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CATHERINE FOREST RESTORATION

Environmental Assessment

and

Review for Consistency with the

Columbia River Gorge National Scenic Area Management Plan

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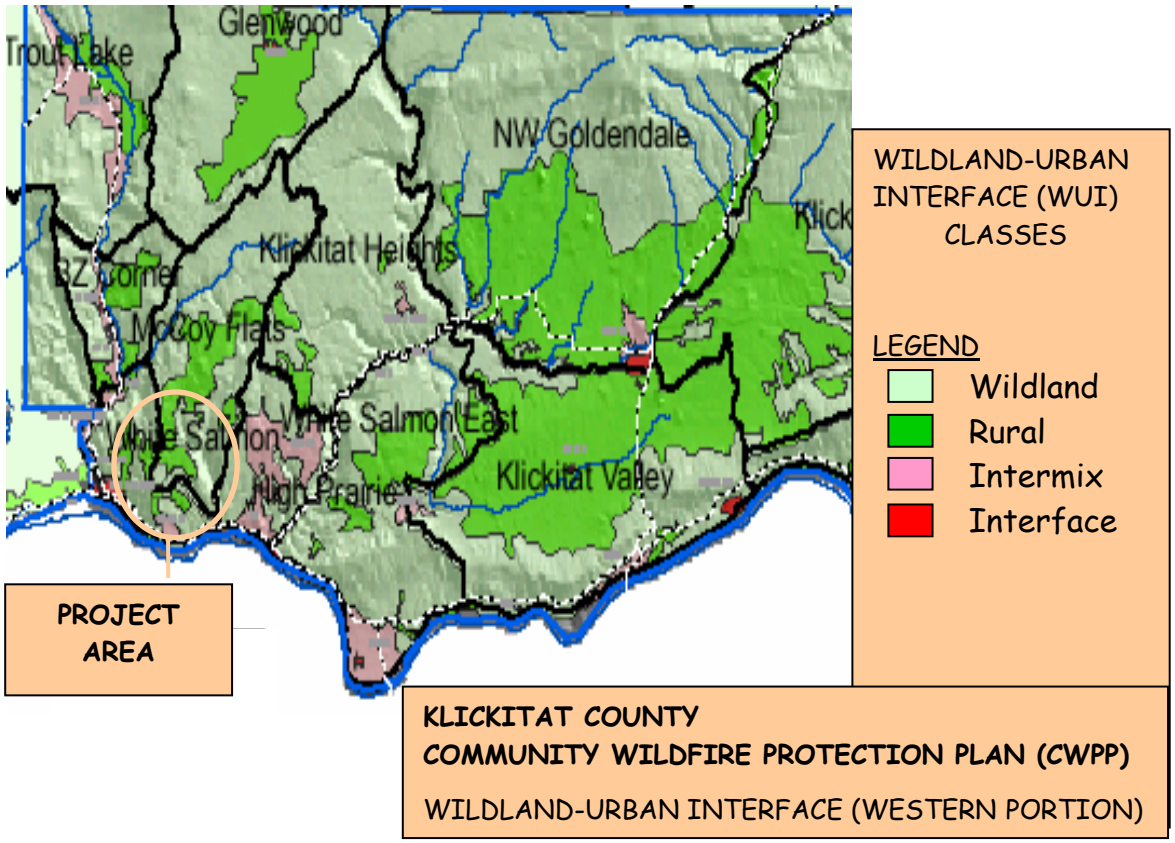


CHAPTER 1 - PURPOSE AND NEED FOR ACTION

1.0 – INTRODUCTION

The Catherine Forest Restoration Assessment (EA) is prepared in accordance with the Healthy Forests Restoration Act of 2003 purposes (1) to reduce wildfire risk to communities…through a collaborative process…and (6) to protect, restore, and enhance forest ecosystem components.

This proposal is designed to increase fire resilience and to restore fire-dependent habitats by reducing the unsustainable in-growth of small trees or the encroachment of Douglas-fir caused by decades of fire exclusion. The planning process benefited from an on-going public and collaborative effort that resulted in a proposed action involving a combination of tree thinning and/or prescribed underburning, implementation requirements for affected resources, and requirements for monitoring.

The project is planned in a portion of the Klickitat County Wildland Urban Interface designated by the Klickitat and Skamania County, Washington Community Wildfire Protection Plan.

This chapter includes the following:

- The planning area location and setting,
- Management direction and guidance,
- The existing and desired conditions,
- The purpose and need for the proposed action,
- an overview of the proposed action,
- The decisions to be made by the responsible official about the proposed action,
- A summary of the results of scoping and the collaborative process, and
- Identification of issues and concerns related to the implementation of the proposed action.

1.1 - PLANNING AREA LOCATION AND SETTING

The Catherine Planning Area encompasses approximately 4,100 acres of acquired National Forest Systems lands within the following:

- Township 4 North, Range 12 East Sections 30, 31
- Township 3 North, Range 12 East Section 30
- Township 3 North, Range 11 East Sections 2, 3, 13, 14, 15, 23, 24, 25, 26, 27, 28, 34, 35, 36

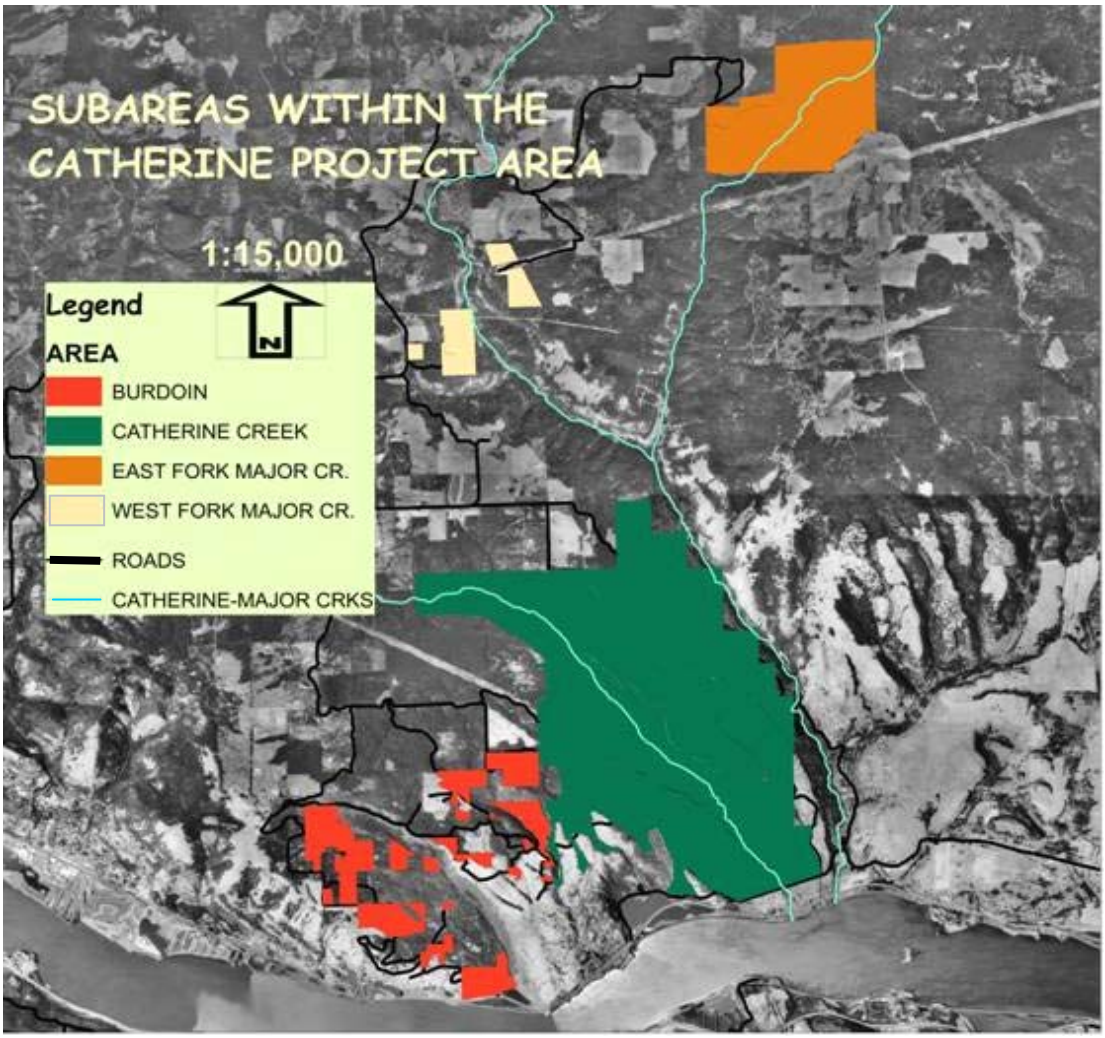
The 4,100-acre planning area is generally bounded on the south by SR-14, on the north by the boundary of the Columbia River Gorge National Scenic Area (NSA), on the east and west by National Forest System land ownership within the Catherine-Major watersheds and Burdoin Mtn. The primary travel routes are SR-14, Courtney Road, Snowden Road, North and South Major Creek Road, Bates Road, and Acme Road.

The landscape ranges in elevation from 80 to 2,500 feet above sea level. The average slope is 20-30% and ranges from 0-10% to over 60%. Vegetative cover consists of grasslands,

Oregon white oak woodlands with scattered ponderosa pine at the lower elevations and mixed conifer with scattered oak and pine at higher elevations. The vegetation composition transitions gradually or suddenly depending on the variables of elevation, slope, aspect, or soil conditions and their combined effect on moisture retention. Precipitation arrives principally from November to March, with amounts ranging from 28 to 32 inches annually. Summers are hot and dry, with limited surface water available. Several small unnamed ephemeral channels and two intermittent fish-bearing streams, Major and Catherine creeks, lie within the planning area. During summer, Major Creek contains surface water upstream from approximately river mile 0.5, while all other channels, including Catherine creek and the mouth of Major Creek, become dry. As expected, fish use in these intermittent channels is seasonal in nature.

1.2 - PROJECT SCOPE

This document will analyze the environmental effects within the planning area of thinning selected tree stands and related activities such as road maintenance, invasive plant control, planting native species, snag creation, soil de-compaction, slash pile burning, and prescribed fire.



1.3 – MANAGEMENT DIRECTION AND GUIDANCE

Decision Framework

The CRGNSA Area Manager will decide, on the basis of this document, and considering the results of the collaborative effort and public comments received during scoping whether to:

- Implement the proposed action as described,
- Select and/or modify an alternative, or
- Take no action at this time

Guiding Documents: In addition to the direction given by the National Fire Plan policies and the Healthy Forests Restoration Act, two management plans provide direction for this undertaking within the Open Space and Agriculture zones in the Special Management Area (SMA) of the Columbia River Gorge National Scenic Area:

- Gifford Pinchot Land and Resource Management Plan (GPNF Plan) as amended by the Northwest Forest Plan, and
- Revised Columbia River Gorge National Scenic Area Management Plan (NSA Management Plan, 2004).

All applicable guidelines from each plan apply. The most protective guidelines apply in cases where guidelines conflict. Applicable key guidelines and applicable regulatory requirements such as the Endangered Species Act and the Migratory Bird Treaty Act are cited in this document in Chapter 3-Environmental Consequences for each resource. Biological Evaluations are located in Appendix A.

Guidance is also contained in the Watershed Analysis of the Catherine-Major Creek Area (CRGNSA, 1995, updated 2005), the CRGNSA 5-year Action Plan for Improving Forest Resiliency (2004), and the Klickitat and Skamania County, Washington Community Wildfire Protection Plan (2006).

GPNF Plan Goals

The Forest-wide Management Direction applies to acquired lands in the CRGNSA. The following direction is applicable to the proposed action:

Riparian Reserves-TM-1c)

Apply silvicultural practices for Riparian Reserves to control stocking, reestablish and manage stands, and acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy objectives.

Riparian Reserves-FM-1

Design fuel treatment and fire suppression strategies, practice, and activities to meet Aquatic Conservation Strategy Objectives, and to minimize disturbance of riparian ground cover and vegetation. Strategies should recognize the role of fire in ecosystem function and identify those instances where fire suppression or fuels management activities could be damaging to long-term ecosystem function.

NSA Management Plan Goals and Allowed Uses

Open Space SMA Policy 1/SMA Guidelines, Review Uses

Open Space shall be designated to provide special protection for sensitive scenic, cultural, recreational, and natural resources, and for sensitive and/or representative ecosystems.

- Resource enhancement projects for the purpose of enhancing scenic, cultural, recreation and/or natural resources are allowed subject to review for compliance with the scenic, cultural, natural, and recreation resource guidelines. These projects may include vegetation management and forest practices for the restoration of forest health.

Forest/Agriculture SMA Policy 17/SMA Guidelines, Review Uses

Forest management of National Forest System lands shall be for the purpose of ecosystem management and forest health.

- Forest uses and practices are allowed subject to review for compliance with the scenic, cultural, natural, and recreation resource guidelines.

Catherine-Major Watershed Analysis and Open Space Plan Guidance

The Desired Future Condition

Ecological processes before European settlement created a disturbance pattern of frequent low intensity fires, drought/wet cycles, and contribution of large woody debris (LWD) as trees fell into creeks. Restore presumed pre-European settlement ecological processes and communities. Activities are proposed to enhance native plant communities… add large woody debris to Major Creek, and introduce prescribed fire or thinning to mimic the pre-settlement disturbance regime.

Klickitat County CWPP Guidance

Goal 3

Decrease risk of catastrophic fire in the Wildland-Urban Interface (WUI)

Objective 3.1

Treat vegetation in the Wildland-Urban Interface of CWPP communities to decrease fuel loading and fuel ladders.

Action 3.1.1

Emergency Management shall support treatment of vegetation in the WUI on public lands, Forest Service, Washington Department of Natural Resources, and private lands to create conditions that would decrease the hazard of large wildfires.

1.4 – EXISTING CONDITIONS AND THE NEED FOR RESTORATION

(See section 1.11 on page 23 for definitions of terms)

Fire Resilience

In 2004, the CRGNSA developed a 5-year Action Plan for Improving Forest Resiliency priorities for the treatment of fire dependent landscapes. These treatments were proposed in order to improve fire resilience for the objective of ecosystem health and the protection of adjacent properties. The Catherine area was determined to be a high priority because of its location near development and because past land management activities and fire suppression left these fire dependent plant communities with high stem densities making them

susceptible to wildfires of greater severity than typical of the natural fire regime.
Fire regimes describe the historic frequency and severity of wildland fires. Under the natural fire regime in Catherine, fires occurred at a frequency (0-35 years) repetitive enough to kill younger trees and brush. This repetitive burning reduced the fuel loading (including ladder fuels) for the next fire. Thus, under the natural fire regime, fires tended to burn at the ground surface rather than in the tree crowns. Fire suppression and the resulting exclusion altered this regime by removing an important pattern of disturbance and renewal.

Condition class is an expression of the difference between the current condition of vegetation types and the condition during the historic fire regime. It is used as a proxy for the probability of severe fire effects. (e.g., the loss of key ecosystem components - soil, vegetation structure, species; or alteration of key ecosystem processes - nutrient cycles, hydrologic regimes). Condition class is useful as an index of ecosystem risks attributable to an occurrence of wildland fire under the current regime of fire suppression.

Fire regimes and condition classes are listed in the USDA Forest Service General Technical Report RMRS-GTR-87.2002 as cited in the Healthy Forest Restoration Act (HFRA) to describe existing stands in fire-dependent landscapes as to the degree of alteration from the historic fire regime and the relative risk of fire-caused losses of key components of the forest ecosystem:

Condition Class 1-Fire regimes are within an historical range, low risk for losing key ecosystem components, vegetation attributes (species composition and structure) are intact and functioning within an historical range. These areas can be maintained using fire.

Condition Class 2-Moderately altered fire regime, moderate risk for losing key ecosystem components, moderate change to pattern, size, frequency, or severity of fires, vegetation attributes have been moderately altered from their historical range. These areas may need moderate levels of restoration treatments, such as hand or mechanical thinning and prescribed fire.

Condition Class 3-Significantly altered fire regime, high risk for losing key ecosystem components, dramatic change to pattern, size, frequency, or severity of fires, vegetation attributes have been significantly altered from their historical range. These areas may need high levels of restoration treatments, such as hand or mechanical thinning before prescribed fire can be used to restore the historical fire regime.

As stated in the 2002 report, departures from the natural fire regime are caused by fire suppression, timber harvesting, livestock grazing, introduction and establishment of exotic plant species, introduced insects or disease, or other management activities.

Most of the stands in the Catherine area were categorized by the CRGNSA ecologist and fuels specialist as Condition Classes 3—requiring thinning followed by prescribed underburning in order to reduce the severity of wildland fires and the risk of losing ecosystem components that would not have been lost under a more natural frequent fire regime. The Condition Classes 3 assessment was based on 2006 stand exams and the inspection of existing stand conditions coupled with the following information:

OAK-PINE WOODLANDS-Historically, Oregon white oak was subjected to a fire regime of low-severity surface fires occurring every few years. A study in the Oregon white oak woodlands of Humboldt Redwoods State Park, California revealed a history of fire every 7.5 to 13.3 years during the pre-settlement era (Stuart, John D. 1987). The following summarizes key findings related to this vegetation type:

- Fire has been largely excluded from the project area for nearly 80 years.
- In the absence of fire, Oregon white oak sprout clumps form dense, even-aged stands. Most Oregon white oak woodlands of today are of this type due to fire suppression (Habeck, J. R. 1962).
- The vast majority of the Oregon white oak seen within project area has evolved from dense sprout clumps and is even-aged.
- Frequent fire in Oregon white oak habitat resulted in the open savannas typical of pre-settlement times in the Willamette Valley, Oregon, and the bald hills of California (Sugihara, Neil G.; Reed, Lois J.; Lenihan, James M. 1987).
- Due to encroachment by less fire tolerant species and sprout density, there are few remnants of these open savannas within the project area.

PINE-OAK-DOUGLAS FIR FORESTS-Fire is an integral part of the ecology of Pacific ponderosa pine. Studies have shown that prior to 1900, most stands experienced low-severity surface fires at intervals ranging from 1 to 30 years (Arno, Stephen F. 1988; Baumgartner, David M.; Lotan, James E, 1987). The following summarizes key findings related to this vegetation type:

- Fire has been largely excluded from the project area for nearly 80 years.
- Fire also shapes the composition of ponderosa pine stands. In the late 1800's stands exhibited open parklike appearances with well-stocked overstories and relatively few understory trees. Over the last 100 years of fire suppression, seral Pacific ponderosa pine stands have been replaced by shade-tolerant climax stands (Habeck, James R. 1990).
- Within the project area there are few open parklike areas and understory trees tend to be dense enough to make foot travel difficult.
- Douglas-fir is successional to ponderosa pine in the absence of major disturbance. Fire suppression favors increased Douglas-fir because it is less fire resistant and slower growing than ponderosa pine when juvenile.
- Though heavier and more pronounced at the higher elevations, Douglas-fir encroachment is evident within all stand types in the project area.

Existing Condition of Fuels

Surface Fuels

Surface fuels are defined as any materials lying on or immediately above the ground including needles or leaves, duff, grass, small dead wood, downed logs, stumps, large limbs, low brush, and reproduction. Generally speaking, surface fuels within the project area cover just about the full spectrum of fuels typically associated with Pacific Northwest forest types. On one end of this spectrum these fuels are categorized as being “light” or “flashy” and are comprised of a grass understory with some needle cast, leaf litter, and twigs. Fires tend to

spread rapidly though these fuels especially when pushed by the west winds so characteristic of the gorge. The other end of the spectrum finds much "heavier" or larger diameter fuels comprised of a dead-down component in greater quantities of 3-inch or larger limb-wood. Due to the higher intensity generated by these heavier fuels, fires burning here tend torch, spot and crown and have a high resistance to control.

Ladder Fuels

Ladder fuels are defined as fuels that provide vertical continuity between the surface fuels and crown fuels in a forest stand, thus contributing to the ease of torching and crowning. The majority of the project area is dominated by timber stands that are tiered with ladder fuels. Such fuels pose a threat to both fire fighter and public safety in that they can generate extreme fire behavior and promote rapid rates of spread and lead to crown fires.

Crown Fuels

Canopy bulk density, canopy base height and canopy continuity are the key characteristics of crown fuels. Where bulk density, base height, and continuity align the threat of a crown fire exists. Crown fires are generally considered the primary threat to life, property, ecological and human values. They typically move faster than surface fires, are more difficult to suppress and pose the greatest threat to fire fighter and public safety. This threat comes from increased fire-line intensity and long range spotting. Such hazards often mandate an indirect suppression strategy, which increases the acres burned as well as the fire severity over the landscape. This results in higher tree mortality and smoke production. Some 42% of the project area is typed as containing heavy crown loading, 37% is moderate, and the remaining 21% is light.

Expected Fire Behavior and the Need for Action

Fire behavior within the project area is anticipated to be consistent with the existing fuel characteristics described above. Fires burning in light fuels pushed by typical gorge winds will spread rapidly. Recent examples of this include both of the Major Creek Fires (the first in July, 1999; the second in August, 1999) which burned through a portion of the project area and consumed one residence and some 600 acres. The challenge for fire fighters in light fuels is not the fire's resistance to control--but the rate at which the fire spreads.

Under high fire danger conditions, fires burning in heavier fuels can be anticipated to exhibit extreme fire behavior with torching, spotting, and crowning as the expected norm. On July 23, 2002, a lightning strike ignited a fire on Sheldon Ridge—eight miles south of the project area across the Columbia River in Oregon. The typical gorge winds and heavy fuels prompted extreme fire behavior including torching, spotting, and crowning. By July 25 the Sheldon Ridge fire had consumed some 15,000 acres. The fuels, elevation and topography are nearly identical to those found in the project area.

Klickitat County Community Wildfire Protection Plan (CWPP)

The Klickitat County CWPP identifies the need to decrease the risk of catastrophic fire in the Wildland-Urban Interface (WUI) by treating vegetation to reduce fuel loading and fuel ladders as its third objective. The CWPP further states that county emergency management shall support such treatments on public lands administered by the USDA Forest Service and Washington Department of Natural Resources and private lands as well to "create conditions that would decrease the hazard of large wildfires."

Forest Ecosystem Components

Forest ecosystem components include the structure, species composition, and landscape pattern of the forested system as well as the diversity of the wildlife and flora that use the forested system as their habitat.

Fire Dependent Transition Zone Ecosystem

The Catherine project area and the Columbia River Gorge, in general, are ecologically diverse. The Catherine area occupies a part of a larger transition zone between the wetter western forests and the drier eastern grasslands. As discussed above, the forest structure and pattern on the landscape in this zone was developed by and is highly dependent on the effect of regular fires (Agee, 1993).

The dominant conifer (fir) forests of the higher elevation Cascades rapidly transition, as elevation and rainfall decreases, to forests with co-dominant pine and fir, to forests with dominant pine, then to open oak-pine forests and oak woodlands, ending at the edge of the shrub-steppe of the Columbia basin. This transition is predominantly correlated to decreasing soil moisture or rainfall. Oregon oak and ponderosa pine are capable of growing on a wide variety of sites, but on sites with higher moisture and/or infrequent fire occurrence, they are eventually choked out and replaced by faster growing and less fire tolerant conifer species (USDA, 1990).

Significance of Oregon Oak-Pine Woodlands and Pine-oak forests

The present distribution of Oregon white oak extends from the Willamette Valley north to Puget Sound along the western side of the Cascade Range with a projection through the Gorge. Pine-oak forests fan out along the eastern flanks of the Cascades. The acreage of oak woodlands and the diversity of oak species both increase towards southern Oregon and California. The center of oak diversity is thought to be in Central America. Oaks were likely more widely distributed in Oregon and Washington during inter-glacial periods when climates were more moderate. Many species, such as the California mountain kingsnake, have followed the changing oak woodland distribution.

The key factors defining this area as wildlife habitat are the historically open forests or woodlands with large pines and oaks producing mast crops of acorns and pine nuts that are important to many wildlife species. Pine-oak and oak woodlands provide habitat for over approximately 200 species of terrestrial wildlife, including species that are on the Washington state endangered, threatened and sensitive list (Larsen and Morgan, 1998).

Acorns and pine nuts from Oregon white oak and ponderosa pine are important fall and early winter food for many species of wildlife including woodpeckers, western gray squirrels, and deer. Acorns are also an important food source for many invertebrates which in turn provide food for insectivorous birds, such as warblers and flycatchers. Many other birds, such as woodpeckers, eat insects and insect eggs found in the wood, fissured bark, and cavities of living and dead oaks. Oak leaves are likewise food for insect larvae and a fair–to-good quality deer browse.

The level of wildlife use of oak woodland is dependent on the stand structure and spatial pattern of the stand. Open canopy stands will generally have a more complex under-story than closed-canopy stands, and therefore support more wildlife species and diversity. Acorn and pine cone production is most abundant in older and larger trees. Small and competitive oaks and pines tend to produce very little mast, if any at all. Mast production, both acorn and pine cone, is cyclical, with very abundant years often followed by several poor years. The average interval between good cone crops for ponderosa pine in the Pacific Northwest is every 4 to 5 years (USDA, 1990). As an example, the Lewis' woodpecker remains throughout the year in Washington when there is a good acorn crop; however, in poor years the majority of the population migrates south during the winter to California (and southern Oregon where the diversity of oak species with differing cycles produce a more stable acorn crop) (Wahl et. al, 2005). Because of the cyclical nature of mast production, it is critical for wildlife species dependent on mast, such as the western gray squirrel, that a large population of mast-producing trees be maintained to help offset these cycles. The presence of a diversity of other seeds and fruits, such as maples, hazelnuts, Oregon ash, serviceberry, and Indian plum, also help to provide a more stable food supply over time (Linder and Stinson, 2006 *in Draft*).

Many wildlife species nest in oak cavities or use them to avoid inclement weather or predators. Open–form (savannah) oak tends to provide more cavities than closed–form (woodland) oak. Good habitat for most species would be composed of diverse woodlands with both dense areas for cover, as well as open meadows with savannah oaks. Similarly, pine trees interspersed within the oak woodlands provide important diversity for foraging and nesting. The larger oak and pines offer the most suitable habitat and produce the most mast. Their presence, or lack thereof, are perhaps the most telling as to the quality of the oak-pine habitat.

Existing Conditions

Large pines and oaks in the transition zone have disappeared over time for many reasons. Large pines were cut down for wood to build homes and the large oaks for fire wood. Local knowledge indicates that oak was a prime wood for the steam boats that ran up the Columbia during the late 1800s consuming 1 cord per hour. The advent of active fire suppression programs near the turn of the century has allowed for uncontrolled Douglas-fir and grand fir seedling establishment to encroach on the once inhospitable fire-prone communities. Thickets of young trees have established that are now competing with the older (legacy) trees for moisture, nutrients and sunlight. Over the last 80 years many of the pine-oak forests have succumbed to the expanding firs. As the firs slowly encroach further into the oak-pine woodlands, more of these communities begin to decline. This decline directly impacts habitats and food availability for locally-adapted wildlife species.

Encroachment by Douglas-fir has been most notable at higher elevation or on east slopes where the soil moisture is more conducive for their growth. Close inspection of the current conditions indicate that there are scattered old, large oaks and pines dying or dead throughout areas where Douglas-fir have now become the dominant species (see pictures in this document).

In other areas one can find the remnant stumps of large pines. Thickets of young oaks, pines, and firs have grown without fire to provide thinning. They have grown spindly with little mast production.

In other areas, where intense fires are believed to have burned in the late 1800s or early 1900s without subsequent fires, the trees have grown back into thickets of even-aged, non-mast-producing woodlands. While all these stand types provide habitats for wildlife, none provide the habitats previously existing under which the local species evolved.

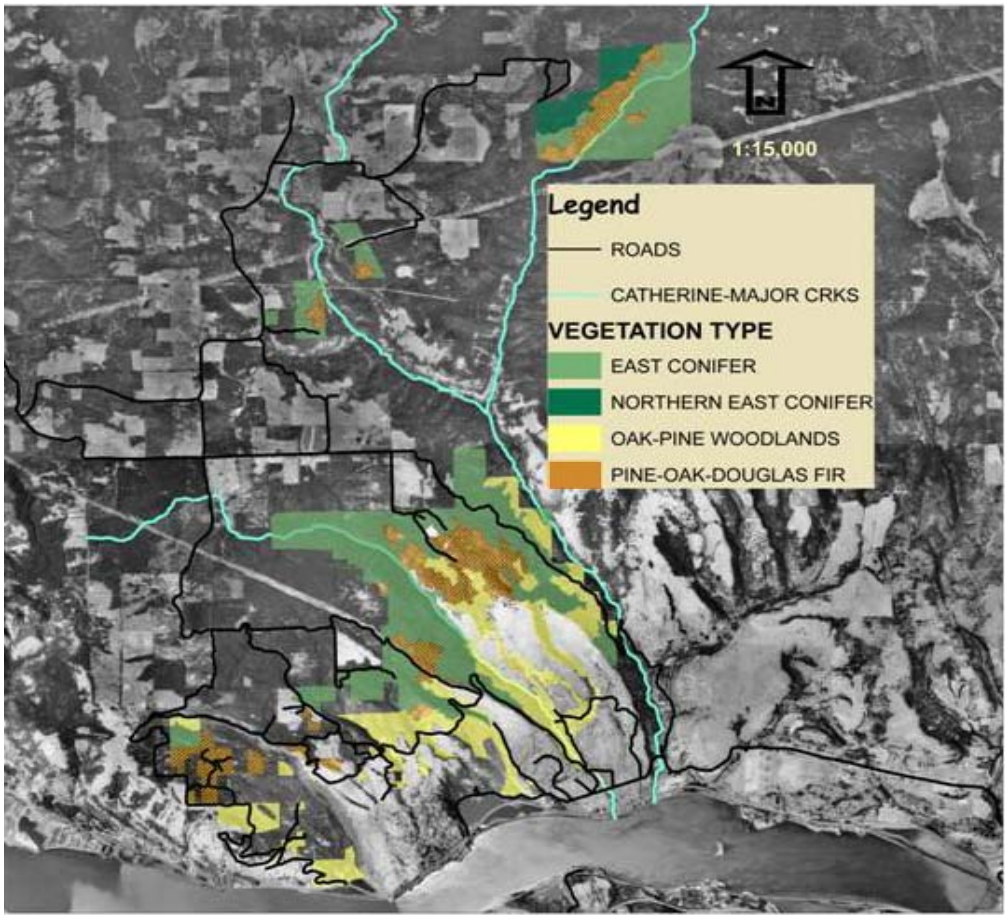
Douglas-fir was the naturally dominant species in stands in the most northern areas of the East Fork of Major Creek and at the highest elevations throughout the project area (referred to as Northern East Conifer by the collaborative group). As fire becomes less frequent and moisture increases, the conditions favoring pine-oak habitat decrease in favor of Douglas-fir habitat. Historically, trees (as evidenced by stumps noted by the working group) grew extremely large and appeared to be spaced at distances from 40-50 feet apart. This spacing was encouraged by the still relatively frequent fire disturbance that regularly removed seedlings and allowed the existing trees the moisture, light and space to grow very large.

At the lowest elevations and along the natural edges of the forested communities, the open savannah oak is to a degree still present. This community intermixes with the open grasslands that were dominant at the lowest elevations where all top soil was washed away during the Bretz floods 10,000 years ago. Although the large pines have largely been cut down, the savannah oaks are today some of the largest and most productive oaks, providing a unique habitat for many edge dependent species. This community is pressured by some fir encroachment and the continued in-growth of younger oaks.

Need for Action

The Cascades transition zone is an ecosystem that has been heavily impacted, declining in quality and quantity, due to human activities such as agriculture, land and housing development, fire suppression, and forest harvest practices (Partners-In-Flight, 2001). Human activities and development continue to fragment and alter natural processes. The pine-oak forests are recognized as a priority habitat by the state of Washington because their distribution is limited and their diversity is very unique (Larsen and Morgan, 1998). Many listed and important game species are dependent on these habitats.

The information summarized above shows that it is critical and timely to take action to move the pine-oak and east conifer communities closer to their historic conditions in order to continue to provide the habitat components that will sustain locally adapted species.



Existing Conditions by Each Vegetation Type:

Existing Conditions for Northern East Conifer in 2006:

- Generally, Douglas-fir stands with few pine or oak.
- Overstory: Stands mostly consist of younger Douglas-fir with scattered older legacy Douglas-fir where not harvested.
- Understory: Understory is heavy in-growth of young Grand fir or Douglas-fir.
- Openings: Large openings in the area appear to be human-made. Natural openings are few and small.
- Shrub and Herbacious Layer: Ground relatively bare—except where harvested.

Existing Conditions for East Conifer in 2006:

- Generally, Three story stand of old oaks, younger Douglas-fir and few pine.
- Overstory: Stands mostly consist of younger Douglas-fir with scattered older Douglas-fir and Ponderosa Pine. Much more Douglas-fir than natural fire regime would have produced.
- Understory: Understory where present is Oregon Oak with heavy in-growth of young Grand fir or Douglas-fir. Large oaks are dying from being overtopped by Douglas-fir. Some small Douglas-fir were removed in 2005. Grand fir seedlings and saplings common with occasional large Grand-fir trees.
- Openings: Small openings that are relatively scarce. Increase somewhat to the southwest into Catherine Creek.
- Shrub and Herbacious Layer: Ground relatively bare--where cover present: ocean-spray, snowberry, hazel, vinemaple, oregon grape, ceanothus, allium, yarrow, and lupine.

Existing Conditions of Pine-Oak-Douglas Fir in 2006:

- Overstory: Large pine much more common than in East Conifer but less than 50%
- Understory: Grand fir less prevalent. No longer over 2% of stand as in East Conifer.
- Oaks are becoming over-topped by fir. Oak regeneration is prevalent.
- Openings: Typically serpentine around oaks and pines.
- Shrub and Herbacious Layer: Cover present: ocean-spray, snowberry, hazel, vinemaple, oregon grape, ceanothus, allium, yarrow, and lupine

Existing Conditions of Oak-Pine Woodlands in 2006:

- Overstory: Scattered Ponderosa Pine and sparse Douglas-fir
- Some areas pine and DF so sparse that Oregon oak is overstory.
- Understory: Understory where oak and pine is present is largely Oregon Oak that is either Oak Savanna or growing in even-age thickets. Some areas have a mixture of both.
- Openings: Disturbance-caused openings are rapidly re-growing with tree species. Some openings appear to be permanent based on soils or moisture content of soils.
- Shrub and Herbacious Layer: Poison Oak very prevalent, some area of other shrub species, native and non-native grasses and wildflowers.

1.5 – DESIRED CONDITIONS

Based on the identified need and the above management direction and guidance, the Columbia River Gorge National Scenic Area Manger sent a letter on March 22, 2006 to interested parties requesting participation in a collaborative effort to design a vegetation management project in the Wildland-Urban Interface including the Catherine Creek area. A collaborative process created the following objectives:

- Fire Resilience: Wildfires will, as far as can be predicted, be surface fires that stay close to the ground under the majority of conditions. Maintenance underburns will be possible.
- Ecosystem Restoration: Restore, as much as possible, the natural fire regime and associated habitats while protecting threatened, endangered or sensitive species and species such as the western gray squirrel.

Fire Resilience

For all stand types, the desired condition is that hazardous fuels would decrease to the point that the potential for uncharacteristic high intensity wildfires is reduced. Fuel management techniques would decrease surface fuel loading, lower branches on larger trees, and reduce the density of understory trees, thereby reducing ladder fuels. Increased spacing between overstory tree crowns would reduce the risk of fire spread between crowns. Herbaceous understories would result in lower intensity fires as native bunchgrasses remain green well into mid-summer.

Forest Ecosytem Components

The desired condition is to move the vegetation structure closer to that of the historic condition when fire was the dominant disturbance regime. This condition can be described in general terms as a more open forest with larger trees and a diverse native herbaceous understory. The forest stand structure would be somewhat less diverse than the existing structure but would have more large trees and snags associated with it.

The desired forest species composition would be similar to what it is today except in the pine-oak-Douglas fir vegetation type. This particular community would have fewer young Douglas and grand fir trees, with a stronger and more dominant pine and oak component. This composition would vary with aspect and moisture conditions--more firs would be expected in areas of higher moisture such as in the East Conifer and Northern East Conifer vegetation types.

Desired Conditions by Each Vegetation Type:

Desired Conditions for Northern East Conifer in 2106:

- Generally, single-story stands of extremely large (50+) Douglas-fir with a vibrant herbaceous understory.
- Overstory: Overstory canopy is large diameter Douglas-fir widely spaced from 30-70'. Pine is protected where present--over the years pine increases from current canopy cover if more open canopy and prescribed underburning encourages it. Otherwise, no pine is present.
- Understory: Regeneration is discouraged by prescribed underburning. New oaks may take advantage of more open canopy. The understory is sparser than in East Conifer so the total canopy is lower. However, Big Leaf Maple is present to increase the total canopy cover between burns.
- Openings: Fire creates openings when prescribed underburning occurs.
- Shrub and Herbacious Layer: Herbacious layer is encouraged. Bare ground is rare, shrub and wildflower cover is common.

Desired Conditions of East Conifer in 2106:

- Overstory: Variable—where oak and pine are present, the canopy is more open, in swales or other places where Douglas-fir is dominant, the canopy is more closed. Pine is present in the more open areas, Douglas-fir is more dominant than pine.
- Understory: Large diameter oak is favored in more open areas.
- Openings: Fire creates openings when prescribed underburning occurs.
- Shrub and Herbacious Layer: Bare ground is rare, shrub and wildflower cover is common.

Desired Conditions of Ponderosa Pine-Oak-Douglas fir in 2106:

- Overstory: Small clumps of Douglas-fir and Ponderosa pine where oak not present-in some places oaks dominate enough to be called the overstory.
- Understory: Oaks are dominant with few seedlings and saplings.
- Openings: New openings and opening maintenance is created by prescribed fire.
- Shrub and Herbacious Layer: Same as existing except more native bunchgrass and other native grasses.

Desired Conditions of Oak-Pine Woodlands in 2106:

- Overstory: Douglas-fir is less than 1% of stand. Pines predominate. In most places, oaks dominate enough to be called the overstory.
- Understory: Foraging area for western gray squirrel. Large oaks are plentiful.
- Openings: New openings and opening maintenance is created by prescribed fire.
- Shrub and Herbacious Layer: Same as existing except more native bunchgrass and other native grasses.

1.6 - PURPOSE AND NEED FOR ACTION

The difference presented between the existing and desired conditions represents a need for management action. The purpose of the proposed action in the Catherine Planning Area is to:

- Take measured management action that will further the long-term objectives created by the collaborative group:
  - Fire Resilience: Wildfires will, as far as can be predicted, be surface fires that stay close to the ground under the majority of conditions. Maintenance underburns will be possible.
  - Ecosystem Restoration: Restore, as much as possible, the natural fire regime and associated habitats while protecting threatened, endangered or sensitive species and species.
- Reduce the immediate risk of high intensity wildfires that have the potential to result in loss of life, property, and important forest ecosystem components by removing the small trees that create fuel ladders into the crowns of larger trees and by increasing the spacing between trees.
- Release overtopped oak trees to forestall their rapid decline.
- Improve the growing conditions for large legacy ponderosa pine trees by removing the understory trees competing with them for moisture and light.
- Reduce the risk of bark beetle tree mortality by reducing the number of trees per acre.

Measurements

- Acres in the planning area that would be treated by removing fuel ladders and increased spacing between trees.
- Acres of planning area where prescribed fire would be possible.
- Acres of oak woodland communities with Douglas-fir encroachment.
- Acres of pine-oak Douglas-fir communities with improved growing conditions for ponderosa pine legacy trees and trees per acre reduction.

1.7 - PROPOSED ACTION OVERVIEW

Catherine Collaborative Group:

The collaborative process for this proposal continued an already active group process begun on March 22, 2006. The deliberations for this proposal began on June 15 with a public meeting in Hood River, Oregon and included 7 meetings and 4 field trips spanning June 15 through September 21, 2006. The collaborative group recommended the following:

The Columbia River Gorge National Scenic Area (CRGNSA) proposes to thin and underburn approximately 2800 acres of Fire Regime I, condition class 2 and 3 tree stands in the Wildland-Urban Interface in the Catherine Creek area and to underburn approximately 1300 acres:

- The proposed action calls for thinning approximately 1800 acres in the Catherine Creek planning area followed by underburning. Thinning will include trees <21" dbh (diameter at breast height) and will require some road maintenance and landing creation, mechanical tree yarding, piling of slash, and pile burning.
- The proposed action calls for no ground-based mechanical thinning on steep slopes (>30%), riparian buffers, and in the oak-pine woodlands (which do not require it). Therefore, approximately 1000 acres will be thinned followed by hand-piling of slash and pile burning.
- The proposal includes the release of overtopped oak and of large, legacy ponderosa pine trees by removing trees around them on approximately 500 acres in the Catherine Creek planning area.
- The proposal would create a prescribed underburning schedule for thinned tree stands and areas where fire can be reintroduced without thinning in the Catherine Creek planning area, and on Burdoin Mtn. Approximately 1300 acres are proposed for underburning only.
- Creation of snags where they are below requirements of the CRGNSA Management Plan.
- Thinning will be "from below" meaning that the smallest--mostly understory trees in the stands will be removed first to achieve the prescribed canopy closure, species preference and size classes after treatment. Large legacy trees will remain. Lower branches on conifers >12" dbh will be considered for being pruned up to 6 ft. to reduce ladder fuels-->21" dbh at a minimum.
- Slash will be grapple or hand piled and burned. Stands will require a 2.5-3ft. fire-line dug before burning where no other fuel break exists.
- All stands will be monitored post-activity for invasive plants.
- Haul routes will be on existing roads or tracks.
- All decommissioned temporary access and other disturbed areas such as fire-line will be seeded with native grasses and wildflowers.
- The treatment for fish bearing and perennial riparian areas (Catherine and Major Creeks):
    - No entry buffer for 50 feet on either side
    - From 50-100 feet, no mechanical thinning (i.e. cut to the prescription for the stand type with sequential entries if necessary leaving the larger cut wood on the ground, hand piling and underburning).
    - Beyond 100' but within the buffer, use mechanical means to achieve the prescriptions per stand type such as helicopter or cable yarding if

necessary and feasible. Where the use of mechanical methods is not advantageous, (such as in oak-pine woodlands), use non-mechanical methods. Where mechanical methods are indicated but not feasible, use the method described in the above bullet for no mechanical thinning.

Some details of the recommended proposal have changed since the NEPA analysis began but the proposal's prescriptions and main components remain. Detail has been added as new information became available (such as the number of acres in riparian buffers, acres of feasible helicopter tree removal areas, fire-line locations, additional implementation requirements, etc.) See Chapter 2, page 25 for the detailed proposed action.

1.8 – PUBLIC INVOLVEMENT AND CONSULTATION

Public Scoping and Coordination with the Tribes and other Agencies:

Public notification regarding the need to restore fire-dependent forest landscapes began in the Burdoin Mountain Planning Area in the winter 2001. In April of 2005, a collaborative and on-going public involvement process was developed and incrementally improved over the years. On March 22, 2006, the Columbia River Gorge National Scenic Area Manger sent a letter to known interested parties including the Indian tribal and local governments, state and federal agencies, and adjacent landowners requesting participation in a collaborative effort to design a forest restoration project in the Wildland-Urban Interface in the Rowena and Catherine Creek areas. All the meetings were announced and open to the general public with the meeting notes placed on the CRGNSA website. Discussions on the Catherine area began on June 15, 2006 with an independent facilitator. The proposed action was the result of the collaborative effort among the following interested individuals, organizations, and agencies:

- 3 private landowners or interested parties
- Washington Department of Fish and Wildlife
- Friends of the Columbia Gorge
- Gifford Pinchot Task Force
- Oregon Natural Resources Council
- USDA, Forest Service

A brief history of the meetings follows:

June 15

The Forest Service introduced the Catherine area, including the objectives developed by the Rowena collaborative group for both projects.

AGREEMENTS

- Forest Service will get background information on the internet and we would use our time on June 22 for the field trip
- The group agreed to a schedule:
    - Office work days every other Thursday when we make final decisions on our field trip tentative decisions.
    - The following field trips:
        - "Allen" property stands (no public access on road)
        - Stands along Major Creek Road

    - Stands along Atwood Road
    - Upper Major Creek stands
- The Forest Service committed to taking photos to use during the office conversations and for those not able to attend a particular field trip.
- The group will have a quiet 5 minutes for considering stands after reaching them.
- For each stand visited the group will note existing condition of each layer including the herbaceous (ground cover) layer. The group will then discuss desired condition and a tentative decision on a treatment prescription.
- The group will discuss the effect of implementation on social issues such as recreation.
- The group described what each would consider a successful process.

June 22-FIELD TRIP-BURDOIN MTN. and CATHERINE SUB-AREA

The group stopped at a Burdoin Mtn. Oak Woodland stand that had been thinned in 2003:

DISCUSSION:

- Question if the thinning was too light. FS replied that monitoring in general indicated that the thinning was too light.
- The monitoring report states for this stand: The Desired Future Condition (DFC) was to maintain average canopy of 70% and a range of 15-75%. The treatment was within that range --with canopy average of 56%. We also decided that the DFC 70% average did not meet the purpose and need of the project which led to the Burdoin II project. The Burdoin II collaborative team changed Oak Woodlands to a 25-60% canopy range.
- The group discussed how maintenance using underburning is necessary to produce the full desired conditions over time in these kinds of stands.

