based on the criteria for eligibility to the National Register of Historic Places. First priority shall be for those cultural resources that may be affected by project activities.

7-4 Nominate cultural resources that meet the appropriate criteria to the National Register of Historic Places. Nominations shall be scheduled incidentally until completion of the forest-wide inventory of cultural resources.

7-5 Protect eligible cultural resources from management activities by making reasonable efforts to avoid adverse impacts to the resource or develop a procedure to conserve the values through proper scientific methods of study.

7-14 Coordinate with Native American Tribes regarding cultural resources of suspected preh8istoric origin and to identify key native plant gathering areas and species.

7-15 Information about planned project activities shall be presented to Native American Tribes for coordination about effects to traditional religious sites.

7-16 Consultation with the Washington State Historic Preservation Officer shall follow the procedures in the PMOA between Region 6 and Washington State Office of Archaeology and Historic Preservation.

The Forest Service is responsible for the management of heritage resources that are listed or are eligible for listing on the National Register of Historic Places (NRHP). Listed or eligible heritage resources are known as historic properties and they are given consideration in planning for federally licensed, permitted, approved, or funded projects. Heritage resources that are documented but not yet evaluated for nomination or listing on the NRHP, are managed as eligible also. Sites that have been determined ineligible require no further management consideration.

Tribal Consultation

Executive Order 13175 and the NHPA require consultation with tribal governments when federal projects have the potential to affect resources of interest to the tribes, tribal rights guaranteed by treaty or executive order, and the agency's trust responsibility to federally recognized tribal governments. For this project, formal government-to-government letters and maps were mailed to the Yakama Nation and to the Confederated Tribes of the Colville Reservation in December of 2006. The letters described the project, defined the area of potential effect, and outlined how affects to heritage resources would be considered. The Confederated Tribes of the Colville Reservation identified a potential gathering area of interest. This location will be surveyed before project decision.

ANALYSIS METHOD

Scale of Analysis

The Area of Potential Effects and this analysis covers about 3,400 acres within proposed units and associated road systems within the Tripod Fire Salvage Project area over the next eight years (the length of time likely needed to complete the proposed project). This is the area considered in designing a heritage resource inventory to identify heritage resources that may be affected by this project. The indicators for impacts to heritage resources to be carried through the analysis for comparison purposes are:

Number of acres in each alternative with potential to affect heritage resources.

Survey Design

Heritage resource site and report files at Forest Headquarters and at the Methow Valley and Tonasket Ranger District offices were reviewed to determine where field inventory had already occurred and where heritage resources associated with those inventories had been documented relative to this project. The Forest Heritage GIS site layer was also consulted to insure consideration of heritage resources documented but not linked to a specific project. The search revealed that since 1999, at least six project-related heritage resource inventories occurred within or near the current project area for integrated resource, range management, prescribed fire projects, and, most recently, for the 2006 Tripod Fire.

For the most part, previous heritage resource inventories within the Tripod Salvage project area do not overlap proposed salvage units and associated road systems. To insure adequate coverage, the Okanogan-Wenatchee National Forests archaeological site probability/predictive model was applied to the entire planning area regardless of alternative. The model considers a variety of environmental variables – such as slope, distance to water, and landform type – along with oral and recorded history to predict the

likelihood that an area will contain material evidence of past human activity. The model requires that intensive, systematic pedestrian survey be applied to 100% of high-probability areas within the project (for example, flat or rolling terrain of 15% slope or less that occurs along edges of major ridge systems or along major travelways, within 700 feet of water). Moderate-probability areas within the project boundary include features such as flat or rolling terrain of 15% slope or less that are greater than 700 feet from water; 35% of this probability type within the project area must be surveyed for heritage resources. Low-probability areas generally include slopes more than 15%; 5% of the total low-probability areas within the project must be surveyed (Carter 1983). Application of the model to the Tripod Fire Salvage project area dictated the survey model outlined in Figure 3.16-2 below. All alternatives have been inventoried in accordance with the model. Heritage resource inventories on all alternatives were completed in spring/summer 2007, before the project decision is made.

Use of the aforementioned material was a consideration of the best available science.