Catherine Stop #1-East Conifer

DISCUSSION:

- The natural fire regime kept Douglas-fir from benefitting from the moisture it can get in this area. Fire kept succession from proceeding to Grand fir.
- Nature needs help—but will take 100 years to reach a desired condition.
- Too thick, needs thinning
- 90-95% of remnant oak woodlands are in Klickitat County.
- Treatments should be a mosaic—similar to a pattern that fire would have produced—more oak on ridges and more fir in drainages.

- Single species or indicator species management not favored by FS specialists.
- Important for Washington Department of Natural Resources to manage for Western gray squirrel. Need clumps of conifer, not single trees.

Catherine Stop #2-Oak-Pine-Douglas fir

Catherine Stop #3 Oak-Pine

The group developed tentative existing conditions for each stand type and some desired conditions for each stand type.

June 29-July 20-FIELD TRIP to ATWOOD ROAD and office follow-up meeting

The group visited more representative stands along Atwood Road in the Catherine sub-area and then met at the FS office to develop prescriptions for the oak-pine woodlands and pine-oak-Douglas fir stand types and continued the discussion on the desired condition and prescription for East Conifer.

DISCUSSION:

- No significant fire in the area since the late 1800s-- Grazing stopped in 1987.
- Some small fires happened, the largest 400 acres of arson
- The oak-pine component of Catherine is roughly estimated at 40% of the project area.
- The group is concerned about clearing radius around large pine--whether it's 30' for large pine (>20") or all sizes.
- There is concern about fir composition. One person would like it represented as 100% in some places in the Desired Conditions.
- Need more Western Gray Squirrel info. FS to invite a specialist speaker.
- FS entomologist Bruce Hostetler is coming on July 27th to discuss ponderosa pine.

- The group planned the last meeting to discuss general prescription things such as how to treat riparian areas, steep slopes, invasives, snags, etc.
- Will plants sensitive to fall prescribed underburning?
- Need a good monitoring plan.
- Some of the group suggested that we should discuss these items with the Tribes.
- Contractors should be very carefully trained to implement the prescriptions.
- The group would like a sample area marked by the FS.
- FS volunteered to see what prescription works in East Conifer with regard to the fire model.

July 27-FIELD TRIP EAST FORK MAJOR CREEK
The group introduced a new stand type, Northern East Conifer, as a result of this trip. They developed a tentative existing and desired condition as well as a prescription.

DISCUSSION:
- Natural fire frequency was probably about 35 years. Major Creek will draw wildfire up like a chimney.
- Area on top where stopped has been logged at least twice.
- Legacy 30-60" dbh Douglas-fir stumps are at anywhere from 30-70 feet spacing. Canopy varies due to clumpiness but is at about 50%.
- No ponderosa pine or Oregon oak in the vicinity but is likely present in small amounts.
- Co-dominant in-growth of Douglas-fir about 40-60 years old and not spaced at the distance of the legacy stumps.
- Not squirrel habitat, some sign of possible goshawk use.
- The stand to the east down towards Major Creek is much more closed, the canopy at 100% or more, no ground cover. Fewer large legacy trees.
- Concerns with sensitive soils, access, steep slopes.

August 3
The meeting was spent verifying the on-going notes on the existing and desired conditions as well as prescriptions for the four stand types.

August 10-FIELD TRIP WEST FORK MAJOR CREEK
Stop #1-Snowden and Bates Rd.

- The group walked down the road to the Forest Service parcel. The group was delighted by large legacy pines with some remnant oak. Growing in a cohort much younger than the pine and oak was Douglas-fir.
- The group discussed the pine and oak prescription for releasing large trees. This sparked a discussion about the degree of open-ness that would create.
- There was also a discussion about spotted owl habitat.
- The group concluded that the stand was in transition between East Conifer and Pine-oak Douglas-fir but thought the prevalence of grand fir indicated that it was East Conifer.

There was lively discussion about the need to thin. Looking down the west slope into the West Fork Major Creek, the stand had been "cherry-picked" by previous private forest practices. Lots of grand fir left—large and small.

Stop #2-Dorsey Road and BPA Line

- The group walked to the south from the end of the road and found a remnant of almost-DFC. It had huge old firs bigger (50+) than any of our DFC descriptions. There were pine trees growing at the edge of the BPA line but this particular stand was fir-dominated. It got much less DFC-like the further east the group walked.
- The group discussed the East Conifer existing and desired condition but did not discuss the prescription.

August 17

The group finished the East Conifer prescription thus finished the proposed action recommendation as it was to appear in the September 2 scoping letter pending approval of the proposed action by CRGNSA Area Manager Dan Harkenrider.

Scoping

The scoping letter and project description, dated September 2 with an extension on September 18, was mailed or e-mailed to approximately 263 individuals, organizations and agencies interested or affected by the proposal recommended through the collaborative process. The letter requested comments on the detailed project description. The collaborative group met with the Forest Service on September 21 to offer comments and to recommend the riparian prescription. (For a listing of agencies and organizations contacted the reader is referred to section 4.4 of this environmental document). On March 13, the Forest Service sent out a consistency review application to interested parties, adjacent landowners, the CRGNSA tribes, and the collaborative group for a 30-day comment period with comments due on April 16. This notice was also added to the CRGNSA website.

Scoping and Consistency Review Comments

The comments received are on file in the project record. A summary of the comments and how they were addressed are located in Appendix B.

1.9 – ISSUES AND CONCERNS

During the development of the proposed action by the collaborative group there were concerns about how the proposal would be implemented and what effects the proposed activities would have on the issues described below. These issues raised during scoping and the collaborative process were addressed by modifying the proposed action or developing additional implementation requirements and are discussed throughout this document.

Air Quality

Levels of smoke from slash and prescribed underburning may have a local, transitory effect on air quality and visibility. Limited visibility along roadways may cause short duration public safety issues. Sensitive members of the public may experience eye, throat, or lung irritation from these exposures. There is some risk that chronic, low-level exposure of workers or the public to smoke may lead to adverse health effects.

Measurement: Tons of emissions with high concentrations of particulate matter.

Access and Third Party Rights
Access issues associated with the project area are complex as a result of the lands being combined together from many different acquisitions. A distinction is made between legal access and physical access. It is not uncommon to have physical access (an existing road), but no legal right of use to the road. Likewise, there are areas with legally defined access for which a road was never constructed. Lastly, there are areas with neither legal nor physical access.

Measurements: Evaluation of types of legal and physical access.
Solution found to access issue (yes or no).

Steep Slopes and Soil Stability
Sections of the treatment area are very steep (>50%), with thin soils. Construction of temporary roads and landings to facilitate thinning can increase the chance of landsliding, surface erosion and delivery of sediment to adjacent stream systems.

Measurement: Miles of temporary road construction on very steep slopes (>50%).

Effects to Soils such as Disturbance and Compaction
Log yarding equipment (tractors, skidders, cable yarding) and burning has the potential to damage soil through compaction, displacement and sterilization. This in turn may increase erosion and decrease site productivity.

Measurements: Intensity of acres burned (high-low)
% acres intensive prescribed burn.
Acres of ground based treatment-% Compacted.

Effects to the Habitats of Plants and Wildlife
Public comment indicated that there would be long term benefits to wildlife and plant habitats as a result of this project, but there were concerns that the short-term impacts would not off-set the long-term benefits. Would the short-term impacts be restored over time?

Measurements: Activity scheduled to avoid sensitive breeding seasons or life cycles.
(Yes or No).
Analysis of Effects in Biological Evaluations (BE).

There were concerns that invasive plants would become established in areas with soil disturbance and infestations would occur within fairly pristine oak-pine-Douglas fir habitats.

Measurement: Monitoring, eradication, and prevention requirements established.
(Yes or No).

There was a concern that converting current Douglas-fir habitats (including those with remnant old oaks and pines) into oak-pine habitats, as were likely present when fire regimes were at a more natural frequency and intensity, may not be desirable in all areas.

Measurement: Acres converted of sustainable Douglas-fir habitat
(East Conifer and Northern East Conifer).

Measurement: Dominant species before treatment is Douglas-fir, other species dominant after treatment.

Effects on Riparian Reserves and Buffers
Tree removal adjacent to streams and wetlands has the potential of increasing stream temperature and increasing sediment due to loss of stream shading and soil disturbance next to the water. This in turn may reduce water quality and degrade aquatic habitat.

Measurement: Miles of fire-line in Riparian reserves, acres treated in Riparian reserves

Effects on Scenic Resources
There may be short term visible disturbance factors such as visible slash, stumps, boundary marking, etc. that will require mitigation to realize the benefits of the long term effect of larger trees in the viewsheds.

Measurements: Acres treated in Foreground, middleground, background distance zones.
Degree of deviation: "form, line, color, or texture common to the natural landscape"--pertaining to meeting scenic standards.

Communication
Residents and others who may be affected need to be informed. Bicycles use Courtney and Atwood roads to access areas inside and outside of the proposed project area. Most hiking by non-locals occurs during the spring flowering season in the open meadows of the lower Catherine Creek drainage.

Measurement: Notice required in alternative? (Yes or No).

Prevention of escaped fire during underburning near private property
There are potential risks to adjacent private property from escaped prescribed fires.

Measurement: Expected Fuel loads and
Miles of fire-line planned at adjacent property boundaries.

Cultural Resources
There are potential risks to cultural resource sites that will require mitigations in order to realize the benefit of reducing fire risk by reducing excess fuels with prescribed fire.

Measurement: Number of sites adversely affected.

1.10 – PROJECT RECORD

This EA hereby incorporates by reference the Project Record. The project record contains specialist reports and other technical documentation used to support the analysis and conclusions in this EA and are included in separate files in order to reduce the size of the EA. The Project Record is available for review at the CRGNSA at 902 Wasco Avenue in Hood River, Oregon.

Portions of the project record such as the Environmental Analysis, Appendices, and notes and background information from the proceedings of the Catherine collaborative group can be found on the CRGNSA website http://www.fs.fed.us/r6/columbia/forest/projects/

1.11 –HELPFUL DEFINITIONS

Canopy closure: The percentage of forest cover formed by the branches and foliage of tree crowns. Looking up, the canopy closure percent is judged by the amount of sky visible as opposed to the amount of sky covered by trees. Looking down, it's the percent of ground shaded by tree crowns directly overhead.

Crown: The portion of a tree composed of branches and stem above the lowest live limb.

Desired Future Condition (DFC)- As used in this document, a description of an ideal stand structure that can be used as a model for designing actions to take in the present that would create the ideal stand in the future. It is based on an historic sustainable stand condition before changes such as fire suppression, timber harvest, or livestock grazing occurred.

Diameter at Breast Height (DBH): The diameter of a tree stem measured 4.5 feet from the ground.

Forest stand structure: The number, types and spacing of tree species, tree sizes, and canopy layers contained in a stand of trees.

Openings: Spaces in the forest where trees are not growing. These may be permanent due to soil and moisture conditions, or they may be temporary—often caused by disturbances such as fire, a wind storm, harvest, or landslide.

Overstory: The highest vertical stratum of individual plants within a community. In a forest or woodland, the overstory is composed of dominant and co-dominant trees. These are the tall or mature trees that rise above the shorter or immature understory trees.

Reference Condition- An historic sustainable condition of forest stand structures before significant alteration from factors such as fire suppression, timber harvest, or livestock grazing occurred at landscape levels.

Remnant overstory or legacy trees: The oldest and largest trees in the overstory, usually the left over "remnants" of a previous stand that was almost completely removed by fire, harvest, or other disturbance. The size differences between these trees and the overstory co-dominants are usually marked. For example, legacy tree diameter at breast height (dbh) may be over 50 inches, while the rest of the stand may contain overstory trees from 20-30 inches.

Savanna: A plant community or vegetation type dominated by grasses with scattered, drought-resistant trees.

Shrub and Herbacious Layer: The layer of vegetation near or on the ground that is typically composed of grass, shrubs, flowers, tree seedlings, and saplings.

Size Composition: The mix of the different sizes of trees in the forest.

Species Composition: The mix of different types of trees and other vegetation in the forest.

Total canopy closure: The percentage measuring the degree to which all layers of the tree canopy combine together to block sunlight or obscure the sky as measured from below.

Understory: The layer of vegetation between the overstory canopy and the shrub and herbaceous layer. These are the shorter or immature trees that are below the tall or mature overstory trees.

Example of how the forest can change without fire.

The picture above was taken in the early 1920s.
The picture below was taken 30 years later.

CHAPTER 2 – ALTERNATIVES

2.0 – INTRODUCTION

This chapter contains a description of the process used to formulate alternatives; a description of alternatives considered but eliminated from detailed study; a detailed description of the action alternatives and the implementation requirements designed into the alternatives. This chapter concludes with a listing of the monitoring and evaluation needs associated with the alternatives.

2.1 - PROCESS USED TO FORMULATE ALTERNATIVES

This chapter describes in detail the Proposed Action that was developed with extensive collaboration under the Healthy Forests Restoration Act (HFRA) authorities to meet the purpose and need described in Chapter 1. This project is wholly within the wildland urban interface described in the Klickitat and Skamania County, Washington Community Wildfire Protection Plan (2006), and is designed to protect, restore, and enhance forest ecosystem components. Therefore, no alternatives to the proposed action are required. The no-action alternative will be analyzed in order to fully describe its consequences.

2.2 – ALTERNATIVES ELIMINATED FROM DETAILED STUDY

Prescribed Fire Only

The use of prescribed fire (under burning) was considered for all stands in the Catherine planning area and eliminated from detailed analysis because the present level of fuel loading and fuel configuration does not support the safe application of this management tool alone in this Wildland-Urban Interface. The exclusion of fire has resulted in an increase in fuel loading, with accumulations of needle duff, branches, brush, and under-story trees, creating a "fuel ladder" which allows surface fires to travel upwards into shrub under-stories and then to tree crowns. Prescribed burning would probably burn hot with high flame lengths lethal to all trees, including large trees.

Prescribed burning only became a prescription within a wider framework of tools—for example in the Burdoin Mtn. subarea where stands have been thinned, the existing grassy meadows within the Catherine subarea, or other areas with light fuel loads.

No treatment of Steep Slopes and Stands with No Access

The Management Plan does not allow new roads in the Open Space zone and the collaborative group was not in favor of introducing the negative effects of temporary road building on steep slopes (>30%) in the area. Such road building would also be costly. Therefore, there are areas that can only be accessed on foot. The group considered not treating these areas but came to the conclusion that some effort should be made to treat these areas using non-mechanical means or by helicopter where feasible. The driving factor for not recommending this alternative is that it does not meet the purpose and need.

Treatment of 8” DBH or less on Steep Slopes and Stands with No Access

Same reasons as above plus the fuel specialists are of the opinion that some larger diameter trees could be felled and the larger portions left on the ground. Therefore, these stands should be treated to prescription where possible rather than be held to a particular size limit not related to the prescription.

Shaded Fuel Break
The fuel specialists stated that these can be effective if there are fire suppression resources present when the fire hits the fuel break --but they have been proven through experience not to be effective. The collaborative group was not in favor of this approach because it is too single-resource oriented. Therefore, this alternative does not meet the purpose and need.

No Burning
The most important reason not to pursue this alternative is that opening stands through thinning will quickly increase the understory growth and fuel load. Underburning is required to control this growth. The investment of expensive small-diameter thinning can reasonably be offset over years of maintenance underburning which is expected to be much less expensive. However, repeated thinning was not acceptable as a continual tool because it will be too expensive and because the collaborative group has an interest in a more natural means to maintain resiliency. In many areas, burning is the only way to remove the fuels because of access. One of the objectives of this forest restoration is to put fire back into the landscape because it was a basic ecological input in dry forest areas such as Catherine. Mechanical thinning does not and cannot mimic all of the beneficial effects to the ecosystem. Therefore, this alternative does not meet the purpose and need.

2.3 - ALTERNATIVES

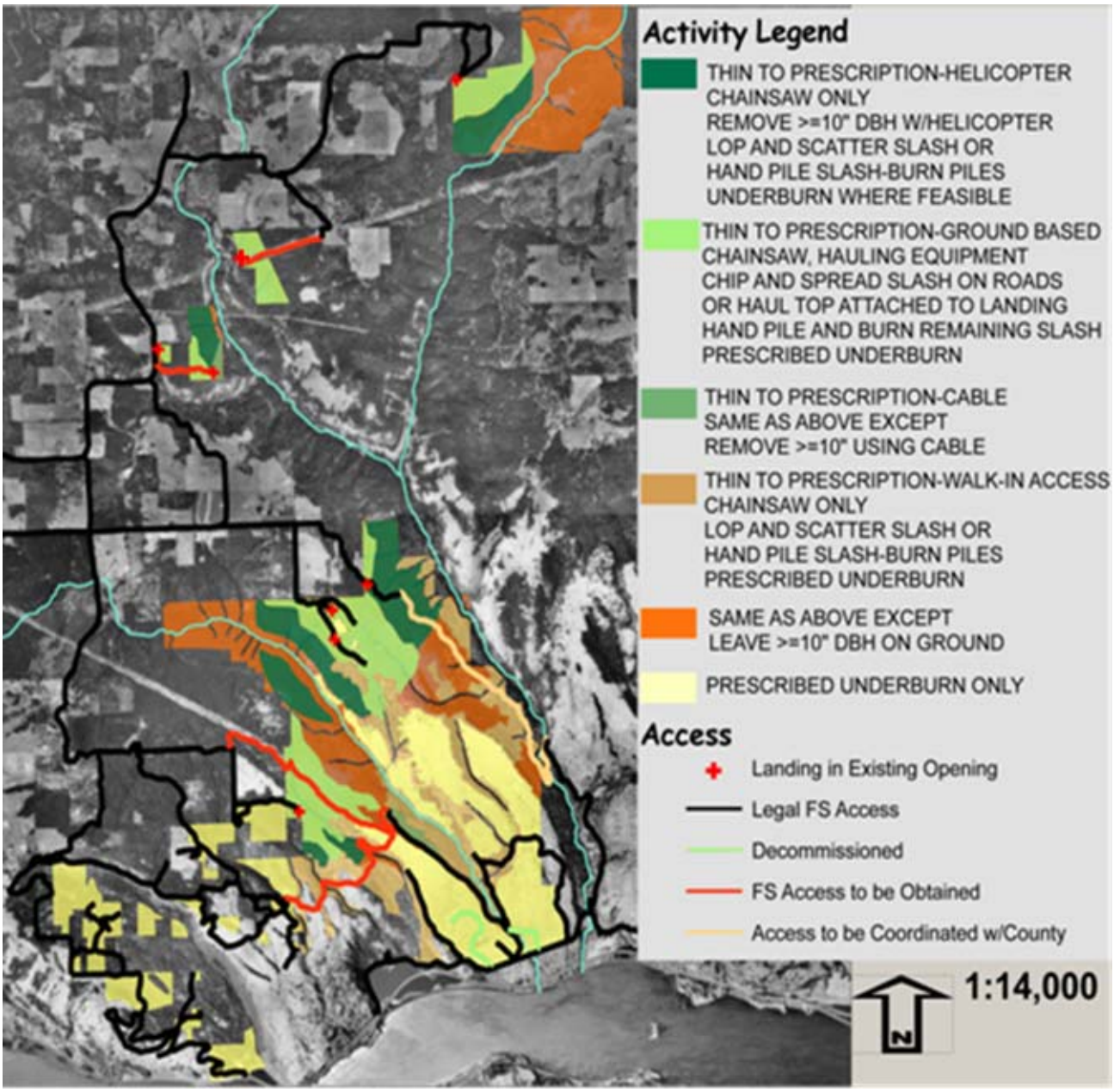
Alternative 1 – No Action Alternative
Under the no action alternative no tree thinning, prescribed fire, or associated actions would occur on federal lands within the Catherine Planning Area to improve fire resilience or restore ecosystem components.

Alternative 2- Proposed Action
This alternative proposes to thin and underburn approximately 2510 acres of Fire Regime I, condition class 2 and 3 tree stands in the Wildland-Urban Interface in the Catherine Creek area, to underburn approximately 1300 acres and retain 290 acres in untreated buffers:

- The proposed action calls for thinning approximately 1,111 acres in the Catherine Creek planning area followed by underburning. Thinning will mostly include trees <21" dbh (diameter at breast height) and will require some road maintenance and landing creation, mechanical tree yarding, piling of slash, and pile burning.
- The proposed action calls for no ground-based mechanical thinning on steep (>30%) slopes and in the oak-pine woodlands (which do not require it). Therefore, approximately 1,399 acres will be thinned using chain saws only followed by hand-piling of slash and pile burning.
- Thinning will be "from below" meaning that the smallest--mostly understory trees in the stands will be removed first to achieve the prescribed canopy closure, species preference and size classes after treatment. Large legacy trees will remain. Lower branches on conifers >12" dbh will be considered for being pruned up to 6 ft. to reduce ladder fuels-->21" dbh at a minimum.

- The proposal includes the release of overtopped oak and of large, legacy ponderosa pine trees by removing trees around them on approximately 500 acres in the Catherine Creek planning area.
- The proposal would create a prescribed underburning schedule for thinned tree stands and areas where fire can be reintroduced without thinning in the planning area. Approximately 1300 acres are proposed for underburning only.
- Slash in excess of what can be left on the ground will be chipped and spread on existing roads, grapple or hand piled and burned. Stands may require a 2.5-3ft. fire-line dug before burning where no other fuel break exists. See preliminary burn plan on page 44.
- Creation of snags where they are below requirements of the CRGNSA Management Plan.
- All stands will be monitored post-activity for invasive plants.
- Haul routes are planned to be on existing roads or tracks except for a small temporary entry to a landing off Snowden Road. See section on roads starting on page 39.
- All decommissioned temporary access and other disturbed areas such as fire-line will be seeded with native grasses and wildflowers.
- The implementation window for project activities within ¼ mile of a bald eagle nest is August 16 - December 31, within 400 ft. of a western gray squirrel nest (or 650 ft. from a goshawk nest) is September 1 - February 28.
- The implementation window for pile burning and prescribed underburning will be set according to weather conditions, air quality requirements, and natural resource conditions specific to the exact location and season. The general season outside of bald eagle nest buffers is July 1-March 15 when moisture and weather conditions are favorable.
- The implementation window for thinning w/o hauling on native surface roads or using ground-based machine operation is July 1-February 28 unless winter range is needed for deer and elk.
- The implementation window for hauling and ground-based machine operation is July 1-October 15. This window may be extended up to February 28 in the event of a prolonged dry period as determined by the contract administrator in consultation with CRGNSA resource specialists.

The table and map on the next page graphically depict the activities described above for this alternative:



PROJECT ACTIVITY IMPLEMENATION WINDOWS (LIGHT GRAY SHADING)												
ACTIVITY	**JUL**	**AUG**	**SEPT**	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**
THINNING &	HAULING DRY MILD WINTER								NOT ALLOWED			
HAULING IN	WET WINTER			NOT ALLOWED								
THINNING &	HAULING IN WINTER RANGE					NOT ALLOWED IN SEVERE WINTER						
PRESCRIBED	FIRE									NOT ALLOWED		
THINNING OR	FIRE	WITHIN ¼ MI. BALD EAGLE NEST					NOT ALLOWED					
THINNING OR	FIRE		WITHIN 400' WG SQUIRREL NEST Or 650' GOSHAWK NEST						NOT ALLOWED			

TREATMENT IN WATER RESOURCE BUFFERS & NWFP RIPARIAN RESERVES

Introduction
Treatments within portions of buffers are necessary in order to increase fire resilience and encourage the development of large trees for improved ecological function. The CRGNSA Management Plan requires that a practicable alternative test be applied when buffers are entered by project activities.

Practicable Alternative Test
The CRGNSA Management Plan states that "A practicable alternative (for entering a water resources buffer) does not exist if a project applicant satisfactorily demonstrates all of the following:

- The basic purpose of the use cannot be reasonably accomplished using one or more other sites in the vicinity that would avoid or result in less adverse effects on wetlands.
- The basic purpose of the use cannot be reasonably accomplished by reducing its proposed size, scope, configuration, or density, or by changing the design of the use in a way that would avoid or result in less adverse effects on wetlands.
- Reasonable attempts were made to remove or accommodate constraints that caused a project applicant to reject alternatives to the proposed use. Such constraints include inadequate infrastructure, parcel size, and land use designations."

The Natural Resource Mitigation Plan that is required by the Management Plan when buffers are entered starts on page 36. It is not possible to restore the stands within the buffers without entering them. The following restrictions designed into the project by the collaborative group and the Forest Service reduced the proposed scope of the treatments within the water resource buffers. A reasonable balance was struck between reducing or removing adverse effects while providing the benefits of the restoration to the water resource buffers:

Treatment restrictions for intermittent and ephemeral non-fish bearing streams
<u>Management Plan buffer width: 50 ft.--Northwest Forest Plan (intermittent only): 200 ft.</u>

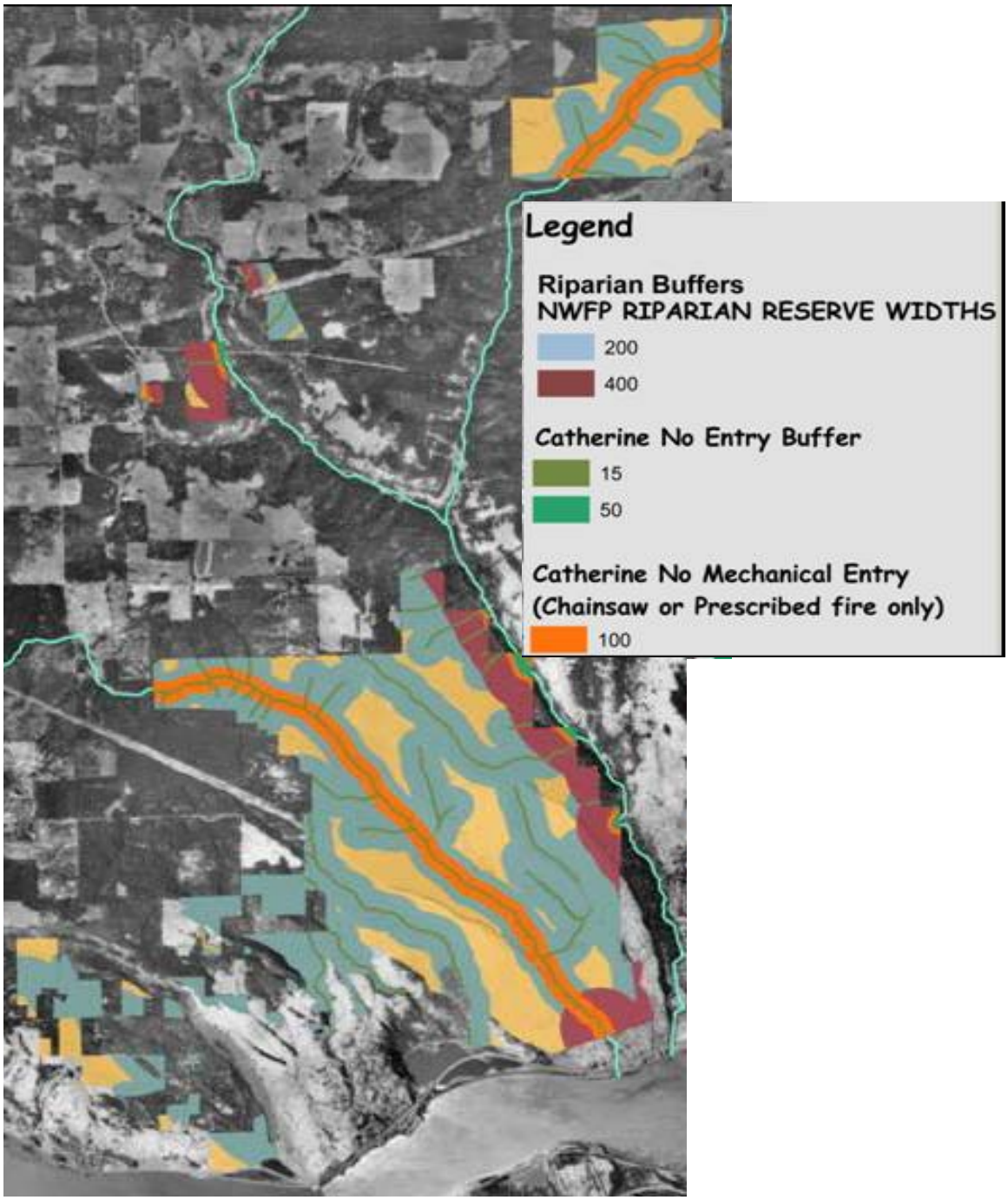
- Intermittent-No thinning or mechanical entry for 15 feet on either side of stream.
- Intermittent and Ephemeral- Ground based yarding, slash piling, or fire-line creation equipment will not be allowed to operate within 20'of channels except to cross them at designated crossings.
- No mechanical constructed fire-line will be allowed within Riparian Reserves

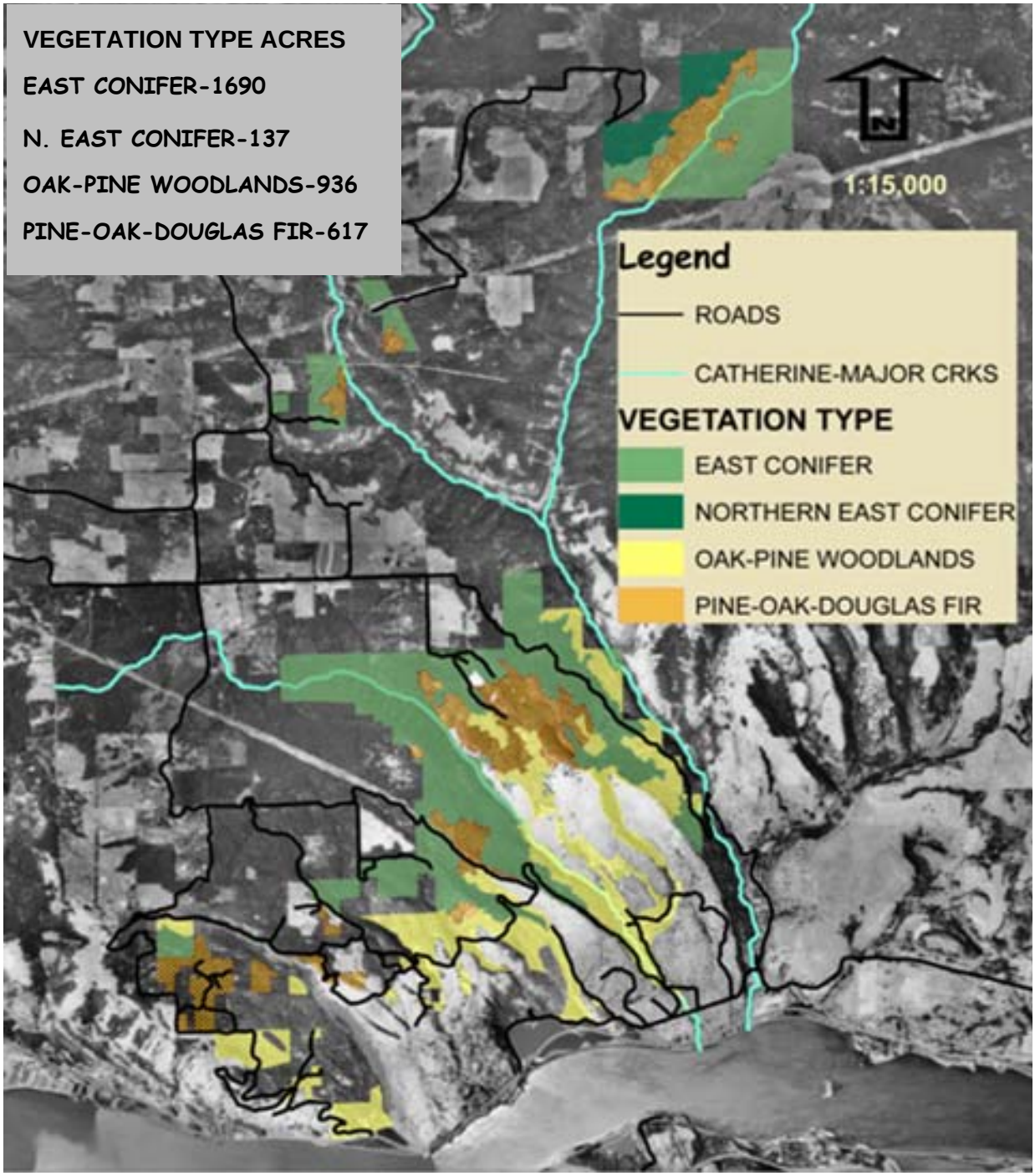
Treatment restrictions for Catherine Cr, Major Creek, and wetland buffers:
<u>Management Plan buffer width: 200 ft.</u>
<u>Northwest Forest Plan buffer width Major Cr: 400 ft.—Catherine Cr: 200 ft.</u>

- 50 feet-No thinning or prescribed fire for 50 feet on either side of stream.
- 100 feet-No mechanical tree removal (i.e. cut using chainsaw only to the prescription for the stand type leaving larger wood on the ground, hand piling slash and schedule underburning if feasible--use sequential entries if necessary). Canopy closure reduction is 50% or less from existing conditions.

- Beyond 100' but within the buffer, use mechanical means to achieve the prescriptions per stand type such as helicopter or cable yarding if necessary and feasible. No mechanical constructed fire-line will be allowed within Riparian Reserves. Where the use of mechanical methods is not indicated, (such as in oak-pine woodlands), use non-mechanical methods. Where mechanical methods are indicated but not feasible, use the method described in the above bullet for no mechanical tree removal.

- Water resource buffers will be delineated during project layout.




VEGETATION TYPE ACRES
EAST CONIFER-1690
N. EAST CONIFER-137
OAK-PINE WOODLANDS-936
PINE-OAK-DOUGLAS FIR-617
N
1:15,000
Legend
ROADS
CATHERINE-MAJOR CRKS
VEGETATION TYPE
EAST CONIFER
NORTHERN EAST CONIFER
OAK-PINE WOODLANDS
PINE-OAK-DOUGLAS FIR

PRESCRIPTIONS BY VEGETATION TYPE

Northern East Conifer East Fork Major Creek
PRESCRIPTION:
Canopy closure is the primary prescription characteristic and shall influence all other elements.

Thin stands to the DFC average canopy closure of 45%. If large (>=20" dbh) pines are found, preserve by removing all trees within a 30'-40' radius of the center of ponderosa pine >=20" dbh. Preserve legacy largest diameter trees (>20" dbh).

Remove grand fir < 20", create snags> 20" dbh. (Number per acre as per Management Plan)

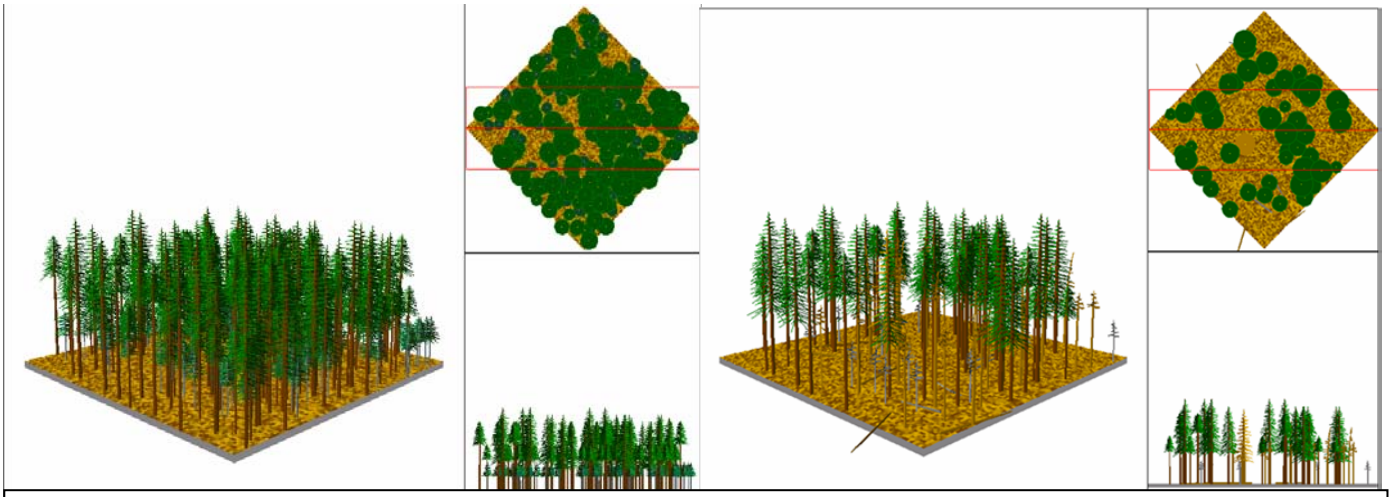
Thin all species from below. Thin to a total canopy no more than 20-30% less than existing canopy while maintaining an average of 45% within the DFC range of 35-65%. Exception is allowed to meet DFC canopy maximum of 65%. Emphasize future diameter growth in the spacing.

Release live oak trees >=10" dbh where found by removing all trees within a 25' radius except leave 1-2 of the largest (>20") conifer trees on the north side if present. Prefer pine.

Set underburning schedule (every 5-10 years) -- conditions will be monitored starting after thinning implementation and slash treatments are complete.

Openings: Created and maintained by underburning.

Snags, Downed Wood, Shrub and Herbacious Layer: Mitigate the effect of thinning and underburning with reference to invasive plants. Snag creation as per Management Plan.



BEFORE THINNING CANOPY 82% AFTER THINNING CANOPY 60%
Forest Vegetation Simulator Model Example for Northern East Conifer

East Conifer
PRESCRIPTION:
Canopy closure is the primary prescription characteristic and shall influence all other elements.

Overstory: Emphasize protection of large legacy pines. Remove all trees within a 30'-40' radius of the center of ponderosa pine >=20" dbh, preferring the largest pine at a rate no more than 3-4 per acre. Leave oak trees >= 12" dbh within radius if present.

No thinning of overstory pine. Remove accumulated duff around legacy pines where a distinct mound has formed. Leave largest diameter fir.

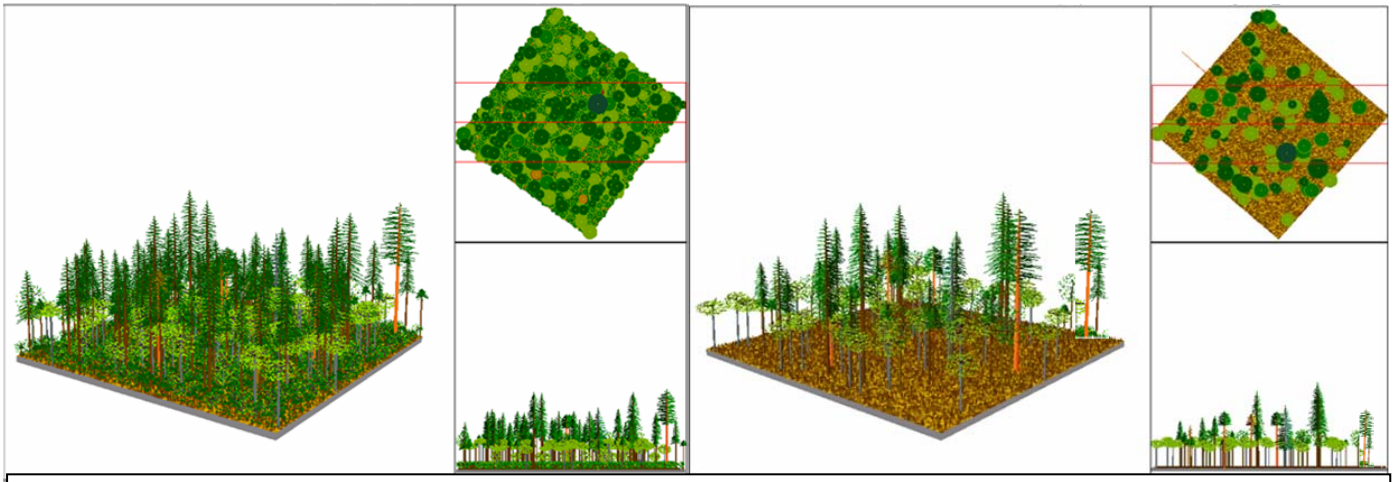
Understory: Thin all species from below. Prefer pine to fir.
Thin to a total canopy no more than 20-30% less than existing canopy while maintaining an average of 60% within the DFC range of 50-70%.

Release live oak trees >=10" dbh within a 20' radius but leave 1-2 of the largest (>20") conifer trees on the north side. Prefer pine.

Set underburning schedule (every 5-10 years) -- conditions will be monitored starting in 5 years from thinning implementation.

Openings: Created and maintained by underburning.

Snags, Downed Wood, Shrub and Herbacious Layer: Mitigate the effect of thinning and underburning with reference to invasive plants. Snag creation as per Management Plan.



BEFORE THINNING CANOPY 66% AFTER THINNING CANOPY 59%
(Canopy is measured without seedlings—canopy is 96% with seedlings)
Forest Vegetation Simulator Model Example for East Conifer

Pine-Oak-Douglas Fir
PRESCRIPTION:
Canopy closure is the primary prescription characteristic and shall influence all other elements.

Overstory: Step 1: Emphasize protection of large pines. Remove all trees within a 30'-40' radius of the center of Ponderosa pine >=20" dbh, preferring the largest pine at a rate no more than 3-4 per acre while leaving 1-2 oak trees >= 12" dbh if present within radius. No thinning of overstory pine.

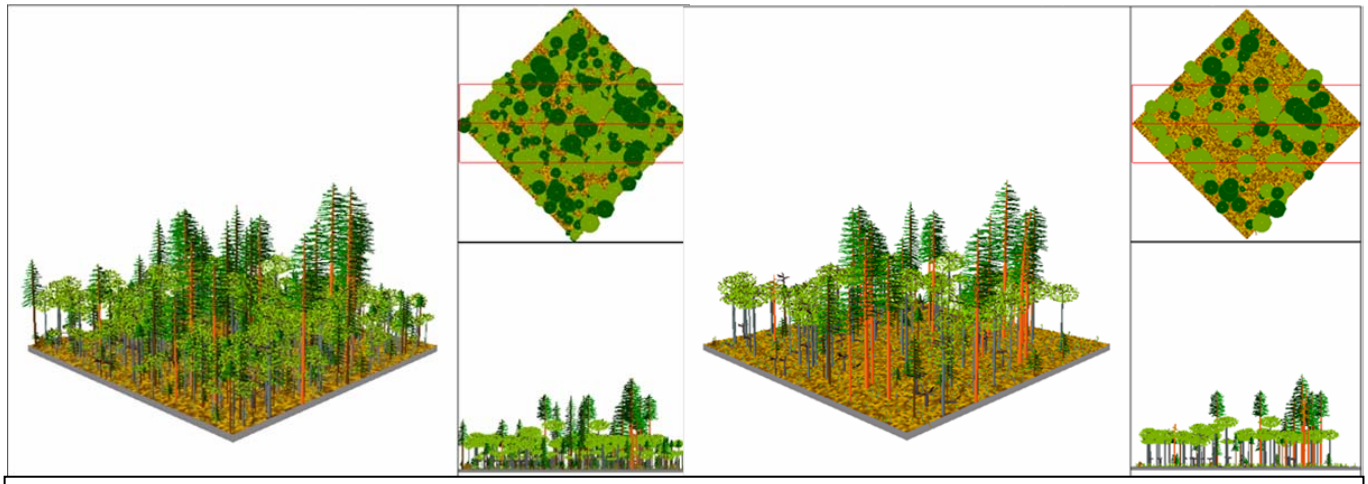
Release DF-overtopped live oak trees >= 10" dbh within a 20' radius but leave 1-2 of the largest (>20") conifer trees on the north side. Prefer pine.

Step 1: Not prescribed for areas within 350 feet of western gray squirrel nest.
Step 2: Check residual canopy from Step 1, if desired total canopy allows, thin understory Douglas-fir to 10% canopy while maintaining total canopy as per "understory" below. Leave largest diameter fir (>20" dbh) unless interferes with getting the desired canopy %.

Understory: Thin all species from below. Prefer pine to fir.
Thin to a total canopy (including overstory) of no more than 20-30% less than existing canopy while maintaining an average of 50% within the DFC range of 30-70%. No thinning of oak >10" dbh. Step 2 not allowed within 50 feet of western gray squirrel nest unless canopy not affected.
Set underburning schedule (every 5-10 years) -- conditions will be monitored starting after thinning implementation and slash treatments are complete.

Openings: Created and maintained by underburning.

Snags, Downed Wood, Shrub and Herbacious Layer: Mitigate the effect of thinning and underburning with reference to invasive plants. Snag creation as per Management Plan.



BEFORE THINNING CANOPY 84% AFTER THINNING CANOPY 59%
Forest Vegetation Simulator Model Example for Pine-Oak-Douglas Fir

Oak-Pine Woodlands
PRESCRIPTION:
Canopy closure is the primary prescription characteristic and shall influence all other elements.

Overstory: Emphasize protection of all large trees. Especially pine >20", oak >10" dbh.
Understory: Thin Oregon oak from below. Thin to a total canopy no more than 30% less than existing canopy while maintaining an average of 50% within the DFC range of 25-60%. Thin areas above 60%. Can thin areas with 25-60% canopy from below if the residual canopy remains at existing per cent.

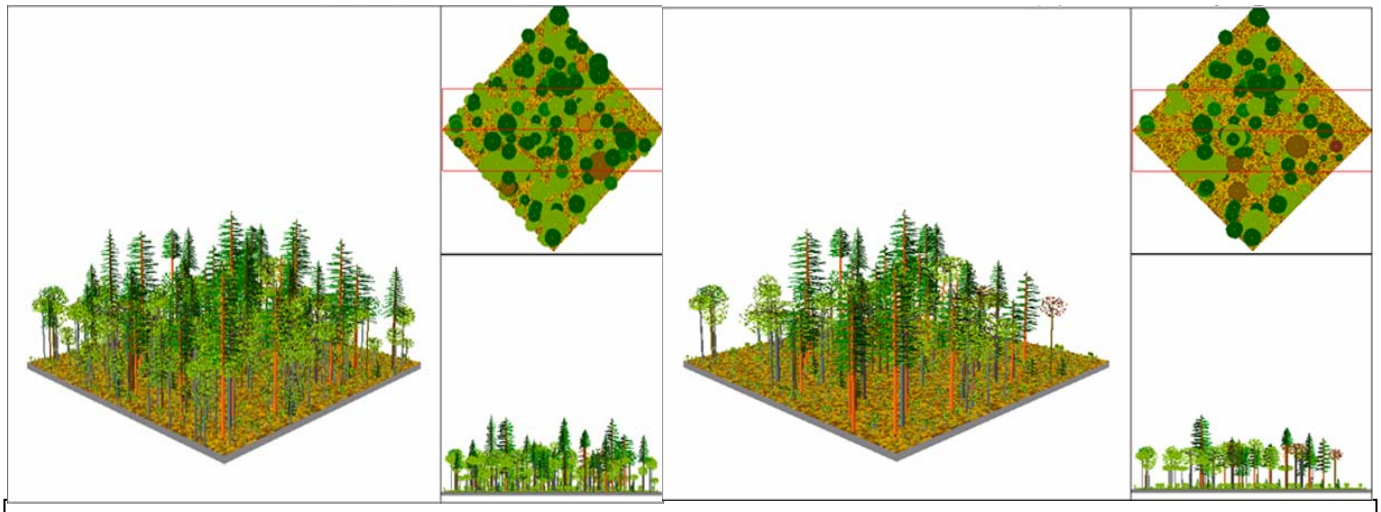
If existing, remove all Douglas-fir seedlings and saplings either by underburning or mechanical means.

Preserve clumps 100' feet away from the base of cliffs, caves, or talus slopes with the following:
Leave untreated clumps of 6-10 oaks spaced 50-150 feet apart (vary).
Treated areas within the 100' buffer are thinned from below in a manner that maintains the existing canopy cover.

Set underburning schedule (every 5-10 years) – Begin underburns in areas not requiring thinning. Monitor conditions in areas requiring thinning after implementation of both thinning and slash treatments.

Openings: Created and maintained by underburning.

Snags, Downed Wood, Shrub and Herbacious Layer: Mitigate the effect of thinning and underburning with reference to invasive plants. Snag creation as per Management Plan.



BEFORE THINNING CANOPY 72% AFTER THINNING CANOPY 58%
Forest Vegetation Simulator Model Example for Oak-Pine Woodlands

IMPLEMENTATION REQUIREMENTS

Air Quality

1. Minimize the amount of material burned by making it available for other uses such as personal use firewood and habitat restoration projects as a first priority.
2. When necessary, excess material shall be burned only when weather conditions minimize impacts from smoke. These include: burning on cloudy days when residual smoke cannot be seen; burn during low visitor time periods; and burning during periods of atmospheric instability for better smoke dispersal. Generally these conditions exist or a window can be found in all seasons. It is the most difficult from December to March when inversions are common.

Natural Resources

(Serves as Natural Resource Mitigation Plan as required by CRGNSA Management Plan)

Helpful definitions:

- **Haul Routes**-Existing roads chosen to accommodate vehicles up to the size of a log truck.
- **Temporary Road**-A short, (<.5 mile) new natural surface road to a landing built to a standard that will allow both temporary (1-2 years) use by vehicles the size of a log truck and effective decommissioning and restoration.
- **Skid road**-Provides temporary (1 year) access to landings for skidders, tractors, etc. No log truck access and little to no blading is used to create them. Tree removal is usually not necessary. They are usually designated on existing roads or tracks.
- **Skid trail**-Provides very short term access (1 to 3 passes) for skidders, tractors, etc. No log truck access, no blading and no tree removal (other than as per prescription) is used to create them.
- **Landing**-An existing or newly cleared area (up to 150 x 200 ft.) for the temporary storage of logs and slash that may need some minimal blading or grading to create. Usually located in existing disturbed areas such as roads, turnouts, quarries, previous created openings, etc. but may require additional tree removal.

3. This project was designed to use existing roads. New temporary roads shall be considered only if the protection of resources requires it and shall be very short (<.15 mile). Any temporary road shall be pre-designated and agreed to by the CRGNSA hydrologist, engineer and archeologist prior to tree removal activities.
4. Track-mounted piling equipment or other low-impact equipment shall operate on top of slash to minimize soil disturbance where possible.
5. Ground based yarding, slash piling, or fire-line creation equipment will not be allowed on slopes steeper than 30%. These steeper areas will be hand piled if fuel reduction is necessary.
6. No mechanically constructed fire-line shall be allowed within Riparian Reserves.
7. Skid roads determined by the Forest Service to have detrimental soil compaction will be ripped to a depth of 18”, water-barred, sown with native grass seed, and mulched with fine slash.
8. Any new temporary roads and all landings not part of an existing road shall be decommissioned and restored as per #7 above as part of contract completion.

9. Scenic Area Management Plan standards for soil productivity will be met in the project area. These state that not more than 15% of an activity area will be detrimentally disturbed. This includes compaction, displacement, puddling and removal of organic layers exposing mineral soil. This will require the designation of skid trails.
10. Ground based yarding, slash piling, or fire-line creation equipment in ground-based treatment areas will not be allowed to operate within 20'of intermittent or ephemeral channels except to cross them at designated crossings.
11. Trees will be directionally felled away from streams and wetlands.
12. All wetland-dependent vegetation shall be left undisturbed.
13. Invasive plant issues shall be part of project effectiveness monitoring and the yearly CRGNSA eradication program shall prioritize needs in the planning area.
14. Clean equipment before entering NFS lands and before moving to each treatment area in a manner that will ensure that it is not contributing to the spread of invasive plants. Known patches of invasive plants shall be avoided to forestall spread until eradicated.
15. Snags and large woody debris shall be provided or preserved as per the CRGNSA Management Plan. Burn pile location shall take less than 10% of the area and shall protect trees, snags, and down wood.
16. Treatment areas shall be reviewed for snag creation needs as part of this project.
17. Snags and down wood shall not be taken for firewood. Firewood permits and signs at cutting areas shall state this prohibition and encourage compliance.
18. Any snags cut for worker safety shall remain on the ground. Snags >12" dbh will not be cut without prior FS approval.
19. Project activities except prescribed fire will occur outside of the growing season of plants and the general nesting/rearing season for birds, gray squirrel and other wildlife species (March 1 through June 30). Prescribed fire shall not occur March 15-June 30.
20. No project activities are allowed within ¼ mile of a bald eagle nest from January 1 through August 15. Nest and roost trees shall be retained.
21. No project activities are allowed within 650 ft. of goshawk nest from March 1 through August 31. Nest trees shall be retained. Surveys to be conducted before implementation.
22. All active western gray squirrel (WGS) nest sites shall have a 50 ft. no-thinning buffer around the nest tree. The trees within the buffer will be limbed to a 10' height to reduce crown fire risk, as needed. As nests are located, the most current WDFW management recommendations will be consulted; currently the 2006 *Draft* Washington State Recovery Plan for the WGS. Deviations from the Management Recommendations may be prescribed to fit local site characteristics, as collaborated with WDFW before implementation.
23. No loud (thinning activities including chainsaws) activity will occur within 400 ft. of active WGS nest trees from March 1 through August 31.
24. If the scenic area or state wildlife biologist determines that the area is needed as winter range (such as due to harsh winter weather), no mechanized equipment (including chainsaws) will be used between December 15-March 1 to reduce cumulative disturbance to deer/elk on their designated winter range.
25. If any sensitive wildlife or flora is located during the project, the Scenic Area wildlife biologist or ecologist shall be notified and appropriate measures taken to ensure protection.
26. Areas where post treatment field surveys indicate that a majority of the vegetation was removed and slow vegetation recovery is expected will be seeded with a native seed mixture to reduce the chance of surface erosion.

27. Revegetate all disturbed areas with desired native bunch grass, forb and shrub species. Appropriate forage species include bluebunch wheatgrass (*Agropyron spicatum*), Idaho fescue (*Festuca idahoensis*), Serviceberry (*Amelanchier alnifolia*), arrowleaf balsamroot (*Balsamorhiza sagittata*), deerbrush (*Ceanothus integerrimus*), and others.
28. Known sites of sensitive plant species shall be protected by a buffer (200 ft) around each site within which no pile burning or mechanized equipment (except chain saws) shall be allowed. Any newly found sites will be given similar protection.

Scenic Resources

29. No permanent leave tree marking shall be used except the marking of boundary trees near the base of each tree.
30. Stumps >10" dbh shall be flush cut in the immediate foreground (within 50 ft) of Snowden Road.
31. The landing at Snowden Road shall retain screening from existing trees as seen from Snowden Road wherever safety concerns permit.
32. Minimize the visual exposure of the BPA powerline to adjacent properties by maintaining the tallest screening trees in stands traversed by BPA lines.

Recreation and Recreational Facilities and Access

33. Trail users, residents and the general public will be notified of thinning and underburning activities by posting warning signs at key trail intersections at a minimum of four weeks before the activity. Develop and distribute press release/key messages to local press, outdoor equipment stores, user clubs, user organizations, and the Forest Service web site.
34. Before project commences, pursue necessary agreements with landowners for access.
35. Firewood will be made available to the public only on roads where public access is allowed rather than on roads owned by others where the Forest Service is allowed access for administrative purposes only.
36. The implementation window for hauling and ground-based machine operation is July 1-October 15. This window may be extended to February 28 in the event of a prolonged dry period as determined by the contract administrator in consultation with CRGNSA resource specialists.

Cultural Resources

37. Archeological sites shall be identified in the field and taken out of the treatment boundaries, including the appropriate buffers.
38. Should any historic or prehistoric cultural resources be uncovered during project activities, the Forest Service, or their agents, shall cease work and immediately notify the CRGNSA office and the Washington State Historic Preservation Office (Department of Archaeology and Historic Preservation). If the cultural resources are prehistoric or otherwise associated with Indian people, the Forest Service shall also notify the Indian tribal governments within 24-hours.

Vegetation Management

39. All prescriptions and marking guides shall include canopy closure as a control on the extent of tree removal, and use variable spacing for diversity and to maintain interlocking canopies.
40. De-commissioned landings shall be considered as areas suitable for planting ponderosa pine and/or Oregon oak seedlings.
41. Adaptive Management effectiveness monitoring may require changes to prescriptions after first treatments are monitored. Changes must reflect the intent of the original prescriptions to meet the stated desired conditions, mitigations and effects to resources.

ACCESS AND LANDS INFORMATION

The project area is comprised of land acquired from private parties, with the exception of two 40-acre parcels transferred from Bureau of Land Management jurisdiction to Forest Service jurisdiction. Each acquisition file was examined to determine access status and third party rights. This information is displayed in depth in Appendix C. Access to the Burdoin sub-area was established during development of the Burdoin Mtn. EA.

The map on page 28 indicates which roads require the Forest Service to obtain permanent easement rights where there is existing physical access but no legal access rights, particularly where the physical access is over Bonneville Power Administration (BPA) managed land or easements.

ROAD MAINTENANCE AND LANDINGS

Some of the local roads accessing the project area will need minor reconstruction work to accommodate log haul. All of the local roads used for log haul will require some level of maintenance between the landings and the public road system. Haul routes will be on existing roads or tracks. The hauling window is July 1 – October 15 because most of the local roads providing access are native surfaced and will not support extended season haul without additional cost for reconstruction. This window may be extended up to February 28 in the event of a prolonged dry period as determined by the contract administrator in consultation with CRGNSA resource specialists.

Cost data for minor local road reconstruction and for local road maintenance are from the Gifford Pinchot National Forest publication "Cost Estimation Guide for Road Maintenance", last updated in June, 2006.

Haul Routes

The table below indicates preliminary log haul routes. The routes on National Forest System lands and within the treatment areas will not change, but the actual routes on public roads may change according to the needs of the contractor.

Common point is the intersection of SR 14 with Oak Street in Bingen, Washington. Note that the Forest Service does not currently have access rights on all of the local access roads. Refer elsewhere to the section "Access and Lands Information" for further discussion. Courtney Road is not included in the log haul routes proposed. The section between the end of the existing pavement and a point approximately two miles northerly consists of one narrow lane with few turnouts and tight curves. Reconstruction of this two mile section would be required to accommodate log haul from both operational and safety standpoints.

Preliminary Haul Routes to Bingen, Washington

Access Road	Forest Service Access Rights	Haul Route (public roads unless otherwise noted)
3119267	Yes	Acme Road – Snowden Road
BPA-3119097	No	Dorsey Road – Acme Road – Snowden Road
Landing, Sec. 3 (1)	Yes	Snowden Road
Upper Major Creek (2)	Yes	Bates Road – Snowden Road

3110320	Yes	Upper Major Creek Road – Bates Road – Snowden Road
BPA-3112300	No	Atwood Road – FS 1230020 – Old Hwy. No. 8 – SR 14
1230020	Yes	Old Hwy. No. 8 – SR 14
3112304	Yes	Bristol Road – Bates Road – Snowden Road

(1) T. 3 N., R. 11 E., NW1/4 SW1/4 SE1/4 Sec. 3, adjacent to Snowden Road.
(2) County road; Forest Service maps a.k.a. 3110000.

Proposed Road Work

CONSTRUCTION AND RECONSTRUCTION

Chapter 4 of Forest Service Handbook 7709.56, "Road Preconstruction Handbook", was used to determine log truck and lowboy minimum lane widths for the type of local access roads to be used for tree removal (Traffic Service Level D, low standard, low use and as further defined in Chapter 4) and forms the basis for determining reconstruction or construction work required. For any given central angle and radius of curvature, the lowboy will require a greater minimum lane width than a log truck. Traffic Service Level D roads typically accommodate log trucks, but not lowboys as vehicles such as yarders and log loaders "may have to be off loaded and walked in". Because of physical constraints, insufficient right-of-way or easement width, and environmental concerns, only one of the local access roads included in this proposal will be designed to accommodate lowboys.

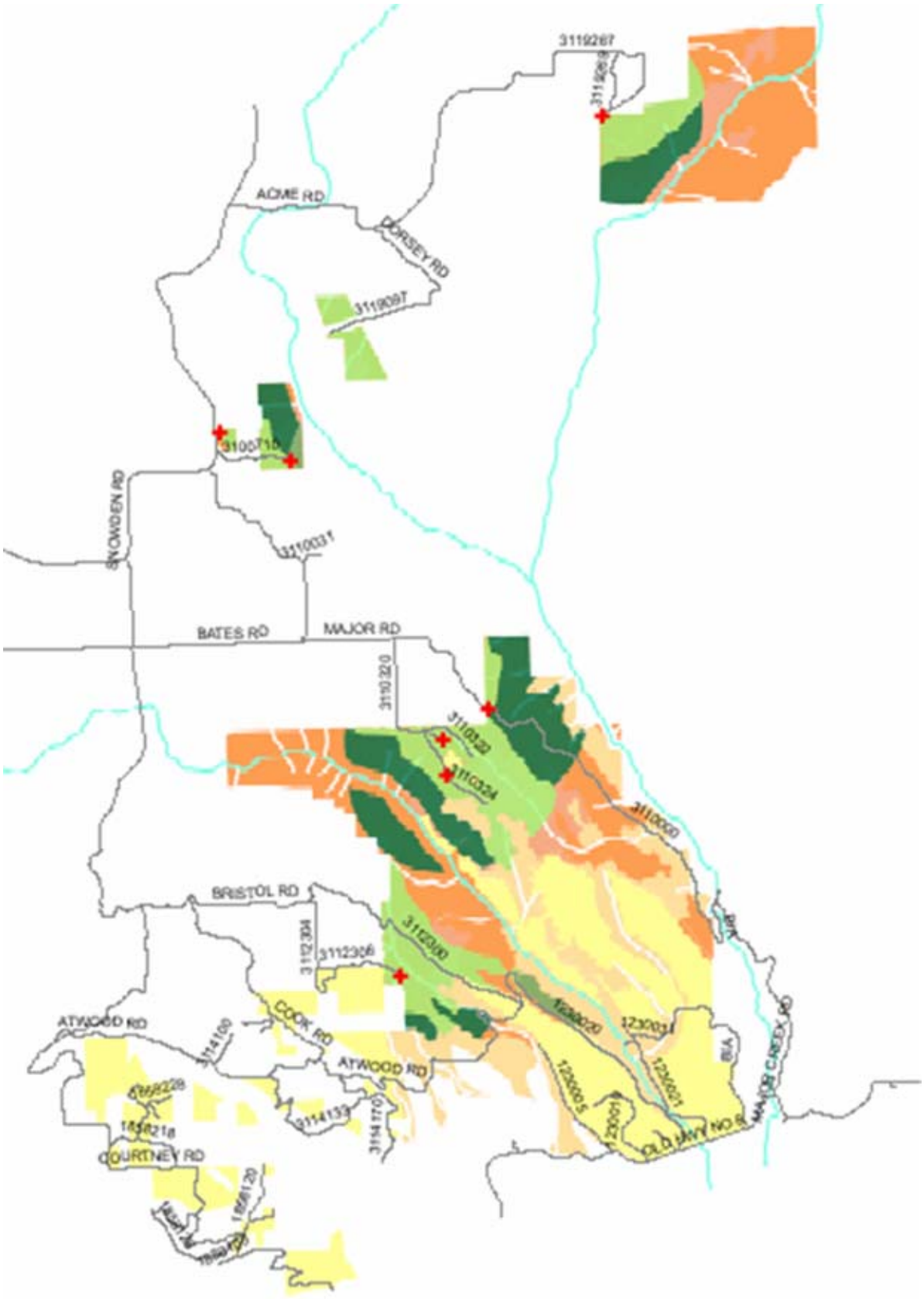
The following table provides a description of the construction or reconstruction work needed to utilize some of the local roads for log haul. A permit from Klickitat County is required where noted.

Roads with Construction or Reconstruction Work to Allow Log Truck Access (1)

Access Road	**Description of Work (all dimensions and quantities are approximate *post haul restoration work included where it is proposed*)**
BPA-3119097	Temporary improvement at the junction with Dorsey Road to provide log truck turning radius. A road approach permit from Klickitat County is required. Anticipated work includes 50 feet of fence removal; clearing 0.02 acre of brush; and grading for a length of 60 feet (by 16 feet wide). Grading involves minimal excavation or fill. *Post haul, reset fence and re-contour graded area.*
Landing, Sec. 3	Temporary road approach to Snowden Road at milepost 7.3 to provide lowboy as well as log truck access. A road approach permit from Klickitat County is required. Anticipated work: relocation of road warning sign; 45 feet of fence removal; clearing by removing four fir trees of 12 inch dbh or less; installing 70 feet of 12 inch culvert pipe in the existing ditch line; grading for a length of 150 feet (average width 20 feet), including 50 cubic yards of excavation and 20 cubic yards of fill; and placing 60 cubic yards of pit run rock surfacing over the first 60 feet of road length. Work adjacent to the County road will require temporary traffic control. *Post haul, remove rock, re-contour graded area, remove culvert pipe, restore road shoulder and ditch line, and reset fence. Work adjacent to the County road will require temporary traffic control.*

3110320	(a) Widen the road on its approach to North Major Creek Road to provide log truck turning radius. A road approach permit from Klickitat County is required. Anticipated work includes clearing 0.01 acre of brush; and grading for a length of 60 feet (by 17 feet wide), with 10 cubic yards of excavation. Work adjacent to the County road will require temporary traffic control. (b) Construct 100 feet of road (by 18 feet wide) at milepost 0.5 to provide log truck turning radius. Work includes resetting a power pole guy line and anchor (by the P.U.D.); 30 feet of fence removal; clearing by removing five fir trees of 4 inch to 24 inch dbh; and grading to level the existing ground surface with minimal excavation or fill. *Post haul, re-contour graded area and reset fence.*
BPA-3112300	Construct 170 feet of road on its approach to the Atwood Road to provide log truck turning radius. Work includes grading (average width 20 feet), with 150 cubic yards of excavation. The constructed road will replace 120 feet of existing road. Place the excavated material from the constructed road into the template of the existing road to be abandoned, contour and seed to native grass.
Atwood Road	Widen the road on the inside of a curve ¼ mile northerly of the junction with Road BPA-3112300 for log truck turning radius. Includes clearing 0.01 acre of brush and small firs; and grading by completing 10 cubic yards of excavation.
1230020	(a) Temporary road approach to Old Hwy. No. 8 at milepost 1.5 to provide log truck access. A road approach permit from Klickitat County is required. Anticipated work: 20 feet of fence removal; installation of a temporary gate to control public access during haul; grading for a length of 60 feet (by 16 feet wide) to level the ground surface with minimal excavation or fill; and placing 40 cubic yards of pit run rock surfacing over the first 60 feet of road length. Work adjacent to the County road will require temporary traffic control. *Post haul, remove rock, re-contour graded area and reset fence. Work adjacent to the County road will require temporary traffic control.* (b) Mitigate severe "bumps" between milepost 0.05 and 0.15 by removing the tops of existing exposed rock masses, or by constructing ramping on either side of the "bumps" with placement of a total of 50 cubic yards of pit run rock. (c) At milepost 0.2, through a total length of 150 feet, provide a reverse curve "swing out" to provide log truck access. Work includes removing 20 cubic yards of rock slope to increase road width by 5 feet at the existing angle point in the road (transition to existing road width 60 feet northerly); and placing 10 cubic yards of open graded rock in the flat area south and east of the existing angle point in the road to form the "swing out" area.

(1) Lowboy access provided where noted.


3119267
ADME RD
DORSEY RD
3119097
SNOWDEN RD
3110031
BATES RD
MAJOR RD
3110320
3110324
BRISTOL RD
3112300
3112306
ATWOOD RD
COOK RD
ATWOOD RD
3114133
3114170
COURTNEY RD
MAJOR CREEK RD

ROAD MAINTENANCE

All of the local access roads used for log haul will require some level of maintenance work. The type of maintenance work to be completed is described by category as follows:

- *Pre-haul* – minor log out, spot brush/limb up, fill waterbars, remove ruts, remove minor slough or slide material.
- *During haul* – blade once, remove minor slough or slide material.
- *Post haul* – reestablish waterbars and other drainage, shape the roadway.
- The heaviest *pre-haul* maintenance work is described as follows:
- BPA-3119097-remove deep ruts.
- North Major Creek Road-remove moderate to deep ruts and complete moderate to heavy brush out, milepost 0.9 to milepost 1.4. A permit from Klickitat County to perform work within County road right-of-way is required.
- BPA-3112300-remove moderate depth ruts.
- 3112306-heavy brush out.

ACTIVITY CREATED FUELS TREATMENT

There are several methods proposed to treated the wood residue from the thinning prescription implementation:

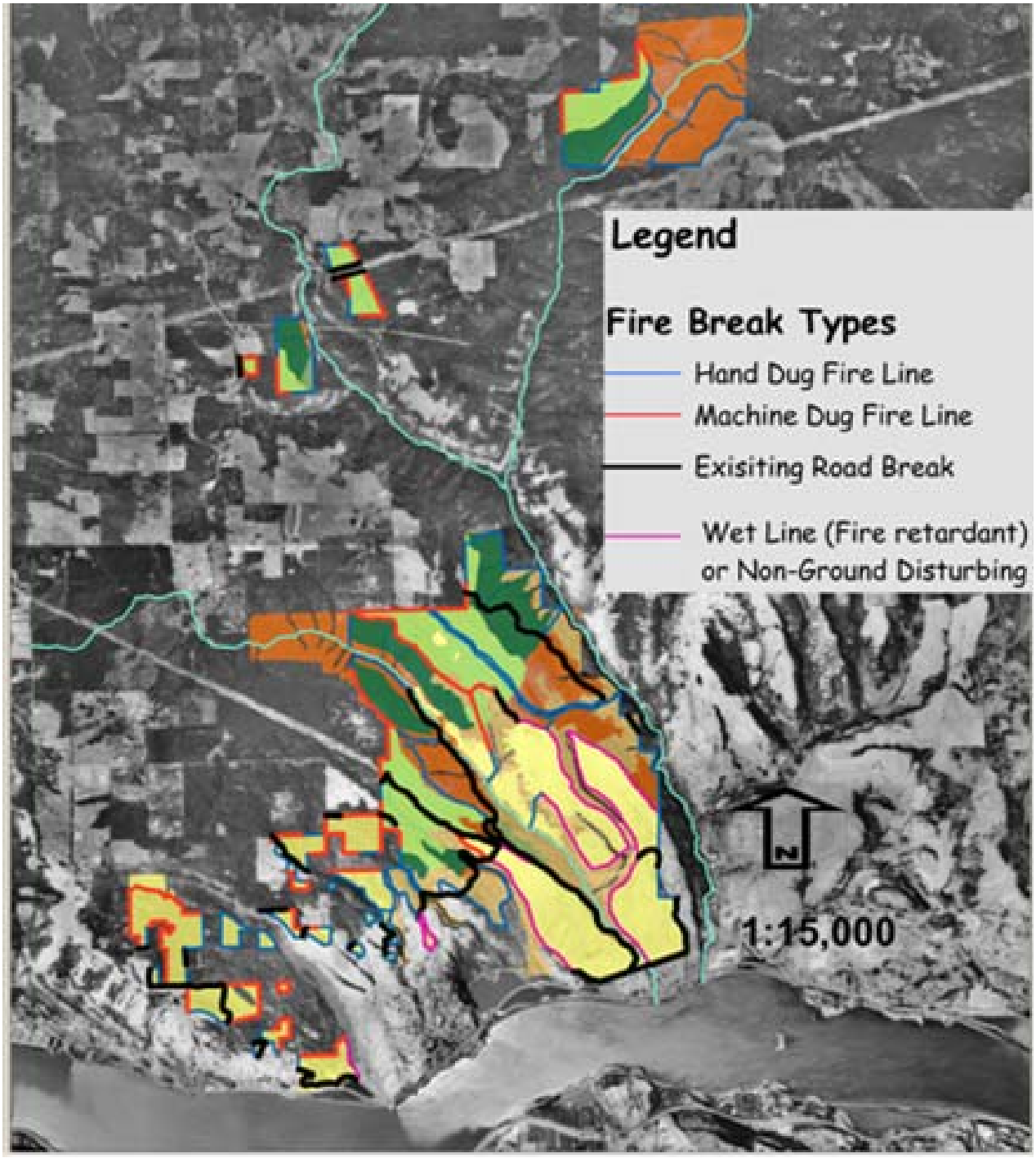
- Hand Pile-approximately 1,464 acres
- Grapple Pile-approximately and/or yard tops attached, chip at landing (spread chips on road)—approximately 619 acres.

PRESCRIBED FIRE IMPLEMENTATION

The purpose of prescribed burning is to reduce the survival of encroaching Douglas-fir seedlings and the number of new oak and pine tree seedlings, reduce surface fuels, reduce litter and duff depth, increase canopy base height, and provide other benefits that are known to occur when fire-adapted landscapes are brought closer to being within the range of natural variability. Prescribed burning is best used in areas with lighter fuel loads. It is estimated that 1,300 acres are currently available for treatment without pre-thinning. Approximately 2,510 acres will require thinning and slash pile burning before prescribed fire can be applied. Future maintenance burning will be needed to limit regeneration and maintain low levels of surface fuels. The CRGNSA fire specialists will evaluate areas for prescribed fire as funding becomes available. Prescribed fire implementation plans will be prepared before treatment. Existing fire breaks and new fire-line will be required to ensure control. Fire-line will be constructed as needed (about 200 acres underburning per year) and will be sown with native grasses following use. The following priorities will be used for fire breaks based on safety and feasibility:

1. Existing roads and other existing breaks.
2. Wet-line (fire retardant) or non-ground disturbing hand-dug fire-line.
3. Hand-dug fire-line.
4. Fire-line dug using small (trail-sized) equipment.
5. Machine dug fire-line using larger equipment.

The map on the next page indicates a preliminary plan for how these priorities apply:


Legend
Fire Break Types
Hand Dug Fire Line
Machine Dug Fire Line
Exisiting Road Break
Wet Line (Fire retardant)
or Non-Ground Disturbing
N
1:15,000

FINANCIAL FEASIBILITY ANALYSIS and SCHEDULE

According to the "Catherine Forest Restoration Economic Feasibility Analysis" (Forest Resource Enterprises, November, 2006), mechanical tree removal systems to be considered consist of helicopter, tractor, and cable systems. The helicopter system is the most expensive method but is considered necessary to avoid the building of temporary roads for access.

The designated landings and several of the roads that access the project area will need minor reconstruction and pre-haul maintenance work. The estimated positive residual value were for Douglas-fir trees >=10" dbh considering removal costs including transportation. A positive residual value means that costs will be offset by the revenue generated and thus will be feasible to accomplish.

Tree Removal System	Estimated Acres	Estimated Average DBH Removed
Helicopter	492	
Ground based	588	
Cable	31	
Total	**1111**	14.6
Non-Mech Thinning	1399	
No thin-buffers	290	
Total project – ALT 2	**2800**	

Attribute	Helicopter	Ground Based	Cable
Acres with positive residual value	492	588	31
Estimated total value, positive residual value	$ 228,381	$ 880,218	$ 39,591

It is assumed that, due to the acres listed above with positive value, stewardship funds will be available to cover the cost of removing the <10" dbh trees as per the prescription, pile slash, and create the necessary fire breaks in the mechanically entered areas. The helicopter areas may be treated separately if necessary (when costs are at a level to make it feasible to proceed). All other mechanically thinned areas are currently scheduled for implementation in 2008.

Total cost for the 1,399 acres of non-mechancial thinning @500.00 per acre is $699,500.00. At the current CRGNSA federal allocation rate of approximately $100,000.00 per year, it will take more than six years to complete. Prescribed underburning will cost approximately $250.00 an acre to implement. At the current CRGNSA federal allocation rate of $50,000.00 a year, prescribed fire could proceed at approximately 200 acres per year unless funding is increased.

ROAD MAINTENANCE COST SUMMARY

The table which follows summarizes the estimated costs for road work associated with hauling logs, including an estimated cost for landing development from the earlier cited reference by Forest Resource Enterprises. The cost of acquiring easements where required is not included in this table.

Summary of Estimated Costs for Local Access Road Work

Access Road	Length, Miles	Minor Reconst.	Road Maint.	Develop Landings	TOTALS
3119267	1.1	$0	$2,200	$500	$2,700
BPA-3119097	0.6	$800	$1,500	$500	$2,800
Landing, Sec.3	0.1	$1,500(1)	$0	$500	$2,000
Upper Major Creek Road	1.4	$0	$1,600(2)	$500	$2,100
3110320	0.8	$0	$1,600	$500	$2,100
3110322	0.4	$0	$800	$500	$1,300
3110324	0.7	$0	$1,700	$500	$2,200
BPA-3112300	1.1	$1,000(3)	$2,400	$1,000	$4,400
Atwood Road	0.3	$0	$700	$0	$700
1230020	0.6	$2,700	$3,200	$500	$6,400
3112304	0.3	$0	$1,200	$0	$1,200
3112306	0.5	$0	$1,200	$500	$1,700
TOTALS	8.9	$6,000	18,100	$5,500	$29,600

(1) Includes traffic control on Snowden Road.

(2) Estimated work for milepost 0.7 to milepost 1.4. Final work required depends upon Klickitat County requirements.

(3) Includes item a) only from the above table "Roads with Minor Reconstruction Work to Allow Log Truck Access".

2.4 - MONITORING AND EVALUATION NEEDS

The following monitoring needs were developed using an adaptive management stance with regard to this project. The areas treated in the first year of implementation would be monitored and the information gained would be used in the next year's implementation. It will afford information for better implementation as the project progresses over time:

Implementation Monitoring

Evaluate the efficiency of the implementation by answering the following:

- Did marking guides fully represent the prescriptions
- Did thinning results match prescriptions?
- Were applicable implementation requirements reflected in contracts?
- Were all implementation requirements useful?
- Were all implementation requirements carried out?

Effectiveness Monitoring

- Evaluate the effectiveness of the implementation requirements.
- Evaluate riparian area buffer treatments with reference to bank stability.
- Evaluate the changes in fire size and intensity over the landscape.
- The CRGNSA Archeologist should field review treatment areas that are adjacent to protected heritage resources to determine if the avoidance measures adequately avoided the resource or if the treatment revealed a larger area than was previously found.
- Measure percent area with encroaching Douglas-fir.
- Measure percent area with large, well spaced, pines and oak
- Measure any change in number of western gray squirrel nests in project area.
- Measure acres reduced ladder fuels.

If we assume that this stand is a fir dominated East Conifer or Northern East Conifer stand, then the above is a possible DFC of a well-spaced cathedral forest with a potential for very large trees.

CHAPTER 3 –AFFECTED ENVIRONMENT AND ENVIRONMENTAL EFFECTS
NSA MANAGEMENT PLAN CONSISTENCY FINDINGS

3.0 – INTRODUCTION

This chapter addresses the potential environmental impacts that could result with the implementation of each alternative. Direct, indirect and cumulative effects are described. Cumulative effects occur because of a combination of past, current, and reasonably foreseeable future actions. Evaluation of these effects help the decision maker select an alternative.

Mitigation measures associated with each, or common to all alternatives, are also identified in this chapter if needed by resource area to be consistent with the NSA Management Plan or other requirements. These mitigations were incorporated into the respective alternative and are part of the design of the alternative and listed as special implementation requirements in Chapter 2. The natural resource mitigation plan required by the CRGNSA Management Plan is also a part of the special implementation requirements. The following tables of known previous and foreseeable future actions within the planning area will be used in the development of the cumulative effect analyses for each resource. The actions relevant to a particular resource will be applied and the cumulative effects evaluated in the cumulative effects sections in this chapter.

Table of Previous Projects and Known Actions within the Planning Area

PROJECT NAME/ TYPE	ACTIONS	LOCATION/DATE
Burdoin I Small diameter Thin	Thinning, slash pile burning	2003 Burdoin Sub-area Complete
Volunteer Fire Dept. Firehouse	Small amount of tree removal, brushing, installation of building and utilities.	2002 Burdoin Sub-area Complete
Courtney Road widening	Tree removal and paving	2005 Burdoin Sub-area Complete
Allen Property thinning and structure removal	Small diameter thinning and structure removal	2003-5 Catherine sub-area On-going
BPA road widening	Road widening	Just North County Rd. 1230-complete
Invasive Plant treatments	Herbicide or Mechanical Treatment	Hand pulling-Rd. 1230 Herbicides-Just east of Coyote Wall. On-going
Catherine Creek Trail	Paved accessible trail	Adjacent but outside planning area-complete
Land acquisitions	Purchase SMA lands	After 1986-present
Historic Forest Practices	Historic Harvests large oak, pine, Douglas-fir	Planning area/ circa 1860-1920

Table of Reasonably Foreseeable Future Projects or Actions within the Planning Area

PROJECT NAME/ TYPE	ACTIONS	LOCATION/DATE
Burdoin II Thin from Below	Thinning, slash pile burning, road maintenance, soil de-compaction	2007 Burdoin Sub-area
Coyote wall FS trails	Designated trails and decommissioning unwanted trails	After 2007
Land aquisitions	Purchase SMA lands	Unknown
Invasive Plant treatments	Herbicide or Mechanical Treatment	On-going
State/Private SMA forest practices	Forest Practices consistent with NSA guidelines	Unknown

3.1 - EFFECTS TO FIRE RESILIENCE AND AIR QUALITY

FIRE RESILIENCE

Introduction

Fire resilience can be summarized as an ecosystem's ability recover from or adjust easily to the disturbance of fire. Fire is an important element of many ecosystems and is necessary for some species to complete their life cycles. In a review of 90 ecosystem management projects in the United States, Yaffee et al. (1996) found that in 34% of the projects, disruption of the natural fire regime was an important human-caused stress on the ecosystem.

Analysis Methods and Measurements

Fire Regime Condition Class

Hardy and other scientists from the USDA Forest Service provided the research to develop condition class attributes. This group of researchers developed a spatial database of historic natural fire regimes for the eleven western states. The base-layer spatial data they used was a 159-class Land Cover Classification database derived from seasonal profiles from the USGS EROS Data Center. In order to assign fire regimes to Land Cover Characterization databases they added in biophysical data, Kuchler's unit data (4th code), and the ecological sub-regions based on Bailey's sections.

Fire regimes describe the historic frequency and severity of wildland fires. Under the natural fire regime in Catherine, fires occurred at a frequency (0-35 years) repetitive enough to kill younger trees and brush. This repetitive burning reduced the fuel loading (including ladder fuels) for the next fire. Thus, under the natural fire regime, fires tended to burn at the ground surface rather than in the tree crowns. Fire suppression and the resulting exclusion altered this regime by removing an important pattern of disturbance and renewal.

Condition class is an expression of the difference between the current condition of vegetation types and the condition during the historic fire regime. It is used as a proxy for the probability of severe fire effects. Condition class is useful as an index of ecosystem risks attributable to an occurrence of wildland fire under the current regime of fire suppression.

Fire regimes and condition classes are listed in the USDA Forest Service General Technical Report RMRS-GTR-87.2002 as cited in the Healthy Forest Restoration Act (HFRA) to describe existing stands in fire-dependent landscapes as to the degree of alteration from the historic fire regime and the relative risk of fire-caused losses of key components of the forest ecosystem.

Surface Fuel models

Surface Fuel models (FM) are used to help describe and quantify surface fuel situations and estimate fire behavior. Fuel Models are selected based on the fact that fire burns through fuels that are best conditioned to support sustained combustion (smallest, least compact, continuous, driest, etc). Criteria for choosing a fuel models involves assessing the fuel layers that will support a fire as it spreads and generates heat intensity. Where fuel beds are relatively continuous with similar fuel characteristics, one model can provide a realistic representation of expected fire behavior. On the other hand, situations occur where one fuel model represents the rate of spread most accurately and another best depicts fire intensity. In other situations, two fuel conditions may exist, so the spread of fire across the area must be weighted by the fraction of the area occupied by each fuel type.

The publication, Aids to Determining Fuel Models for Estimating Fire Behavior (Anderson, 1982) was used to identify fuel models within the project area. Fuel loadings for naturally occurring forest debris were calculated using the Photo Series For Quantifying Natural Forest Residues in Common Vegetation Types of the Pacific Northwest (1980), Stereo Photo Series for Quantifying Natural Fuels Volume I: Mixed Conifer with Mortality, Western Juniper, Sagebrush, and Grassland Types in the Interior Pacific Northwest (1998), and Volume VII of the National Wildfire Coordinating Group Stereo Photo Series for Quantifying Natural Fuels (Maxwell & Ward, 2004).

Ladder and Crown Fuels

The density and continuity of tree canopies as well as the canopy base height provide ladder fuels. More simply stated, ladder fuels are any shrubs, limbs or branches, either living or dead, which can provide a surface fire with a route into the tree crown.

Existing Conditions

Weather

The Columbia River Gorge provides the only east-west sea-level break in the Cascade Mountain Range--connecting the Columbia Basin with the Pacific coastline. As a result, strong winds are common year round. In the spring and summer, wind direction is predominately from the west as the cooler west side air near the Pacific Ocean pushes through the gorge to replace the warmer rising air of the desert interior. In the fall, this pattern begins to fluctuate and gives rise to significant episodic east wind events that last throughout the winter.

There are no remote weather stations located within the project area. However, wind readings recorded at an air quality monitoring station in Wishram, Washington during the summer of 2000 show an average wind speed for June through August of 18.4 MPH, that the wind was out of the west 88 % of the time, and the maximum wind speed was 47.5 MPH.

Additionally, the average wind speeds listed below were measured in Dallesport Washington from May through November during the years indicated. Approximately 75% of the time these winds were out of the west.

Years	Average wind speed (MPH)	Average gusts
1996-1998	10.50	24.89
1999-2001	11.24	26.48
2002-2004	10.77	28.41

The Cascade Mountain Range serves as an effective moisture barrier causing weather systems to dump the majority of their moisture west of the peaks leaving the project area in a "rain shadow." Rainfall totals are collected and averaged at weather stations managed by the Oregon Climate Service (OCS) throughout the gorge. From 1961-1990 the Hood River weather station averaged 31.05 inches of rain per year. Only 19 miles east and during the same time period the OCS weather station in The Dalles recorded an average 13.97 inches of rain per year. The project area is some six miles east and two miles north of the Hood River OCS weather station. Extrapolating this weather data, the estimated average annual precipitation within the project area is 23-26 inches. The majority of this precipitation reaches the ground as rain.

Temperature readings measured in The Dalles, Oregon from 1975 through 1995 indicate that the east end of the gorge spends an average of 42.6 days above 90˚ F. The average number of days with temperatures between 90˚-100˚ F. was 34 and an average of nine days are experienced with temperatures exceeding 100˚ F.

In early September east wind conditions develop and the directional pattern throughout the gorge begins to fluctuate. Under certain atmospheric conditions the gorge acts like a chimney and carries the arid east wind directly through the west end of the gorge. Early settlers referred to the east wind as the "Devil Wind" for the fire problems it created. Extreme fire behavior associated with the 'Devil Wind" has been observed in the Columbia River Gorge since 1902 when the Yacolt Fire burned over 200,000 acres in less than 36 hours.

Topography

Topography influences fire behavior at different special scales. The rate at which a fire spreads doubles from 0 to 30 percent slope and doubles again from 30 to 60 percent slope. Ridges, drainages, and other topographic features work with and against the wind to create localized turbulence that affects both the rate at which a fire spreads as well as the amount of energy released. Such topographical influences combine with general wind direction to dictate the rate and direction of a fire's spread as well as the effects a fire has over the landscape.

Volcanism; lava flows, glaciations and erosion are the key forces that formed the Columbia Gorge landscape. The project area is fractured by Catherine and Major Creek drainages which flow southeasterly. While the predominant aspect of the project area is southerly, these drainages offer significant and steep east and west aspects. The remainder of the area presents gentle to moderately steep slopes. Elevations within the project area range from 80 to 2500 feet above sea level.

Fire Suppression and Protection

There are some 94 adjacent land owners and an estimated 55 homes within or adjacent to the project area. Adjacent land parcels and in-holdings vary in size as well as uses and management objectives. Some are as small as five acres and have primary residences. Others are hundreds of acres and are currently being managed for timber values.

Wildland fire threatens structures and adjacent property in three primary ways; direct exposure from flames, radiant heat and airborne firebrands. The proposed treatment is intended, in part, to decrease the probability of wildland fire damaging structures and private property by reducing these primary threats.

Defensible space refers to the reduction of vegetation between a structure and an oncoming fire to reduce fire intensity and provide fire fighters with the opportunity to safely and effectively defend the structure. Fuels can be treated in a relatively small area immediately surrounding a structure to reduce exposure to radiant heat and direct flame impingement. Fuel reduction within 40 meters of a structure can substantially reduce ignitions from direct exposure to flames and their radiant heat (Cohen 1995 and Alexander et al 1998).

With the exception of the Burdoin Mtn. fire station, (located on USFS systems land under a special use permit) all of the structures at risk in the project area are on private property. Some landowners have created defensible space around their structures and more are in the process. Reducing the fuel loading, fuel continuity and the availability of ladder fuels decreases fire intensity and firebrands which increases the ability to control fires. Reducing the threat of ignition from firebrands requires reducing the vegetation both near and at some distance from private property. Ignitions may result from firebrands originating as far away as 1 kilometer or more (Cohen, 2000). Anecdotal evidence suggests that viable firebrands may travel as far as 1 ½ miles.

Four Volunteer Fire Departments (VFD's), The Washington Department of Natural Resources (WDNR) and USDA, Forest Service (USFS) share fire protection responsibilities within or directly adjacent to the project area. The VFD's include Bingen, Lyle, Cherry Heights and Appleton and they respond to both structure and wildland fires within their respective district boundaries. The WDNR assumes wildland fire protection responsibilities on both state and private land within and adjacent to the project area and the USFS assumes wildland protection responsibilities for those lands administered by the Forest Service. This fire community is universally concerned about the existing fuel loads, stand structure and fuel continuity fuels within the project area.

Risk
Fire risk is defined as the chance of a fire starting from any ignition source. This is determined by using the frequency of past fire starts. Since 1997 there have been numerous fires within and immediately adjacent to the project area. Ignition sources include virtually the full spectrum of human causes and include lightning. Human causes include power lines, fireworks, vehicle and equipment exhaust, debris burning, and arson.