AFFECTED ENVIRONMENT

Previous Inventories

The Tripod Salvage project area overlaps several former project areas. Heritage resource inventories conducted in the current project area through October 2006 are described below. Each inventory covered a portion of each project area in accordance with the Forest site predictive model. The inventories were completed by a professional archaeologist or by certified cultural resource technicians working under the direction of the Forest Archaeologist. Pedestrian transects were spaced no more than 30 meters apart. Several heritage resources were documented and some were evaluated for nomination to the National Register of Historic Places (NRHP). No traditional cultural properties were identified in these project areas following consultation with the Tribal Historic Preservation Officer (THPO) for the Colville Confederated Tribes.

Skip Timber Sale (1993)
This project was a 5,100-acre timber sale located in the Lightning Creek drainage of the former Twisp Ranger District. The heritage resource sample survey covered 1,440 acres and it resulted in the documentation of three historic heritage resource sites. One of the sites is a cabin located just outside a Tripod Salvage unit (Dowie 1993). The other two sites, a trail shelter and a radar site, are located well outside the Tripod project area.

Conger Integrated Resource Project (1999)
The planning area was approximately 19,865 acres in the West Fork Salmon Creek drainage on the Tonasket Ranger District. The heritage resource sample survey conducted for this project covered about 2,000 acres. Documented sites included lithic scatters, culturally modified trees, fire lookout locations, and several historic cabins associated with mineral extraction, recreational and logging activities in the area (Hutton 1999). Two of the acres inventoried for the project lie within proposed Tripod salvage units. One of the sites documented lies within the Tripod salvage project area but outside any salvage units or associated road system.

Mutton Integrate Resource Project (1999)
The planning area for this project was 19,840 acres in the North Fork Salmon Creek drainage on the Tonasket Ranger District. The heritage resource sample survey covered 2,400 acres. Documented sites included fire lookouts, several historic cabins associated with recreational and logging activities in the area, and the Muckamuck Trail, a segment of which crosses through a proposed Tripod salvage unit (Pepin et al. 2000).

Ramsey Fuels Project (2002)
Initiated by a prescribed fire project, this investigation involved 2,752-acres around Ramsey Peak and within the Ramsey Creek drainage on the Methow Valley Ranger District. The heritage resource sample survey covered 493 acres. Documented sites included a stock driveway and numerous refuse scatters associated with recreational and logging activities in the area (Neider and Trebon 2002). The Tripod salvage sale overlaps much of the Ramsey Fuels Project. Of the 493 acres inventoried in this 2002 project, about 275 acres now lie within proposed Tripod salvage units. All four of the sites documented during the Ramsey project lie within the Tripod Salvage project area but outside salvage units or the associated road system.

West Fork Salmon Allotment Management Plan (2005)
This project planning area was 39,225 acres within the West Fork of Salmon Creek on the Tonasket Ranger District. Much of the project area was inventoried for the Conger IRP project referenced above so the heritage resource inventory specific to this project totaled 20 acres and it was focused on existing and proposed range improvements and cattle bedding areas. Some of the heritage resource sites documented during the Conger IRP inventory were revisited but none were re-documented. Three new isolated artifacts were documented (Hughes 2005).

Tripod Complex Wildfire (2006)
The Tripod Complex wildfire covered 175,540 acres on the Methow Valley and Tonasket Ranger Districts between July and October, 2006. During this emergency situation, surveyors evaluated heritage resources in advance of fire, suppression efforts, and rehabilitation work. Forty-nine properties were inspected in and near the fire; of these, 34 were within the fire perimeter, 11 of which are newly-recorded. Twelve of the total 49 properties are considered NRHP-eligible, 30 are considered ineligible, and 9 are unevaluated pending future research (Beidl 2007).

Known Resources

Reviewing the inventories listed above and Heritage Resources geographic information systems (GIS) data revealed the heritage resources within the Tripod Salvage project area listed in Figure 3.16-1. One of these sites lies in proposed units.

Figure 3.16-1: Heritage resource sites within the Tripod Fire Salvage Project Area

FS Site #	Site Name	Site Type	NRHP*
3-45	Muckamuck Trail	Trail	Potentially Eligible
3-76	370 Rd CCC Cabin	Log shack	Not Eligible
3-134	Snow White Mine	Trail	Not Eligible
3-263	Tiffany Meadows Salt Shack	Objects	Not Eligible
3-265	Brown Meadow Culvert	Wooden culvert	Not Eligible
3-270	37-650 Road Culverts	Wooden culvert, flume	Not Eligible
3-271	Brown Meadow Culvert Isolate	Wooden culvert remains	Not Eligible
4-93	Brewster-Pasayten Stock Driveway	Stock driveway	Not Eligible
4-137	Lightning Creek Cabin	Cabin site	Not Eligible
4-163	Ramsey Can Dump #1	Trash	Not Eligible
4-164	Ramsey Can Dump #2	Trash	Not Eligible
4-165	Ramsey Can Dump #3	Trash	Not Eligible
4-303	Blue Buck Mountain Stock Drive	Trail	Not Eligible
4-304	Pearrygin Ridge Isolate	Isolated can	Not Eligible