Fire Hazard
Fire hazard for any given forest or landscape is the potential magnitude of fire behavior and effects as a function of fuel conditions (Peterson et al. 2004). Fire hazard most commonly refers to the predicted difficulty of controlling a potential wildfire. Fire behavior characteristics such as rate-of-spread, intensity, torching, crowning, spotting, persistence, or resistance to control are generally used to determine and describe fire hazard. Fire severity can also be considered an element of fire hazard (Brown et al. 2003).

Wildfires burn quickly and can consume hundreds and even thousands of acres in a single day. Under average summer weather conditions, at the lower elevations of the project area, fires have repeatedly consumed hundreds of acres in a matter of hours. Fire suppression resources confine 95% of all starts to less than 10 acres. Those that exceed 10 acres are typically ignitions that occur when atmospheric conditions allow for extreme fire behavior, are initiated in areas of high contiguous fuel loads, are not quickly accessible, or do not allow suppression resources to work in close proximity to the fire, or some combination of the above.

Fire behavior and severity depend on the properties of various fuel strata and the continuity thereof. Such fuel strata have been classified into the following layers:

- Tree canopy
- Shrubs and small trees
- Woody fuels
- Moss, lichens and litter
- Ground fuels or duff (Graham et al. 2004).

The influences of fine fuels such as litter, duff, grasses and small woody vegetation (less than 3 inches in diameter) have the most effect on a fire's intensity and rate-of-spread. Such fuels are used in the fire behavior models developed for predicting the behavior of an initiating fire (Rothermel 1983). Coarse woody debris 3 inches in diameter and larger have little influence on spread rates and intensity of an initiating fire. However, they do contribute to the development high fire severity and large scale fires. Fire persistence, resistance-to-control and residence time are significantly influenced by fuel loading and size and the decay state of large woody fuel. Torching, spotting and crowning contribute to large fire growth and are greater where large woody fuels have accumulated under a forest canopy. Large woody fuel with significant decay are the preferred fuel bed for firebrands and can hold can hold fire for extended periods of time (Brown et al. 2003). Spot fires can also be started in rot pockets of standing snags.

Crown fires are considered the primary hazard to life, property, and ecological function. Crown fires occur when surface fires create enough energy to preheat and combust the fuels

well above the surface (Agee 2002). Crown fires present the greatest hazard to public and fire fighter safety due to long range spotting. Such hazards prompt fire fighters to use indirect fire suppression strategies which increase both the area burned and the fire severity over the landscape.

Fuel conditions within the project area and their representative hazards are the result of fire exclusion, timber management practices and livestock grazing. This has led to an increase in understory vegetation and surface fuels, a change in species composition, and an increase in the continuity of vertical and horizontal stand structure. As a result, the potential for crown and severe fires has increased. Historically, stand structure played an important role in maintaining fire resilient ecosystems (Graham, et al. 2004).

Fire Regime Condition Class

The Catherine area was determined to be a high priority because of its location near development, its location in the transitional rain shadow zone east of the Cascades. Past land management activities, including fire exclusion, left this fire dependent ecosystem with high stem densities that make it susceptible to wildfires of a greater severity than is typical of the natural fire regime.

Fire regimes describe the historic frequency and severity of wildland fires. Under the natural fire regime in Catherine, fires occurred at a frequency (0-35 years) repetitive enough to kill younger trees and brush. This repetitive burning reduced the fuel loading (including ladder fuels) for the next fire. Thus, under the natural fire regime, fires tended to burn at the ground surface rather than in the tree crowns. Fire exclusion and altered this regime by removing an important pattern of disturbance and renewal.

Condition class is an expression of the difference between the current condition of vegetation types and the condition during the historic fire regime. It is used as a proxy for the probability of severe fire effects. Condition class is useful as an index of ecosystem risks attributable to an occurrence of wildland fire under the current regime of fire exclusion.

Fire regimes and condition classes are listed in the USDA Forest Service General Technical Report RMRS-GTR-87.2002 as cited in the Healthy Forest Restoration Act (HFRA) to describe existing stands in fire-dependent landscapes as to the degree of alteration from the historic fire regime and the relative risk of fire-caused losses of key components of the forest ecosystem.

Within the project area, departures from the natural fire regime were caused by fire exclusion, timber harvesting, livestock grazing, introduction and establishment of exotic plant species, introduced insects or disease, or other management activities.
Most of the stands in the Catherine area were considered to be in Condition Classes 3. Condition Class 3 is a significantly altered fire regime, at high risk for losing key ecosystem components, dramatic change to pattern, size, frequency, or severity of fires where vegetation attributes have been significantly altered from their historical range.

Additional information on condition classes may be found in Protecting People and Sustaining Resources in Fire-Adapted Ecosystems–A Cohesive Strategy, published by the National Wildfire Coordinating Group.

The Condition Class 3 determination for the project is based on the following research used as reference conditions and juxtaposed with existing site conditions in the project area:

1. **Reference Condition-Fire Frequency**
   Historically, Oregon white oak was subjected to a fire regime of low-severity surface fires every 7.5 to 13.3 years (Stuart, John D. 1987. Madrono 34(2):128-141).

   Existing Condition
   Fire has been largely excluded from the project area for nearly 80 years.

2. **Reference Condition-Oregon Oak Sprout Behavior**
   In the absence of fire, Oregon white oak sprout clumps form dense, even-aged stands. Most Oregon white oak woodlands of today are of this type due to fire suppression. (Habeck, J. R. 1962. Proceedings of the Montana Academy of Sciences. 21:7-17).

   Existing Condition
   This is the condition of much of the Oregon white oak seen within project area; it has evolved from dense sprout clumps and tends to be even-aged.

3. **Reference Condition- Oak Savannas**
   Frequent fire in Oregon white oak habitat resulted in the open savannas (Sugihara, Neil G.; Reed, Lois J.; Lenihan, James M. 1987. Madrono. 34(3): 193-208).

   Existing Condition
   Due to encroachment by less fire tolerant species and oak sprout density there are few remnants of these open savannas within the project area.

4. **Reference Condition- Pondersoa Pine Forests**
   Fire is an integral part of the ecology of ponderosa pine. Prior to 1900, most stands experienced low-severity surface fires at intervals ranging from 1 to 30 years. (Arno, Stephen F. 1988. Fire ecology and its management implications in ponderosa pine forests. In: Baumgartner, David M.; Lotan, James E., compilers. Ponderosa pine: The species and its management: Symposium proceedings; 1987 September 29 - October 1; Spokane, WA. Pullman, WA: Washington State University, Cooperative Extension: 133-139.)

   Existing Condition
   Fire has been largely excluded from the project area for some 80 years.

5. **Reference Condition-Composition Ponderosa Pine Forests**
   Fire also shapes the composition of ponderosa pine stands. In the late 1800's stands exhibited open park-like appearances with well-stocked overstories and relatively few understory trees. Over the last 100 years of fire suppression, seral ponderosa pine stands have been replaced by shade-tolerant climax stands. (Habeck, James R. 1990. Northwest Environmental Journal 6(2): 271-292.)

   Existing Condition
   Within the project area there are few open park-like areas and understory trees tend to be dense enough to make foot travel difficult.

6. **Reference Condition –Frequent Fire Containment of Douglas-Fir In-growth**

Douglas-fir is successional to ponderosa pine in the absence of fire. Fire suppression favors increased Douglas-fir because it is less fire resistant and slower growing than ponderosa pine when juvenile.

Existing Condition

Within the project area, though heavier and more pronounced at higher elevations, Douglas-fir encroachment is evident within all stand types in the project area. The highly altered composition and structure of the vegetation predisposes each stand and the transition zone ecosystem to disturbance events well outside the range of historic variability-- potentially producing changed environments never before measured.

The above photo is a good example of how reference conditions for Pine-oak forests change due to fire exclusion. Note the establishment of the Douglas-fir saplings on the far left and background of the photo.

As a result of the comparison of reference conditions with existing conditions, it was determined that most stands in the project area were Condition Class 3 and that such stands may require thinning followed by prescribed under-burning in order to reduce the severity of wildland fires and the risk of losing ecosystem components for species that evolved under the natural fire regime.

Surface Fuels

Within the project area six fuel models were identified (FM 1, 2, 3, 5, 8, 9, & 10). Of these six fuel models, four were identified as covering the majority of the project area. A brief description of the majority fuel model characteristics located within the project area and their representation follows:

Fire Behavior Fuel Model 1

Fire spread is governed by the fine, very porous, and continuous herbaceous fuels that have cured or are nearly cured. Fire runs rapidly through the cured grass and associated material. Very little shrub or timber is present. Grasslands and savannahs are represented.

Fire Behavior Fuel Model 2

Fire spread through this fuel model is primarily through fine herbaceous fuels, either curing or dead, and litter. These are generally surface fires where the herbaceous material, in addition to litter and dead-down stemwood from the open shrub or timber overstory, contributes to the fire intensity. Open shrub, oak and pine stands found within the project area generally fit this model. Many of these stands include concentrations of dead and down material that could generate higher intensity flames and may produce firebrands.

Fire Behavior Fuel Model 9

Fire in this fuel model tends to actively burn through the surface litter. Both long-needle conifer and hardwood stands such as oak typically represent this fuel model. Closed stands of long-needle pine such as ponderosa are included in this model where concentrations of dead-down woody material will contribute to possible torching, spotting and crowning.

Fire Behavior Fuel Model 10

Due to the heavier fuels in this model, fires burn with greater fire intensity than in the previous fuel models. This fuel model includes nearly any forest type with a larger dead-down component of fuel at the surface. Such moderate loading is gained through insect and disease damage and mortality and wind throw as well as natural mortality. High heat intensity with longer flame lengths are experienced under these fuel conditions and as a result, higher rates of torching, crowning and spotting may be expected during wildfire events; resistance to control is high. Some 45% of the project area falls within the definition of FM 10.

Within the project area many stands identified as fuel model 2 have a component of fuel model 10. This is due to stand density, or density induced mortality. An estimated 16% of the area is in a fuel model 2/10.

Duff levels over the project area vary greatly with less accumulation in the pure oak stands and higher levels in the mixed conifer stands. Ponderosa pine bark constantly flakes off and accumulates within the first few feet of the bole of the tree. The exclusion of fire over the past century has allowed these bark flakes to reach depths of up to 12" under some of the larger ponderosa pine. When these duff mounds burn completely, under low moisture conditions, a high level of stress can be placed on the tree, often causing mortality.

Fuel Model Percent across project area:

Fuel Model	Percent of Project Area
1	18%
2	21%
2/10	16%
9/10	45%

Existing Fuel Loadings by Fuel Model:

Size Class	Loading for Areas Identified as FM 1	Loading for Areas Identified as FM 2	Loading for Areas Identified as FM 2/10	Loading for Areas Identified as FM 9/10
0" – 0.25"	0.18 Tons per Acre	.13 Tons per Acre	1.9 Tons per Acre	0.6 Tons per Acre
0.26" – 1"	0.30 Tons per Acre	0.9 Tons per Acre	0.9 Tons per Acre	1.4 Tons per Acre
1.1" – 3"	0.60 Tons per Acre	.7 Tons per Acre	1.5 Tons per Acre	2.2 Tons per Acre
3" +	2.4 Tons per Acre	3.7 Tons per Acre	17 Tons per Acre	35 Tons per Acre
Litter	0 Tons per Acre	1.4 Tons per Acre	1.5 Tons per Acre	1.3 Tons per Acre
Herbaceous	0.5 Tons per Acre	0.5 Tons per Acre	0.9 Tons per Acre	0.2 Tons per Acre
Shrubs	2.5 Tons per Acre	1.9 Tons per Acre	1.4 Tons per Acre	0.4 Tons per Acre
Foliage	0 Tons per Acre	3.0 Tons per Acre	4.5 Tons per Acre	3.0 Tons per Acre
Branch	0 Tons per Acre	0.4 Tons per Acre	.5 Tons per Acre	1.5 Tons per Acre
Duff	2.5 Tons per Acre	3.7 Tons per Acre	17 Tons per Acre	40 Tons per Acre
Total	**8.98** Tons per Acre	**16.3** Tons per Acre	**47.1** Tons per Acre	**106** Tons per Acre

Ladder and Crown Fuels
As discussed under fire risk above, crown fires are generally considered the primary threat to life, property, and ecological function. Crown fires develop when surface fires create enough energy to preheat and combust fuels well above the surface (Agee, 2002). Crown fires typically move faster than surface fires, are more difficult to suppress and pose the greatest threat to fire fighter safety. This threat comes from increased fire line intensity and long range spotting. Such hazards often mandate an indirect suppression strategy, which increases the acres burned as well as the fire severity on the landscape. This results in higher tree mortality and smoke production.

The density and continuity of tree canopies as well as the canopy base height provide ladder fuels. More simply stated, ladder fuels are any shrubs, limbs or branches, either living or dead, which can provide a surface fire with a route into the tree crown. These characteristics in combination with numerous weather factors as well as topography provide the conditions for a rapidly moving crown fire. Canopy bulk density, canopy base height and canopy continuity are the key characteristics of forest structure that affect the initiation and propagation of crown fires. Reducing canopy bulk density by thinning is a means to minimize crown fire potential. As surface fire intensity increases, or canopy base height decreases, it takes less wind to cause a surface fire to jump into the crowns. As a stand becomes denser, active crowning occurs at lower wind speeds and the stand is more vulnerable to crown fire.

Expected Fire Behavior
Fire behavior within the project area is anticipated to be consistent with the aforementioned fuel characteristics. Fires burning in light fuels and pushed by typical gorge winds will spread rapidly. Recent examples of this include both of the Major Creek Fires (July, 1999; and August, 1999) which burned through a portion of the project area consuming one residence and some 700 acres. The challenge for fire fighters in light fuels is not found in the fire's resistance to control, it is found in the rate at which the fire spreads.

As outlined above, fires burning in heavier fuels can be anticipated to exhibit extreme fire behavior characterized by torching, spotting, and crowning. For a recent example of this we need only look eight miles south of the project area. On July 23, 2002 a lightning strike ignited a fire on Sheldon Ridge; typical gorge winds and heavy fuels prompted extreme fire behavior including torching, spotting, and crowning. By July 25 the Sheldon Ridge fire had consumed some 15,000 acres. While this fire burned in Oregon; the fuels, elevation and topography are nearly identical to those found in the project area.
Under existing conditions episodic smoke production is unpredictable and may be experienced in high volumes and for long duration, posing significant impacts to human health, safety, and societal values.

Considering the Fire Regime Condition Class, localized steep topography, current fuel loading and predominant weather patterns, a wildfire within the project area could represent a significant threat to the lives and safety of residents and firefighters, the ecosystem, and human improvements such as homes and infrastructure.

The photos above show good examples of ladder fuels. The Catherine planning area contains many stands that look like these.

Regulatory Framework
The regulatory framework governing fire resilience includes:

The Management Plan for the Columbia River Gorge National Scenic Area, approved in 1992 (revised 2004)

Land & Resource Management Plan, Gifford Pinchot National Forest, approved in 1990

The Record of Decision amended the Gifford Pinchot National Forests' Land & Resource Management Plans in 1994 within the Range of the Northern Spotted Owl. The Record of Decision is also referred to as the Northwest Forest Plan.

The Fire Management Plan for the Columbia River Gorge National Scenic Area

The Fire Management Plan (FMP), using federal fire policy as its guide, tiers to local land & resource management plans to provide clear direction for fire management activities. It describes the Scenic Area's program to manage wildland and prescribed fire as defined by direction in the Columbia River Gorge National Scenic Area Plan, the Gifford Pinchot National Forest Land and Resource Management Plan, and the Northwest Forest Plan.

Other documents used to develop the Fire Management Plan include:

- Federal Wildland and Prescribed Fire Management Policy, Implementation Procedures and Reference Guide, August 1998
- Review and update of the 1995 Federal Wildland Fire Management Policy, January 2001
- USDA Forest Service Manual (FSM) 5100
- USDA Forest Service Handbook (FSH) 5109

The FMP provides the operational parameters needed to implement the Land Management and Resource Management Plans. It is a detailed program of action, on how to carry out fire management policies that will help achieve resource management objectives as defined in the Columbia River Gorge National Scenic Area Plan.
Applicable direction from the Land and Resource Management Plans for Fire Management Activities includes:

- All fire management activities shall comply with area management direction. FW-248
- All wildfires shall receive an "appropriate suppression response" (Regional Guide for Pacific Northwest Region, 1984). FW-256
- Dead, down woody material loading levels shall be managed to provide for multiple resource objectives (Regional Guide for Pacific Northwest Region, 1984).
- The role and potential of fire as an integral part of the forest and rangeland environment shall be considered in obtaining multiple-use forest management objectives. FW-048
- Prescribed burning should be considered for use in meeting management objectives in areas where ecological studies show that natural fire has played a significant role in ecosystem development (Regional Guide for Pacific Northwest Region, 1984). FW-049

- Prescribed burning may be used when analysis indicates that it will be effective and feasible. Analysis shall include consideration of measures to mitigate impacts on air quality. FW-050, FW-051

The 2001 Federal Wildland Fire Management Policy directs Federal agencies to achieve a range of acceptable practices from full response to fire use to protect life, property, resources, and maintain healthy ecosystems. The policy provides nine guiding principles that are fundamental to the success of the Federal wildland fire management program:

- Fire Management Plans will be developed for every burnable acre of Federal Land.
- Firefighter and public safety is the first priority in every fire management action.
- The role of wildland fire as an essential ecological process and natural change agent will be incorporated into the planning process.
- Fire management plans, programs, and activities will support land and resources management and their implementation.
- Sound risk management is a basis for all fire management activities.
- Fire management plans and activities incorporate public health and environmental quality considerations.
- Federal, state, tribal, local, interagency coordination and cooperation are essential for implementing broad-scale fire management activities.
- Incorporate standardization of policy and procedures among federal agencies.

AIR QUALITY

Introduction

Air and by extension, air quality, is an integral part of the forest environment. Its character directly affects plant, animal and human habitat, as well as many of the scenic and recreational opportunities within the Columbia River Gorge National Scenic Area.

Analysis Methods and Measurements

Visibility and air quality are being monitored by the Forest Service and Washington dept. of Ecology in the Columbia River Gorge. The Federal Environmental Protection Agency has developed and promulgated National Ambient Air Quality Standards (NAAQS) for six pollutants: carbon monoxide, nitrogen dioxide, sulfur, dioxin, lead, ozone, and particulate matter. The standards were established to protect public health and welfare. States are responsible for developing and implementing programs to assure that the NAAQS and any other standards (visibility) are met. Washington and Oregon Smoke Management Plans are now part of the State Implementation Plans for both states. They detail the procedures and lines of authority for land management burning in the two states. Numerous areas in the Region are classified "designated areas" in the Smoke Management Plan. Designated areas are typically the larger population centers. A "smoke-sensitive area" is an area that would be negatively affected by smoke, but is not necessarily a designated area.

Existing Conditions

"It was warm work, all the way, and the last fortnight of it was suffocatingly smoky, for in Oregon and along the Columbia the forest fires were raging." (Mark Twain, Following the Equator, 1897)

For centuries, the Pacific Northwest has had periods of poor air quality due to natural and human-caused forest fires. Diaries of early explorers and newspaper accounts of the last two centuries have commented on the problems of smoke from wildfire, burning of land clearing and logging slash, and the burning of woodstoves for home heating. Early twentieth century (1910-1920) legislation required the burning of logging slash. This practice became well established on private, state and federal lands. Early on, the accepted practice was to delay most slash burning until the fall season. With an enormous amount of logging slash burned in a very short time period; smoke pollution episodes were not uncommon. In the later part of the 1960's the states of Washington and Oregon developed and implemented Smoke Management Programs (SMP) and fall slash burning continued until the early 1970s. Air quality began to improve once SMP's moved both industry and natural resource agencies away from fall burning and towards spring and summer burning. This change provided for better climatic conditions for improved dispersion of pollutants. Pollutant-carrying smoke from summer and early fall burning can be trapped by temperature inversions, which aggravate the problem. A temperature inversion forms when the air in upper levels is warmer than the air that is closer to the ground. The warmer air keeps the cooler ground-level air from rising and dispersing its pollutant load.

Increased concern for air quality in the 1960s led to passage of the Amended Clean Air Act of 1970. The provisions of this Act were written to reduce the emissions of major pollutants, including small suspended particles called particulates. The Clean Air Act of 1963 (as amended) has designated that all areas of the country be placed into one of the following classifications: Class I: areas where anything but the smallest degradation of air quality would be unacceptable; Class II: areas where moderate degradation of air quality would be acceptable; Class III: areas where a considerable degradation of air quality would be acceptable. The Columbia River Gorge National Scenic Area is a Class II air shed.

As previously stated, the Columbia River Gorge provides both an effective moisture barrier and the only east/west sea level passage through the Cascade Mountain range. This results in dryer eastside conditions and year round vigorous winds. In the spring and summer, wind direction is predominately from the west as the cooler west side air near the Pacific Ocean pushes through the gorge to replace the warmer rising air of the desert interior. In the fall this pattern begins to fluctuate and gives rise to significant episodic east wind events that last throughout the winter.

In early September east wind conditions develop and the directional pattern throughout the gorge begins to fluctuate. Under the right atmospheric conditions the gorge acts like a chimney and carries the arid east wind directly through the west end of the gorge. Early settlers referred to the east wind as the "Devil Wind" for the fire problems it created. Extreme fire behavior associated with the 'Devil Wind" has been observed in the Columbia River Gorge since 1902 when the Yacolt Fire burned over 200,000 acres in less than 36 hours.

The prevailing wind conditions in the gorge have advantages and disadvantages. The primary advantage is the ability to plan prescribed fire activity when transport winds will disperse and carry smoke out of the area. The disadvantages are that under west wind conditions industrial, urban and suburban pollutants from the Portland/Vancouver area migrate into and through the gorge. Under east wind conditions industrial pollutants from large feedlot operations and coal fired power plants migrate through the gorge. Particulate is a term used to describe dispersed airborne solid and liquid particles, which will remain in atmospheric suspension from a few seconds to several months. Particulates that remain suspended in the atmosphere are efficient light scatterers and therefore contribute to visibility impairment. Very small particles can travel great distances and contribute to regional haze problems. Regional haze can result from prescribed burning over multiple days and/or multiple owners utilizing the airshed over too short a period of time. Cumulative particulate load may be the result of prescribed burning only, or urban and industrial sources only, or it may be a combination of the two. The causes of regional haze are often difficult to identify. Total suspended particulates (TSP) include all suspended particulates, no matter the size. Particulate matter less than 2.5 microns in diameter (PM 2.5), or less than 10 microns in diameter (PM 10) describes particles small enough to enter the human respiratory system.

National Ambient Air Quality Standards (NAAQS) for PM 2.5 and PM 10 have been established to protect human health. The annual PM 2.5 standard is 15 micrograms per cubic meter and the 24-hour standard is 65 micrograms per cubic meter. The annual PM 10 standard is 50 micrograms per cubic meter and the 24-hour standard is 150 micrograms per cubic meter. This means that the average PM 2.5 or PM 10 concentration in a given area over the stated period of time cannot be exceeded. State air agencies mandate air quality standards, many which are stricter than federal standards. PM 2.5 and PM 10 are used for comparison to health based NAAQS and TSP is used for tracking impact on Prevention of Significant Deterioration (PSD) increments.

Regulatory Framework

The CRGNSA Revised Management Plan states that:

- Air quality shall be protected and enhanced, consistent with the purposes of the Scenic Area Act. The States of Oregon and Washington and the U.S. Forest Service shall: (1) continue to monitor air pollution and visibility levels in the Gorge; (2) conduct an analysis of monitoring and emissions data to identify all sources, both inside and outside the Scenic Area, that significantly contribute to air pollution. Based on this analysis, the States shall develop and implement a regional air quality strategy to carry out the purposes of the Scenic Area Act, with the U.S. Forest Service, the Southwest Air Pollution Control Authority and in consultation with affected stakeholders.

- The States and the Forest Service shall together provide annual reports to the Commission on progress made regarding implementation of this policy. The first report shall include a work plan and timeline for gathering/analyzing data and developing and implementing the strategy. The work plan and strategy shall be submitted to the Commission for approval.

Environmental Consequences
DIRECT AND INDIRECT EFFECTS ALTERNATIVE 1-NO ACTION

Fire Hazard
The no action alternative would not reduce fuels through thinning, mechanical surface treatment, or prescribed fire. The effect of no action would see the continued increase and expansion in tree stocking levels, canopy bulk density, lower canopy base heights and surface fuel loading. This would translate to increased potential for extreme fire behavior and severity and ever greater threats to neighboring property and life. The no action alternative would result in increasing potential for stand replacing fires would also be experienced in areas of large Oregon white oak, ponderosa pine and Douglas-fir.

Under the no action alternative, large ponderosa pines would continue to be vulnerable to mortality from wildfires due to the aforementioned ladder fuels and deep accumulations of duff that have built up around the boles. High stand densities would increase and spread under this option and continue to migrate into areas of mature oak. Sites that were historically dominated by large widely spaced Oregon white oak and ponderosa pine would continue towards a climax community of Douglas-fir. This would result in the loss the oak and pine/oak ecosystems as well as the loss of the dry meadow component. The native shrub and herbaceous layers in the project area are adapted to low severity fire and the absence of this disturbance has had adverse effects on these communities through shading and direct surface competition. When wildfires occur fire severity will be greater with this alternative, likely killing plants that would have been able to re-sprout following a low severity fire.

Surface, Ladder and Crown Fuels
With no action surface fuels would continue to increase contributing to the potential for stand replacing fires. Fir, and as a result, fuel model 10 would continue to spread and it is estimated that in 50 years some 60-75% of the project area would be in this condition. Fires would burn with higher intensities and torching, crowning, and spotting would be expected during wildfire events.

Stand density would continue to increase and tree vigor would continue to decrease. With this, the resiliency of stands within the project area to survive natural disturbance; be that fire or insect and disease, would decrease and late seral species would continue to increase within mixed species stands. The continuity of ladder and crown fuels under these conditions would provide for sustained crowning runs through the timber.

In short, avoiding action within the project area will have the following effects:

- Continued change from relatively low damage, stand-maintenance fires to more severe high damage, stand-replacement fires.
- Conversion from fire-resistant species to fire-intolerant species having less resilience to fire disturbances.
- Less controllable and more costly wildland fires.
- Increasing danger to the public and firefighters.
- Growing threat to wildland/urban interface values.
- Increasing potential for higher particulate matter emissions as fuel loads and understory biomass increase.

Fire Regime Condition Class
As previously stated, Fire Regime 1 represents the ponderosa pine, Douglas-fir and Oregon white oak plant association and includes nearly all of the of the project area. A fire burning under the existing condition would not burn as a low severity surface fire but would be of mixed severity and/or stand replacing. This would have detrimental effects to a broad range of natural resources not adapted to high severity fires.

The no action alternative would see continued deterioration of the overall condition of the vegetation as well as continued departure from the natural fire regime. Stand densities would continue to increase and tree species would continue to migrate towards higher proportions of shade tolerant fire and more fire susceptible fir. At the same time, there would be a continued decline in fire tolerant oak and ponderosa pine due to shading and density induced mortality. Under these conditions the Fire Regime Condition Class within the project area would continue to rise showing an ever greater departure form the natural fire regime.

Air Quality
The no action alternative would have the least immediate impact on air quality in the short-term. However, under the no action alternative biomass would continue to accumulate and remain available for consumption by wildfires. This increases the potential for large amounts of smoke during the summer and early fall months. Because wildfires occur at the driest time of the year, fuels are more completely consumed which nets about twice as much particulate matter in the 10 micron range (Huff and Ottmar et al. 1995). There is potential during a wildfire for as much as 440 pounds per acre of PM 2.5 emissions. Such smoke concentrations have high particulate levels that can cause health problems. Depending on the prevailing weather pattern during and after any wildfire event many residences and communities throughout the gorge may be impacted.

Wildfires are not planned--so there is little opportunity to mitigate air quality issues except to suppress the fire as quickly as possible. The smoke generated will be directed and concentrated according to prevailing winds and atmospheric stability. Wildfire does have one advantage over prescribed fire: it might not happen in our lifetime. The air quality trade off is less smoke from prescribed fire over a period of years or gambling that a catastrophic wildfire, with its large amounts of heavily concentrated smoke, will not occur.

Air quality monitoring in the CRGNSA by the Forest Service began using photographic data collected at Vista House on Crown Point in Oregon. Among the 17 camera locations in the Pacific Northwest, Vista House ranked near the bottom, 16th, 17th and 13th with respect to poor, medium and good visibility categories. In January 1993 an IMPROVE-protocol visibility monitoring station was installed near Wishram, Washington. The primary purpose of air quality monitoring is to assess the impact of pollution on the visual resource, as mandated by the Columbia River Gorge National Scenic Area Management Plan. Some baseline data exists to quantify scenic quality in the west end of the CRGNSA, and data from future monitoring will add sufficient detail to determine if the scenic resource is improving, degrading or not changing.

Ozone data from the Wishram site shows concentrations at or above the injury threshold for sensitive lichens. This is a concern because several popular recreational sites in the Gorge owe their appearance and visual attraction to lichens. An example is Oneonta Gorge, where

lichens color the sheer cliffs a peculiar shade of vibrant chartreuse. High ozone readings from the air quality stations support the initial results of a Forest Service study, which suggests a change in lichen distribution is a result of air pollution. Forest Service lichen specialist Linda Geiser is in the process of analyzing lichen data from the Gorge. Her preliminary findings indicate the Columbia River Gorge has clearly elevated levels of all three pollutants (sulfur, nitrogen and toxic metals) compared to all other National Forests measured between 1993-1995 (e.g. Siskiyou, Willamette, Mt. Hood, Gifford Pinchot and Deschutes National Forests). Air quality appears to be generally degraded at low elevations in the Gorge (Geiser 1998: personal communication).

Medical studies have shown a relationship between increases in particulate concentrations and rises in the number of clinic and hospital visits for upper respiratory infections, cardiac diseases, bronchitis, asthma, pneumonia, and emphysema. Deaths of elderly persons afflicted with respiratory diseases and cardiac conditions also show an increase during periods when the concentration of particulate matter is unusually high for several days.

Sulfur Dioxide

Sulfur dioxide (SO2) is emitted primarily from combustion of fuel containing sulfur; generally either coal or oil.

Most forest fuels contain less than 0.2 percent sulfur so sulfur oxides could be produced only in negligible quantities during wildfires.

Carbon Monoxide

Carbon monoxide (CO) is produced by automobile exhaust and other incomplete combustion sources. Carbon monoxide is a poisonous inhalant that deprives the body tissues of necessary oxygen. Extreme exposure (>750 ppm) can cause death. Impaired time-interval discrimination can occur when humans are exposed to concentrations as low as 10 to 15 ppm for 8 hours.

Large quantities of carbon monoxide are emitted from wildfire s. Carbon monoxide exposure from these sources can be detrimental to fireline workers but CO dilutes very rapidly in the atmosphere and is not likely a concern for urban and rural areas even a short distance downwind. One study measured CO concentrations as high as 200 ppm close to flames but observed that the concentration was reduced to less than 10 ppm just 100 feet from the fire.

Ozone

Ozone is a secondary pollutant formed from the reaction of volatile organic compounds with oxides of nitrogen in the presence of sunlight. Volatile organic compounds originate from industrial processes, solvent use, and transportation. Wildfires emit volatile organic compounds that can react with urban sources of nitrogen to form ozone. Elevated ozone levels have been measured at the top of smoke plumes. How this relates to ground level concentrations of ozone is uncertain.

Ozone effects on vegetation have long been recognized. Ozone can cause visible injury, reduced photosynthetic capacity, increased respiration, premature leaf senescence, and reduced growth. Other effects include alteration of carbon allocation, greater susceptibility

to environmental stress, changes in plant community composition, and loss of sensitive genotypes from a population. Sensitivity to ozone differs within and among species because of differences in uptake and genetic factors. Vegetation may begin to experience effects from ozone at concentrations as low as 0.06 ppm (7-hour growing season mean). Little research has been completed on lichen sensitivity to ozone but sensitive species may be impacted by concentrations as low as 0.02 ppm.

Nitrogen Dioxide

Oxides of nitrogen are formed during combustion when nitrogen in the air or in fuel combines with oxygen at elevated temperatures. Nitrogen dioxide acts as an acute irritant.

Formations of oxides of nitrogen occur at temperatures not normally found in prescribed fires. Some oxides of nitrogen may be formed at lower temperatures in the presence of free radicals and nitrogenous compounds in forest fuels are another possible source. Generally, wildland fire is considered an insignificant contributor of these emissions.

Lead

The principal source of lead emissions is the combustion of gasoline containing lead alkyl additives. Since use of leaded gasoline is dramatically decreasing, lead air pollution is rarely a problem anymore. Lead particles that have been deposited on vegetation over decades can become re-emitted if the vegetation is burned. This phenomenon was documented during chaparral burning which took place east of the Los Angeles basin.

CUMULATIVE EFFECTS ALTERNATIVE 1

CUMULATIVE EFFECTS DETERMINATION					
Past, Current or Reasonably Foreseeable ACTIVITY or PROJECT	**Potential Effects**	**OVERLAP in TIME or SPACE**		**Measurable?**	**Extent**
		Time	**Space**		
Burdoin I and II Forest Restoration Project Thinning, Pile Burning	Smoke	No	No	No	There will be no measurable effects
	Fire Behavior	Yes	No	No	No measurable effect

DIRECT AND INDIRECT EFFECTS ALTERNATIVE 2 – Proposed Action
This alternative seeks to mimic the stand and overall vegetation conditions that would be expected had low intensity, high frequency fire been historically allowed to burn through the project area. The proposed action would reduce fuel loading within the project area by reducing the amount of both live and dead vegetation in the three fuels layers: Crown and ladder fuels would be reduced through thinning stands from below according to the prescriptions described in Chapter 2. Surface fuel would be reduced through piling (both by hand and machine) and pile burning. Once thinned, these stands would be maintained through the scheduled application of prescribed broadcast burn followed by scheduled under burning.

The proposed action addresses Goal 3 as identified in the Klickitat and Skamania County Community Wildfire Protection Plan. Goal 3 is described as, Decrease the Risk of Catastrophic Fire in the Wildland Urban Interface (WUI). The proposed action specifically addresses Goal 3, Actions 3.1.2 and 3.1.3. This proposal reduces fuel loadings thereby addressing the risk factors and improving fire suppression effectiveness and safety.

In general, fuel reduction would be accomplished through thinning the smaller diameter trees and retaining the larger trees at variable spacing. There would be some species conversion from fire sensitive fir to more fire resilient species such as oak and pine through selective thinning. Mechanical treatments and thinning of small diameter trees would remove ladder fuels and canopy continuity that carry fire into the crowns.

Fire Hazard
The proposed action would reduce canopy, ladder and surface fuels and thereby improve stand resiliency to fire and wildland fire suppression effectiveness. It would also improve fire fighter and public safety while reducing the threat to neighboring property, structures and natural resources. Treatments included in this alternative will have a direct effect on and decrease surface fuels, increase canopy base height and reduce crown bulk density. As a result, fuel continuity will be broken up reducing, under most climate conditions, the chance of wholesale ecosystem loss within the project area due to catastrophic fire.

Surface Fuels
Under this alternative existing surface fuels and created slash will be treated through a variety of methods. Whole tree yarding for utilization or disposal by burning is one method. In areas where whole tree yarding is impractical, tops and limbs will be left in the stand where they, along with the existing fuels, will be hand or machine piled and burned. Within the units that are identified helicopter yarding, limbs and tops will be separated from the bole and left in the stand. Due to the steepness of the slope in these areas, the slash will be piled primarily by hand, but some grapple piling may occur where slope allows. The target for hand pile burning is not less than one year and not more three years after a pile is created. The target for burning machine piles is not less than one year and not more than five years after the pile is created. Other treatments include thinning and piling by hand and burning piles and the application of understory prescribed fire. A prescribed burning program will need to be implemented to maintain the desired surface fuel levels and limit new growth from becoming a ladder and stand density concern in the future.
Reduction in fuel loads decreases subsequent fire behavior, increases fire control possibilities and decreases fire suppression costs (Van Wagtendonk 1996). And, under

reduced fuel loads, resistance to control decreases and fireline construction rates increase (Agee et al. 2000).

The beneficial effects of prescribed fire on altering fuel structure and wildfire behavior and effects have long been observed and reported. Prescribed fire alters potential fire behavior by influencing many fuel bed characteristics:

- It reduces the amount of fine fuels, duff, large woody fuels, decadent material, shrubs and other live surface fuels, which when coupled with compactness and continuity change the stored energy and potential intensity and spread rate.
- It reduces the horizontal continuity which disrupts growth of surface fires and reduces spot fire ignition probability.
- It increases compactness of surface fuel components which slow combustion rates (Graham et al. 2004).

The primary stand attributes that dictate fire behavior are surface fuel condition, crown bulk density, and crown base height (Graham, 1999). Prescribed fire consumes much of the lowest ladder fuel and often scorches the lowest tree branches, which raises the live crown above the surface. As a result, prescribed burning can reduce fire intensity and severity from wildfires (Omi, Martinson 2002, Pollet, Omi, 1999). In a study of the effects of low intensity fire on ponderosa pine stands in Zion National Park, the needle and litter fuel load layer was reduced by 54 percent, duff loading was reduced by 35 percent and pole sized trees were reduced by 18 percent (Bastian, 2001). With such reductions in ladder fuels there would be a reduced probability of a surface fire moving into the crowns of the trees.

Expected Surface Fuel Reductions

The prescribed burning proposed in this alternative is all within fire regime 1. It is proposed on all acres within the project area. Some areas require thinning before underburning. The objective for surface fuels is to reduce loadings to desirable levels. Given the range of existing loadings within the project area, this could be as little as a 15 percent reduction in the lighter loaded oak stands and as much a 60 percent reduction in the more heavily loaded pine/oak/Douglas-fir stands. Burning in existing meadows, fields and other open areas would be intended to maintain those openings and prevent encroachment. Mortality of small diameter trees is not only acceptable it is desirable. Mortality of larger diameter trees would be minimized as described in the project design. Weather and fuel moisture prescription coupled with ignition patterns will be employed to best meet the surface fuel reduction target with limited large tree mortality and soil exposure. Burning would be conducted as to avoid a decrease in ground cover below that identified in the LRMP standards, so erosion would be insignificant.

Average flame lengths would be expected to increase in those areas within the project boundary that convert from FM 2/10 to a FM 2. This is due to increased exposure to the wind and more fine fuels, such as grass. While increased flame-length is not desirable under extreme fire-weather conditions, the combination of modified surface, ladder and canopy fuels suggests improved fire fighting capability even under difficult weather conditions as fire severity and resource impacts are reduced. These anticipated outcomes are the result of reduced crown fire potential and lower overall intensity.

Ladder and Crown Fuels
When mechanical thinning emphasizes smaller diameter trees it is effective in reducing the vertical fuel continuity that contributes to crown fire initiation. By removing ladder fuels, surface fires burning through treated stands are less likely to spread to overstory fuels (Graham et al. 2004). Not only is thinning effective at reducing the probability of crown-fire spread but it is precise in that specific species and size classes are targeted for removal from the fuel bed. Under this alternative tree removal would be accomplished by thinning from below, cutting the smaller diameter trees and retaining the larger diameter trees.

Some concern has been raised that the removal of canopy level tree can increase fire risk. Under some conditions the removal of trees from the understory and canopy could increase surface wind movement, thereby facilitating the drying of live and dead fuels (Peterson, 2004). However, the proposed alternative addresses this issue by reducing the fuel load. Sufficient fuel treatment after thinning provides for an overall reduction in expected fire behavior and severity that typically outweighs the changes in wind speed and fuel moisture (Agee, 2005).

With this alternative surface, crown, and ladder fuels, and fuel continuity would be reduced. Treatments in dense stands would reduce the ladder fuels and help break up canopy continuity and increase the average distance between ground and the crown of the trees. Mechanical treatments followed by prescribed fire (including pile burning) have been shown to have the greatest effect on mitigating fire severity (Cram, 2006). Specifically, as mean tree diameter increases, fire severity decreases.

Canopy base height, canopy bulk density and canopy continuity are the key forest structure characteristics that affect the initiation and propagation of crown fires. Reducing canopy bulk density and raising the crown base height through improved tree spacing and small diameter thinning is a means to minimize crown fire hazard.

By reducing fuel loadings, fuel continuity and the availability of ladder fuels the proposed alternative will help keep fire confined to the surface and reduce the occurrence of firebrands. This increases the ability to control fires. In the WUI, reducing the threat from fire brands requires fuels reductions both near and at some distance from structures, infrastructure and private property. The proposed treatments reduce the likelihood of firebrands being lofted from fires onto private land and structures which improves fire fighter's ability to protect life and property.

Additional benefits of this alternative would include improved vigor in residual trees through less moisture and nutrient competition. This makes for healthier stands that are less susceptible to mortality due to insect, disease, and draught.

Fire Regime Condition Class
Fire regime 1, a low severity high frequency regime comprises the vast majority of the project area. The proposed alternative would change vegetation characteristics including stand density, species composition, structural stage, fuel composition and potential fire severity as related to the reference condition. After completion of the mechanical treatment and prescribed burning, stands slated for such treatments would be changed from condition class 3 to condition class 2. In preceding years, continued applications of prescribed fire would move these stands from condition class 2 to condition class 1. Elsewhere in the

project area, stands scheduled strictly for prescribed fire will be maintained in condition class 1.

Under this alternative untreated acres will remain in their existing FRCC and will depart further from the reference condition.

Increased growth of the remaining trees associated with thinning would promote the development of old forest structural stages, allowing thinned stands to grow into larger size classes sooner.

Air Quality

Based on current fuel loadings and thinning prescriptions of the proposed alternative total smoke emissions from activity created pile burning and underburning would range from 12 to 29 tons per acre. This is less than half of predicted emissions under wildfire conditions.

Pile and prescribed burning affects air quality in ways similar to wildfires, however, prescribed burning offers many advantages over wildfire. The effects of prescribed fire can be manipulated to reduce adverse effects to air quality. Smoke mitigation techniques include consideration of atmospheric conditions, season of burn, fuel and duff moisture, diurnal wind shifts, appropriate ignition techniques and rapid mop-up.

Particulate matter, alone or in combination with other pollutants, can constitute a health hazard. Particulates enter the body mainly via the respiratory system. Particulate matter may exert a toxic effect in one or more of the following ways:

1. The particle may be intrinsically toxic because of its chemical and/or physical characteristics.
2. The particle may interfere with one or more of the mechanisms that normally clear the respiratory tract.
3. The particle may act as a carrier of an absorbed toxic substance.

Medical studies have shown a relationship between increases in particulate concentrations and rises in the number of clinic and hospital visits for upper respiratory infections, cardiac diseases, bronchitis, asthma, pneumonia, and emphysema. Deaths of elderly persons afflicted with respiratory diseases and cardiac conditions also show an increase during periods when the concentration of particulate matter is unusually high for several days.

<u>Sulfur Dioxide</u>

Sulfur dioxide (SO2) is emitted primarily from combustion of fuel containing sulfur; generally either coal or oil.

Most forest fuels contain less than 0.2 percent sulfur so sulfur oxides could be produced only in negligible quantities during prescribed fires and wildfires.

<u>Carbon Monoxide</u>

Carbon monoxide (CO) is produced by automobile exhaust and other incomplete combustion sources. Carbon monoxide is a poisonous inhalant that deprives the body tissues of necessary oxygen. Extreme exposure (>750 ppm) can cause death. Impaired time-interval discrimination can occur when humans are exposed to concentrations as low as 10 to 15 ppm for 8 hours.

Large quantities of carbon monoxide are emitted from wildfire and prescribed fires. Carbon monoxide exposure from these sources can be detrimental to fireline workers but CO dilutes very rapidly in the atmosphere and is not likely a concern for urban and rural areas even a short distance downwind. One study measured CO concentrations as high as 200 ppm close to flames but observed that the concentration was reduced to less than 10 ppm just 100 feet from the fire.

Ozone

Ozone is a secondary pollutant formed from the reaction of volatile organic compounds with oxides of nitrogen in the presence of sunlight. Volatile organic compounds originate from industrial processes, solvent use, and transportation. Prescribed fires and wildfires emit volatile organic compounds that can react with urban sources of nitrogen to form ozone. Elevated ozone levels have been measured at the top of smoke plumes. How this relates to ground level concentrations of ozone is uncertain.

Ozone effects on vegetation have long been recognized. Ozone can cause visible injury, reduced photosynthetic capacity, increased respiration, premature leaf senescence, and reduced growth. Other effects include alteration of carbon allocation, greater susceptibility to environmental stress, changes in plant community composition, and loss of sensitive genotypes from a population. Sensitivity to ozone differs within and among species because of differences in uptake and genetic factors. Vegetation may begin to experience effects from ozone at concentrations as low as 0.06 ppm (7-hour growing season mean). Little research has been completed on lichen sensitivity to ozone but sensitive species may be impacted by concentrations as low as 0.02 ppm.

Nitrogen Dioxide

Oxides of nitrogen are formed during combustion when nitrogen in the air or in fuel combines with oxygen at elevated temperatures. Nitrogen dioxide acts as an acute irritant.

Formations of oxides of nitrogen occur at temperatures not normally found in prescribed fires. Some oxides of nitrogen may be formed at lower temperatures in the presence of free radicals and nitrogenous compounds in forest fuels are another possible source. Generally, wildland fire is considered an insignificant contributor of these emissions.

Lead

The principal source of lead emissions is the combustion of gasoline containing lead alkyl additives. Since use of leaded gasoline is dramatically decreasing, lead air pollution is rarely a problem anymore. Lead particles that have been deposited on vegetation over decades can become re-emitted if the vegetation is burned. This phenomenon was documented during chaparral burning which took place east of the Los Angeles basin.

Short-Term Adverse Health Effects of Slash Burning
Slash burning presents the combined hazards of fire and smoke to ground crews at the site. Effects on workers may include eye irritation, coughing, and shortness of breath in moderate-to heavy smoke concentrations. Workers trapped in an area of heavy smoke could be asphyxiated. Heavy smoke may also endanger members of the public in adjacent areas. Visibility may also be affected during the duration of the slash burn.

The following mitigation measures would lessen the negative effects of Alternative 2:

- Minimize the amount of material burned by making it available for other uses such as post and poles and habitat restoration projects where feasible.
- Where possible, burn material when weather conditions minimize impacts from smoke. These include: burning on cloudy days when residual smoke cannot be seen; burn during low visitor time periods; and burning during periods of atmospheric instability for better smoke dispersal and transport.

Long-term Effects
Lower levels of smoke from slash burns may have a local, transitory effect on air quality and visibility. Sensitive members of the public may experience eye, throat, or lung irritation from these exposures. There is some risk that chronic, low-level exposure of workers or the public to smoke may lead to such health effects and emphysema, lung cancer, or chronic respiratory disease.

Toxicity of Smoke Constituents
The various components of forest fire smoke are fairly well known, but the quantities produced vary considerably, depending on fuel moisture and fire temperature. The hazards include particulate matter, gases (carbon monoxide, carbon dioxide, and oxides of nitrogen), and chemicals that may enter the lungs on the surface of particulate matter.

There are few studies that evaluate the toxicity of forest fire smoke. Almost all investigations of the toxicity of smoke particulate matter in human populations have been conducted with particulates associated with burning coal or fossil fuels where sulfur oxides and sulfates are the important constituents. However, these chemicals are not generated in a noteworthy quantity by vegetation fires.

Some components of smoke, such as many polycyclic aromatic hydrocarbons (PAH), are carcinogenic. Probably the most carcinogenic is benzo-a-pyrene (BaP), which has been demonstrated to increase in potency when mixed with carbon particulates. Other components, such as the aldehydes, are acute irritants. These are most likely to affect forest workers who receive high exposures at the burn site.

CUMULATIVE EFFECTS ALTERNATIVE 2

CUMULATIVE EFFECTS DETERMINATION					
Past, Current or Reasonably Foreseeable ACTIVITY or PROJECT	**Potential Effects**	**OVERLAP in TIME or SPACE**		**Measurable?**	**Extent**
		Time	**Space**		
Burdoin I and II Forest Restoration Project Thinning, Pile Burning	Smoke	No	Yes	No	There will be no measurable effects as units from Catherine and Burdoin I and II will not be burned concurrently
	Fire Behavior	Yes	No	No	No measurable effect due to prevailing winds & natural barriers

3.2 – EFFECTS TO FOREST ECOSYSTEM COMPONENTS

Introduction

Forest ecosystem components include the structure, species composition, and landscape pattern of the forested system as well as the diversity of the wildlife and flora that use the forested system as their habitat. There is inherent overlap with the sections on fish, wildlife, and plants because of the importance of discussing the ecosystem components as linked to all wildlife and plant habitats. Habitats depend not only on the physical nature of the environment (topography, climate, etc), but on vegetation components such as tree densities, tree ages and sizes, tree species composition, tree canopy cover, the configuration of overstory and understory tree layers, the composition of the herbaceous layer, and the size and pattern of openings within the forest.

Fire Dependent Transition Zone Ecosystem

Ecosystem components are shaped by the natural processes endemic to the area. As has been discussed throughout this document, fire (Agee, 1993) and European colonization are the most important processes influencing this project area. Fire thinned the pine/oak/Douglas-fir communities creating the open oak woodlands and forests containing widely spaced large trees and rich herbaceous layer that were once predominant throughout this area. European colonization changed the physical components as well as the processes that shaped them.

Analysis Methods and Measurements
The approach taken here to analyze the forested ecosystem components is to identify the major disturbance factors that influence these forested communities. As mentioned throughout this document, the natural fire regime is the most important process that is no longer operational due to fire exclusion efforts since the early 1900s, followed in importance by the historic harvest of the largest pines, oaks, and firs. These components were present for centuries prior to the early 1800's. Next, the analysis identifies how the components change as a result of fire exclusion: The most important of these are increased fuels, increased tree densities and canopy cover, fewer large trees, more complex under-stories, and a reduction in forest openings and the herbaceous layer.

The biodiversity of an ecosystem evolves and adapts to the native forest communities (habitats) which in turn evolved with the natural disturbance regimes. Therefore, deviations indicate likely reasons for decreasing population trends of species. Changes in the forest structural and compositional components are the measurements used for identifying disruptions and changes in the disturbance regimes that would affect the forest ecosystem.

Existing Conditions
The Catherine Creek planning area is a mosaic of grassland, oak savannah, oak-pine woodlands, and mixed oak/pine/Douglas-fir vegetation communities. Typically the drier areas of grasslands and oak savannahs are at lower elevations or southern exposed slopes, while the oak-pine woodlands and mixed oak-pine-Douglas-fir are found in moister areas at higher elevations and on north and east aspects.

Over the past 10,000 years this area has been under important influence of Native Americans. It has been well documented that they often burned the oak woodlands causing frequent, low intensity fires to become the most important disturbance regime. To further supports this premise, today one can find evidence of large savannah oaks, which clearly developed in more open, frequently burned conditions, being over-topped by young Douglas firs dating back to the start of fire exclusion in early 1900s.

The stand structure of the oak-pine and mixed-conifer communities has changed as a result of fire exclusion. Prior to fire exclusion, frequent fires thinned the woodlands creating spaces and soil profiles for individual trees to grow large. Thus the woodlands were dominated by old, large diameter trees that could withstand low intensity ground fires and which produced a large mast crop. Today, these older trees have been harvested or died due to competition and drought and have been replaced by dense stands of younger trees increasingly encroached by Douglas-fir.

Historically, frequent but low-intensity fires stabilized the ecosystem keeping stand densities low, eliminating Douglas-fir encroachment, regenerating the grass and herbaceous layers, and keeping fuel accumulations low. Today the stability of the ecosystem has declined because of increased fuel loads and the risk of catastrophic fires has been increasing with each year. Today a catastrophic fire would destroy the structural components of these communities and, although the diversity may re-generate fairly quickly after a fire, the structural components will take decades, if not centuries to re-generate.

The grasslands today are dominated with non-native grasses with a poor herbaceous component and little plant diversity. These grasslands have been dramatically changed due to heavy cattle and sheep grazing in the mid 1800's. The native bunch grass/herbaceous communities, which were once rich and diverse, have virtually been eliminated throughout the project area except for remnants scattered in areas where the cattle or sheep did not congregate. The subsequent invasion of non-native annual grasses from Europe then made it more difficult for the native grasses to become re-established. The loss of the native bunch grasses and the rich herbaceous components has dramatically changed the structure and diversity of the grasslands.

Example of late encroachment where an older oak approx. 200 yrs old is over-topped and dying as a result of encroaching Douglas-fir which are less than 100 yrs old.

Regulatory Framework
Applicable Standards and Guidelines

The following applicable standards and guidelines were used to form the criteria for this effects analysis:

Columbia River Gorge National Scenic Area Management Plan

- Maintain, protect, and enhance the integrity and function of priority habitats (including oak woodlands, old-growth forests, talus, and others).
- Silvicultural prescriptions shall maintain the desired natural forest stand structures, created forest openings, and snag and down wood as given in the Desired Forest Structure and Pattern Table in the Management Plan.

Environmental Consequences
DIRECT AND INDIRECT EFFECTS ALTERNATIVE 1-NO ACTION

The direct effect of this alternative is the continued change in forest composition and structure as a result of not re-establishing the primary disturbance processes, fire, in this forested ecosystem. Douglas-fir would continue to encroach upon the oak/pine woodland communities changing the structural components from the simple, old-growth oak/pine forest (a Management Plan priority habitat) to a more complex, younger, multi-layered forest community. This change will result in higher fuel loading and higher risks to catastrophic fires. The habitat types present in the historic forest conditions of older, larger, well-spaced oaks and pines would continue to be lost to more dense stands of younger oak/pine/Douglas-fir and with this change the species composition will continue to show slow shifts as indicated in the wildlife and plant section.

Indirect effect of taking no action, is the increased potential for a catastrophic fire. Loss of over-story trees and shrubs would effectively eliminate large portions of an already diminishing set of forest communities and it would likely take several hundred years before they would become re-established. A high-intensity fire and resultant soil damage would retard re-colonization of the area, especially by native vegetation. Initial colonization by aggressive, early-seral, and non-native species, such as cheatgrass, thistle, knapweed, and scotch broom would further retard habitat recovery for native species dependent on oak woodland habitat.

Cumulative Effects of Alternatives 1 – No Action
The cumulative effects of no action would continue the present change in structure of the forested ecosystem and the increased risk of catastrophic fire. Both of these result in continued change in ecosystem components and in the continued deviation from the historic range of natural conditions. Linked to these changes are the negative impacts to the many floral and faunal species, including the listed species and important game wildlife, dependent on oak woodlands. The continued failure to re-establish the processes that keep the forested ecosystem components healthy and resilient will continue to place all aspects of the ecosystem at higher risk to future problems. Furthermore, as fire risk increases the cumulative impacts increase because of the temporal factor inherent in the extended time frames to re-establish the structural components of the pine/oak communities.

CUMULATIVE EFFECTS DETERMINATION					
Past, Current or Reasonably Foreseeable ACTIVITY or PROJECT	**Potential Effects**	**OVERLAP IN**		**Measurable Cumulative Effects?**	**Extent Detectable?**
		TIME	**SPACE**		
Burdoin I	Short term disturbance and possible loss to individuals. Long term beneficial effects on habitats.	No	Yes	Yes	Burdoin I project thinning has helped delay fuel loading, but is not sufficient to prevent catastrophic fires and loss of ecosystem components.
Road work on BPA easement	Effects on riparian habitats. Road was built within riparian area	No	Yes	No	Minor.
firehouse	Loss of habitat – increase disturbance	No	Yes	Yes	Loss of forest to permanent development is cumulatively detrimental.
Courtney Rd widening	Temporary disturbance. Long term - increase numbers of recreationists	No	No	No	
Allen Property thinning and structure removal	Short term disturbance and possible loss to individuals. Long term beneficial effects on habitats.	No	Yes	Yes	This project thinning has helped delay fuel loading, but is not sufficient to prevent catastrophic fires and loss of ecosystem components.
Weed treatments	Short term disturbance.	Maybe	Yes	No	Minor
Paved accessible trail at Catherine Creek	Short term disturbance. Long term attraction for more people , more disturbance.	No	No	No	Minor
Burdoin II Thin from Below	Short term disturbance and possible loss to individuals. Long term beneficial effects on habitats	Maybe	Yes	Yes	This project thinning has helped delay fuel loading, but is not sufficient to prevent catastrophic fires and loss of ecosystem components.
Coyote wall FS trails	Increased disturbance from recreation	Maybe	Yes	No	Minor
Land acquisitions	Reduces chronic disturbance. Encourages recreation, protects more habitat.	Maybe	Yes	Yes	Increasing land base enhances the ecosystem components in that more land becomes part of the ecosystem.
Historic Tree Harvest	Removed Large Trees	No	Yes	Yes	Fewer large trees Now more valuable to save
Future State/Private Forest Practices	Thinnings for ecosystem purposes In Open Space, to SMA guidelines in Forest/Agriculture	Maybe	Yes	Not now	Must meet SMA guidelines Slightly reduces the negative effects of no action

DIRECT AND IDIRECT EFFECTS ALTERNATIVE 2-PROPOSED ACTION

The short-term direct impacts of this alternative would be the impacts associated with the thinning operation. This would include the disruption of the ground cover and the temporary disruption and change of the existing composition and structure. Both of these are short term impacts which ultimately will be replaced by long-term benefits to stability and ecosystem long-term viability.

Priority Habitats

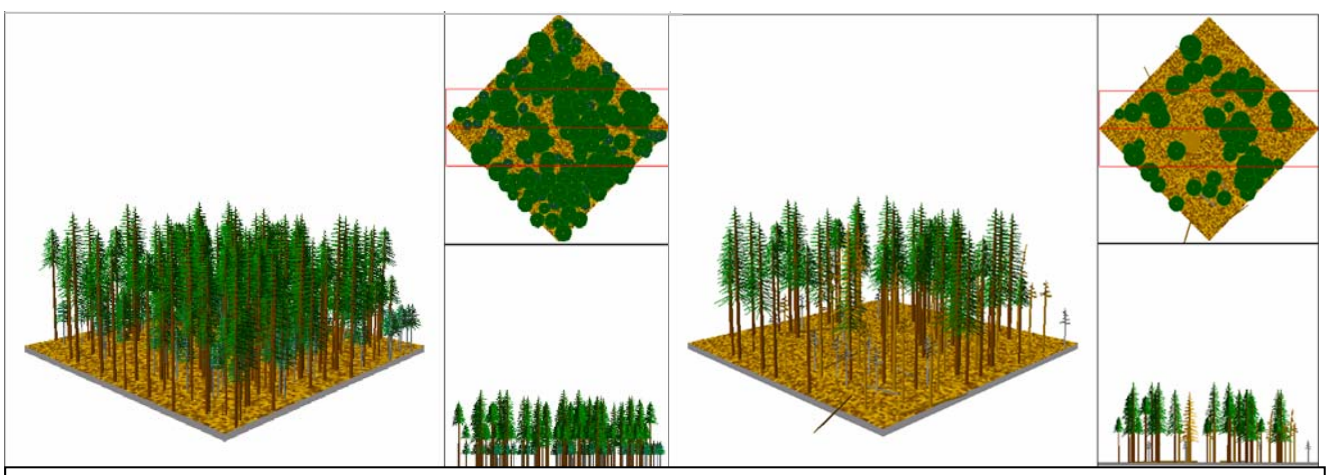
Priority habitats (such as talus slopes, cliffs and caves) are given protection in the prescriptions:

- Preserve clumps 100' feet away from the base of cliffs, caves, or talus slopes with the following:
  - Leave untreated clumps of 6-10 oaks spaced 50-150 feet apart (vary).
  - Treated areas within the 100' buffer are thinned from below in a manner that maintains the existing canopy cover.

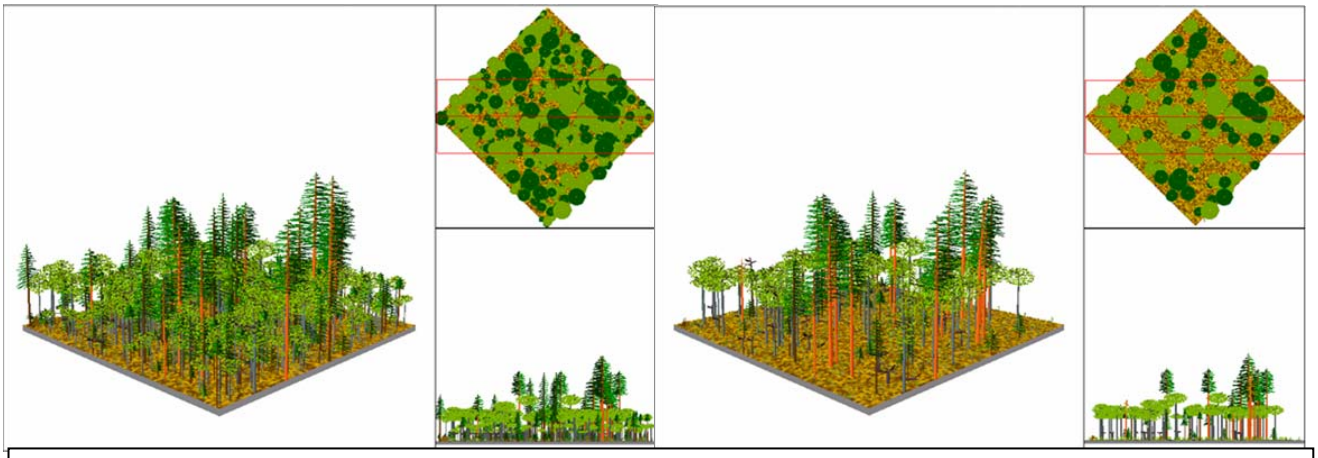
The overall objective of this restoration project is to enhance the long-term function of the area's habitats which includes the function of priority habitats such as oak-pine woodlands.

The indirect impacts of the proposed action would be to begin to re-establish the natural processes (low intensity and frequent fires) that were historically so critical to this ecosystem. Thinning of the oak/pine/mixed conifer followed by prescribed fire would create, in the long term, a more resilient and stable structural condition with larger and older trees well spaced out. The increased spacing will permit more light and more diversity in the under-story. This condition would reduce management costs (frequent prescribed fire is more cost effective than mechanical fuel reduction) and enhance the wildlife and plants endemic to this transitional zone.

As described in the proposed action alternative in Chapter 2, the computer models below indicate the expected range of structural changes for each stand type example:

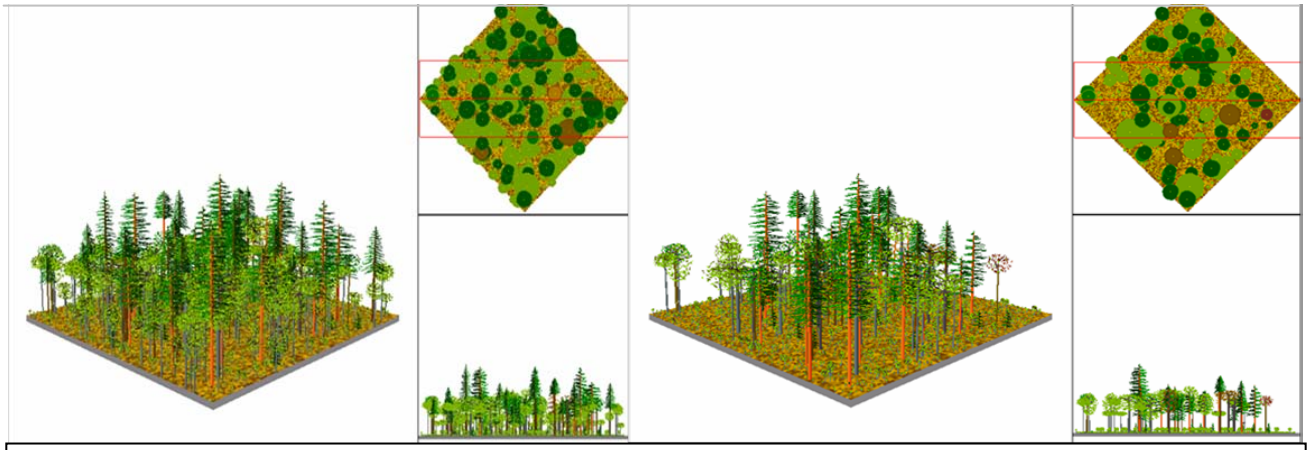


BEFORE THINNING CANOPY 82% AFTER THINNING CANOPY 60%
Forest Vegetation Simulator Model Example for Northern East Conifer



BEFORE THINNING CANOPY 84% AFTER THINNING CANOPY 59%
Forest Vegetation Simulator Model Example for Pine-Oak-Douglas Fir

This photo shows how an oak woodland may have looked with frequent low intensity fires and with some oak thinning as a result of the fires.



BEFORE THINNING CANOPY 72% AFTER THINNING CANOPY 58%
Forest Vegetation Simulator Model Example for Oak-Pine Woodlands

Desired Forest Structure and Pattern Table
Silvicultural prescriptions were designed to meet all guidelines given in the Desired Forest Structure and Pattern Table. The Management Plan defines a created opening as an opening with "…less than 40 percent average canopy closure of overstory trees and less than 60 percent average canopy closure of understory trees averaging less than 5 inches diameter at breast height for coniferous forests and less than 25 percent total canopy cover for oak woodlands. This definition does not include agricultural fields".

Landings will be located in existing openings and may need to be enlarged for worker safety. The size of the additional clearing will not exceed the Management Requirement in the structure and pattern table of less than one acre (including the size of the original opening).

Prescriptions for the east conifer types (including pine-oak-Douglas fir) require an average canopy from 45-60% and the pine/oak vegetation type requires average canopy closure of 50% percent which falls within the desired limits required by the Management Plan as indicated below with an excerpt from the Desired Forest Structure and Pattern Table:

Vegetation Type	**Forest Structure** (Average % total canopy closure (cc)) *
East Conifer (Ponderosa Pine/Douglas fir)	40-80% canopy closure Understory layer less than 25% of total cc
Ponderosa Pine/ Oregon Oak	25-60% canopy closure Understory layer greater than 25% of total cc.

Cumulative Effects of Alternative 2 – Proposed Action
The cumulative effects of this alternative would foremost be the cumulative benefits to long-term stability and fire resiliency brought to the area as a result of this action which adds to the benefits provided by previous actions at Burdoin I and II and the Allen property as summarized in the table below. The long term objective is to piece together, through land acquisition, a contiguous area of functional habitat in which ecological processes are re-established to maintain the habitat's viability over the long term. The most important component of this is to re-establish the ecosystem components, as described above, such that the area becomes fire resilient and functionally more stable.

As illustrated in the table below, the potentially negative cumulative effects of short-term disturbance is not a problem because there is little overlap in time of the activities and projects. Thus the effects of disturbance from one project to another are not cumulative.

CUMULATIVE EFFECTS DETERMINATION					
Past, Current or Reasonably Foreseeable ACTIVITY OR PROJECT	**Potential Effects**	**OVERLAP IN**		**Measurable Cumulative Effects?**	**Extent Detectable?**
		TIME	**SPACE**		
Burdoin I Small diameter Thinning	Short term disturbance and possible loss to individuals. Long term beneficial effects on habitats.	No	Yes	Yes	Burdoin I project thinning will increase the overall area thinned to meet fire resiliency thus reducing the risk of catastrophic fires and the loss of pine-oak ecosystem components.
Road work on BPA easement	Effects on riparian habitats. Road was built within riparian area	No	Yes	No	Minor
Firehouse	Loss of habitat – increase disturbance	No	Yes	No	Loss of forest to permanent development is cumulatively detrimental.
Courtney Rd widening	Temporary disturbance. Long term - increase numbers of recreationists	No	No	No	Minor
Allen Property thinning and structure removal	Short term disturbance and possible loss to individuals. Long term beneficial effects on habitats.	No	Yes	Yes	This project thinning was the first step in thinning portions of the CC project area. This project is a cumulatively beneficial effect towards fire resiliency and enhancing ecosystem components.
Weed treatments	Short term disturbance.	Maybe	Yes	No	Minor
Paved accessible trail at Catherine Creek	Short term disturbance. Long term attraction for more people, more disturbance.	No	No	No	Minor
Burdoin II Thin from Below	Short term disturbance and possible loss to individuals. Long term beneficial effects on habitats	Maybe	Yes	Yes	This project thinning is cumulatively beneficial in that it increases the overall area meeting fire resiliency and enhancement of ecosystem components.
Coyote wall FS trails	Increased disturbance from recreation	Maybe	Yes	No	Minor
Land aquisitions	Reduces chronic disturbance. Encourages recreation, protects more habitat.	Maybe	Yes	No	Increased land base enhances ecosystem components by blocking up larger tracts of land. Cumulatively this is a beneficial effect.
Historic Tree Harvest	Removed Large Trees	No	Yes	Yes	Fewer large trees Now more valuable to save
Future State/Private Forest Practices	Must meet SMA guidelines	Maybe	Yes	Not now	Must meet SMA guidelines

3.3 - EFFECTS TO SCENIC RESOURCES

Introduction and Analysis Methods and Measurements
This section evaluates the existing scenic condition, visibility, and effects of the alternatives on scenic resources. The analysis is based on the requirements of the Revised Columbia River Gorge National Scenic Area Management Plan (Management Plan) as adopted by the Gorge Commission, GIS data, digital photos, and several site visits during 2006 and early 2007. This analysis is invalid if photo copied or printed in black and white.

The measurement for the effect to scenic resources is the degree to which the project activities are predicted to meet Management Plan scenic resource guidelines in the required timeframes from Key Viewing Areas. The project activities relevant to scenic resources analyzed for the proposed action are: road maintenance and reconstruction, landings, thinning, slash piling, fire line, scheduled prescribed underburns, and proposed implementation requirements.

Land Use Designations and Landscape Settings
The project is located on Burdoin Mtn. and on National Forest System lands just east of Burdoin Mtn. in the Catherine and Major Creek drainages. The most visible portions of the landscape facing KVAs are the grasslands proposed for prescribed underburning.
The NSA land use designations are SMA Open Space for the Catherine and Major Creek sub-areas and SMA Forest or Agriculture for the Burdoin Mtn. sub-area. The landscape settings are Oak Woodlands on Burdoin Mtn. and Gorge Walls/Canyonlands/Wildlands for the rest of the planning area.

BURDOIN MOUNTAIN SUB-AREA
FROM THE HISTORIC COLUMBIA RIVER HIGHWAY AT MOSIER

Key Viewing Areas
The portions of the site visible from Key Viewing Areas (KVAs) were obtained from the KVA GIS layer developed by the Forest Service and Gorge Commission based on a 10-meter digital elevation model.

The factors that influence potential visual impact of a proposed development listed in the Management Plan are the following:

- The amount of area of the building site exposed to Key Viewing Areas.
- The degree of existing vegetation providing screening.
- The distance of the building site to the key viewing areas from which it is visible.
- The number of key viewing areas from which it is visible.
- The linear distance along the key viewing areas from which the building site is visible.

Visibility Analysis
The planning area is topographically visible (considering landform only, not vegetative screening) from the viewpoints listed below.

- Foreground Distance Zone (0-1/2 mile): SR-14, County Rd. 1230
- Middleground Distance Zone (1/2-3 miles): I-84, Historic Columbia River Highway (HCRH), Rowena Plateau, and the Columbia River.
- Background Distance Zone (3 miles or more): I-84, Historic Columbia River Highway (HCRH), Dog Mountain, Pacific Crest Trail, and the Columbia River.

Amount of Exposure to Key Viewing Areas (KVAs) and Existing Vegetative Screening
The KVAs of most concern for this project are the Middleground viewpoints. These viewpoints will provide a panorama of the project area while the view from all of the other distance zones will be largely unaffected by the project activities.

County Road 1230
Distance Zone-Foreground ¼ mile or less and Middle-ground 1 to 2 miles is superior to the viewer's position. Grasslands of the project area meet the road and the forested section of the project area appear above the viewer.

SR-14
Distance Zone-Foreground ¼ mile or less and Middle-ground 1 to 2 miles is superior to the viewer's position.

Duration of View-Relatively short because Coyote Wall blocks views from Westbound traffic until Locke Lake, because there are technically no viewing areas from the Bingen Urban Area to the west, and because landforms block views.

I-84 and Columbia River
Distance Zone- Middleground from .7 to 2 miles

Duration of View-Long open view going both Westbound and Eastbound

Historic Columbia River Highway and Rowena Plateau
Distance Zone-Middle-ground from 1 to 3 miles

Duration of View - Short duration on the Highway itself. Views are glimpse. At overlooks and turnouts, the duration can be very long.

Existing Scenic Condition
The Burdoin Mtn. sub-area is located within the Oak Woodlands landscape setting described by the Columbia River Gorge NSA Management Plan below:

Overview and Land Use
This visually complex setting represents the climatic transition area between the lush forests of the western Gorge-and the semi-arid grasslands of the eastern Gorge. Dry oak-pine woods, Savannah areas (predominantly grassy openings with scattered trees), and grassy prairies are interspersed with scattered rural development. Such development includes

residences, roads, fences, etc. In some portions of this setting, orchards and cultivated areas lend a pastoral flavor to this generally natural-appearing landscape. Most parcels are over 20 acres in size, and are frequently between 40 and 160 acres.

Landform
Most of this setting is found on gently rolling to hilly terrain. Pastures and small farm uses are interspersed in the gentler portions of this setting. Some very steep slopes and deeply incised side canyons are contained in the least developed portions of this setting.

Vegetation
This setting contains perhaps the most varied vegetative communities in the Gorge, adding to its visual richness. Mixed stands of Oregon white oak and ponderosa pine typify this setting. In the western portions, highest elevations, and north slopes, this community transitions into woodland vegetation patterns, with increasing numbers of Douglas-fir occurring. Drier portions of this setting and areas with poor, thin soils are often treeless prairies. "Biscuit scablands," or patterned ground areas with little vegetation and hummocky rock outcrops, also occur. This special landscape, created by scouring of great floods, is also found in some portions of the Grassland setting.

The escarpment at Coyote Wall is an exceptional landscape feature and draws the eye from key viewing areas to the south and southwest.

The vegetation on Burdoin Mountain has undergone changes over the last 100 years that are not apparent to the casual visitor. Stands that were once open and park-like are now generally more densely stocked with small trees, and are in most cases less than one-half to one-third as many large trees in the over-story than in the past.

The Catherine and Major sub-areas are located within the Gorge Walls/Canyonlands/ Wildlands landscape setting described by the Columbia River Gorge NSA Management Plan below:

Overview and Land Use
This setting represents the bluffs, cliffs and steep slopes that form the walls of the Gorge and the deeply incised canyons of the Columbia River's major tributaries. Because of extreme steepness, and in some cases inaccessibility and instability, these areas are largely undeveloped...Prevailing land use in these areas is undeveloped vacant land, although low-intensity recreation use and some silviculture occur in a few limited areas.

Landform
The landform component of this setting is a much greater determinant of its character than is true for any other setting. Steep wooded slopes, canyon walls, and sheer rock faces characterize this setting. In the side canyons, small ribbons of riparian floodplain areas also occur.

Vegetation
The steepest portions of this setting are rocky cliffs devoid of much vegetation or loose talus slopes with limited vegetation (although such slopes often include large, old fir, pine, and maple trees). Other portions of this setting include stands of large fir and pine trees, some of which appear to be the (remnants of) original forest cover.

Existing Scenic Quality Level
Currently, the planning area appears highly scenic from the middleground and background views from key viewing areas. It currently meets Not Visually Evident from all the previously mentioned key viewing areas because most private development is screened from view, not visible from KVAs, or is a naturalized landscape feature such as a pasture. However, the vegetation in the Catherine and Major Creek area has also undergone changes over the last 100 years that are not apparent to the casual visitor. Stands that were once open and park-like are now generally more densely stocked with small trees, and are in most cases stocked with less than one-half to one-third fewer large trees in the over-story than in the past. Douglas-fir is a more dominant landscape component than it was historically. It does not appear natural from the foreground due to the lack of large character trees.

The scenic desired future condition for the planning area is to decrease tree density and increase the average diameter of the remaining trees. In the long term, this would be more dramatic and therefore more scenic from foreground and close middleground views.

VISIBILITY FROM KVAs SUMMARY TABLE

KVA VIEWPOINT	VISIBILITY	DURATION OF VIEW	TOPOGRAPHIC OR VEG ETATION SCREENING	DISTANCE FROM KVA	EXISTING VISUAL QUALITY LEVEL
SR-14 and Rd. 1230 FOREGROUND	LOW	LOW	HIGH	LOW	NOT EVIDENT[1]
COLUMBIA RIVER MIDDLEGROUND	MED	HIGH	LOW	MED	NOT EVIDENT
ALL OTHERS	MED	MED	HIGH EXCEPT AT VIEWPOINTS	HIGH	NOT EVIDENT

Regulatory Framework
The Management Plan, Part I, Chapter 1, Scenic Resources, SMA guidelines, states:

- Forest practices shall meet the design guidelines and scenic standards for the applicable landscape setting and zone.

- The required SMA scenic standards for all development and uses are summarized in the following table:

(The following standards are applicable to the land use designations and landscape settings in the project area:)

REQUIRED SMA SCENIC STANDARDS		
LANDSCAPE SETTING	**LAND USE DESIGNATION**	**SCENIC STANDARD**
Gorge Walls, Canyonlands, Wildlands, Oak-Pine Woodland	Forest (National Forest Lands), Open Space	Not Visually Evident
Oak-Pine Woodland	Agriculture	Visually Subordinate

Visually Subordinate from Key Viewing Areas is defined in the Management Plan as:

Visually subordinate: Visually subordinate forest practices in the SMA shall repeat form, line, color, or texture common to the natural landscape, while changes in their qualities of size, amount, intensity, direction, pattern, etc., shall not dominate the natural landscape setting.

Not Visually Evident from Key Viewing Areas is defined in the Management Plan as:

Not visually evident (SMA): A visual quality standard that provides for development or uses that are not visually noticeable to the casual visitor. Developments or uses shall only repeat form, line, color, and texture that are frequently found in the natural landscape, while changes in their qualities of size, amount, intensity, direction, pattern, etc., shall not be noticeable.

The following are the scenic resource guidelines required by the Management Plan for forest practices:

- Created forest openings visible at one time shall be within the desired range for the vegetation type as set forth in the forest practice Natural Resources guidelines
- Size, shape, and dispersal of created forest openings shall maintain the desired natural patterns in the landscape as set forth in the forest practice Natural Resources guidelines
- The maximum size of any created forest opening is set forth by the "Desired" vegetation type in the Forest Structure and Pattern Table.
- Created forest openings shall not create a break or opening in the vegetation in the skyline as viewed from a key viewing area.

Oak Woodland landscape setting.

- Use of plant species native to the landscape setting shall be encouraged. Where non-native plants are used, they shall have native-appearing characteristics.

Gorge Walls, Canyonlands, and Wildlands landscape setting

- New developments and land uses shall retain the overall visual character of the natural-appearing landscape.
- Temporary roads shall be promptly closed and revegetated.
- Use of plant species non-native to the Columbia River Gorge shall not be allowed.

Environmental Consequences

DIRECT AND INDIRECT EFFECTS OF ALTERNATIVE 1-NO ACTION

Partial Retention or Not Visually Evident from Key Viewing Areas -The No Action Alternative would meet the required scenic standards unless a large, catastrophic fire revealed existing development and caused an unnatural amount of tree mortality. In the natural fire regime, most fires would burn frequently and would stay in the understory. A large amount of crown death would not be a natural occurrence and thus would not meet the scenic standards as defined by the Management Plan.

Structural, Species and Age Diversity - There is currently a lack of structural diversity in the current stand structures. Over time there will be fewer and fewer large diameter trees. Stagnant stands will increase the risk of a depauperate under-story and a reduction of desirable wildflower species.

Form, Line, Color, or Texture Common to the Natural Landscape

LANDSCAPE ELEMENT From KVA'S	NATURAL	EXISTING	AFTER TREATMENT	DEGREE CHANGE (From Natural)
LANDSCAPE PATTERN (Form/Line)	MOSAIC	MOSAIC (fewer openings)	NO TREATMENT PROPOSED	MINIMAL : Will appear natural unless large fire occurs
LANDSCAPE STRUCTURE (Form, Line, Color)	Large Trees Park-like or Cathedral-like Orange bark visible on large pines.	Smaller Trees Not park-like Except at very low elevation. Not Cathedral-like Few visible large pines	NO TREATMENT PROPOSED	Short Term: MEDIUM : Large oaks and pine continue to die Unless large fire occurs Long Term: HIGH Eventual loss of pine-oak transition zone Ecosystem.
GROUND PLANE (Color, Texture)	Grasses Wildflowers Short Shrubs	Many areas grass and wildflower layer shaded out. Shrubs overgrown.	NO TREATMENT PROPOSED	Short Term: MEDIUM Long Term: HIGH Concern for Foregrounds only

Existing Created Openings

The Management Plan defines a created opening as an opening with "…less than 40 percent average canopy closure of overstory trees and less than 60 percent average canopy closure of understory trees averaging less than 5 inches diameter at breast height for coniferous forests and less than 25 percent total canopy cover for oak woodlands. This definition does not include agricultural fields." Created Forest Openings are human-made and will likely continue at the rate allowed in the Management Plan for private and state forested lands. Under this alternative, they would not increase in the planning area.

Below is an excerpt from the Management Plan Desired Forest Structure and Pattern table:

Vegetation Type	**Forest Structure** (Average % total canopy closure (cc)) *
East Conifer (Ponderosa Pine/Douglas fir)	40-80% canopy closure Understory layer less than 25% of total cc
Ponderosa Pine/ Oregon Oak	25-60% canopy closure Understory layer greater than 25% of total cc.

Large portions of the planning area would not meet the desired structure as defined above because stands exams have shown that that total canopies exceed desired and that understory layers exceed the above percentages of total canopy. See discussion starting on page 75.

CUMMULATIVE EFFECTS OF ALTERNATIVE 1-NO ACTION

The foreseeable cumulative effects of Alternative 1 would be the continued growth of small diameter trees competing for water and light with the existing trees. This competition will lead to the accumulation of fuels and the mortality of existing larger diameter trees. This effect will also occur in other similar landscapes throughout the Gorge, creating risk of a large fire which would reveal existing houses and cause negative effects to the scenic resource. The cumulative effects of the risk of wildfire throughout the Gorge may reduce scenic quality. If a large stand-replacing fire does not occur, the tree stands will slowly lose scenic quality. Large oaks and large diameter ponderosa pine trees will continue to die without being replaced. Note: The table below contains an assumption of continued in-growth of Douglas-fir.

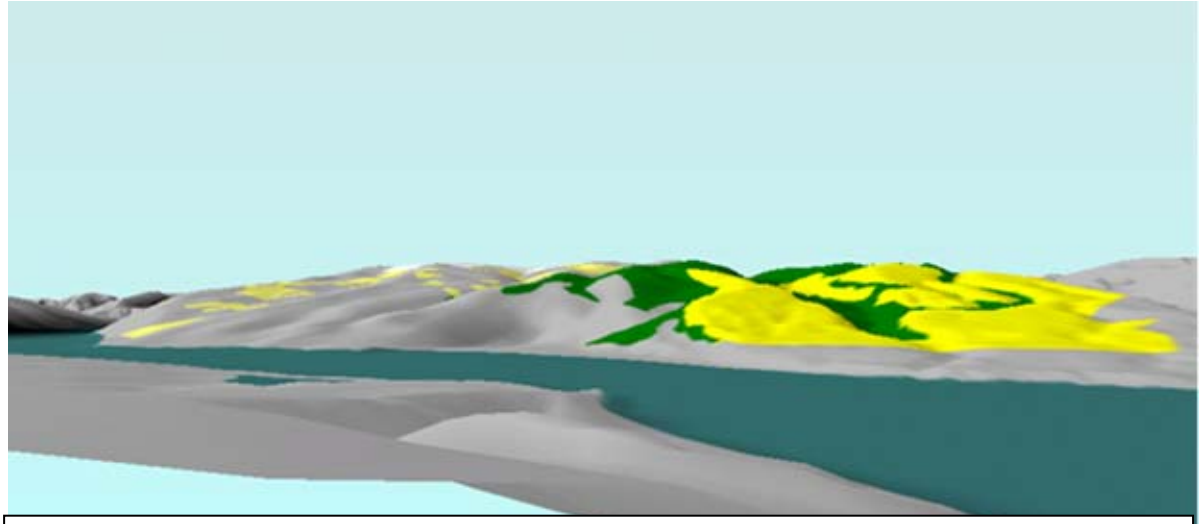
CUMULATIVE EFFECTS DETERMINATION					
Past, Current or Foreseeable **PROJECT**	**Potential Effects**	**OVERLAP IN: TIME**	**or SPACE**	**Measurable?**	**Extent**
Burdoin I	Foreground SR-14 Stumps, slash piles	No	Yes	No	No effects from Burdoin I are currently evident from KVAs, including SR-14.
Firehouse	Not visible KVAs	No	Yes	No	Not evident
Courtney Rd. widening	Not visible KVAs	No	Yes	No	Not evident
Allen property thinning and structure removal	Not visible KVAs	No	Yes	No	Not evident
Invasive Plant treatments past or future	Temporary Dead Plants Future-improve natives	Maybe	Yes	No	None evident—small input to cumulative scenic effects.
Paved accessible trail at Catherine Creek	Trail visible, Not very evident	No	Yes	No	Not very evident. Small input to cumulative scenic effects.
Burdoin II Thin from below	Middleground Not evident	Maybe	Yes	No	Fewer numbers of trees in viewsheds from Middleground distance but small visual deviation from the natural patterns.
Coyote wall FS trails	Not evident	Maybe	Yes	No	Not evident
Past/Future Land acquisitions	Less development-positive	Maybe	Yes	Yes	Measureably less development in SMA purchased by FS. Reduces cumulative negative effects.
Historic Tree Harvest	Removed Large Trees	No	Yes	Yes	Fewer large trees (due to past harvests) in viewsheds from Middleground distance but small visual deviation from the natural patterns.
Future State/Private Forest Practices	Must meet SMA guidelines	Maybe	Yes	Yes	Fewer numbers of trees in viewsheds from Middleground distance but small visual deviations from natural patterns.

DIRECT AND INDIRECT EFFECTS OF ALTERNATIVE 2-PROPOSED ACTION

Scenic Standards from Key Viewing Areas

Middle-ground views -Most of the treatment area will be seen from the Middle-ground distance zone where the change will be a difference in the density of the under-story layers. This will meet the definition for scenic standards above. The large tall pines visible from key viewing areas may be more visible. The over-all natural appearance of the landscape will not be modified.

Effects from prescribed burning in the grasslands may be more visible and there will be short term effects such as visible smoke. These effects meet the definition of "line, color, or texture common to the natural landscape" as defined by the Management Plan.



Computer analysis of visible terrain of Catherine Alternative 2 from Memoloose Overlook.
YELLOW-PRESCRIBED BURNING ONLY
GREEN-AREAS PROPOSED FOR THINNING
(Riparian no-thinning areas are also shown green).

Foreground views -Prescribed burns will be visible in the foreground of County Road 1230 and will produce natural effects on the landscape and therefore retain the scenic standard as defined. A temporary road re-alignment of the road 1230020 intersection will the only evident temporary effect. The transportation plan calls for the following :

- *Post haul, remove rock, re-contour graded area and reset fence*

Short term negative scenic effects such as stumps, slash, and ground disturbance in the thinning units will not be visible in the foreground of any KVAs.

Almost all of the project activities are in the middleground or background distance zone from the above KVAs. No foreground KVAs are affected by thinning activities. A temporary road re alignment and a small area of the Burdoin and Catherine prescribed fire areas will be visible from SR-14 in the foreground. The project activities meet the requirement that management activities appear natural because the change in canopy closure will appear natural from the middle ground distance zone, fire is a natural disturbance, and the temporary road changes will not be visible within the required time frame to meet scenic standards (they will be removed).

The project will also exceed scenic requirement due to the following mitigations at non-KVA viewpoints:

- No permanent leave tree marking shall be used except the marking of boundary trees near the base of each tree.
- Stumps >10" dbh shall be flush cut in the immediate foreground (within 50 ft.) of Snowden Road.
- The landing at Snowden Road shall retain screening from existing trees as seen from Snowden Road wherever safety concerns permit.

Structure, Species and Age Diversity - The reduction of canopy in layer 2 and 3 will decrease structural diversity until the growth of larger diameter oak and pine in the thinned stands increases structural diversity. Age diversity will decrease until natural regeneration recurs. Species diversity will decrease because this project plans to minimize the encroachment of Douglas-fir seedlings and Douglas-fir trees less than 8 inches dbh into areas where this species was limited by frequent fire.

The current level of species diversity is out of the range of natural conditions. The prescriptions call for clumps of untreated or minimally treated vegetation within the treatment areas that will help offset any negative effects on species and age diversity.

The project is designed to meet scenic resources from Key Viewing Areas and will meet the scenic standards as summarized in the table below:

Form, Line, Color, or Texture Common to the Natural Landscape

LANDSCAPE ELEMENT From KVA'S	NATURAL	EXISTING	AFTER TREATMENT	DEGREE CHANGE (From Natural)
LANDSCAPE PATTERN (Form/Line)	MOSAIC	MOSAIC (fewer openings)	MOSAIC (no change from existing although some existing openings may be more visible)	MINIMAL (due to existing conditions rather than treatments)
LANDSCAPE STRUCTURE (Form, Line, Color)	Large Trees Park-like or Cathedral-like Orange bark visible on large pines.	Smaller Trees Not park-like Except at very low elevation. Not Cathedral-like Few visible large pines	Larger Trees more visible but not big enough for Cathedral-like Park-like possible More large pine may be visible. Fewer trees visible over oaks. Short-term effects from prescribed fire-- red needles, etc. are common to the natural landscape.	Short Term: MEDIUM (but caused by existing condition more than by treatment) Long Term: MINIMAL, Prescribed fire would help create park-like, cathedral conditions.
GROUND PLANE (Color, Texture)	Grasses Wildflowers Short Shrubs	Many areas grass and wildflower layer shaded out. Shrubs overgrown.	Short Term: Disturbed ground, stumps, slash, spindly trees, boundary marks, Long-term: Improved layer of grasses, Wildflowers, Short shrubs	Short Term: MEDIUM Long Term: MINIMAL Concern for Foregrounds only

Created Openings and Breaking the Skyline

The Management Plan defines a created opening as an opening with "…less than 40 percent average canopy closure of overstory trees and less than 60 percent average canopy closure of understory trees averaging less than 5 inches diameter at breast height for coniferous forests and less than 25 percent total canopy cover for oak woodlands. This definition does not include agricultural fields."