*National Register of Historic Places

Current Inventory

Heritage resource inventory for the Tripod Salvage project began in November 2006 and was completed in July 2007. A total of 741 acres were inventoried by Forest Service cultural resource technicians using transects spaced no more than 30 meters apart. Alternative D was used as the basis for survey needs because it would disturb the most ground of any potential salvage alternative. Survey categories (low, moderate, and high) are described above with the percentage of each category that was surveyed. About 85% of the proposed units in Alternative D fall into the low-probability category, 6% lie in the moderate-probability category, and 9% in high-probability category. Alternatives B, C, and E contain similar proportions of low, moderate, and high probability categories, but would cover about 20% to 33% less area because they would disturb less ground. Surveys included system roads that access the proposed units. Three new sites were found during these surveys; these sites consisted of old can dumps containing rusted debris and are not eligible for the National Register of Historic Places (Trebon 2007d).

ENVIRONMENTAL CONSEQUENCES

Direct and Indirect Affects

Alternative A – No Action

Under this alternative there would be no risk of further disturbance to heritage resources due to management activities. All known and unknown heritage resource sites in the project area would continue to deteriorate naturally. With the loss of surface vegetation caused by the Tripod Fire, heritage resource sites would remain visible and possibly more

susceptible to vandalism until the vegetation recovers. Vegetation loss may also lead to the erosion of a heritage resource site and as such, loss of integrity and research potential through artifact displacement and damage to surface and/or subsurface cultural deposits and features (e.g. structural remains, middens, and depressions).

All Action Alternatives

Potential Area of Interest

A location of interest specified in a letter from the Colville Confederated Tribes lies within the Tripod Fire Salvage Project area. All action alternatives contain three ground-based and one skyline-based harvest units totaling 178 acres within the legal description given for this area.

Activities associated with this project include commercial salvage log removal, establishment of temporary roads, landing site activities, and pile burning. These activities have the potential to affect heritage resources. Under all action alternatives, eligible or potentially eligible heritage resources sites located within areas of proposed activity would be avoided or appropriate mitigation would be developed in consultation with interested parties and the Washington State Historic Preservation Officer (SHPO). Some heritage resource sites may remain more visible to the public and hence prone to vandalism, illegal excavation, and collection until vegetation across sites re-establishes.

Cumulative Effects Common to All Action Alternatives

The area considered for cumulative effects for heritage resources consists of the Tripod Fire Salvage Project area. The time period for considering cumulative effects consists of eight years. A complete list of past, present, and future activities is listed at the beginning of this chapter. Ground-disturbing activities such as BAER work (road maintenance), recreational use of OHVs, and firewood gathering, will be included in this cumulative effects analysis. Activities from the list above that do not disturb the ground would not threaten or have an effect on heritage resources.

Within or adjacent to this area since 1962, there have been at least 25 Forest Service or Forest Service permitted projects (e.g. timber sales and hazard fuels reduction underburns). Heritage resource inventories associated with some of these projects have resulted in the documentation of sites within the present project area as listed in Figure 3.16-1. These sites were not directly affected by previous projects because of mandated avoidance. However, because fuel loading within some heritage resource site boundaries increased over time, some sites were impacted by the effects of the Tripod Fire in 2006. Road building associated with past projects has provided public access into the project area and, along with dispersed camping, has made heritage resource sites more accessible and hence, susceptible to vandalism, illegal excavation and collection. Public use of the project area would likely continue and potentially increase with development on adjacent private lands. Periodic future monitoring of the most accessible heritage resource sites would serve to reduce instances of vandalism, illegal excavation, and collection. Future projects may result in the documentation and preservation of new heritage resource sites within the project area but as required would avoid impacting them.

In summary, the past, present, and reasonably foreseeable future actions and Alternatives B, C, D, or E on heritage resources would have no cumulative effect on heritage resources. Mitigations and monitoring as described in Chapter 2 would eliminate impacts to NHRP properties.