Landings will be located in existing openings and may need to be enlarged for worker safety. The size of the additional clearing will not exceed the Management Requirement in the structure and pattern table of less than one acre (including the size of the original opening). No openings are located on a ridge-top or are of a size that would break the skyline.

Prescriptions for the east conifer types (including pine-oak-Douglas fir) require an average canopy from 45-60% and the pine/oak vegetation type requires average canopy closure of 50% percent which falls within the desired limits required by the Management Plan as indicated below with an excerpt from the Desired Forest Structure and Pattern Table:

Vegetation Type	**Forest Structure** (Average % total canopy closure (cc)) *
East Conifer (Ponderosa Pine/Douglas fir)	40-80% canopy closure Understory layer less than 25% of total cc
Ponderosa Pine/ Oregon Oak	25-60% canopy closure Understory layer greater than 25% of total cc.

Temporary Roads

The only temporary road planned is a short spur off of Snowden Road (See description in Chapter 2). This road will be removed and the area re-planted with native plants as per the Management Plan requirement for the Gorge Walls, Canyonlands, and Wildlands landscape setting that temporary roads shall be promptly closed and revegetated.

Native Plants

The Natural Resources Mitigation plan in Chapter 2 calls for the use of native plants for all revegetation needs in the planning area.

CUMULATIVE EFFECTS OF ALTERNATIVE 2-PROPOSED ACTION

Cumulative effects from existing development and other forest practices along with the proposals in Alternative 2 will have a small effect on viewsheds because most of the effects of thinning prescriptions are found in the Foreground distance zone. Almost all of the project area is in the middle-ground or background distance zone from KVAs. The table below summarizes these cumulative effects.

The foreseeable future cumulative effects of Alternative 2 would be that the private or state landowners would implement similar thinning projects in the future or other visible projects in the planning area and these require implementation requirements or approval conditions under the Management Plan to forestall short-term or long-term negative scenic effects with regard to impacting viewsheds. The scenic protections in the Management Plan were meant to protect the resource from these effects. This should prevent cumulative negative effects to scenic resources. The cumulative positive effects of these thinnings would be to reduce the overall fire risk in the Gorge and to increase over time the development of very large trees and more prevalent wildflower under-stories. The table below summarizes these effects:

CUMULATIVE EFFECTS DETERMINATION					
Past, Current or Foreseeable **PROJECT**	**Potential Effects**	**OVERLAP IN: TIME or SPACE**		**Measurable?**	**Extent**
Burdoin I	Foreground SR-14 Stumps, slash piles	No	Yes	No	No effects from Burdoin I are currently evident from KVAs, including SR-14.
Firehouse	Not visible KVAs	No	Yes	No	Not evident
Courtney Rd. widening	Not visible KVAs	No	Yes	No	Not evident
Allen property thinning and structure removal	Not visible KVAs	No	Yes	No	Not evident
Invasive Plant treatments past or future	Temporary Dead Plants Future-improve natives	No	Yes	No	None evident—small input to cumulative scenic effects.
Paved accessible trail at Catherine Creek	Trail visible, Not very evident	No	Yes	No	Not very evident. Small input to cumulative scenic effects.
Burdoin II Thin from below	Middleground Not evident	Maybe	Yes	No	Fewer numbers of trees in viewsheds from Middleground distance but small visual deviation from the natural patterns.
Coyote wall FS trails	Not Evident	Maybe	Yes	No	Not evident
Past /Future Land acquisitions	Less development-positive	Maybe	Yes	Yes	Measureably less development in SMA purchased by FS. Reduces cumulative negative effects.
Historic Tree Harvest	Removed Large Trees	No	Yes	No	Fewer large trees in viewsheds from past harvest in Middleground distance but small visual deviation from the natural patterns.
Future State/Private Forest Practices	Must meet SMA guidelines	Maybe	Yes	No	Fewer numbers of trees in viewsheds from Middleground distance but small visual deviation from the natural patterns.

Summary

The following table summarizes the scenic effects of the alternatives:

VISUAL DISTURBANCE SUMMARY		ALT 1-No Action	ALT 2-Proposed Action
Foreground SR-14/County Rd 1230	KVA Visible Acres Treated	FG-0 Unless wildfire	135 Underburn
Middlegrounds/ Backgrounds		MG/BG-0 Unless wildfire	2055 Thin 1300 Underburn
% Visually Disturbed	% Negatively Affected Viewshed	0-Unless wildfire	Less 1%-Rd 1230 Temp realignment

3.4 - EFFECTS TO CULTURAL RESOURCES

Introduction
A comprehensive review of the history and prehistory of the project area was presented by Hess and Stump (1995) and will not be repeated here. McDaniel (2002) compiled the background research for the Burdoin Mountain portion of the project area. In summary, the Burdoin Mountain, Major Creek and Catherine Creek drainages show a long history of human occupation. While no documented Indian villages have been found within the project area there is evidence of extensive Indian use of the White Salmon River and Klickitat River drainages. Catherine and Major Creeks occur west of the Klickitat River and east of the White Salmon River. Talus rock feature site, 45KL327, is a complex rock feature site and is listed on the National Register of Historic Places. In addition, lithic debris and pictographs have also been recorded in previous surveys.

European-American settlement began in the nineteenth century. General Land Office (GLO) maps from the 1860-1870s show few structures, fields or roads within the project area. By the early twentieth century (1913) a significant number of land patents covered the project area. A review of the land patent records on the BLM website showed 38 different landowners had filed patents within the project area between 1883 and 1918. Seventy-six percent of the patents were filed in the nine years between 1904 and 1912. The earliest patents were filed in the southwest corner of the project area. The later patents occurred near the confluence of Major Creek and the Columbia River. Logging of the Catherine Creek and Major Creek drainages occurred throughout the first half of the twentieth century.

Analysis Methods and Measurements
The entire area of potential effect (APE) includes 4,177-acres of national forest lands in Klickitat County. Over the past 14-years several cultural resource surveys have been conducted within the area of potential effect for this project. In the mid-1990s a large cultural resource survey was conducted under contract by Hess and Stump (1995). They surveyed nearly 2700-acres of lands north of Rowland Lake. Two-thousand thirty-one acres of those areas occur within the current APE. Also in 1994, 38-acres of the Bonneville Power Administration transmission line were surveyed through the current project area (Luttrell 1994). Three more surveys were conducted in the Burdoin Mountain vicinity in the early 2000s (McDaniel 2002, Dryden 2004 and Dryden 2005). The McDaniel survey covered 422 acres Dryden (2004) covered 125-acres, and Dryden (2005) covered 86-acres.

1994 Charles Luttrell, archaeologist for Archaeological and Historical Services Eastern Washington University surveyed along the Ross-Franklin power transmission line in the southern portion of the project area (Luttrell 1994). The survey project was confined to 125-foot-400-foot corridor following the transmission rights-of-way. Transects were 30-meters apart. Area specific topographic maps of the survey area were not included in the final report so I was not able to determine the exact width of the area surveyed. The conservative corridor width of 125-feet (38-meters) has been arbitrarily attributed to this section of the 29-mile long survey that was conducted. No less than 38-acres were surveyed within the current project area. One historic habitation site was recorded along this section of the power transmission line.

1995 Sean Hess and Sheila Stump, archaeologists for Boas, Inc., surveyed 2653-acres for the Columbia River Gorge National Scenic Area and recorded 35 sites (Hess and Stump 1995) during the spring of 1994. Most of that survey (2,032-acres) falls within the Catherine Forest Restoration Project. While the inventory report and site forms were sent to the State Historic Preservation Office, the area surveyed map was not submitted using 7.5-min. topographic maps and the surveyed areas do not appear on the electronic Department of Archaeology and Historic Preservation (DAHP) GIS survey database.

Many of the sites recorded by Hess and Stump were assigned Smithsonian Trinomial numbers in 1997. Later, in 2002, there was a mix-up and two of the sites were given additional trinomial numbers. Site 45KL648 was also assigned 45KL882 and 45KL649 was also assigned 45KL887. Subsequent to the Hess and Stump survey, two additional pictograph sites were discovered by Michael Boynton and by Rich Davis (ranger at Horsethief Lake State Park) in 1996 (45KL658 and 45KL657)

2002 Sarah McDaniel, archaeologist for the Gifford Pinchot National Forest, conducted a cultural resource survey of 386-acres for the Burdoin Mountain Fuel Treatment Project (McDaniel 2002). Five cultural resources sites were observed. The areas surveyed by McDaniel appear on the GIS survey database.

2004 Charlene Schmid, archaeological technician for the Columbia River Gorge National Scenic Area, conducted a cultural resource survey of 165-acres for the Catherine Creek – Allen Tract Small Fir Removal and Prescribed Burn Project (Dryden 2004). One new cultural resource site and one isolated find were observed. The areas surveyed for this project appear on the DAHP GIS survey database.

2005 Eric Gleason and Jacqueline Cheung, consulting archaeologists, conducted a cultural resource survey of 100-acres for the Burdoin II Vegetation Management Project (Dryden 2005). No new cultural resource sites were observed. The areas surveyed for this project appear on the DAHP GIS survey database.

All five surveys were composed of linear transects averaging 30-meters or less in width and followed acceptable survey standards. The areas surveyed within this proposed project area were examined for evidence of surface and subsurface cultural artifacts. Visibility was variable, but generally poor and hampered by poison oak and vegetation thickets. Lineal transects were augmented by examination of areas of exposed mineral soil. Exposures were found where there was thin vegetation, native surface road beds, cut banks and rodent burrows.

In assessing the needs of the Catherine Forest Restoration Project, the probability map (Boynton 2002) was consulted. The project area encompasses 4177 acres. Of that 741 acres (18%) is high probability and 3,436-acres (82%) are low probability. The areas that had been previously surveyed were compared to the probability map to assess the distribution of the areas that had been covered.

One-hundred-seventy-four (174) acres (7% of the surveyed areas) were surveyed on more than one occasion between 1994 and 2005 with the following distribution:

Twelve-acres of low probability and 16-acres of high probability were surveyed by Lutrell and Hess and Stump in 1994.
McDaniel (2002) resurveyed 126-acres of Hess.
The 2005 (Dryden) resurveyed 20-acres of Hess.

Five of Boynton's high probability zones are present within the Catherine project area. "Surface sites within the H1 classification east of Hood River are normally defined by the presence of structural features, including but not limited to dwelling remains, occupational deposit (midden), ground and flaked stone tools, fire-cracked rock, bone and shell, burials, cairns, and petroglyphs/pictographs.

"Sites within the H2 classification, which are anticipated on benches on slopes in excess of 30 percent, tend to include secondary residential, primary seasonal, specific-task, burial and cairn sites. The presence of a nearby stream or spring will tend to weight the use of the area towards complexity.

"H4 classifications include the distinctive physiographic features of ridge crests, intersects, and saddles. ..Interestingly, prehistoric and historic activities within the H4 designation tend to be similar. They are associated with transportation (trails, roads), temporary occupation sites, and resource procurement and processing.

"H6 designated areas are the summits of peaks, bluffs, and hill tops. Prehistoric resource expectations for this zone include cairns and spirit quest sites. Historic uses include Indian and non-Indian cemeteries and burials, cremation disposals, lookouts, recreation/trail destinations, and monumented survey points.

"H7 areas consist of talus slopes, cobble and boulder fields, and the margins of these areas. …Prehistoric sites that will be encountered within talus slopes will consist of spirit quest features (cairns, pits, walls, sinuous features, single rock stacks) within the slopes. (Boynton 2002:64-67)."

Just over 221-acres of high and approximately 51-acres of low probability areas were selected for coverage. Seven acres of high probability and five acres of low probability that had previously been surveyed by Hess and Stump were resurveyed in 2006. Ten acres of high probability that had been surveyed in 2004 (Dryden) was also resurveyed. Of the 272-acres selected for survey, 22-acres were resurveyed acres and 250-acres were to be new acres surveyed. Twelve of those acres were not accessible and a final total of 238-acres of new acres surveyed were accomplished.

Michael Dryden, archaeologist for the Mt. Hood National Forest and Margaret Dryden, Heritage Program Manager for the National Scenic Area, conducted the cultural resource survey of 260-acres for the Catherine Forest Restoration Project. Eight new historic cultural resources sites and one prehistoric lithic isolated find were documented.

Existing Conditions

The project area has a large number of archaeological resources. Reconnaissance surveys conducted from 1994-2006 have located 36 historic properties within the area of potential effect. Eighteen of the sites have been evaluated for eligibility to the National Register of

Historic Places (NRHP). One prehistoric site is listed on the NRHP; six prehistoric sites and three historic sites have been found "eligible" to the NRHP, but are not listed; and five historic sites and four prehistoric sites have been evaluated as "not eligible" to the NRHP. The remaining 17 sites, 11 historic and five prehistoric, remain unevaluated.

All sites that are listed, eligible or unevaluated must be protected from the adverse effects of the project proposal. Many of these properties include artifacts that are combustible such as wood or that could be damaged by fire such as glass, leather, and some metals.

Regulatory Framework
Gifford Pinchot National Forest LRMP Forest-wide standards and guidelines and the Columbia River Gorge National Scenic Area Management Plan

NSA policy for cultural resources in the special management area (SMA) is:

- New developments or land uses shall not adversely affect significant cultural resources;
- NSA guidelines for cultural resources in the special management area (SMA) are:
- Professional expertise is required to conduct cultural resources surveys, evaluations, assessments and mitigation plans
- Federal undertaking shall complete consultation responsibilities under Section 106 of the Historic Preservation Act of 1966.
- A "new discovery" shall require immediate notification of the Forest service if cultural resources are discovered during construction. Specific notification requirements are triggered if human bone or burials are discovered.
- The following steps must be followed in assessing potential effects to cultural resources:
    - Literature Review and Consultation
    - Field Inventory
    - Evaluation of Significance
    - Assessment of Effect
    - Mitigation

Environmental Consequences
DIRECT AND INDIRECT EFFECTS ALTERNATIVE 1-NO ACTION

This alternative proposes no fuel treatment. Effects related to cultural resources are described below.

The No-Action alternative (without the foreseeable event of a catastrophic fire) would have the least risk of adverse effect on cultural resources because disturbance or any other adverse effect would be lower if there were no activity in the area.

The No-Action alternative (with the foreseeable event of a catastrophic fire) would have a greater risk of adverse effects on cultural resources because of disturbance of the fire and fire suppression actions.

Uncontrolled fires and suppression of wildfires have the potential to adversely affect cultural resources. Sites that have combustible artifacts and features, such as milled lumber or log walls can be damaged by fire. Suppression of wildfires can necessitate the use of equipment

such as shovels, fire hoses, retardant drops, water bucket drops from helicopters, and mechanically constructed firelines. The construction of dozer fire breaks has the potential to adversely affect historic structure remains, such as cabins and logging camps and to cause subsurface disturbance of archaeological sites. Some sites may not be damaged by wild fires but are still susceptible to the adverse effects cause by suppression actions. It is unlikely that even a catastrophic wildfire would have adverse effects to all cultural resource sites within the project area because of natural and man-made fire breaks which will protect an unknown number of sites.

DIRECT AND INDIRECT EFFECTS ALTERNATIVE 2-PROPOSED ACTION

This alternative proposes to treat vegetation to begin to restore this area to pre-fire exclusion conditions and discourage fire from spreading throughout the area. Treatments would vary depending on the existing vegetative conditions. In total, approximately 3,810 acres are proposed for some type of treatment. A detailed description of the location and type of treatments can be found in Chapter 2 of this document.

Thirty-five cultural resource sites have been identified within the project area. None of the sites are known to extend off of forest service lands.

Individual Indicator Table	**Effects of the Actions** **Alternative 1-No Action** **Potential wildfire and suppression actions.**			**Effects of the Actions** **Alternative 2** **Thinning and prescribed burning**		
INDICATORS	Avoid	Potential Adverse Effect	Effect but Not Adverse	Avoid	Adverse Effect	Effect but Not Adverse
Sites Listed on National Register of Historic Places	0	0-1	0	1	0	
Sites Eligible to the National Register of Historic Places	0	0-9	0	9	0	Burn over some sites
Sites that may be found Eligible to the National Register of Historic Places	0	0-17	0	17	0	
Sites that are not eligible to the National Register of Historic Places	0	0	0-9	0	0	9

Significant cultural resources sites may not be adversely affected by actions proposed in Alternative 2. The preceding table shows that 35 sites have been documented within the

project area. Of those sites, nine have been evaluated as "not significant" and require no protection or mitigation measures. Under alternatives 1 and 2, there may be effects to these nine sites, but that effect will not be adverse because the sites are not considered significant.

Ten sites have been evaluated as significant and one of them is listed on the National Register of Historic Places (NRHP). Sixteen sites have not yet been evaluated but are being treated as if they are eligible to the NRHP.

Adverse effects could be caused by the following proposed actions:
Thinning (falling trees)- trees could fall on some sites and damage features. Rock walls could be knocked down, wood walls could be knocked down or broken, soil could be exposed by yarding and piling trees.
Fireline Construction: mechanically constructed firelines will naturally expose mineral soil. Archaeological sites can be damaged by ground disturbance. Features and structures can be damaged by being knocked down or crushed by the machinery
Burning: Artifacts and features made of combustible materials such as wood can be damaged or destroyed by fire. Fire can also damage non-combustible items such as glass, ceramics, porcelain and some kinds of metals. Burning can release smoke and radiant heat that could damage pictographs.
Access: Road improvements, repairs, helicopter landing areas etc.

Mitigation Measures:
Of the 35 sites, no mitigation measures are necessary for the nine sites that are not significant and have been found to be "not eligible" to the NRHP. Five other sites, that have been found to be significant will be protected from ground disturbing actions through project design. Burning will be allowed over these sites as there are no artifacts or features which would be damaged by the prescribed burn. The remaining 19 sites will be protected from thinning, fireline construction, prescribed burning and access improvements through project design. There will be no effects to these sites.

To ensure that no **historic properties are affected by the undertaking (36 CFR 800.4 (d)(1)),** the following mitigation measures are required:

- Burning, fire line construction, machine piling of slash and in some cases, hand piling of slash, will be restricted within the boundaries of eligible heritage resource sites as per the implementation requirements specified for cultural resources specified in Chapter 2.
- Mitigation measures detailed above and outlined in (Dryden 2007) will be followed.
- If any additional cultural resources are discovered during the implementation of this project, the Forest Service shall immediately notify the State Historic Preservation Office and the appropriate tribal governments as per the implementation requirements previously mentioned.

Indirect, Long-Term and Cumulative Effects of Alternative 1-No Action
The indirect, long-term and cumulative effects of Alternative 1 are the same as the direct and indirect effects.

Indirect, Long-Term and Cumulative Effects of Alternative 2
Since there would be no effects to cultural resources under Alternative 2 and for other projects under the regulations in the Management Plan, there would be no cumulative effects as summarized below:

Project	Potential Effects	Overlap in		Measurable Cumulative Effect?	Extent, Detectable?
		Time	Space		
Burdoin 1 Allen property thins	Ground disturbance of archeological sites and Burning of combustible artifacts and or features	No	Yes	No	Project is completed. No damage to buried archaeological sites or combustible artifacts and or features occurred because of implemented mitigation measures.
Burdoin 2 Thin	Ground disturbance of archeological sites Burning of combustible artifacts and or features	Yes	Yes	Yes	There may be an overlap in timing of this project with Catherine Forest Restoration project. Mitigation measures will protect sites from adverse effects.
Other Developments on Private and non-Forest Service public lands	Ground disturbance of archeological sites Burning of combustible artifacts and or features	Yes	No	Yes	Other projects on non-forest service lands may occur at the same time as the Catherine Forest Restoration project; however, Gorge Commission reviews and conditions will prevent adverse effects to significant archaeological sites. There is no indication that any known sites in the Catherine Project area extend onto non-forest service lands.

Finding of Effect
Application of criteria of effects [36 CFR 800.5 (A)(1)] suggest that the proposed undertaking would result in a finding of "**No adverse effect**" per 36 CFR 800.5(b) . The undertakings effects do not meet the criteria of adverse effect (36CFR800-5(a)(1). The State Historic Preservation Officer and consulting Tribes had 30-days to review the findings. Concurrence from the State Historic Preservation officer was received on April 9, 2007.

3.5 - EFFECTS TO NATURAL RESOURCES

SOIL AND WATER RESOURCES

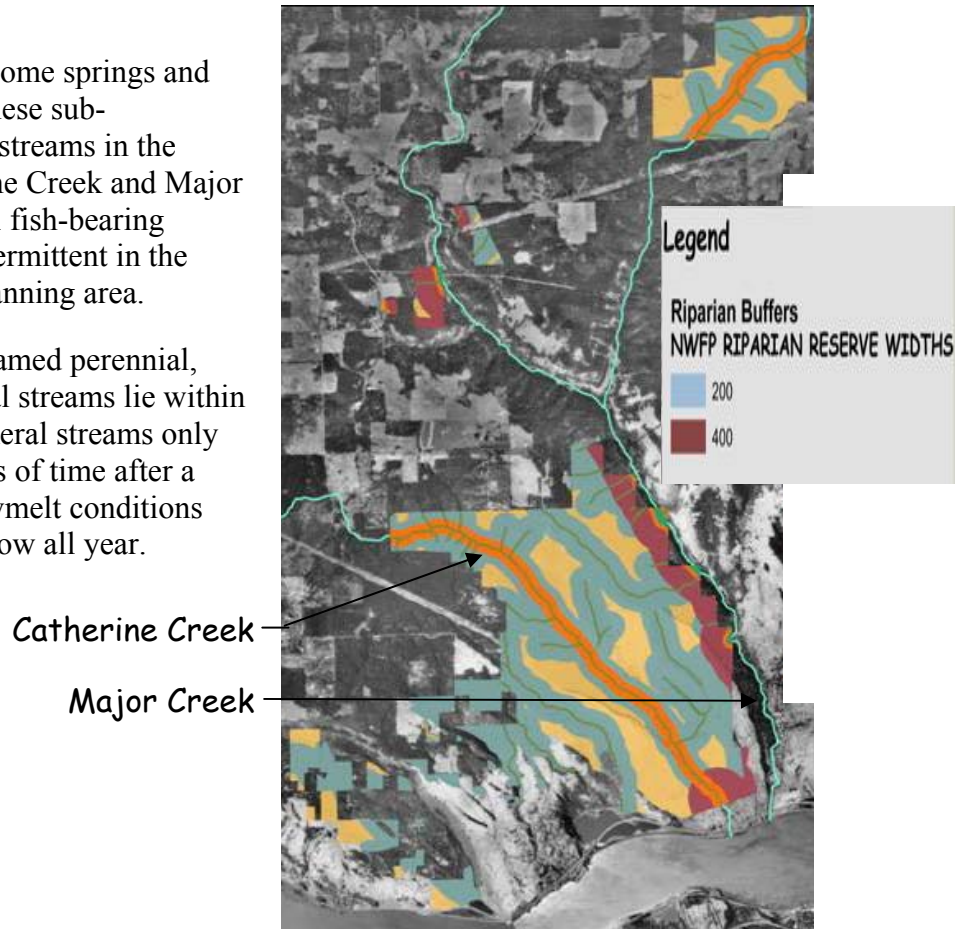
Introduction
The following analysis will describe existing conditions related to the soil and water resources in the Catherine Forest Restoration area. Direct, indirect and cumulative effects will be displayed for soil and water resources, if the project does not go forward (no action) and if the project does go forward.

Analysis Methods and Measurements
The amount of soil disturbance from the project as well as the amount of disturbance in the general area of surface water will be used as measurements for potential erosion and sedimentation. This will be analyzed in the context of proposed mitigation measure to determine the overall potential direct, indirect and cumulative effects from this project.

Existing Conditions
The Catherine Forest Restoration area is located within portions of two 6th field sub-watersheds; Major Creek (31.4 square miles in area) and Rowena Creek (50.5 square miles in area). The planning area is in a portion of the Middle Columbia/Grays Creek 5th field watershed.

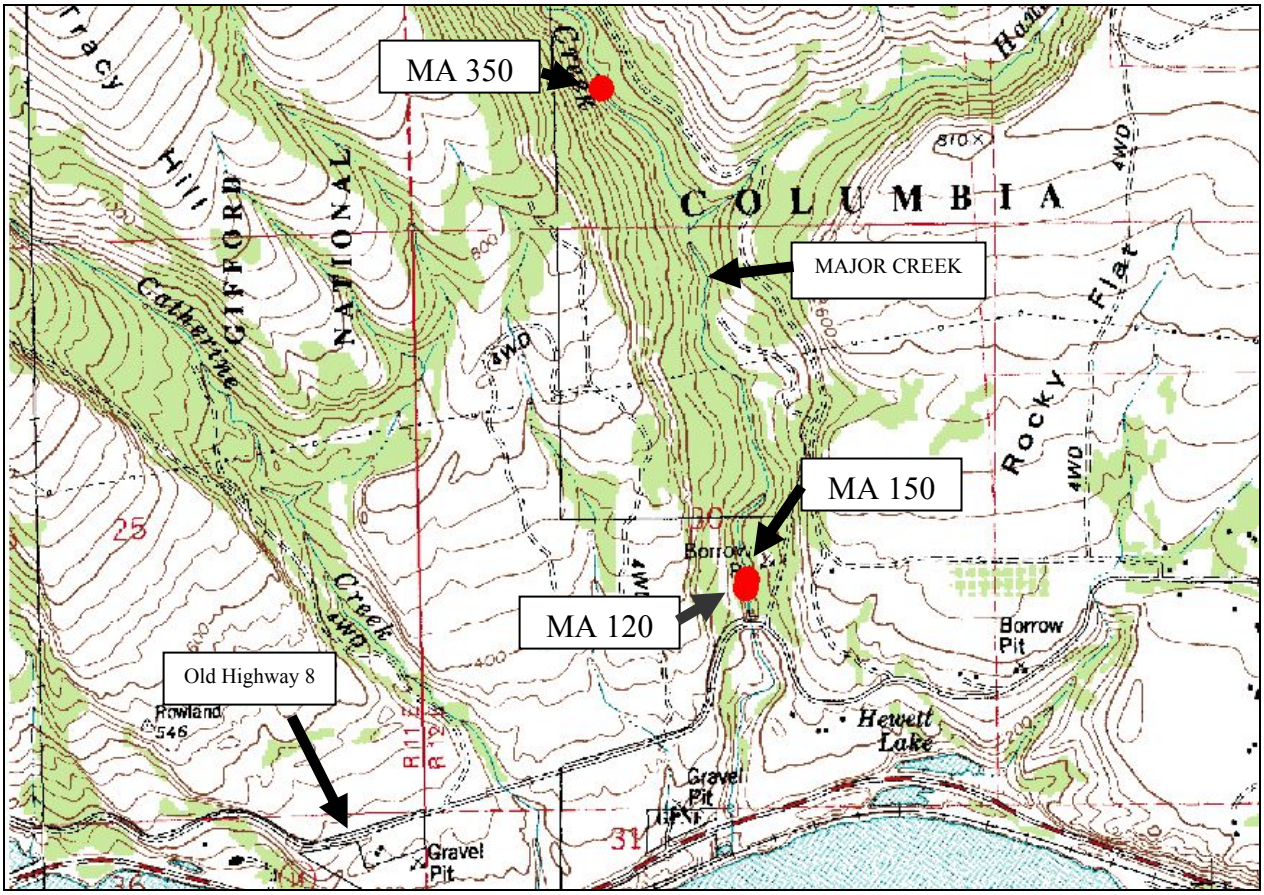
There are many streams, some springs and wetlands located within these sub-watersheds. The primary streams in the planning area are Catherine Creek and Major Creek. Both are perennial fish-bearing streams that change to intermittent in the northern portion of the planning area.

Several other smaller unnamed perennial, intermittent and ephemeral streams lie within the planning area. Ephemeral streams only run water for short periods of time after a storm or during high snowmelt conditions while perennial streams flow all year.



Water Quality

Stream Temperature – Major Creek is the only stream in the planning area where water temperature data has been collected by the Forest Service. Data has been collected on continuous temperature recording dataloggers in three locations on Major Creek (see figure below).



Water temperature monitoring sites on Major Creek. The three sites are labeled MA 120, MA 150 and MA 350.

The highest 7-day average maximum stream temperatures for the years deployed ranged as follows:

Stream	2000	2001	2002	2003	2004	2005	2006
Major Creek Site 120	25.5°C	24.6	ND	23.5	24.2	22.7	23.8
Major Creek Site 150	ND	ND	24.5	ND	ND	ND	ND
Major Creek Site 350	ND	ND	ND	22.4	22.8	21.7	ND

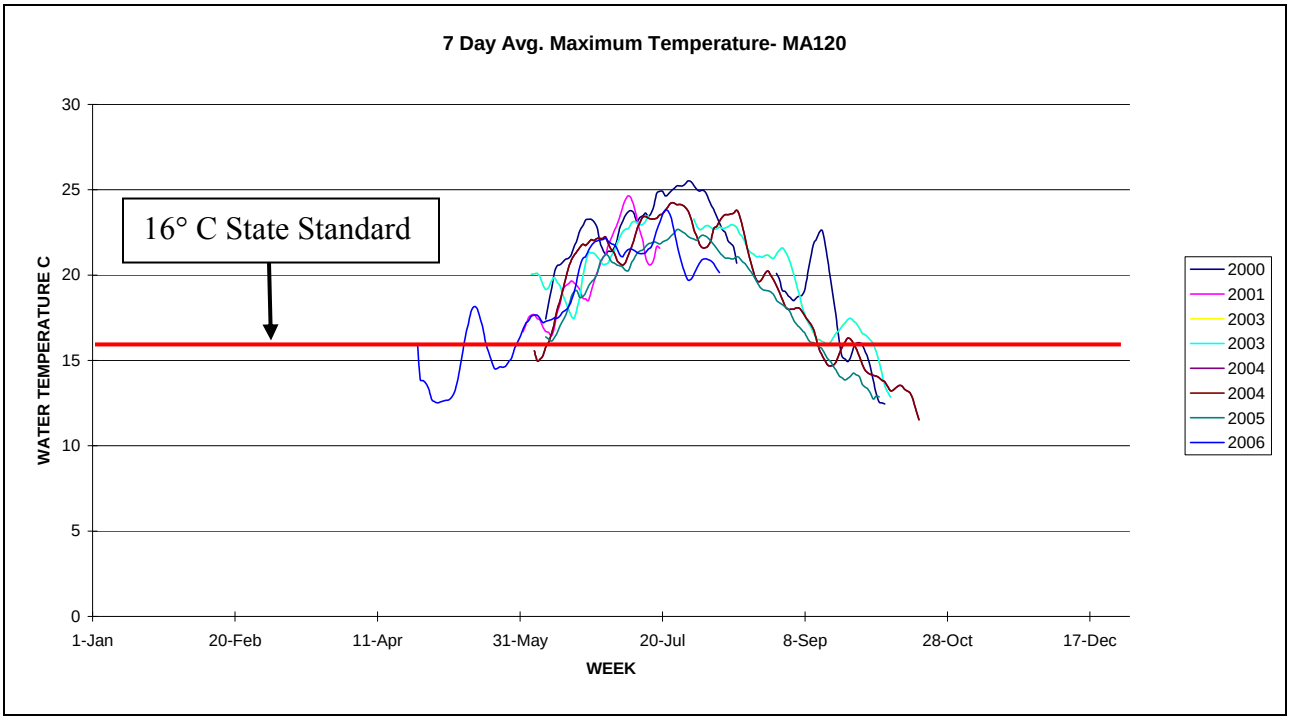
ND = Not Deployed for that Year

Major Creek is listed on the 2004 State of Washington 303(d) list of impaired water bodies. New State Water Quality Standards were adopted on December 21, 2006 which includes new water temperature standards. The new standards identified for Catherine Creek, Major Creek and all of their tributaries are for core summer salmonid habitat temperatures that are not to exceed a 7-day average maximum of 16° C. The table below shows the number of days the 7-day average maximum temperature standard was exceeded for each year that the dataloggers were deployed. The equipment is usually deployed between 120 and 140 days each year.

Stream	2000	2001	2002	2003	2004	2005	2006
Major Creek Site 120	92 days	49	ND	104	98	95	80
Major Creek Site 150	ND	ND	108	ND	ND	ND	ND
Major Creek Site 350	ND	ND	ND	68	99	76	ND

ND = Not Deployed for that Year

The graph below shows the 7-day average maximum stream temperature for all of the years of deployment at site MA120. The y-axis is the temperature and the x-axis is the date. The main finding is that this station consistently exceeds the new temperature standard of 16° C.



Graph showing the 7-day average maximum stream temperatures for monitoring site MA120. Each line represents a separate deployment year. The 16° C standard is routinely exceeded as shown by the amount of time that the lines are above the red line that represents the standard.

High stream temperatures are due primarily to low summer flow conditions and high air temperatures, but stream shading is also a concern in some areas.

Sediment –The main stem and East and West forks of Major Creek were surveyed in 1994 and 2001. The surveys include information on riparian area, stream channel and fish habitat conditions. According to the stream surveys, Major Creek lacks gravel and smaller sediment sized material in the channel. It also lacks large woody material in channel. This is due to the geomorphology of the basin; specifically most of the stream is a confined bedrock channel that traditionally has flashy flows that tend to move smaller substrate out very quickly. This problem is compounded by the lack of channel complexity (LWD) that would provide velocity breaks to retain this smaller substrate component. The only source of finer substrate material identified in stream surveys is the upper reaches of E. Fork. Major Creek. This area has unstable streambanks that are providing finer substrate and wood to the Major Creek system.

Road density (miles of road per square mile of basin) can be used as a general indicator of potential problems associated with roads. One of those problems is introduction of coarse and fine sediment into area surface water. Road densities within a sub-watershed that exceed 3.0 miles per square mile indicate areas that should be examined more closely for specific sediment related problems, although it is possible to have isolated areas of road instability even in areas of low road density. This value is based on several years of observations by local Forest Service hydrologists, fish biologists, and earth scientists. Road density for Major Creek 6th field sub-watershed is 1.6 mi/mi^2 and Rowena Creek 6th field sub-watershed is 4.6 mi/mi^2. These figures represent a number of different road types and surfaces that range from State Highway 14 to native surfaced 4-wheel drive roads. Some erosion was noted during field visits, along native surface roads on non-National Forest land and in ditch-lines along some of the major roads. This erosion appeared to be isolated in ditchlines predominately related to a lack of relief culverts.

The new State of Washington turbidity standards for core summer salmonid habitat state that turbidity shall not exceed 5 Nephlometric Turbidity Units (NTU) over background when background is 50 NTU or less. This applies to Catherine Creek, Major Creek and all of their tributaries. We currently don't have any turbidity measurements for streams in this area.

Soils and Geology

The planning area lies on the south dipping limb of a large syncline that has formed in Columbia River basalt flows. The axis of the syncline trends east west with the Columbia River flowing west along this axis. These basalt flows tend to be fairly competent and no areas of mass wasting were noted within the planning area. Considerable rock-fall occurs along the Major Creek canyon and a large "apron" of talus can be found along the length of the wall.

The productivity and health of entire plant communities depend on the maintenance of healthy soils. Regional soil productivity protection standards were originally implemented in 1976, and have been revised several times since then (Pacific Northwest Region Monitoring and Evaluation Report, 2001). Soils in the Catherine Creek planning area are generally thin, ranging from 0" to 60" in depth. They range from silty clay

loams on the flat grass covered benches to loams to gravelly loams on the steeper, tree covered areas (greater than 3% slope). Numerous areas of basalt outcrop are found throughout the planning area mostly associated with canyon areas. Clasts within the soil range from a few inches in size to approximately 2 feet and are unsorted. Some localized thin clay layers were noted during field reconnaissance in this area.

Regulatory Framework

Numerous existing plans provide guidance for projects in the form of Standards and Guidelines (S & G) and recommended Best Management Practices (BMP). These documents include the Columbia River Gorge National Scenic Area Management Plan (LRMP), the Northwest Forest Plan (NWFP) and associated supporting documents. A summary of applicable water quality S&G's and BMP's from these documents are displayed below.

Gifford Pinchot NF Forest Plan/Northwest Forest Plan (NWFP) Standards and Guidelines:

- Standards and Guidelines dealing with Fire/Fuels Management – FM-1, 4 10% of the activity areas burned at a severe intensity.
- Standards and Guidelines dealing with Riparian Reserves (NWFP ROD pg. C-31 through C-38). The primary S&G's that pertain to this project are Fire/Fuels Management – FM-1, 4.
- The Gifford Pinchot Land and Resource Management Plan requires that prescribed burning activities result in less than 10% of the activity areas burned at a severe intensity.

Columbia River Gorge National Scenic Area Management Plan (LRMP)

SMA Guidelines:

- Water Resources A1,2,6
- Soil Productivity A1,2,3,4
- Practicable Alternatives Test
- Mitigation Plan

Other Pertinent Guidance:

In addition to the plans discussed above other documents such as USFS "General Water Quality Best Management Practices" provide guidance about potential BMP's for this project. Those BMP's will be incorporated where appropriate.

Environmental Consequences

DIRECT AND INDIRECT EFFECTS ALTERNATIVE 1-NO ACTION

This alternative proposes no thinning or prescribed underburn treatments. Effects related to water quality are described below.

Water Quality

Stream Temperature – Stream temperatures would remain at current levels in the watershed due to no reduction in streamside shading. Primary shade zones (areas of riparian vegetation directly adjacent to streams) along perennial streams would continue to fill in with

understory vegetation. Since these areas are already densely vegetated, it is not anticipated that this component will reduce stream temperatures any great degree within the project area.
These densely vegetated areas are more susceptible to high severity burns due to excess fuel loading from fire exclusion. In the event a wildfire burned in this watershed, riparian areas have the potential to burn hot in areas that have high fuel loading. Recent research by Tollefson and others (2004) on 33 burned watersheds in the central, western Cascades of Oregon indicates that fire severity in intense events may be similar between intermittent stream channels and adjacent upland areas. It had been thought that the riparian areas may burn with a lower severity due to the presence water and other fire resistant features. Research on the effects of wildfire on stream temperature is limited, but there is quite a bit of research on burning after clearcut logging. In the central Oregon Cascades, clearcut harvesting along a stream increased summertime maximum stream temperatures by 4° F. This same area was burned the following year and stream temperatures increased 14° F when compared to an undisturbed forest watershed (Levno and Rothacher 1969). In the central Oregon Coast Range, clearcut harvesting along a stream increased maximum stream temperatures by 17° F; after a hot slash burn, an additional increase of 10° F was measured the following summer (Brown 1972). The above mentioned studies indicate that riparian vegetation can experience a high severity burn that has the potential to increase water temperature.

Erosion and Sediment – Erosion and sediment delivery to streams in the project area are expected to remain at current levels. Vegetation that impedes erosion and sediment delivery will be maintained. In the event a wildfire burned in these watersheds, areas that have high fuel loading have the potential to experience high severity burns. These areas have the potential to have high sediment input to adjacent surface water through increased landsliding and surface erosion, increased stream channel and bank erosion from increased runoff and sediment bulking from ash deposits. Sediment yields for the Wilson River watershed in Oregon were 252 tons per square mile per year or 5.7 times higher than for a comparable unburned watershed, after the 1933 Tillamook Fire. The number of days that the river experienced very high turbidity (sediment concentrations greater than 27 mg. per liter) increased from 18 to 102 days per year (Anderson 1976). It is not known to what extent salvage operations in the burned area contributed to this sediment increase. Increased sediment yields were found after a wildfire burned three relatively steep watersheds (average slopes of 50%) in the central Washington Cascades (Helvey 1980, Helvey et. al. 1985). An increased susceptibility to debris torrents was noted following the fire and was an important factor in causing increased sediment yields.

While much of the sediment increase can occur within the first year after the fire (Agee 1993, Debano et. al. 1998), it may take many years for sediment levels to reach pre-fire levels depending on fire severity. DeBano et al. (1996) demonstrated that following a wildfire in ponderosa pine, sediment yields from a low severity fire recovered to normal levels after three years, but moderate and severely burned watersheds took 7 and 14 years, respectively. Robichaud and Brown (1999) reported first year erosion rates after a wildfire from 9 to 22 tons per acre decreasing by one to two orders of magnitude by the second year and to no sediment by the fourth in an unmanaged forest stand in eastern Oregon. Erosion rate reduction was due to recovery of natural vegetation. First year growing season shrubs, forbs and grasses accounted for 28 percent of the total ground cover whereas after the

second growing season, total ground cover was 82 percent. In the event of a high severity burn, area surface water could be severely impaired due to high turbidity levels. It may take many years (5 – 10) for turbidity levels to decrease to background levels.

Soil Productivity
Soil productivity is expected to continue to change at current rates under this alternative. Similar to erosion risk described above, the expected effect is that the soils at landscape and site scales will respond and change proportionate to the severity of natural events such as storms or wildfire. If a wildfire does burn through this area, the risk of decreased soil productivity through increased erosion and nitrogen, sulfur and phosphorus reductions are possible. The amount of productivity loss is related to the burn severity of the wildfire.

In summary, stream temperature, erosion, sedimentation and soil productivity are not expected to appreciably change in the project area. Current riparian and upland areas are overstocked with shrubs and small trees due primarily to fire exclusion creating ample stream shading. If a large wildfire does occur in this project area, it will likely lead to seriously impaired water quality and soil productivity conditions for quite some time. The overstocked riparian and upland areas will encourage higher intensity fires due to high fuel loading that could lead to higher burn severities. As described above, these high severity burn areas have the potential for high erosion, turbidity, increased stream temperatures and loss of soil productivity.

DIRECT AND INDIRECT EFFECTS ALTERNATIVE 2-PROPOSED ACTION

This alternative proposes to treat vegetation to begin to restore this area to pre-fire exclusion conditions and discourage fire from spreading throughout the area. Treatments would vary depending on the existing vegetative conditions. In total, approximately 3810 acres are proposed for some type of treatment. A detailed description of the location and type of treatments can be found in Chapter 2 of this document.

Water Quality
Stream Temperature – This alternative proposes to thin vegetation within Riparian Reserves. Vegetation removal has the potential of increasing solar radiation to surface water which in turn may increase water temperature. The following analysis will utilize tools contained within the "Sufficiency Analysis for Stream Temperature" (2004) document to identify necessary shade so that stream temperatures within treatment areas will not increase as a result of the proposed vegetation treatments. The previously mentioned document is the result of work between the USFS, BLM and State of Oregon DEQ and identifies how to maintain sufficient stream shading while providing the opportunity to treat Riparian Reserve vegetation to improve stand condition. While this project is located in Washington State, the concepts presented in the Sufficiency Analysis document are still applicable for this area. Vegetation treatments in the Catherine Forest Restoration project will have the benefit of minimizing negative effects that may result from a catastrophic wildfire.

The concept of the sufficiency analysis is to maintain a primary shade zone next to the stream and identify a secondary shade zone that can be treated to reach Riparian Reserve Objectives. In order to maintain sufficient shade next to the stream, the primary shade zone

is untreated. The size of this zone is dependant on the current height of the trees and the hill slope. This relationship is shown in the table below.

Height of Tree	Hill slope <30%	Hill slope 30% – 60%	Hill slope >60%
Trees < 20 feet	12 feet	14 feet	15 feet
Trees 20 to 60 feet	28 feet	33 feet	55 feet
Trees > 60 feet	50 feet	55 feet	60 feet

As an example, if the height of trees in the riparian area are predominately <20' tall, the primary shade zone would be 14 feet wide for an area that had 30% to 60% hill slopes next to the stream. Based on field observations in proposed treatment units, most of the hill slopes are between 30% and 60% and existing tree heights range from <20' to 60'+. The majority of riparian area treatments would thin vegetation that would be <60' tall but some trees will be greater than 60'. This translates into a primary shade zone of 33' for most of the project area but some areas will have a primary shade zone of 50' to 55'. Mitigation measures call for a 50' wide untreated area to be left next to all perennial steams in the project area to maintain current shading and stream temperatures.

In addition, vegetation treatments within the secondary shade zone (55' to 100' from the stream), will result in a canopy closure reduction of <50% which will provide consistency with the Sufficiency Analysis. Due to project design that meets and exceeds the Sufficiency Analysis, there should be no increase in stream temperature resulting from implementation of this project.

Erosion and Sediment – Some ground disturbing activities in this alternative have the potential to dislodge soil particles which in turn may increase erosion and sedimentation to surrounding surface water. These features include new temporary roads, landings, skid roads and trails, yarding corridors, burn piles, underburning areas and areas of road maintenance and repair. In general, disturbed areas close to surface water have a greater potential to deliver eroded soil to streams. A GIS analysis indicates the following acres of Riparian Reserve will have ground based equipment out of a total of 1097 treated:

Acres Treated in Riparian Reserves	
Tractor	57
Hand	1040
Max to Contain burn piles <10% high intensity	109

Ground based (skidder, tractor) harvest has a greater potential for erosion and sedimentation due to the amount of ground disturbance (soil compaction and displacement) associated with this type of activity. Since ground based logging equipment will not be allowed within 100 feet of streams, this kind of activity will occur in the outer portion of the Riparian Reserve. In addition to harvest activities, some fireline construction has the potential to expose soil to erosion. A total of approximately 56 miles of fireline is proposed in this alternative of which roughly 37 miles will involve new ground disturbance. Ground disturbance is associated with hand and machine fireline construction.