CONSISTENCY FINDING

None of the proposed actions within the Tripod Fire Salvage Project would adversely affect documented heritage resources within the project area because of avoidance or the development of appropriate mitigation The steps being implemented to consider effects to heritage resources is consistent with Forest Plan standards and guidelines.

Consultation with the Yakama Nation and Confederated Tribes of the Colville Reservation has been completed. The Colville Confederated Tribe submitted one comment. Consultation with the State Historic Preservation Office was completed once surveys were completed, prior to any decision on this project.

3.17 SPECIFICALLY REQUIRED DISCLOSURES

This section describes how the action alternatives comply with applicable state and federal laws, regulations and policies.

Consistency with National Environmental Policy Act, the National Forest Management Act and the Okanogan Forest Plan
This project and this analysis is consistent with the Okanogan Forest Plan as amended. The Forest Plan contains direction for each resource area. The discussion of how the alternatives analyzed in this EIS meet that direction is included in the discussions above in Chapter 3. The analysis documented in this EIS meets the National Environmental Policy Act of 1969 and it's implementing regulations and Forest Service policy, to inform the public of the proposed action and alternatives and to disclose the effects of implementation.

The National Forest Management Act of 1976 (NFMA), including it amendments to the Forest and rangeland Renewable Resources Planning Act of 1074, states that when trees are cut to achieve timber production objectives, the cuttings shall be restocked within five years after harvest. Forest Service policy and interpretation is that this requires salvage units to be reforested within fire years of harvest. The Tripod action alternatives include plans to reforest salvage harvest units. For burned areas where the fire-killed trees are not salvaged, NFMA does not require that reforestation occur. Even so, the United States Congress and the Forest Service are often interested in reforesting these burned areas promptly. Reforestation of salvage units is part of the proposed action and reforestation of areas not salvaged are considered reasonably foreseeable future actions and considered in the cumulative effects analyses above.

National Historic Preservation Act
Heritage surveys have been completed and State Historic Preservation Office consultation has been conducted before the project decision is made. Identified sites and and newly recorded sites would be protected from all project activities associated with the Tripod fire Salvage Project. Because heritage resources would not be affected by activities associated with any of the action alternatives, there would be no effect to any historic property listed in or eligible to the National Register of Historic Places.

Endangered Species Act and Regional Forester's Sensitive Species
The Endangered Species Act requires protection of all species listed as threatened or endangered by the US Fish and Wildlife Service and the National Oceanic and Atmospheric Administration-Fisheries. The Forest Service also maintains a list of species which are proposed for classification and official listing under the ESA, species which appear on an official State list, or that are recognized by the Regional Forester as needing special management to prevent their being placed on Federal or State lists. Biological evaluations and assessments have been completed for all TE&S plants, and aquatic and terrestrial wildlife. Determinations were made that none of the proposed actions would adversely affect, contribute to a trend toward federal listing, nor cause a loss of viability to listed or sensitive plant, fish and animal populations or species. Details are found in the Aquatic Resources, Sensitive Plants and Wildlife sections of this EIS. Consultation with the regulatory agences has been completed prior to the signing of the Record of Decision.

Wild and Scenic River Act
The Chewuch River section adjacent to the salvage area is allocated under the Okanogan National Forest Land and Resource Management Plan to maintain its potential Scenic River classification within one-quarter mile of the river (Forestwide standard and guideline 9-3). None of the units in the salvage fall within one-quarter mile of the river, so future potential designation under the Wild and Scenic River system is not affected.

Floodplains and Wetlands
Executive Orders 11988 and 11990 direct Federal agencies to avoid, to the extent possible, both short-term and long-term adverse impacts associated with the modifications of floodplains and wetlands. Surveys and research carried out for this EIS indicated that there are designated wetlands within the project area. However there are no identified wetlands within any salvage harvest units and wetlands would be sufficiently buffered to protect this habitat. Riparian habitat conservation areas were designated in part to protect floodplain functions. No temporary roads would be constructed in RHCAs and any danger trees felled would be left in place. Consequently there would be no adverse impacts to wetlands or floodplains due to this project.

Prime Farmlands, Rangelands, Forestlands
The Secretary of Agriculture issued Memorandum 1827, which is intended to protect prime farmlands and rangelands. The policy for Prime Forestlands is in Forest Service Handbook 1909.15.65.21. The project area does not contain any prime farmlands. These designations generally do not apply to lands within the National Forest System. This project would not convert any prime rangelands or prime forestlands to other uses. National Forest system lands would be managed with consideration of the impacts on adjacent private lands. There would be no direct, indirect, or cumulative adverse effects to these resources.