The table below displays an estimate of the number of fireline miles by fireline type.

Type of Fireline	Total Miles of Fireline	Miles of Fireline in Riparian Reserve
Hand Line	25.7	10.9
Machine Line	11.5	0
Wet Line	11.8	2.0
Existing Road	7.1	1.8
Total	56.1	14.7

The ability of BMPs to reduce erosion and sediment delivery is documented in a number of studies. Rashin et. al. (2006) found that stream buffers were effective at preventing chronic sediment delivery to streams. "Stream buffer practices were most effective where timber falling and yarding activities were kept at least 10m from streams…" They found that the overall effectiveness of streamside buffers was diminished by crossing buffers with skid trails and cable yarding routes. Other studies also support the effectiveness of mitigating sediment delivery by maintaining a buffered area adjacent to surface water. Burroughs and King (1989) found that 80% of sediment reaching streams from roads in the first year after construction came from the fill slope of the road. They also found that transport distances and obstructions between the fill slopes and streams influenced the amount and likelihood of eroded material reaching these streams. Burroughs and King found that windrowed fill slopes, which would act very similar to unharvested Riparian Reserves in that there would be obstructions to flow, had an average travel distance of 3.8 feet for eroded material, and a maximum travel distance of 33 feet. Similar results were found by Packer (1967). He found that "the most important factors that affect the distance that sediment moves are the spacing between down slope obstructions and an interaction between this spacing and the kind of obstruction". He found that logs, rocks, and trees or stumps were the second, third, and fourth most effective materials in reducing sediment movement distances below roads. Travel distances were similar to those reported by Burroughs and King.

Mitigation that includes erosion control (e.g. erosion control blankets, straw wattles, waterbars etc.) will substantially reduce the amount of sediment reaching the streams from this work. Burroughs and King (1989) reported that measures such as erosion control blankets alone can reduce sediment production by 80 to 90 percent. This in conjunction with other measures such as minimizing the amount of ground disturbance and seeding these areas will further decrease the chance of short term direct and indirect sediment production.

Prescribed fire units are not expected to introduce additional sediment into surface water. A literature review by Beschta (1990) states that "Management practices that prevent the occurrence of hot slash burns and encourage rapid revegetation will help minimize potential increases in fire-related sedimentation from upslope sources". Relatively "cool" burns" (such as the prescribed fire units in this project) "should have little impact on erosion and sedimentation, regardless of general watershed slope."

Fuel treatment activities have the potential to increase surface erosion in the harvest units along temporary roads, landings, fireline, skid trails and yarding corridors. The amount of erosion is expected to be low and short lived due to mitigation measures such as ground based logging restrictions on ground over 30 percent side-slope, limiting the amount of soil disturbance to 15% of the area, and ripping, water barring and seeding disturbed areas. It is unlikely that a measurable amount of material will reach any perennial streams due to buffering by the Riparian Reserves and the other required mitigation measures such as ripping skid trails and water barring skid trails and firelines.

Soil Productivity

Detrimental soil conditions such as compaction and intense burning have the potential to alter water movement through the soil and reduce site productivity. In addition, soil biology may be altered because of insufficient amounts of down woody material that provides carbon and nutrient cycles in the less frequent fire plant communities or the burning of large amounts of organic matter in more frequent fire plant communities. Poor soil biological systems may lead to difficulties in revegetation or decline in existing desirable vegetation. Soil biology is extremely difficult to evaluate because of the complex interactions between organisms and the soil habitats. It is assumed that soil biological systems will properly function given certain habitat components are present, such as non-compacted soils, appropriate levels of organic matter, and types of native vegetation under which the soil developed.

Management actions that change soil structure by displacement, compaction or burning or that removes ground cover are considered to result in a greater risk to soil productivity. These actions would include landing use, log skidding with ground based equipment, skyline yarding and corridors, temporary road use, fireline construction, underburning and pile burning. Other aspects of the proposed action would not have a measurable effect on soil productivity and will therefore not be analyzed.

Logging system patterns will be designed to ensure that less than 15% of the area will have ground disturbance. Since not all ground disturbance equates to detrimental soil condition it is not expected that any of the proposed treatment areas will exceed the Scenic Area standard.

Soils underlying skid trails nearest landings are most likely to incur detrimental damage because they receive the most trips with equipment. Further away from landings, soils are impacted less and less as fewer trips occur over them. Forest Plan monitoring conducted on the Mt. Hood National Forest supports this conclusion as there was a reduction of detrimental impacts noted as one moved away from landings. Observations during monitoring also indicate detrimental impacts on main skid trails and landings that receive numerous trips with higher impact machinery (such as skidders), with much less impact on lateral trails and within the unit where harvester equipment typically works. Mitigation measures that restrict the amount of disturbed ground and repair some of the soil damage through ripping and planting will result in minor amounts of soil damage.

Prescribed burning has the potential to reduce nutrients and soil productivity. Nitrogen, and to a lesser extent sulfur and phosphorus are the most common elements lost in a prescribed burn (McNabb et al 1990). If fuel consumption is controlled, losses of these nutrients are less in a prescribed burn than from a wildfire. There appears to be a relationship between the amount of forest floor consumed in a fire and the loss of nutrients. Except for areas underneath fuel piles, the nutrient loss from burning is expected to be low because of the low fire intensities expected. Sites where piles will be burned will likely burn hot enough to cause some soil damage. These areas will be rehabilitated with seeding of native herbaceous plants and bunch grasses and mulching to encourage revegetation.

Cumulative Effects

Water Quality

Stream Temperature – No detrimental cumulative effects are expected as a result of increased water temperature due to mitigation measures designed to maintain existing vegetation adjacent to streams. As described in the direct and indirect effects section, this project will maintain existing water temperatures.

Sediment - No detrimental cumulative effects are expected as a result of sediment introduction due to the small amount of sediment expected from this project. As described in the direct and indirect effects section, mitigation measures and project design features aimed at minimizing erosion and sedimentation reduce the potential of erosion and delivery of the material to adjacent surface water.

Soil Productivity
No detrimental cumulative effects are expected to soil productivity due to mitigation measures designed to maintain existing vegetation adjacent to streams. As described in the direct and indirect effects section, this project will minimize the loss of soil productivity.

Consistency with Direction (GPNF Plan and CRGNSA Management Plan)
As outlined in the effects section this project is consistent with applicable direction. Major highlights include:

- Not more than 15% of a treatment area will have detrimental soil damage.
- The inclusion of a Practicable Alternatives Test and Mitigation Plan.
- Establishment of buffers and Riparian Reserves.
- Designing prescriptions within Riparian Reserves to contribute to attainment of Aquatic Conservation Strategy Objectives.

Summary Cumulative Watershed Effects
The table below provides a qualitative summary of potential cumulative watershed effects. It shows existing and potential projects, effects from those projects that may result in cumulative effects with Catherine Forest Restoration project, whether these projects overlap in time and space and an assessment if a measurable cumulative effect is expected. Findings of this summary are supported by the analysis above which utilizes pertinent research, mitigation measures and design features and applicable management standards and guidelines:

Project	Potential Effects	Overlap in		Measurable Cumulative Effect?	Extent, Detectable?
		Time	Space		
Burdoin 1	Suspended Sediment	No	Yes	No	Project is completed. No remaining sediment, stream temperature and water quantity effects due to mitigation implementation and natural recovery.
	Stream Temperature	No	Yes	No	
	Soil Productivity	No	Yes	No	
Burdoin II	Suspended Sediment	Yes	Yes	No	There may be an overlap in timing of this project with Catherine Forest Restoration project; any minor suspended sediment would not be measurable due to implementation of mitigation measures aimed at minimizing erosion and sedimentation.
	Stream Temperature	Yes	Yes	No	The Catherine Forest Restoration project will maintain the primary shade zone so there should be no increase in stream temperature.
	Soil Productivity	Yes	Yes	No	There may be an overlap in timing of this project with Catherine Forest Restoration project; any minor loss of soil productivity would not be measurable due to implementation of mitigation measures aimed at reducing soil disturbance.
Other Private Tree Removal	Suspended Sediment	Yes	Yes	No	There may be an overlap in timing of this project with Catherine Forest Restoration project; any minor suspended sediment would not be measurable due to implementation of mitigation measures aimed at minimizing erosion and sedimentation.
	Stream Temperature	Yes	Yes	No	The Catherine Forest Restoration project will maintain the primary shade zone so there should be no increase in stream temperature.
	Soil Productivity	Yes	Yes	No	There may be an overlap in timing of this project with Catherine Forest Restoration project; any minor loss of soil productivity would not be measurable due to implementation of mitigation measures aimed at reducing soil disturbance.

Northwest Forest Plan Aquatic Conservation Strategy Objectives

In order for a project to proceed, "a decision maker must find that the proposed management activity is consistent with the Aquatic Conservation Strategy objectives" (ROD B-10). The nine objectives are listed on page B-11 of the ROD. The effects analysis above has focused on key parameters or indicators that make up elements of the nine Aquatic Conservation Strategy objectives, to determine if the project will restore,

maintain, or degrade these indicators. Once this determination is made, the indicators are be examined together to ascertain whether the project is consistent with the objectives. The following table displays the individual indicators and the effect the action alternatives have on those indicators at the 5th and 6th field watershed scale. Fifth field watersheds are generally large in size (40,000 acres to 250,000 acres), while 6th field watersheds are smaller (5,000 acres to 40,000 acres).

Individual Indicator Table	**Effects of the Actions** **Alternative 1-No Action**			**Effects of the Actions** **Alternative 2**		
INDICATORS	Restore[1]	Maintain[2]	Degrade[3]	Restore	Maintain	Degrade
Water Quality: Temperature		X			X	
Sediment		X			X	
Chem. Contam.		X			X	
Habitat Access: Physical Barriers		X			X	
Habitat Elements: Substrate		X			X	
Large Woody Debris		X			X	
Pool Frequency		X			X	
Pool Quality		X			X	
Off-channel Habitat		X			X	
Refugia		X			X	
Channel Cond. &Dynam: Width/Depth ratio		X			X	
Streambank Cond.		X			X	
Floodplain Connectivity		X			X	
Flow/Hydrology: Peak/base flows		X			X	
Drainage Network Increase		X			X	
Watershed Conditions: Riparian Reserves		X		X		

[1]"Restore" means the action(s) will result in acceleration of the recovery rate of that indicator.

[2]"Maintain" means that the function of an indicator does not change by implementing the action(s) or recovery will continue at its current rate.

[3]"Degrade" means to change the function of an indicator for the worse.

The following summarizes the Individual Indicator Table:

- The proposed project will treat vegetation in Riparian Reserves to restore them to a more natural vegetation state. This will result in more natural function of the riparian area.

- Indicators other than those described in the proceeding paragraph will be maintained as outlined in the effects analysis above.

- The following table displays specific Aquatic Conservation Strategy objectives and the indicators from the previous table that comprise each objective. All of the indicators that are checked for a particular objective should be evaluated together to determine whether the action maintains or enhances the specific Aquatic Conservation Strategy objective.

	Aquatic Conservation Strategy Objectives								
Indicators	**#1**	**#2**	**#3**	**#4**	**#5**	**#6**	**#7**	**#8**	**#9**
Temperature		X		X				X	X
Sediment				X	X	X		X	X
Chem. Contam.				X				X	X
Physical Barriers	X	X						X	X
Substrate			X		X	X			X
Large Woody Debris			X					X	X
Pool Frequency			X						X
Pool Quality			X						X
Off-Channel Habitat	X	X	X						X
Refugia	X	X						X	X
Width/Depth Ratio			X					X	X
Streambank Condition			X			X		X	X
Floodplain Connectivity	X	X	X				X	X	X
Peak/base Flows					X	X	X		
Drainage Network Increase					X	X	X		
Riparian Reserves	X	X	X	X	X	X		X	X

The following is a summary the Aquatic Conservation Strategy objectives (ROD B-10) and how the action alternative will influence them:

1. Maintain The Distribution, Diversity And Complexity Of Watershed And Landscape-Scale Features: This project will meet this objective because of the protection that the Riparian Reserves provide. No new road crossings of perennial streams or wetlands are proposed, which would maintain the current level of aquatic habitat fragmentation. Some temporary crossings of ephemeral and intermittent channels will be constructed and removed immediately after project completion. These crossings will not result in any long-term aquatic habitat fragmentation.

2. **Maintain Spatial And Temporal Connectivity Within And Between Watersheds:** The project will meet this objective because decommissioning the new temporary haul route will maintain the connectivity within and between watersheds by encouraging tree growth on roadbeds and re-establishing filtration of water through soil instead of down road surfaces.

3. **Maintain The Physical Integrity Of The Aquatic System, Including Streambanks, Side channels (Refugia), And Channel Bottom Configurations:** This project will meet this objective through the protection provided by Riparian Reserves. Mitigation measures aimed at reducing soil compaction and erosion, and the lack of any new crossings on perennial streams will greatly reduce risks of increased peak flow, and resulting bank erosion and channel bed scour. There are no temporary roads entering the Riparian Reserves.

4. **Maintain Water Quality Necessary To Support Healthy Ecosystems:** This project will meet this objective through protection provided by Riparian Reserves, which will maintain stream temperature. Mitigation measures aimed at reducing erosion will maintain the overall sediment levels in the long term.

5. **Maintain Sediment Regimes:** This project will meet this objective through mitigation measures, repair of some existing erosion areas and protection provided by Riparian Reserves.

6. Maintain In-Stream Flows That Are Closer To Natural Regimes: This project will meet this objective through mitigation measures, protection provided by Riparian Reserves. Loss of the vegetation may cause increased runoff locally in some situations, but these are not expected to result in damage to the aquatic system.

7. Maintain The Timing, Variability, And Duration Of Floodplain Inundation: This project will meet this objective through mitigation measures and protection provided by Riparian Reserves. Floodplains are extremely limited in this area due to the steep nature of the landscape.

8. Maintain The Species Composition And Structural Diversity Of Plant Communities In Riparian Areas And Wetlands This project will meet this objective through protection provided by Riparian Reserves. Treatments within the Riparian Reserves are aimed at producing a more natural vegetative composition and density. This has been lost through many decades of fire suppression.

9. Maintain And Restore Habitat To Support Well-Distributed Populations Of Native Plant And Riparian Dependent Species: The project will meet this objective with mitigation measures, protection provided by Riparian Reserves and vegetative treatments that are designed to simulate a more natural disturbance regime within the area.

FISH, WILDLIFE AND PLANTS

Introduction

This section will examine the effects of the alternatives on fish, wildlife and plants. It would be impossible to assess all the individual species' needs within this document, and as a result, the emphasis here will be on habitat types which are the homes of guilds of species and become proxies for large sets of species diversity. Nonetheless, all federal and state threatened, endangered, and sensitive species will be described individually, and also placed within a habitat context (see the Biological Evaluations in Appendix A for a complete discussion).

The key habitat found within this project area is the oak-pine, a priority habitat recognized by the Washington State Dept of Fish and Wildlife (Larsen and Morgan, 1998). This habitat is not only close to its northern limits, but has many unique species associated with it, such as the disjunct population of California kingsnake and western gray squirrel.

Analysis Methods and Measurements

Assuming that healthy habitats will provide for healthy populations of species diversity, our approach was to evaluate and measure the health and function of the habitats. This would examine habitat components, such as its structure, diversity, resiliency, and complexity. For example, a diversity of native plants will support a diversity of invertebrates which in turn will support diversity in insectivorous bird, which in turn supports a diverse predatory guild, etc.

In addition, this analysis will include the review and protection of all known and new sites of sensitive species (federal and state-listed endangered, threatened, sensitive, and state concern spp.). Background information on those species likely to be found or whose habitat is found within the project area will be collected such that field surveys can be planned and conducted in a manner that is likely to determine their presence within the project area. A field survey will be undertaken as per appropriate protocols and all findings documented. Appropriate protection measures as outlined in this document will then be implemented to ensure protection of the species and their habitats. The continued health of these species and their habitat will be measured through monitoring of pre and post project implementation.

Existing Conditions

The overall existing habitat conditions within the project area are described in chapter 1.4 of this document. Emphasis in this section will be on the specific habitat elements or components that are pertinent to the evaluation of habitat health. Diversity and structure are two very important components that need to be addressed.

The diversity component was once very high and has continued to decrease since the arrival of Europeans, along with their domesticated animals and invasive plants from the Old World. The once diverse groundcover of native bunch grasses and herbaceous flora, including balsam root, lupines, and frasera, supported an equally diverse invertebrate population. This diversity was key to supporting not only the food base for diverse avian populations but a diverse vegetation structure for their habitat needs (nesting and cover).

This under-story flora not only occurred in the open grass lands, but was equally important in the under-story of the oak and pine woodlands. As this under-story diversity collapsed under the onslaught of sheep and cattle grazing during the late 1800's and early 1900's, the diversity of all those populations dependent on them for food and/or habitat likewise decreased.

In addition to grazing damage, the structure of the oak-pine woodland also underwent dramatic changes with logging and fire exclusion beginning in the early 1900's. The diversity and structure of the habitats had developed over thousands of years with frequent, low intensity fires, as described earlier in chapter 1.4. Fire suppression and exclusion, had a profound effect on the structural elements of the habitats (Johnson and O'Neil, 2001) (Agee, 1993). As new seedlings germinated, fire no longer thinned them out and dense stands began to develop under the larger trees competing for scarce water. Larger trees succumbed to drought stress and subsequent beetle attacks. In addition, logging cut down the largest pines and oaks. The old, large tree elements became scarce, mast production dropped (older trees are the largest mast producers), and the upper canopy structure of the oak woodlands virtually vanished.

At the same time, fire exclusion allowed young Douglas-fir trees (that previously had not been able to grow within an unfriendly fire environment) to begin to invade the oak-pine woodlands. This slow, but steady, encroachment has caused thousands of oak-pine acres to become decadent or destroyed. This can yet be witnessed by closely examining young Douglas-fir stands within the project area and noting large, once-open-grown oaks dead or succumbing to over-shading by the firs.

These changes have altered the habitats that once existed throughout the project area. The food sources have changed as mast production has dwindled and diversity of species has dropped. Structural components have likewise changed from more open oak-pine to more thickly shaded fir. Shrubs, once common, are now becoming scarce due to the shaded conditions from the encroaching firs. Tree ages have changed dramatically. Old pines are virtually gone; old oaks with all their cavities are rapidly disappearing. While species dependent on fir communities have taken advantage of this change, those species that were once dependent on the habitats of historic times, have either adapted or their populations have decreased. This is likely the case with such species as the western gray squirrel, the Lewis' woodpecker, flying squirrels, many bats, and a host of invertebrates and pollinators, not to mention those species that are specifically limited to these oak-pine habitats like the California mountain kingsnake and southern alligator lizard.

While many of the floral species are not listed or noted by most observers, their populations have also dwindled as a result of the a-fore mentioned changes. The once common and abundant balsam root, which covered large areas of open grasslands and open woodlands, has now become restricted to small areas where for one reason or another grazing has not eliminated it. Other less common species, such as the mountain lady slipper, being adapted to those more open woodland habitats at mid-elevations which have largely become scarce, have likely shown a dramatic decrease in populations.

The authors of the reference volume "Wildlife-Habitat Relationships in Oregon and Washington" (2001) have concluded that, "Collectively, fire suppression, grazing and

logging have contributed to the loss of most fire-maintained old-growth East-side forests and (oak) woodlands. Today, the two greatest immediate threats to future viability of ponderosa pine forests (this term includes East-side oak woodlands) are high-severity fire occurrences and increased site-specific competition for nutrients and moisture that result in reduced ponderosa pine regeneration and increased mortality over the long term. Little forests remain today that represents historical old-growth (>200 years) ponderosa pine forest. Where stands still contain old-growth ponderosa pine, tree density and fuel accumulation present a significant risk to long-term survival and future restoration of this forest type. Lightning and accidental fires are expected to cause future burns of unprecedented and uncontrollable intensity".

When current habitat types (within 4th field watersheds) of the Columbia River Gorge National Scenic Area are compared to historic habitat types, ponderosa pine and Eastside white oak forest and woodland habitat types has decreased by 196,000 acres, or 36%, while Eastside interior mixed conifer forest has decreased by 257,000 acres, or 41%. Both stand types are functioning much differently than historic stands due to shifts in plant species and density.

Existing condition: Aquatic species and habitat

Major creek has been stream surveyed in 1994 and 2001. The stream ranges in gradient from 7 to 8%, and contains a ratio of 1 pool to 1 riffle habitat. Surveys found rainbow trout throughout the system; up to river mile 1.4 in the west fork of Major Creek, and to river mile 1.2 in the east fork of Major Creek. Sculpin were also found throughout the main stem of Major Creek. Anadromous fish use (coho and steelhead) goes from the mouth and continues upstream to a natural fish barrier, consisting of a series of 3 waterfalls at river mile 0.3. Steelhead has been confirmed past this set of waterfall this spring (2006). It is likely that steelhead spawn in the upper watershed whenever there is sufficient flow during their late winter/early spring upstream spawning run. Upper extent of steelhead spawning and rearing habitat is not known. During summer, Major Creek has some surface water only upstream from approximately river mile 0.5, while all other channels, including Catherine creek and the mouth of Major Creek, becomes dry. As expected, fish use in these intermittent channels are seasonal in nature. The 1994 survey noted the substrate to be largely composed of cobbles and large substrate, with few in-stream large wood pieces. There is currently a deficit of large trees in the riparian area of Major Creek—likely due to historic harvests. This lack of large wood contributes to an increase in substrate particle size and thus a propensity for the stream to subsurface due to lack of smaller size substrates that "seal" the stream bed. Gravel-sized particles cannot be retained in the system without these natural hydraulic control structures. This gravel loss directly decreases available spawning habitat for fish. Lack of large wood also reduces cover and forage components for fish and other aquatic wildlife, such as amphibians and macro-invertebrates.

The following are some particular species and habitats of interest during the planning process:

Bald Eagle
Locally, within the Columbia River Gorge, almost all nests are in relatively undisturbed sites, located on large trees within ½ mile of the Columbia River or a direct tributary. Primary prey species is fish, as well as some waterfowl. Bald eagles often construct multiple nests in one area, although only one is used per season. Twenty-two nest sites are known to have been active in 2006 in the National Scenic Area, with a subset of 14 nests (64%) on Forest Service managed land (Isaacs and Anthony, 2007). Bald eagles often forage around five to seven miles away from their nest sites. Courtship and nest building can start as early as January, with eggs laid by late February to early March. In general, adult eagles become less sensitive to nest disturbance once the young develop by mid-June.

Northern Spotted Owl
The planning area is not within spotted owl designated critical habitat unit (USFWS), late successional reserve (USFS Northwest Forest Plan), or Spotted Owl Special Emphasis Area (WA Forest Practices Rules). The planning area units located within upper Major Creek watershed are near the Washington state core habitat delineation for the spotted owl (NE and east conifer forest types). The nearest known pair was located 1.5 miles to the north, in 1994. In addition, three records of single owls were documented within 1.5 to 2 miles away from the northernmost planning area (N. East conifer), in 1994-1996 (WDFW Database, 2006). Within the planning area, none of the stands currently meet the typical structure that would be defined as quality nesting, roosting, and foraging habitat (typically defined as stand average dbh of 16", and at least 4 trees over 30" dbh per acre). Important structural components, such as large snags, down logs, and open flight space under the canopy are also lacking in the young and dense understory. The current habitat may provide some limited foraging, and clearly some dispersal, habitat in its present seral state.

The NE and east conifer habitat types are classic examples of east-side forests that are shifting to a tree composition and forest structure that are considered unstable or are highly vulnerable to stand-replacing events. The habitat degradation and potential loss of these dry eastside forest types that have developed an unnaturally high canopy closure and dense understory characteristics due to fire suppression, are a concern that have been noted in several recent owl briefing or management reports (Buchanan and Swedeen, 2006; USFWS, 2006). Although unlikely to be nesting habitat, protocol surveys will be completed by USFS Scenic Area staff during the 2007 season to conclusively determine spotted owl use within the planning area.

Western Gray Squirrel
Western gray squirrels are distributed from Washington to California in mixed oak and conifer forests. Currently within Washington, gray squirrels are limited to 3 isolated populations; Puget Trough (Fort Lewis), Klickitat and eastern Skamania County, and Chelan/Okanogan Counties (Linders and Stinson *in draft*, 2006). Although Klickitat County contains the largest population of the 3 areas, it is also believed to be declining (Vander Haegen et. al., 2005). In 1993, the state of Washington listed the western gray squirrel as 'threatened' due to declining populations resulting from: habitat loss and conversion, fluctuating food supplies, disease, interspecific competition, road kills and illegal shooting. In the Klickitat region, habitat for the Western gray squirrel occur in the where oak woodlands and pine forest converge, an ecotone between the upland Douglas-Fir forests and the lowland grassland/oak savanna. Stand composition is typically Oregon white oak,

ponderosa pine, and Douglas-Fir, with riparian area that may include bigleaf maple, Oregon ash, black cottonwood, and quaking aspen. Optimum stands are conifer-dominated of large diameter, mast producing trees, usually of pine and oak. A diversity of trees species, and the presence of oak were also important habitat components (Linders and Stinson *in draft*, 2006). Mature trees produce more mast (acorn, pine/fir seeds) than younger stands; a critical winter food item. Leaf nests are generally found in pine or Douglas-fir trees, with cavities in oaks used whenever available. High-use stands in the Puget Trough included a mix of conifers, oaks, and other hardwoods such as big leaf maple and Oregon ash in the canopy. Large, healthy oaks and conifers (especially ponderosa pine) are more likely to provide greater quantities of mast foods and more nest and den sites compared with smaller trees of the same species. Proximity to water may also be important, with more nests generally found from 540' to 1800' of a water source.

Regulatory Framework

Applicable Standards and Guidelines

The following applicable standards and guidelines were used to form the criteria for this effects analysis:

Gifford Pinchot National Forest LRMP Forest-wide standards and guidelines.

Threatened, Endangered, and Sensitive Species

- All project areas affected by Management activities will be reviewed for Sensitive, Threatened, or Endangered plant and animal species.
- A biological evaluation will be conducted before any ground disturbing activities occur which may adversely affect sensitive species.
- Consultation with the U.S. Fish and Wildlife Service will be required for each program activity or project that the Fish and Wildlife Service determines may affect threatened or endangered species and will be completed before any decision is made on the proposed project. Management activities must be conducted in such a manner that they will not impair recovery of any threatened or endangered species.

Cooperation With Washington Department of Fish and Wildlife

- Projects, programs, policies, and other activities affecting fish and wildlife should receive advice and review of the Washington State Department of Fish and Wildlife.

Special Habitat Management Objectives

- Special habitats, such as caves, cliffs, mineral licks, and talus slopes will be evaluated during project planning to determine biological significance, habitat value, and any necessary protection measures.
- Project planning should consider the need for direct habitat improvements such as forage seeding, fertilization, and prescribed burning, e.g., to benefit mountain goat, deer, and elk.
- Road, trail, and area closures may be employed to reduce wildlife harassment and disturbance to sensitive plants and fungi populations.

Columbia River Gorge National Scenic Area Management Plan

- Determine, based on biology and habitat requirements, if the proposed project would compromise the integrity and function of or adversely affect the wildlife or plant site.
- A buffer zone shall be created around sensitive fauna, the size dependent on the species needs. There shall be a 200 ft buffer on all sensitive flora.
- If the project goals include potential work within the buffer zones, a "no practicable alternative" test and mitigation plan will be required.
- The new developments and uses shall not interfere with fish passage.
- New developments and uses shall occur during periods when fish and wildlife are least sensitive to activities.
- In areas of big game winter range, forage and thermal cover must be maintained. If impacts are to occur, enhancements must mitigate the impacts so as to maintain overall values and function of winter range.

See effects section below for findings on these guidelines.

Environmental Consequences

DIRECT AND INDIRECT EFFECTS OF ALTERNATIVE 1 - NO ACTION

After a century of fire suppression, the no-action plan would maintain forests in an altered stand composition that does not shelter fire-adapted wildlife species. The risk of stand replacement crown fires is high; with increasing risk each year that fire continues to be suppressed. Whether through stand replacement fire, or continued encroachment by faster-growing conifers, oak stands will eventually be lost.

The importance of fire in the maintenance of healthy oak, pine and eastside coniferous forests is evident (Agee, 1993, Arno and Fiedler, 2005, Vesely and Tucker, 2004, Larsen and Morgan, 1998, USDA, 1990). The direct effect of this alternative is the continued existence of dense tree stands and non-native grasses/forbs that do not reflect the historic habitats with which native wildlife has evolved to survive in. Oak, pine/oak, and Eastside mixed conifer forest habitat type will continue to decline in health and distribution, concurrent with the host of wildlife species that has evolved to utilize these habitat types. Some of these species include the western gray squirrel, white-breasted nuthatch, western scrub jay, acorn woodpecker, Ash-throated flycatcher, CA mountain king snake, Lewis' woodpecker, sharptail snake, and southern alligator lizard (Huff et. al., 2005, Larsen and Morgan, 1998). The inherent variability within and among the different forest types that historically had low to moderate fire regimes makes it difficult to generalize and assess the effects of long-term fire suppression at a local or species-specific scale (Huff et. al., 2005). Active management has been delayed as a consequence of this uncertainty of effects and the possible public controversy that may result if action is initiated. The 2004 report "Scientific evaluation of the status of the spotted owl" reported that wildfire has resulted in a net loss of 2.3 percent of spotted owl habitat within the first decade of the NW Forest Plan due to uncharacteristically large stand-replacement fires (Courtney et. al., 2004).

The paradox for land managers is the need to treat these dry forest habitats in order to protect it; a result of centuries of fire suppression. The U.S. Fish and Wildlife Service (USFWS) hosted a workshop in May of 2005 to address this issue, titled "Managing the northern spotted owl habitat in dry forest ecosystems". What followed was a USFWS workshop report which condensed the issue into core recommendations (USFWS, 2006). The primary recommendation stressed was that, "No action is not an option". Failure to take action threatens the long-term sustainability of spotted owls and their habitat. This complex dry forest ecosystem supports a diverse wildlife community.

The indirect effect of taking no action is the ever-increasing risk for fragmentation or loss of large areas of dry forest habitat types to high-intensity human or lightning-caused fire (Thomas et. al., 2006, Spies et. al., 2005, Buchanan and Swedeen, 2005, Agee, 1993). The re-establishment of these forests will take over 200 years to replace, depending on the severity of the soil damage (Johnson and O'Neil, 2001). Once the soil recovers, the habitat will primarily consist of early seral plant communities, that may support species such as the black-tailed deer, voles, sparrows, coyote, robin, rubber boa, gopher snake, rattlesnake, and mourning dove (O'Neil et. al., 2001).

As detailed in section 3.4 of the hydrology and soils section, the increase risk of sedimentation into area streams as well as road building activity to aggressively fight a moderate to high intensity fire would be highly detrimental to fish and wildlife species. Loss of over-story trees and shrubs would effectively remove habitat for wildlife species. A high-intensity fire and resultant soil damage would retard re-colonization of the area, especially by native vegetation. Initial colonization by aggressive, early-seral, and non-native species, such as cheatgrass, thistle, knapweed, and scotch broom would further retard habitat recovery for native species dependent on oak woodland habitat. Loss of riparian vegetation would degrade stream habitat through increased temperatures and sediment pathways. The deer and elk winter range would have degraded forage values for an extended period, with slow recovery to pre-burn levels. Big game numbers may temporarily be affected from this loss of forage and cover. The potential loss of the entire area's oak/pine/Eastside conifer habitat, for up to a century, is a serious threat to an important and priority habitat type.

There are currently 22 sensitive species with habitat that may be in or adjacent to the project area (reference Biological Evaluation). Habitat changes that set the vegetation back to an early seral community (conifer/oak to shrub/forb) would support the following wildlife species on the TES list:

- 0 of these species for breeding habitat,
- 3 species where this habitat would provide some foraging opportunity (golden eagle, merlin, peregrine falcon), and
- 4 species (steelhead, western toad, Dalles sideband snail, and Columbia dusky snail), where the change in terrestrial habitat is somewhat neutral to their life history.

The following are effects for the species that were of particular concern during planning:

Bald Eagle
The no-action alternative will continue to provide for habitat in the short-term, but risks the complete or partial loss of habitat (large dominant trees for nesting and perching) due to uncharacteristically large crown fires.

Northern Spotted Owl
The no-action alternative will continue to sustain a forest that does not have structural components that would be beneficial for spotted owl dispersal or foraging habitat. This alternative will not implement the recommendations from the USFWS workshop on silvicultural practices that support northern spotted owl habitat in dry forest ecosystems (USFWS, 2006). Most spotted owl habitat on the eastside of the Cascade crest owes its structure and species composition to fire. Historically, spotted owls occupied a dynamic landscape that often consisted of large areas of burned and unburned forest (Tesky, 1992). Today, however, habitat is greatly reduced and fragmented, and owl populations have become increasingly vulnerable to loss of large tracts of habitat due to unnaturally high intensity stand-replacement fires. Wildfire has resulted in the loss of 2.3 percent of spotted owl habitat due to uncharacteristically large stand-replacement wildfires in the last decade (Courtney et. al, 2004). The no-action will, initially, have no effect to the spotted owl. In the long-term, this alternative will perpetuate the degradation of potential habitat, to the extent that it will eventually be unsuitable, or lost through high intensity fire.

Western Gray Squirrel
The no-action alternative would have no short-term effects on the Western gray squirrel, as increased human and machinery presence would not occur. The continued fire suppression and the resultant shift in oak-pine-DF habitat to dense stands of DF with remnant pines would slowly eliminate squirrel habitat, as presence of oak seem to be associated with squirrel presence. Moderate to high intensity fires that, may later, become reality due to the unnaturally high fuel load will likely cause direct mortality of squirrels (Kaprowski et. al., 2006). The optimal habitat of large mast producing trees would take 100-200 years to replace, depending on fire intensity and resultant soil damage.

Cumulative Effects of Alternative 1 – No Action
This No Action Alternative would cumulatively contribute to the range-wide decline of ecologically stable, open Oregon white oak woodland and pine habitats within Oregon and Washington. Quality wildlife habitat and oak-woodland dependent species would continue to decline correspondingly with this loss. Furthermore, without actions to reduce fuels, the risk of catastrophic fires continues to increase with loss of large segments of the oak/pine increasingly likely within the next several decades. Once this habitat burns as a result of a catastrophic fire, it will likely take decades, if not a century, before the pine/oak woodlands would re-establish their present habitat values. There are fauna and flora species, many of which are listed and/or sensitive, that are associated with oak woodlands and other dry eastside forest types. The loss of this habitat for decades would likely have profound negative effects on their populations.

CUMULATIVE EFFECTS DETERMINATION					
Past, Current or Reasonably Foreseeable ACTIVITY or PROJECT	**Potential Effects**	**OVERLAP IN**		**Measurable Cumulative Effects?**	**Extent Detectable?**
		TIME	**SPACE**		
Burdoin I	Short term disturbance and possible loss to individuals. Long term beneficial effects on habitats.	No	Yes	Yes	Burdoin I project thinning has helped delay fuel loading, but is not sufficient to prevent catastrophic fires and loss of priority habitat that will occur under this Alternative.
Road work on BPA easement	Effects on riparian habitats. Road was built within riparian area	No	Yes	No	Impacts were minor and riparian area has adjusted.
firehouse	Loss of habitat – increase disturbance	No	Yes	Yes	Minor but adds to the loss of habitat
Courtney Rd widening	Temporary disturbance. Long term - increase numbers of recreationists	No	No	No	Minor but adds to the loss of habitat
Allen Property thinning and structure removal	Short term disturbance and possible loss to individuals. Long term beneficial effects on habitats.	No	Yes	Yes	This project thinning has helped delay fuel loading, but is not sufficient to prevent catastrophic fires and loss of priority habitat that will occur under this Alt.. Structure removal is beneficial: removing disturbance and returning over 100 acres to habitat base in the project area.
Weed treatments	Short term disturbance.	No	Yes	No	Containment is important; spray treatment not very effective – now use bio-control which is more effective. Minor.
Paved accessible trail at Catherine Creek	Short term disturbance. Long term attraction for more people, more disturbance.	No	No	Yes	Thus far the numbers have not increased appreciably. Future is yet unknown. Part of the decision of build this trail was to lessen the numbers of people recreating on north side of county road within project area.
Burdoin II Thin from Below	Short term disturbance and possible loss to individuals. Long term beneficial effects on habitats	No	Yes	Yes	The structure and diversity of the pine/oak habitats will be monitored. This beneficial project thinning is equivalent to the CC thinning but without CC thinning the area will still remain at risk to catastrophic fires. The larger the area treated for fuels, the less the risk of catastrophic fires and loss of habitat.
Coyote wall FS trails	Increased disturbance from recreation	No	Yes	Yes	The use of the area by recreationists will be monitored. Minor but adds to the disturbance of the habitat base.
Land acquisitions	Reduces chronic disturbance. Encourages recreation, protects more habitat.	No	Yes	No	The more land put aside to be managed as habitat will benefit the wildlife and plant species.

DIRECT AND INDIRECT EFFECTS ALTERNATIVE 2-PROPOSED ACTION

This alternative sets the stage to mimic the stand conditions that would have resulted from low-intensity, high frequency fires that had been burning through this project area for the last few thousand years. Thinning dense stands will be followed by the re-introduction of fire. There will be short term impacts from the construction of landings, skid trails and other disturbances to the soil and under-story as a result of the thinning. These impacts to the habitats will be minimized by designing the thinning in such a way as to ensure that, not only will there be no long-term impacts, but that the long-term impacts will be beneficial to the habitats of the project area. Thus, the designs, such as to minimize landings to areas where rehabilitation can occur with relative ease, the use of large-tired machines to lessen soil impacts, re-seeding with native grasses and forbs within a year, and extensive use of hand piling in sensitive habitats, were developed.

The original and fundamental premise for this project was initiated to enhance the ecological integrity and health of the oak-pine and eastern conifer forests. This concept has been repeated by many different sensitive species and priority habitat restoration plans for the last few years (Vesely and Tucker, 2004, Larsen and Morgan, 1998, Linders and Stinson, 2006, USFWS, 2006, ODFW, 2006). Considering that both wildlife and plants have historically evolved with low-intensity fires that has shaped their ecological communities' structure and composition, it follows that restoring these conditions will maintain and enhance the habitats which support their long-term sustainability. Though short duration and individual impacts may occur, this project is anticipated to be beneficial in the long-term to both the fauna and flora species of these dry land communities.

There are currently 22 sensitive species with habitat that may be in or adjacent to the project area (reference Biological Evaluation, Appendix A). Habitat changes that restore and maintain the dryland habitat types (grassland, oak/pine forest, pine-oak-DF forest, and east conifer forest) would have long-term benefits to all these species. This is especially true when coupled with restoration plans of native grass/forb species seeding, snag creation, and species monitoring that will occur during and after implementation.

Specific guidelines speak to specific component of the ecological communities being restored. For example, meeting the guidelines for Desired Forest Structure and Pattern as outlined in the NSA Management Plan further enhances and restores, in the long-term, these forested communities in terms of snags and down wood. Others speak to all large oak trees and their associated snags to not be removed or altered in this project; the purpose of the project is to help create more large oaks and their associated snags with a scattering of large pines. The design of this project shall retain a mix of ages to ensure vertical diversity and replacement potential. The diversity of plant species shall be maintained. All shrubs, herbaceous flora and tree species shall be maintained to retain the habitat viability of the area. (See the detailed vegetation management prescriptions in Chapter 2). All of these specific guidelines are instrumental in helping to achieve the desired structure, composition and pattern of the habitats throughout the project area.

Likewise, disturbance to wildlife and plants is important. To minimize wildlife disturbance work windows are designed into the project as detailed in previous chapters. This work window limitation is expected to preclude potential disturbance to critical nesting/rearing activities (March to August) as well as big game winter range use (mid-December to March). Some temporary disturbance to individuals may occur due to machine thinning activity, hand thinning activity, or vegetation movement (dragged to piles, chipped, or burned) but it is unlikely to be significant for the species in the overall planning area, especially in light of the roads and human activities already present within this 1,845 acre planning area including scattered homes. Disturbance to plants will occur at burn piles, skid trails, and landings causing short-term localized soil damage and vegetation loss. As these areas are going to be limited in size and the vegetation is largely non-native annual grasses in open areas, this action is not likely to reduce native habitat appreciably. These disturbed areas will be rehabilitated and seeded with native grass/forbs mix and/or shrub plugs.

Known sites of sensitive plants and wildlife, of which there are several within the project area, will be protected from unnecessary impacts that would put them at risk, as detailed in the Biological Evaluation (BE) in Appendix A. For specific information related to each species as they relate to this project, see Appendix A. Appropriate buffers and timing restrictions are included in the design of the project to ensure that all sensitive species are adequately protected. If work has to be conducted within the buffer zones, a mitigation plan has been completed to show that the site is not compromised and appropriate enhancement will occur to offset any impacts.

The following are effects for the species that were of particular concern during planning:

Bald Eagle
One active bald eagle nest site is on the NW edge of the planning area. The nest site will have a ¼ mile no-entry buffer from January 1 to August 15 to minimize risk of nest disturbance (Effects Determination Criteria Instructions for Bald Eagle, from Northwest National Fire Plan Project Design and Consultation Process, 2003). The tree will also be protected from damage during thinning (see Natural Resource Mitigation Plan, Chapter 2).

Northern Spotted Owl
The proposed action alternative has thinning activities restricted to occur between July 1 to February 28, and underburning restricted to occur between July 1 to March 15 as to be outside of the general breeding season for most native fauna. If paired owls are detected within the east conifer planning unit, the nest area shall have a ¼ -mile no-action buffer for all action, for the period between March 1 and June 30, so as to have no effect to spotted owl (USFWS correspondence September 28, 2001, and December 6, 2006). The implementation of this project will have no-effect on short-term habitat for the northern spotted owl and will result in the long-term development and maintenance of large over-story trees and creation of habitat components (snags) that may provide quality foraging and dispersal habitat. The thinning of dense under-story trees will result in beneficial effects for owl habitat in the long-term as the older canopy trees gain reductions in competition and provide better quality habitat for spotted owl and other mature forest species.

The proposed action follows the recommendations of the latest USFWS workshop to protect the long-term sustainability of spotted owl and their habitat within dry forest ecosystems (USFWS, 2006).

In the long-term, this alternative would improve habitat for native species by allowing remaining trees to mature to a large size commensurate with historic conditions maintained in this stand by the fire regime. Mature trees produce more habitat (snags, insect colonization, prey base) and mast than their younger and more crowded counterparts. Pockets of existing stands would be retained that had young trees to retain the diversity of stand classes. The planning area would regain a more ecologically stable condition that is resistant to catastrophic fire damage and more representative of habitat conditions under which the plants and animals evolved.

Western Gray Squirrel

The proposed action alternative follows the recommendation of all available management plans for the pine/oak habitat type (ODFW, 2006; Larsen and Morgan, 1998; Altman, 2000), as well as specific management plans for the western gray squirrel (Linders and Stinson *in draft*, 2006; Fimbal, 2004; Ryan and Carey, 1995). All plans unanimously agree on the urgent need to restore, as much as is possible, the pine-oak forests to pre-fire suppression vegetation types to sustain native wildlife species. Habitat restoration to benefit the gray squirrel has occurred, or is on-going, at Fort Lewis (Nature Conservancy), WDFW Klickitat wildlife area, and Columbia Land Trust (BLM). All treatments include thinning, followed by prescribed underburns to maintain open forest structure. As 77% of Western gray squirrel habitat in Klickitat County is privately owned, much area will remain unchanged and be a source for comparison of control versus restoration treatments nearby.

Although adaptive management and restoration has been initiated in many different locations of Northwest oak/pine woodland, the newness of the restoration technique has caused a lag in information on the long-term effect of restoration actions specific to the western gray squirrel populations. Many studies have been completed that described no impacts to small mammals populations after prescribed fire in pine/oak forests, regardless of season (Ford et. al., 1999; Monroe and Converse, 2006; Rowan et. al., 2005; Lyon et. al., 2000; McMahon and deCalesta, 1990). The most important factor was the low intensity (flame lengths less than 3 feet and mosaic burn pattern) of the prescribed burn, rather than the season of burn. Small mammal survival of these low intensity burns is attributed to the inherent adaptations of these species to the frequent fire regimes for this habitat type. Small mammals had fossorial habits and readily took refuge in underground burrows, spaces under rocks, as well as large down wood. Tree squirrel species escape into the forest canopy (Kaprowski et. al., 2006).

The following paragraphs summarize fire effects to the Eastern fox squirrel. The information was clipped directly from the Fire Effects Information System (FEIS) online database of the U.S. Forest Service Rocky Mountain Research Station (Tesky, 1993). All references for this report are available on-line.

Fire effects to the Eastern fox squirrel, *Sciurus niger*.

DIRECT FIRE EFFECTS ON ANIMALS:

Eastern fox squirrels would probably not be able to escape fast-moving (high severity) fires. However, they could probably easily escape low-severity ground fires. Kirkpatrick and Mosby found no evidence that prescribed burning caused significant direct mortality among eastern fox squirrels. Wildfires could destroy leaf nests, nest trees, and eastern fox squirrel nestlings. However, cavities used for denning and leaf nests are usually above the impact zone of prescribed fires.