Research Natural Area
Roger Lake Research Natural Area (RNA) is within the project area. Danger tree falling to improve public safety would occur along Road 39 within the RNA, however felled trees would remain in place in accordance with Okanogan National Forest Land and Resource Management Plan standard and guideline MA8-18B.

Environmental Justice, Civil Rights
The project includes both Forest Service contracted work and Forest Service employee accomplished work. Under Executive Order 11246, companies with Federal contracts or subcontracts are prohibited from job discrimination the basis of race, color, religion, sex or national origin. The U. S. Department of Agriculture prohibits discrimination in its employment practices based on race, color, national origin, gender, religion, age, disability, political beliefs, sexual orientation, and marital and family status.

Executive Order 12898 (59 Fed, Reg. 7629, 1994) directs Federal agencies to identify and address, as appropriate, any disproportionately high and adverse human health or environmental effects on minority populations and low-income populations.

The following discussion is derived from the 2000 census information found at http://www.census.gov. The town of Omak has large Native American and Hispanic communities. Large Hispanic communities are also found in the towns of Oroville, Tonasket, Okanogan, Brewster, Pateros, Chelan, Entiat, Wenatchee and Cashmere, and

the rural portions of Okanogan and Chelan County. The Colville Indian Reservation covers a large portion of Okanogan County and the population on the reservation is 60 percent Native American. Almost all of the towns and rural areas in Okanogan, Ferry and Chelan Counties, and the Colville Indian Reservation exceed both the national and State average (12% and 7% respectively) for people living below the poverty level. Poverty is especially acute (more than twice the national average) in the towns of Oroville, Tonasket, Omak, Okanogan, Brewster, and Republic, and on the Colville Indian Reservation.

Many Hispanics in the area hold lower paying jobs in the service and agricultural industries, and many Native Americans live below the poverty level. The project area is near the Colville Indian Reservation and traditional use areas of the Yakama Indian Nation. Many Native Americans have a rural lifestyle that is reliant on a clean and healthy environment, and the Forest is important in providing religious or spiritual settings, and hunting, gathering and fishing opportunities.

The Tribal governments for both the Confederated Tribes of the Colville Indian Reservation and the Yakama Indian Reservation were contacted during scoping. The Colville Confederated Tribes indicated an interest in restoring vegetation in a gathering area that was burned by the Tripod Fire.

The effects from any of the action alternatives on civil rights and low income or minority communities would be minimal. Employment would be created through both timber sale and service contracts, and contractors/subcontractors are prohibited from discrimination on the basis of race, color, religion, sex or national origin.

The Forest Service does not specify non-Forest Service road haul routes in its timber sale contracts. However, these contracts do specify Forest Service road haul routes and it is likely that timber from this project will be hauled through the towns of Winthrop, Twisp, Carlton, Methow, Conconully and rural portions of Okanogan County, all of which have either low-income and/or high minority communities. The rural areas, including unincorporated towns, lie along backcountry roads, not major highways, and therefore would experience disproportionately higher disturbance from increased traffic and noise during hauling activities. None of the haul routes are likely to be though communities that have high Hispanic or Native American populations, except on major highways with already established commercial traffic. If the timber sale purchaser hauls on Highway 97 between Brewster and Omak, haul would be across the Colville Indian Reservation. However, because this State Highway receives heavy commercial traffic, the effects on traffic and noise would not be noticeable. To this point in time, the new Tribal mill in Omak has not bid on any Federal timber sale contracts; if they were to bid and be awarded the timber sale contract, the final ½ mile of log haul would be through a mostly residential Native American community. However, the effects of this traffic would not be especially noticeable because this route is a State highway, already used by commercial traffic. Should the Tribal mill successfully bid on any contracts, employment would benefit a disproportionately high number of Native Americans.

The noise and disturbance from project activities could temporarily displace recreational activity, but would not disproportionately affect Hispanics or Native Americans. The effects on hunting and fishing opportunities can be derived from the effects on wildlife and fish found earlier in this chapter.

Other Jurisdictions
The Okanogan Forest Plan guides management of National Forest system lands in the Tripod Fire Salvage Project area. Information relating to how the project meets Forest Plan standards and guidelines and effects relating to other federal and state laws are also analyzed throughout this chapter. To the extent that State and local laws are applicable to this project, this information is analyzed in the appropriate resource section (e.g. Clean Air Act in Air Quality and Clean Water Act in Hydrology/Fisheries) implementation of all alternatives would be consistent with State and local laws, land use, and environmental policies.

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). 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, 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 again if the productivity of the land is not impaired. All alternatives protect the long-term productivity of the project area through the use of specific Forest Plan standards and guidelines, mitigation measures and Best Management Practices (see Soils section earlier in this chapter).

Soil and water are two key factors in ecosystem productivity, and these resources would be protected through design criteria and mitigation measures. Sustained yield of timber, wildlife habitat and other renewable resources all rely on maintaining long-term site productivity. The quality of water from the project area may fluctuate as a result of short-term uses, but no long-term effects to water resources are expected to occur as a result of salvage harvest activities (See Hydrology/Fisheries section in this chapter).

All alternatives would provide the fish and wildlife habitat necessary to contribute to the maintenance of viable, well-distributed populations of existing native and non-native species. By managing the habitat of management indicator species, the other species associated with the same habitat would also benefit. The alternatives propose standards, guidelines, design criteria and mitigation measures for maintaining long-term habitat and species productivity (see Wildlife and Hydrology/Fisheries sections in this chapter).

None of the alternatives would have an effect on the long-term productivity of timber resources. Trees would be regenerated to provide for post-fire productivity.

Irreversible and Irretrievable Commitment of Resources
Irreversible commitment of resources refers to a total loss of future options with non-renewable resources such as mineral extraction, heritage resources. Under the Action Alternatives, additional area would be irreversibly committed through landing construction. Use of oil and gas products for equipment and vehicles is an irreversible commitment of those resources; once used, they cannot be recovered. However this use is insignificant in the local, regional and national context of the use of these resources. These impacts are considered necessary to implement and maintain the efficacy of treatments over time.

Irretrievable commitment of resources refers to a temporary loss of production of

renewable natural resources. Dead trees and fire-injured trees expected to die within one year of project implementation removed as commodity products under the Action Alternatives is considered an irretrievable impact. Some of the dead and fire-injured trees removed would also have value as wildlife habitat or as organic input to soil productivity. Landings and temporary roads are irretrievable commitments of resources but would be restored to productive ground. Measures planned for treating soils that have been detrimentally compacted would reduce the extent of irretrievable loss to soil productivity. However, this impact is in accordance with management goals and objectives of the Forest Plan and the best available science for wildlife habitat and soil productivity used in the analysis detailed in Chapter 3.

Unavoidable Impacts

Each section above documents the unavoidable impacts associated with the project. Table 3.17-1 summarizes these impacts:

Figure 3.17-1: Unavoidable Impacts

Resource	Impact
Wildlife	**Disturbance and displacement impacts causing wildlife to at least relocate and possibly experience negative population effects.** Noise and activity along roads and at landings including worker traffic, equipment haul, road opening, road construction, log loading, and log hauling. Chain saw use, tree falling, and yarding equipment noise and activity within harvest units. Noise and activity associated with pile burning Noise and overhead activity related to helicopter yarding (Alternative D only). Activity associated with tree planting **Impacts that constitute habitat losses for species.** Loss of structure (hiding cover, perches, roosts, nests) from dead tree removal Soil disturbance from skidding and yarding equipment (see Soils report) Vegetation impacts from skidding and yarding equipment (see Forest Vegetation and Plant Communities reports) Loss of grass and forb production from weed invasion and spread (see Invasive Species report) Improved tree regeneration rate from planting (see Forest Vegetation report) Riparian habitat effects from skidding and crossing (see Hydrology and Fisheries report) **Population Impacts** Reduction in arthropod food resources from dead tree removal (birds, bats, etc.)
Hydrology/Fisheries	Sediment production and delivery to streams from ground-based salvage harvest, temporary road construction and use of existing roads that could slightly reduce habitat quality for redband and westslope trout.
Soil	Log yarding, temporary road construction and landing construction would cause detrimental soil conditions (compaction and erosion). Reduction in Coarse Woody Debris, but standards met.
Forest Vegetation	Soil compaction detrimental to tree growth on skid trails and areas where logging equipment operates.
Plant Communities	Loss of micro-sties for plant germination and disturbance of early seral and recovering species that may delay floristic recovery in the short term.
Invasive Plants	Soil disturbance would create sites for establishment of invasive plants.
Recreation	Recreational access limited due to log haul and to ensure public safety. Log haul generated noise and dust along haul route.
IRAs/Areas with Undeveloped	Sights and sound from salvage operations and smoke from pile burning may be noticeable from areas with undeveloped character.

Resource	Impact
Character	
Fuels and Fire Behavior	Increase in small woody fuels in the short range. Increase in time period that optimum CWD range would be met. Resistance to control ratings would decrease.
Air Quality	Increase in particulate matter from pile burning.
Transportation	Increase in road density during salvage operations.
Range	Soil disturbance would delay regenerating forage vegetation.
Sensitive Plants	Remote risk of an unknown population being disturbed.
Scenic Resource	Visual evidence of post-harvest activity including soil disturbance, slash piles and stumps seen along Middle Salmon-Boulder Forest Road and other forest roads where treatment is proposed in the foreground.
Heritage Resource	Some heritage sites may remain more visible to the public.
Tribal Impacts	One location of interest would contain four salvage harvest units. However all heritage sites would be avoided or mitigation developed.

Road Analysis

A Forest-wide Roads Analysis (USDA Forest Service 2004) on the Wenatchee and Okanogan National Forests addressed only those National Forest System roads maintained for passenger car traffic, arterial and collector roads. Only a few of those roads are located in the Tripod Fire Salvage Project area.

Travel analysis is a science-based interdisciplinary process, which addresses the effects of roads on biological, social and economic factors. It provides the responsible official with information to develop a road system that is safe and responsive to public needs and desires, is affordable and efficiently managed, has minimal ecological effects on the land, and is in balance with available funding for needed management activities.

A project level travel analysis process (USDA Forest Service, 2007) was completed for specific Objective Maintenance Level 1 roads and unauthorized roads within the Tripod Fire Salvage project area, where management direction for the road was not clear. This analysis is titled Tripod Fire Salvage Travel Analysis and is incorporated into this EIS by reference. The objective of the analysis was to identify management direction for specific roads that: 1) Were unauthorized roads that were not on the road system and did not have a maintenance level assigned, and 2) Roads that have been managed on the ground as open roads (Maintenance Level 2) but had an Objective (planned) Maintenance Level of 1 (closed road). The objective is to provide a road system that is safe and responsive to public needs and desires, is affordable and efficiently managed, has minimal ecological effects on the land, and is in balance with available funding for needed management actions. The analysis is a science-based interdisciplinary process, which addresses the effects of roads on biological, social, and economic factors. The Travel Analysis identified opportunities and strategies to move toward the stated objectives.

All roads within the project area are not included in the Travel Analysis for the Tripod Fire Salvage Project. The primary purpose and need of this project is to recover a portion of the economic value of dead and dying trees. It is not to manage roads differently. In most cases, “open roads” will remain open and “closed roads” will remain closed. Therefore the Line Officer determined that the project level travel analysis would focus on and make recommendations for those roads where the current management direction was not clear, as mentioned above.

Tribal Interests
Although the project area lies outside the areas ceded to the United States by the Colville Confederated Tribes and the Yakama Nation, the federal government still has a trust responsibility to manage resources of interest to the tribes in a manner consistent with the rights and privileges secured through treaty or executive order.

The “inherently sovereign” status of federally recognized tribes requires that land management agencies consult with tribes on a government-to-government basis over planned actions that may affect tribal interests. At the early stages of the planning process for the Tripod Salvage project, the Forest Service initiated government-to-government consultation with the Confederated Colville Tribes and the Yakama Nation. The Yakama Nation did not comment but the Colville Confederated Tribes did indicate an interest in restoring vegetation in a gathering area that was burned by the Tripod Fire. After discussion with the Line Officer, it was determined that this request is beyond the scope of this analysis. Information about the gathering area was shared with the Heritage Program Manager.

Energy Requirements/Natural or Depletable Resources and Conservation
Under the Action Alternatives, various amounts of fossil fuels would be expended. Fossil fuel energy would be used for this project and are a irreversible commitment of resources . However, these energy sources are not currently in short supply and their use would therefore not have an effect upon continued availability of these resources.

Public Health and Safety
Public health and safety would be improved with the action alternatives by removing danger trees along roads open to public use.

Urban Quality, Historic and Cultural Resources, and the Built Environment
No urban or built environment is present in the project area. Historic and Cultural resources and impacts to them are discussed in the Heritage section in this chapter.