HABITAT RELATED FIRE EFFECTS:

Fire often has a positive effect on eastern fox squirrel habitat. Fire maintains the pine-oak habitat preferred by eastern fox squirrels and has a direct effect on eastern fox squirrel foods. Under presettlement conditions longleaf pine savannas (preferred eastern fox squirrel habitat) may have burned at average intervals of 3 to 5 years, usually between April and October. The open stands produced by fire result in better pine cone and mast production. Pines and oaks growing in the open receive more light, maintain more branches at lower levels, and produce heavier crops of cones and nuts. Additionally, nutrient availability and the enhanced vigor of burned pine forest are associated with larger crops of fungi, which are also important eastern fox squirrel foods. A lush, grassy understory maintained by fire is important as protective cover.

Fire has probably been a determining factor in the niche separation between gray and eastern fox squirrels on the Coastal Plain. Both exist in mixed pine-oak forests and feed heavily on acorns, but the more competitive gray squirrel dominates where the overlap of oak crowns allows tree-to-tree travel throughout the canopy. Eastern fox squirrels are more abundant where patches of oaks comprise less than 30 percent of pine-hardwood stands and do best in fire-type pine forests with scattered hardwood inclusions. Fire could be a deciding factor in determining the availability of suitable habitat and resources for one or the other species.

FIRE USE:

Prescribed fire can be used to maintain eastern fox squirrel habitat. Prescribed burning at 2- to 5-year intervals can be beneficial to eastern fox squirrels by maintaining an open understory and better foraging habitat. According to Humphrey, ground fires are valuable in maintaining habitats of Big Cypress fox squirrels. In the habitat of this subspecies, future fire management plans call for an increase in prescribed burning to 50,000 acres a year. Pinelands are expected to be burned on a 5- to 7-year rotation.

In summary, the Western gray squirrel is expected to benefit from thinning and prescribed underburning activities within the planning area as this will begin to return their oak

woodland habitat to the more open and mixed age stand that they likely evolved in. Thinning of stands, as occurred with low intensity fires, should result in accelerated growth in the older oaks and pines, which will be retained. The survey of and protection of squirrel nests within the planning area, as well as seasonal restriction of thinning and underburning activities are expected to reduce potential impacts to the western gray squirrel to very low levels. These conservation measures are listed under subsection 2.3 of this document. The unavoidable increase in human and loud machinery within their range may still disturb some individuals, but is not expected to impact the local population (MIIH). In the long-term, the habitat should improve markedly for persistence of this Washington State threatened species.

Threatened, Endangered, and Sensitive Species Review
All known sites of listed species were compiled and surveys for these species and their suitable habitats were completed as per appropriate protocols. All sightings are summarized in the Biological Evaluation (Appendix A). Some additional surveys will be conducted immediately prior to implementation to identify new sensitive sites, such as new nest sites.

Biological Evaluation
A Biological Evaluation was prepared prior to any ground disturbance (Appendix A).

Consultation with U.S. Fish and Wildlife
Consultation with appropriate regulatory agencies was completed. The proposed project, as planned, is not expected to have adverse effect to any species currently listed as federally Endangered or Threatened due to adherence to pre-determined project design criteria and conservation measures (such as seasonal restrictions). These design criteria and conservation measures to prevent adverse effects to T & E species are derived from 2 sources, the current Forest Service programmatic informal consultation with the USFWS (USFWS reference 1-3-01-IR-2231, dated 9/28/2001; extended 12/7/2006, reference #13410-2007-I-0022), and the National Fire Plan Project Design and Consultation (Counterpart Regulations 50 CFR 402.04). The summary table of Biological Effects is in Appendix A, including the rationale for effects determinations. As there are no T&E species or habitat that is likely to have potential for adverse effects, formal consultation, and take statement, will not be required for the Catherine Creek restoration project.

Cooperation With Washington Department of Fish and Wildlife
WDFW was a participating member of the collaborative team. All aspects of the project were developed with input from and reviewed by WDFW.

Special Habitat Management Objectives
All priority habitats were identified and given appropriate protection. While most of the priority habitats, such as cliffs, talus, lakes and ponds do not support forests, these habitats will not be directly affected, they will all be given appropriate buffers to ensure that the habitats are protected from long term adverse impacts. The one priority habitat that will be affected is the pine/oak woodlands. It is the objective of this project to enhance this habitat and therefore entry within this habitat will be required.

Habitat Improvements
All of the project area was within identified winter range and due consideration was given to protection and enhancement of this habitat. Winter range habitat will be enhanced by the proposed actions by retention of all shrubs (which are important browse), opening the canopy to encourage most shrubs and herbaceous plants, encouraging older tree development which will increase mast production. All of these are important components of winter range habitat.

Road, trail, and area closures.
All temporary or existing unneeded roads, skid trails, landings, etc are proposed to be re-contoured and re-vegetated with native species.

Integrity and Function Wildlife Sites.
This project is an enhancement project and all wildlife and plant sensitive sites were protected with appropriate buffers. See effects discussed in this chapter, and the Biological Evaluations in Appendix A.

Appropriate buffers sensitive wildlife and plant site.
The CRGNSA Management Plan requires buffer zones around certain sensitive wildlife and plant sites (see Natural Resource Mitigation plan p.36, #28) for a list of the required buffers and mitigations. See also the prescriptions by each vegetation type in Chapter 2.

Water Resource Buffers (see Chapter 2, pages 29-30.)
The project includes some potential work within the riparian buffer zones, therefore, a "no practicable alternative" test (see page 29) and natural resource mitigation plan has been written as required.

New developments and uses shall not interfere with fish passage.
There were no new crossings or developments to interfere with of fish bearing streams proposed.

New developments and uses shall occur during periods when fish and wildlife are least sensitive to activities.
All activities were timed to occur when the impacts would be least for both wildlife and plant species. No activities were to occur during the Spring when the soils were wet, the plants flowering, wildlife were having young and birds were nesting. Likewise activities were curtailed in late fall and winter to reduce impacts to winter range (see page 36 # 24).

In areas of big game winter range, forage and thermal cover
The project is within winter range and adequate cover was maintained. The canopy closure was only slightly reduced by no more than 30 percent. In addition, disturbance was reduced by identifying work windows if severe winter conditions were in effect (page 36, #24).

Cumulative Effects Alternative 2
A recent article in Partners-In-Flight's Bird Conservation magazine, estimated that 90% of the historical range of oak woodlands has been lost due to urbanization, agriculture and forest conversion, fire suppression and invasion of exotic species (De Groot, 2001).

The decline of the oak woodland eco-type will accelerate the decline of many threatened and endangered species which depend on this habitat component (See Biological Evaluation in Appendix A).

The thinning of under-story vegetation maintained by or initiated by prescribed fire will help slow this range-wide decline of ecologically stable, open Oregon white oak woodlands within Oregon, Washington and California. Quality wildlife habitat and oak-woodland dependent species would benefit from this action and regain a pocket of their former range. These species would then retain the option to re-colonize nearby pine-oak and oak woodland habitats as they are retained or improved in the future.

Cumulative effects on the northern-most fir-dominated forested areas within the project area represent a small fraction of this type of habitat within the Snowden Plateau. The relatively short duration of the project and the temporary disturbances that may occur would not cause any cumulative effects on the wildlife. Most wildlife would temporarily move to adjacent forested habitats to move back at a later date. Furthermore, this project is designed to enhance the long-term quality of this habitat and offer escape habitat when other adjacent areas are being disturbed. There are no known additional forest habitat disturbances being planned for the areas adjacent to this habitat and any that are planned in the future must comply with the SMA forest practices guidelines which are designed to avoid negative cumulative effects on these habitats.

Catherine sub-area from across the Columbia River in Oregon.
Note: 1) Lower elevations predominantly open grass and oak/pine.
2) Upper elevations becoming increasingly dominated with Douglas-fir.
3) Oak-pine encroached by Douglas-fir as a result of fire exclusion.

CUMULATIVE EFFECTS DETERMINATION					
Past, Current or Reasonably Foreseeable ACTIVITY OR PROJECT	**Potential Effects**	**OVERLAP IN**		**Measurable Cumulative Effects?**	**Extent Detectable**
		TIME	**SPACE**		
Burdoin I	Short term disturbance and possible loss to individuals. Long term beneficial effects on habitats.	No	Yes	Yes	Burdoin I project was the first step in reaching fire resiliency. This Alt. will further reduce the risk of fires and give better protection to the habitats.
Road work on BPA easement	Effects on riparian habitats. Road was built within riparian area	No	Yes	No	Impacts were minor.
firehouse	Loss of habitat – increase disturbance	No	Yes	Yes	No cumulative effects of short or long term. The present project is considered as habitat enhancement with short term impacts of one year or less.
Courtney Rd widening	Temporary disturbance. Long term - increase numbers of recreationists	No	No	No	No cumulative effects of short or long term.
Allen Property thinning and structure removal	Short term disturbance and possible loss to individuals. Long term beneficial effects on habitats.	Maybe	Yes	Yes	This project thinning is the first step in reaching fire resiliency. This project Alt. will further enhance the habitats and reduce risk of fire.
Weed treatments	Short term disturbance.	Maybe	Yes	No	No cumulative effects of short or long term. The present project's long term impacts are considered as habitat enhancement with short term impacts of one year or less.
Paved accessible trail at Catherine Creek	Short term disturbance. Long term attraction for more people, more disturbance.	No	No	Yes	No cumulative short or long term effects. The present project's long term impacts are considered as habitat enhancement.
Burdoin II Thin from Below	Short term disturbance and possible loss to individuals. Long term beneficial effects on habitats	Maybe	Yes	Yes	No short term cumulative effects. Long term effects are beneficial – the two projects together will increase the area with fire resiliency and protecting more habitats.
Coyote wall FS trails	Increased disturbance from recreation	No	Yes	Yes	The use of the area by recreationists will be monitored. No cumulative effects will occur as the present project will not add to these impacts.
Land aquisitions	Reduces chronic disturbance. Encourages recreation, protects more habitat.	Maybe	Yes	No	The proposed project will cumulatively add to the enhancement effects of land acquisition.

3.6 - EFFECTS TO RECREATION, ACCESS, AND RECREATIONAL FACILITIES

Existing Conditions

Recreation in the study area is a relatively new use, since much of the land was previously in private ownership. Since the formation of the CRGNSA, dispersed recreation has grown and become an important activity in the area. No formal trail system or facilities have been developed by the CRGNSA. Users, however, formed a well- developed network of mountain bike trails, which intertwine across private and National Forest System lands (attained after SA designation). At least one land owner allows private use on their property with the caveat that no maps be made (which would increase non-local

Mountain bike riding and hiking are the predominant form of recreation in the study area. The majority of bike use occurs on the open slopes around "Coyote Wall" in T3N, R11E sections 26, 27 and 35. Use is significantly lower in the area north of Atwood Road. Hiking and orienteering are popular in the open lands west of Catherine Creek, as well as the natural arch on the east of Catherine Creek, which is highlighted in several hiking books covering the Gorge area. Both uses tend to be seasonal in nature, but for entirely different reasons.

Hikers tend to use the area during the early spring, to view the spectacular early spring wildflowers displays, escape the usually wetter west side, and enjoy the open vistas of the Gorge and its unique geologic features. Hiking during the summer months is relatively low and will not likely experience growth, because of the area's high temperature and lack of water. Fall orienteering is growing in popularity, aided by a Portland orienteering club, and outings by the Lewis and Clark outdoor program. The majority of these users are from the Portland/ Vancouver Metro Area.

Mountain bikers use is concentrated essentially during the winter and spring months. This seasonal use results from lack of accessibility to other trails which tend to be snow bound, or too muddy to ride until early summer. The terrain and informal trail network that has been developed in the study area is unique, because it provides opportunities for riders of all levels of expertise and provides good site distance along the trail. Many of the mountain bikers are from the local area (Hood River and White Salmon/Bingen), but is know by users from the outside the local area through bike users networks.

It appears mountain bike is the dominant form of recreation in the area. Observed use by a local Mountain Bike club includes as many as 60-70 riders on weekends and 5-10 riders on weekday during March and April. Participation in hiking appears to be lower, but use figures could not be validated. Most mountain bikers use the system of trails that they developed but a small number engages in "freeriding". Freeriding is generally off trail and the term is claimed by two kinds of users. One, who have heavy bikes with extra shocks and wear body armor, ride straight down the fall line, "hucking" (jumping) off of rocks, landing and continue to ride down. This kind of use is currently taking place. The second users are more interested in agility, and like to ride up and along rocks and logs, and along narrow, above ground, constructed "bikeways". This use is not currently prevalent in the project area, but could be developed as the forest is opened to a more park-like setting.

Off highway vehicle (OHV) use and deer and turkey hunting are other uses that have been observed. Hunting for deer occurs over most of the area during the months of September and November. Turkey hunting takes place in the spring. OHV use tends to be confined to existing roads and trails and most likely occurs during the spring and fall when temperatures moderate. Use appears to be fairly low as compared to hiking and mountain bike use.

Most of the planning area is in SMA Agriculture or Open Space. The Columbia River Gorge National Scenic Area uses a modified version of the Recreation Opportunity Spectrum (ROS) called Recreation Intensity Class (RIC). Most RIC 1 is associated with Open Space. RIC 1 emphasizes providing semi-primitive recreation opportunities in which people can realize experiences such as solitude, tension reduction and nature appreciation. Maximum design capacity should not exceed 35 people at one time (PAOT) and 10 vehicles for this class. RIC 2 provides settings where people can participate in activities such as physical fitness, outdoor learning, relaxation and escape from noise and crowds. Maximum design capacity should not exceed 70 PAOTs and 25 vehicles. RIC 3 emphases are on facilities that are complementary to the natural landscape, yet accommodate a moderate number of people. People are able to realize experiences such as group socialization, nature appreciation, relaxation, cultural learning and physical activities. Maximum design capacity is 250 PAOTs and 50 vehicles. The majority of the Project area is within RIC 1, with portions west of Coyote Wall and the lower area along Catherine Creek and the Arch within RIC 2.

Projected Use

Demand for most recreation opportunities have increased. The Oregon State Comprehensive Outdoor Recreation Plan (SCORP) Recreation Plan (2003) for Regions 2 (Multnomah, Hood River, Columbia, Washington, Yamhill Polk, Marion and Clackamas Counties) and 3 (Linn, Benton, and Lane Counties) were analyzed together, and show an increase in all activities except horseback riding. And according to the Washington State Comprehensive Outdoor Recreation Plan 2002-2007 (2002), recreation use is projected to increase in Washington.

Existing & Projected Recreational Use

Oregon Region 2 & 3 change from 1987- 2002	
Activity	% change
Nature/wildlife observation	253%
Day hiking	20%
OHV (3 & 4 wheelers)	71%
Mountain biking	Change in use data not included in this edition
Horseback riding	-25%

Washington state-wide		
Activity	2000	2010
Nature activities observe/photo	43%	52%
Mtn/forest hiking	52%	63%
No established trail hiking	21%	25%
Mtn/forest biking	8%	8%
Equestrian mtn/forest	17%	20%
Equestrian no established trails	18%	21%

Overall, recreation in general is expected grow in the study area due to the proximity of Portland and as that population becomes aware of the opportunities. As reported in the 2003 Oregon SCORP, "...according to the Travel Industry Association of America, in the U.S. 40% of weekend travelers report they are taking more day trips and/or weekend trips today than 5 years ago. Meeting this demand will be especially challenging for federal agencies with land management responsibilities near urban areas." Pg 4-32.

Areas once restricted to access are now open to the public. Specifically, mountain biking and freeriding are poised for significant growth in the area given its unique riding opportunities and seasonality. Day hiking will continue to grow at a rate at least equal to the projected growth rate. Given the relatively moderate terrain horseback riding could potentially grow locally although the rate has declined in Oregon overall during the past 20 years. The cost of gasoline will play a significant factor in non-local use.

Demand for recreation opportunities are expected to increase, but since the this area is located further east then the more popular trails on the west end, growth is expected to be more moderate. It would seem reasonable to expect a growth rate that could approach Washington's SCORP prediction, given the lack of opportunities for these activities Gorge wide. Nationally, hunting has declined in recent years. There is no reason to expect hunting to increase significantly given its general downward trend nationally. It is assumed many of the areas now in public ownership were probably hunted prior to acquisition. It appears that there may be a potential for increase in dispersed camping, as more people discover the newly acquired lands.

It is expected that conflicts between recreationists and private landowners will increase. Specifically, conflicts between motorized and nonmortorized use, and between Mt. Bikes, horseback riding and hiking will likely increase as use increases.

Regulatory Framework

Columbia River Gorge National Scenic Area Management Plan

- New developments and land uses shall not displace existing recreational use.
- Recreation resources shall be protected from adverse effects by evaluating new developments and land uses as proposed in the site plan. An analysis of both onsite and offsite cumulative effects shall be required.
- Mitigation measures shall be provided to preclude adverse effects on the recreation resource.

See the effects discussion below for findings concerning these guidelines.

Direct and Indirect, Short & Long Term Effects of Alternative 1
There would be no short-term direct or indirect effects under this alternative, since no treatments would occur.

CUMMULATIVE EFFECTS ALTERNATIVE 1

CUMULATIVE EFFECTS DETERMINATION					
Past, Current or Reasonably Foreseeable ACTIVITY or PROJECT	**Potential Effects**	**OVERLAP in TIME or SPACE**		**Measurable?**	**Extent**
		Yes or no	Yes or no		Description
Recreation Special Use Permits	None	No	No	No	Hike jeep track up Tracy Ridge in early April, below tree line in Oct

Direct and Indirect, Short & Long Term Effects of Alternative 2
There will likely be short-term effects to recreationists predominantly during the implementation phase. The scope of the effects however, will be limited, since most of the significant use (mountain biking and hiking) occurs outside the time of work. There are portions of trails within the treatment area that could be impacted. Direct impacts will be in the form of delays or prohibiting use in the area during treatment activities to protect public safety. These delays or closure would be short and only be implemented during the actual treatment. Road 1230-020 is proposed as a haul route. A portion of the trail (road 1230-020) along Catherine Creek will impact users, as it is a main hiking and biking route and for that short distance, the only place in the canyon for all users to travel. Other overlapping use by the public on haul routs, especially by bikes, also will occur along Atwood Road and the junctions of Roads 1230-020, and BPA 3112-300 with Atwood Road. Bike trails in Sections 26, 27 and 28 will also cross or come very close to proposed underburn areas.

Indirect effects may be more noticeable than the direct effects, due to their longer duration. The proposed thinning and underburning activities may be viewed as unsightly; until the slash is removed and piles are burned in the forested areas and the underburn areas have a chance to green up in the spring. Impacts, however may very by users. For example, visual impacts may be more noticeable to hikers and hunters, because the duration of exposure to the project area is relatively long in duration. Mountain bikers may be less likely to notice the treatment, since they tend to move through the area faster and riders have a tendency to concentrate on trail and keeping their bikes under control. However, they will see more of the impacted area, as they tend to travel farther than hikers.

The indirect effects, however should not last long. Once the slash is removed, piles are burned and disturbed areas “green” up, the effects on recreationist should be minimal. In fact, it may have a positive effect on the recreation experience in the long term as it will move the landscape to a more diverse, open and aesthetically pleasing setting. The more open setting could entice new trail development once it is cleared. It could also increase site

distances along the existing trails and help reduce conflicts between mountain bikers and hikers.

The road reconstruction and maintenance that is permanent will have a positive effect on recreation by providing better access.

Cumulative Effects
Cumulative effects to recreation under alternative 2 could be positive. The overall recreation setting should improve as the landscape is moved toward the desired future condition. This diverse landscape would be a more appealing recreation setting. Although more use-especially in the open area- if allowed to occur without management, could result in braided and multiple trails and trampled vegetation. Recovery time is long on these thin soils, resulting in a loss of vegetation and appeal of the recreation setting.

The no action alternative could have a long-term negative and cumulative effect to recreation outside the open areas. Generally the open landscape would remain open (too rocky to support brush ad trees). Mountain bike users who formed the trails would continue to keep them open in brushy, forested areas. However, hazardous fuels would not be reduced in the forested areas and would continue to accumulate- increasing the risk of a fire start along recreation corridors. The potential for a large wildfire fire would also increase and ultimately result in the loss of recreation facilities and desired settings.

CUMULATIVE EFFECTS DETERMINATION					
Past, Current or Reasonably Foreseeable ACTIVITY OR PROJECT	**Potential Effects**	**OVERLAP IN TIME OR SPACE**		**Measurable?**	**Extent**
		YES OR NO	**YES OR NO**	**YES OR NO**	
Recreation Special Use Permits	Disrupt permitted activities	Not if hauling ends 10-1	Yes	Yes	Minimal
ATV use	Could increase access routes during/after hauling	No	Yes	Yes	Minimal
Recreational hiking & mountain biking	Displace users	Yes	Yes	Yes	Minimal
Recreational freeriding	Access to places previously unrideable	No	Yes	Yes	Minimal

3.7 - OTHER DISCLOSURES

Effects to Wetlands and Flood Plains

The proposed activity does not occur within any floodplains or wetlands. Some vegetative treatments occur within the Riparian Reserves associated with streams. A practical alternative test to consider other options, which eliminate the need to enter these Riparian Reserves was prepared. A No Action alternative was identified which does not require any further intrusion into the Riparian Reserves.

Effects on Prime Farm, Range, and Forest Lands

The proposed action is in keeping with the intent of Secretary of Agriculture Memorandum 1827 for prime lands. The analysis area does not contain any prime farm nor rangeland. Prime forestland does not apply to lands within the National Forest system. In the proposed action, Forest Service land would be managed with sensitivity to the effects on adjacent lands.

Environmental Justice

The Proposed Action would not have adverse effects on Native Americans, women, or any minority group, and the civil rights of any Untied States citizen would also not be affected. No impacts on American Indian social, economic, or subsistence rights are anticipated. There would be no impacts on the American Indian Religious Freedom Act or on American Indian Treaty Rights. All contracts offered by the Forest Service contain Equal Employment Opportunity requirements.

Irreversible and Irretrievable Commitment of Resources

Irreversible commitment of resources refers to non-renewable resources, such as cultural resources, or to those factors, which are renewable only over long time spans such as soil productivity. Irretrievable commitment applies to losses of production, harvest or use of renewable natural resources. No significant irreversible nor irretrievable commitment of resources has been identified with the implementation of any alternative proposed.

3.8 – COMPARISON OF ALTERNATIVES

Introduction

This section will compare the alternatives with respect to meeting the purpose and need of the proposed action and with respect to effects on issues and resources. The following are summaries of the purpose and need along with its measurements, and of the issues and concerns and their measurements. The issues listed are those that

Purpose and Need

Take measured management action that will further the long-term objectives created by the collaborative group:

- Fire Resilience: Wildfires will, as far as can be predicted, be surface fires that stay close to the ground under the majority of conditions. Maintenance underburns will be possible.
- Ecosystem Restoration: Restore, as much as possible, the natural fire regime and associated habitats while protecting threatened, endangered or sensitive species and species.

- Reduce the immediate risk of high intensity wildfires that have the potential to result in loss of life, property, and important forest ecosystem components by removing the small trees that create fuel ladders into the crowns of larger trees and by increasing the spacing between trees.
- Release overtopped oak trees to forestall their rapid decline.
- Improve the growing conditions for large legacy ponderosa pine trees by removing the understory trees competing with them for moisture and light.
- Reduce the risk of bark beetle tree mortality by reducing the number of trees per acre.

Measurements

- Acres in the planning area that would be treated by removing fuel ladders and increased spacing between trees.
- Acres of planning area where prescribed fire would be possible.
- Acres of oak woodland communities with Douglas-fir encroachment.
- Acres of pine-oak Douglas-fir communities with improved growing conditions for ponderosa pine legacy trees and trees per acre reduction.

ISSUES AND CONCERNS

Air Quality

Levels of smoke from slash and prescribed underburning may have a local, transitory effect on air quality and visibility. Limited visibility along roadways may cause short duration public safety issues. Sensitive members of the public may experience eye, throat, or lung irritation from these exposures. There is some risk that chronic, low-level exposure of workers or the public to smoke may lead to adverse health effects.

Measurement: Tons of emissions with high concentrations of particulate matter.

Access and Third Party Rights
Access issues associated with the project area are also very complex as a result of the lands being cobbled together from many different acquisitions. Distinction must be made between legal access and physical access. It is not uncommon to have physical access (an existing road), but no legal right of use to the road. Likewise, there are areas with legally defined access for which a road was never constructed. Lastly, there are areas with neither legal nor physical access.

Measurements: Evaluation of types of legal and physical access.
Solution found to access issue (Yes or No).

Steep Slopes and Soil Stability
Sections of the treatment area are very steep (>50%), with thin soils. Construction of temporary roads and landings to facilitate thinning can increase the chance of landsliding, surface erosion and delivery of sediment to adjacent stream systems.

Measurement: Miles of temporary road construction on very steep slopes (>50%).

Effects to Soils such as Disturbance and Compaction
Log yarding equipment (tractors, skidders, cable yarding) and burning has the potential to damage soil through compaction, displacement and sterilization. This in turn may increase erosion and decrease site productivity.

Measurements: Intensity of acres burned (high-low) and % acres intensive prescribed burn.
Acres of ground based treatment.
% Compacted.

Effects to the Habitats of Plants and Wildlife
Public comment indicated that there would be long term benefits to wildlife and plant habitats as a result of this project, but there were concerns that the short-term impacts would not off-set the long-term benefits. Would the short-term impacts be restored over time?

Measurements: Activity scheduled or buffered to avoid sensitive breeding seasons or life cycles (Yes or No).

Analysis of Effects in Biological Evaluations (BE)

There were concerns that invasive plants would become established in areas with soil disturbance and infestations would occur within fairly pristine oak-pine-Douglas fir habitats.

Measurement: Monitoring, eradication, and prevention requirements established.
(Yes or No).

There was a concern that converting current Douglas-fir habitats (including those with remnant old oaks and pines) into oak-pine habitats, as were likely present when fire regimes were at a more natural frequency and intensity, may not be desirable in all areas.

Measurement: Acres converted of sustainable Douglas-fir habitat
(East Conifer and Northern East Conifer) where dominant species before treatment is Douglas-fir, other species become dominant after treatment.

Effects on Riparian Reserves and Buffers
Tree removal adjacent to streams and wetlands has the potential of increasing stream temperature and increasing sediment due to loss of stream shading and soil disturbance next to the water. This in turn may reduce water quality and degrade aquatic habitat.

Measurement: Miles of fire-line in Riparian reserves, acres treated in Riparian reserves

Effects on Scenic Resources
There may be short term visible disturbance factors such as visible slash, stumps, boundary marking, etc. that will require mitigation to realize the benefits of the long term effect of larger trees in the viewsheds.

Measurements: Acres treated in Foreground, middleground, background distance zones. Degree of deviation from: "form, line, color, or texture common to the natural landscape" pertaining to meeting scenic standards.

Communication
Residents and others who may be affected need to be informed. Bicycles use Courtney and Atwood roads to access areas inside and outside of the proposed project area. Most hiking by non-locals occurs during the spring flowering season in the open meadows of the lower Catherine Creek drainage.

Measurement: Notice required in alternative? (Yes or No).

Prevention of escaped fire during underburning near private property
There are potential risks to adjacent private property from escaped prescribed fires.

Measurements: Expected Fuel load and
Miles of fire-line planned at adjacent property boundaries.

Cultural Resources
There are potential risks to cultural resource sites that will require mitigations in order to realize the benefit of reducing fire risk by reducing excess fuels with prescribed fire.

Measurement: Number of sites adversely affected.

The table on the next page uses the criteria from the above summaries and the information from Chapters 1, 2 and 3 in order to compare the alternatives:

PURPOSE	ISSUE/CONCERN	MEASUREMENT	1-No Action	2-Thin/Underburn
Improve Fire Resiliency		Acres Treated	0	2510
Reduce fire Intensity		Tons per acre Hazardous fuels removed	0	15-oak-pine 92-pine/DF
		Acres low intensity fire Prescribed fire possible	1300	3810
Restore Fire-Regime and Fire Dependent Habitats		Acres Douglas-fir Encroachment	2373	Will remain where pine-oak killed
		Acres Improved conditions for pine legacy trees	0	500
		Fire re-introduced in the landscape on surface rather than in tree crowns	NO	YES
	Air Quality	Tons emissions per acre w/ High concentration particulates	0 > 58 wildfire	12-29
		Impact on Air Quality	None-unless wildfire due to lack of action	Slight
	Access	Solution found	N/A	YES
	Steep Slopes	Miles of temporary road on steep slopes (>50%)	0	0
	Soil	Acres Ground Based Equipment % Compacted	0 0-unless wildfire	588 15% or less
		Risk of Prevalence of intensive burns % acres intensive prescribed burn	HIGH-wildfire 0	MED-wildfire <10%
		Acres disturbed-Compacted soil	0	88
	Wildlife/Plants	Schedule or buffer avoids plant/wildlife disturbance	N/A Wildfire-NO	YES
		Acres DF stands converted Acres oak-pine habitat jeopardy	0-Unless wildfire 2373	0-will not change overall dominance 290-buffers
	Wildlife	# Negatively affected species or habitat	0-species 20 habitat	12-short term 0-long-term
		# Beneficial Impact	0	20 long term
	Plants	# Beneficial Impact	0	9 long term
		# Negatively affected species	13	12-short term 0 –long term
	Invasive Plants	Prevent, monitor, eradicate	YES-eradicate Fewer acres due to funding	YES
	Riparian Reserves and Buffers	Miles fire-line in RR	0	12.9
		Miles mechanical fire-line in RR Reserves	0	0
		Acres RR Treated	0	57-Ground 1040-Hand
		# ACS Objective indicators at risk, degraded, or restored	At risk--All Degraded--0 Restored--0	At risk-Ac Untreated 0 1
	Scenic Resources Foreground	KVA Visible Acres Treated	FG-0 Unless wildfire	135-underburn
	Middlegrounds/ Backgrounds		MG/BG-0 Unless wildfire	2055-thin 1300-underburn
	% Visually Disturbed	% Negatively Affected Viewshed	0-Unless wildfire	Less than 1%
	Scenic standards	Meet scenic standard	YES	YES
	Communication	Notice Required?	N/A	YES
	Prevent Escaped Prescribed Fire	Miles fire-line at adjacent boundaries	0	37
		Expected Fuel Load-tons per acre	9-106	8-43
	Cultural Resources	# sites adversely affected	0-unless wildfire	0

CHAPTER 4
CONSULTATION, COORDINATION AND REFERENCES CITED

4.0 – INTRODUCTION

This chapter discusses the results of consultation with other agencies. It also identifies the agencies, organizations, and interested publics contacted as part of the notification and scoping effort associated with this planning effort.

4.1 - CONSULTATION WITH US FISH AND WILDLIFE SERVICE (USFWS) and US NATIONAL MARINE FISHERIES SERVICE (NMFS)

Consultation with these 2 federal agencies is required before a project may proceed if there is likelihood for adverse effect to species listed under authority of the Endangered Species Act as Endangered or Threatened. Within the planning area, there are 3 species listed as threatened; the bald eagle, the northern spotted owl and the mid-Columbia steelhead. The proposed project, as planned, is not expected to have adverse effect to any species currently listed as federally Endangered or Threatened due to adherence to pre-determined project design criteria and conservation measures (such as seasonal restrictions).

These design criteria and conservation measures to prevent adverse effects to T & E species are derived from 2 sources, the current Forest Service programmatic informal consultation with the USFWS (USFWS reference 1-3-01-IR-2231, dated 9/28/2001; extended 12/7/2006, reference #13410-2007-I-0022), and the National Fire Plan Project Design and Consultation (Counterpart Regulations 50 CFR 402.04) as informally advised by Vince Harke, USFW.

The summary table of Biological Effects is located in Appendix A, including the rationale for effects determinations. As there are no T&E species or habitat that is likely to have potential for adverse effects, formal consultation, and take statement, will not be required for the Catherine Creek restoration project.

4.2 - STATE HISTORIC PRESERVATION OFFICER

An evaluation of the Catherine Forest Restoration with recommended mitigations was submitted by CRGNSA archeologist, Marge Dryden, to the Washington State Historic Preservation Office and concurrence was received on April 9, 2007.

4.3 – PERSONS,AGENCIES AND ORGANIZATIONS CONTACTED

Following is a partial list of county, state, and federal agencies, and tribal governments that have been contacted concerning the proposed action discussed in this Environmental Assessment:

- 94 adjacent land owners (listed in Appendix C).
- Nez Perce Tribal Executive Committee
- Confederated Tribes of the Warm Springs of Oregon
- Yakama Tribal Council
- Confederated Tribes of the Umatilla Indian Reservation
- Bureau of Indian Affairs
- Catherine Collaborative Group
- Chinook Trail Association
- City of Hood River

- City of The Dalles
- Clark Co. Commissioners Chairman
- Clark County Planning Dept
- Clear Creek Distillery
- Columbia Land Trust
- Columbia River Gorge Commission
- Congressman David Wu
- Congressman Greg Walden
- David Evans & Associates
- DEQ, Manager
- Director Western Land Exchange
- Friends of the Columbia Gorge
- Gifford Pinchot Task Force
- Goldendale Sentinel, News Desk
- Gresham Outlook
- Hood River Co. Commission
- Hood River Co. Forestry Dept.
- Hood River County Planning Dept
- Hood River News
- Juniper Flat Dist. Imp. Co.
- Klickitat County Planning Dept
- KWSO Radio
- Little White Salmon NFH
- Longevity Herb Co.
- Mazamas Conservation Committee
- Multnomah County Planning Dept
- Native Plant Society of Oregon
- Nature Conservancy
- Nature Conservancy Oregon
- North Sails Windsurfing Inc.
- Oregon Nation Resources Council
- ONRC-NW Oregon Field Rep.
- Or State Rep District 52
- Or State Rep District 59
- Or State Sen District 26
- Or State Sen District 30
- Oregon Dept of Transportation
- Oregon DEQ
- Oregon State Parks
- Palena Associates Inc
- Pierce National Wildlife Refuge
- Port of Hood River
- Port of the Dalles
- Post Record
- Reeves, Kahn & Eder Attys
- Sandy River Basin Watershed Coun.
- Siuslaw National Forest
- Skamania Co. Commissioners, Chair
- Skamania Co. Parks Dept
- Skamania Co. Pioneer Editor
- Skamania Co. Planning Dept.
- State Representative Dist 15
- State Representative Dist 15
- State Representative Dist 15
- The Columbian
- The Dalles Chronicle
- The Oregonian/NW Outdoors
- U.S. Congressman Brian Baird
- U.S. Congressman Earl Blumenauer
- U.S. Congressman Richard Hastings
- U.S. Sen. Ron Wyden
- U.S. Senator Gordon Smith
- U.S. Senator Maria Cantwell
- U.S. Senator Patty Murray
- US Army Corps of Engineers
- WA Dept of Transportation
- WA Dept. of Community Development
- WA DNR Mgr. SW
- WA State Dept of Wildlife
- WA State Dept. of Natural Resources
- WA State Parks & Recreation
- Wasco County Planning Dept
- Wasco County Public Works
- Washington Dept of Fish and Wildlife
- White Salmon Enterprise
- Wilderness Society
- Other interested Individuals

4.4 - LIST OF PREPARERS

The following interdisciplinary team members participated in the preparation of this document:

ID Team	Title
Diana Ross	Vegetation Team Leader/Landscape Architect
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Mark Kreiter	Hydrologist/Soils
Chuti Fiedler	Fisheries/Wildlife Biologist
Sue Baker	Recreational Planner
Marge Dryden	Archeologist
Allen Morrissette	Civil Engineer
Pam Campbell	Lands Staff Officer

4.5 - CONTRIBUTORS

The following individuals, organizations, and agencies contributed to the project description or collection of data used during project development:

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NFMS and USFWS-Level 1 Team

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4.6 – REFERENCES RESEARCHED AND/OR CITED

Fire Resilience

Agee, James K. 1996. The influence of forest structure on fire behavior. In: Proceedings, 17th Annual Forest Vegetation Management Conference, Redding, CA. January 16-18, 1996: 52-68.

Agee, James K.; Wright, Clinton S.; Williamson, Nathan; Huff, Mark H. 2002. Foliar moisture content of Pacific Northwest vegetation and its relation to wildland fire behavior. Forest Ecology and Management. 167: 57-66.

Agee, J.K., and C. N. Skinner. 2005. Basic Principles of Forest Fuels Reduction Treatments. Forest Ecology and Management 2005.

Agee. 2003. Forging a Science-Based National Forest Fire Policy. Issuses in Science and Technology.

Bastian, H.V. 2001. Effects of Low Intensity Prescribed Fires on Ponderosa Pine Forests in Wilderness Areas of Zion National Park, Utah. Ponderosa Pine Ecosystems Restoration and Conservation: Steps Towards Stewardship, Conference Proceedings. RMRS-P22, September, 2001.Baydack, R.K., Campa III,

Brown, J.K., E.D. Reinhardt, and K.A. Kramer. 2003. Course woody debris: Managing benefits and fire hazards in recovering forest, General Technical Report, RMRSGTR-105. USDA Forest Service, Rocky Mountain Research Station, Fort Collins, Colorado.
Cram, D.; Baker, T.; Boren, J. 2006. Wildland fire effects in silviculturally treated vs. untreated stands of New Mexico and Arizona. Research Paper RMRS-RP-55. Fort

Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 28 p.

Cohen, Jack D. 2000. Preventing Disaster: Home Ignitability in the Wildland-Urban Interface Journal of Forestry 98(3): 15-21. March, 2000..Franklin, J. F. and J. K

Graham, R.T., A.E. Harvey, T.B. Jain, and J.R. Tonn. 1999. The effects of thinning and similar stand treatments on fire behavior in western forests. PNW-GTR-463, USDA Forest Service, Pacific Northwest Research Station, Portland, OR.

Graham, Russell T.; McCaffrey, Sarah; Jain, Theresa B. (tech. eds.) 2004. Science basis for changing forest structure to modify wildfire behavior and severity. Gen. Tech. Rep. RMRS-GTR-120. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 43 p.

Hann, Wendel, Havlina, Doug, Shlisky, Ayn, et al. 2003. Interagency and The Nature Conservancy fire regime condition class website. USDA Forest Service, US Department of the Interior, The Nature Conservancy, and Systems for Environmental Management [frcc.gov]

H., and J.B. Haufer. 1998. Practical Approaches to the Conservation of Biological Diversity. Island Press, Washington D.C. 313pp.

Huff, M. H., Ottmar, R. Alvarado, E. Vihnanek, R. Lehmkuhl, J. Hessburg, P. Everett, R 1995. Historical and Current Landscapes in Eastern Oregon and Washington. Genral Technical Report, PNW-GTR 855
Mason, C. Larry, Kevin Ceder, Heather Rogers, Thomas Bloxton, Jeffrey Comnick,

Bruce Lippke, James McCarter, and Kevin Zobrist. 2003. Investigation of Alternative Strategies for Removal and Administration of Fuel Removal. Rural Technology Initiative, College of Forest Resources, University of Washington, Seattle, WA.

Peterson, David L.; Johnson, Morris C.; Agee, James K.; Jain, Theresa B.; McKenzie, Donald; Reinhardt, Elizabeth D. 2005. Forest structure and fire hazard in dry forests of the Western United States. Gen. Tech. Rep. PNW-GTR-628. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 30 p.

Pollet, J., and P.N. Omi. 2002. Effect of thinning and prescribed burning on crown fire severity in ponderosa pine forests. International Journal of Wildland Fire 11:1-10.

Omi, Philip N. and Erik J. Martinson. 2002. Final report: Effect of Fuel Treatment on Wildfire Severity. Western Forest Fire Research Center, Colorado State University, Fort Collins, CO.

USDA Forest Service. 2000. Protecting People and Sustaining Resources in Fire-Adapted Ecosystems – A Cohesive Strategy. US Dept of Agriculture, Forest Service, Washington, DC.

USDA Forest Service. 2001. Smoke Management Guide 2001 Edition. National Wildfire Coordinating Group, Boise Interagency Fire Center, Boise, ID.

USDA Forest Service and USDI. 2000. Managing the Impacts of Wildfires on Communities and the Environment – A Report to the President. US Dept of Agriculture, Forest Service, and Dept of Interior, Washington, DC.

USDA Forest Service and USDI. 2001. A Collaborative Approach for Reducing Wildland Fire Risk to Communities and the Environment. 10 Year Comprehensive Strategy. US Dept of Agriculture, Forest Service, and Dept of Interior, Washington, DC.

USDA Forest Service and USDI. 2001. A Collaborative Approach for Reducing Wildland Fire Risk to Communities and the Environment. Ten Year Comprehensive Strategy Implementation Plan. US Dept of Agriculture, Forest Service, and Dept of Interior, Washington, DC.

Van Wagtendonk, J.W. 1996. Use of a deterministic fire growth model to test fuel treatments. Pages 1155-1165 in: Status of the Sierra Nevada: Sierra Nevada Ecosystem Final Report to Congress, Volume II. Wildland Resources Center Report No.37, University of California, Davis, CA.

Natural Resources and Forest Ecosystem Components

Agee, J.K. 1993. Fire ecology of Pacific Northwest forests. Washington, DC.: Island Press. 493 p

Abele, Stephen C., Victoria A. Saab, and Edward O. Garton. 2004. Lewis's Woodpecker (*Melanerpes lewis*): A Technical Conservation Assessment. USDA Forest Service, Rocky Mountain Region, Species Conservation Project. June 29, 2004.

Altman, Bob. 2000. Conservation strategy for landbirds of the east-slope of the Cascade Mountains in Oregon and Washington. Oregon-Washington Partners In Flight. June 2000.

Anderson, H.W. 1976. Fire effects on water supply, floods, and sedimentation. Tall Timbers Fire Ecol. Conf. Proc. 15:249-260.

Anthony, R.G., Forsman, E.D., Franklin, A.B., Anderson, D.R., Burnham, K.P.; White, G.C., Schwarz, C.J., Nichols, J., Hines, J., Olson, G.S., Ackers, S.H., Andrews, S., Biswell, B.L., Carlson, P.C., Diller, L.V., Dugger, K.M., Fehring, K.E., Fleming, T.L., Gerhardt, R.P., Gremel, S.A., Gutierrez, R.J., Happe, P.J., Herter, D.R., Higley, J.M., Horn, R.B., Irwin, L.L., Loschl, P.J., Reid, J.A., and Sovern, S.G. 2004. Status and trends in demography of northern spotted owls, 1985–2003. Final report to the Regional Interagency Executive Committee. On file with: Regional Ecosystem Office, 333 SW First Avenue, Portland, OR 97204.

Aulerich, D.E., K.N. Johnson, and H. Froehlich. 1974. Tractors or skylines: what's best for thinning young-growth Douglas-fir? Forest Industries 10 1:42-45.

Bradshaw, G. 1979. Preplanned skid trails and winching versus conventional harvesting on a partial cut. Research Note 62. Forest Research Lab, School of Forestry, Oregon State University. Corvallis, Oregon. 4pp.

Brown, G.W. 1972. The Alsea Watershed Study. Pac. Logging Cong. Loggers Hbk. Vol. 32. 6 p.

Bull, E. L., and J. E. Jackson. 1995. Pileated Woodpecker (*Dryocopus pileatus*). *In* The Birds of North America, No. 148 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington, D.C.

Bull, E. L. and C.T. Collins. 2007. Vaux's Swift (*Chaetura vauxi*). *In* The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Laboratory of Ornithology; Retrieved from The Birds of North America Online database: ttp://bna.birds.cornell.edu/BNA/account/Vauxs_Swift/ .

Burroughs, E.R., Jr., John G. King. 1989. Reduction of soil erosion on forest roads. General Technical Report INT-264. USDA Forest Service, Intermountain Research Station. Ogden, Utah. 21pp.

Burton, Timothy A. 2005. Fish and stream habitat risks from uncharacteristic wildfire: observations from 17 years of fire-related disturbances on the Boise National Forest, Idaho. Forest and Ecology management 211: 140-149.

Cardiff, S. W., and D. L. Dittmann. 2002. Ash-throated Flycatcher (*Myiarchus cinerascens*). *In* The Birds of North America, No. 664 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Christner, J. and R. D. Harr. 1982. Peak streamflows from the transient snow zone, Western Cascades, Oregon. Proceedings of the 50th Western Snow Conference, Colorado State University, Fort Collins, Colorado, pp. 27-38.

Corkran, Charlotte and Chris Thoms. 2006. Amphibians of Oregon, Washington, and British Columbia: A field identification guide – 2nd edition. Lone Pine Publishing. Auburn, WA.

Courtney, S.P., J.A. Blakesley, R.E. Bigley, M.L. Cody, J.P. Dumbacher, R.C. Fleischer, A.B. Franklin, J.F. Franklin, R.J. Gutierrez, J.M. Marzluff, and L. Sztukowski. 2004. Scientific evaluation of the status of the northern spotted owl. Sustainable Ecosystems Institute. Portland, Oregon. September 2004.

Crisafulli, Charles M. 1999. Survey Protocol for Larch Mountain Salamander – Version 3.0. USDA Forest Service, Pacific Northwest Research Station, Olympia, WA. (Chap VII within the Survey protocols for amphibians under the Survey and Manage provision of the Northwest Forest Plan.)

DeBano, L.F., D.G. Neary, and P.F. Ffolliott. 1998. Fire' s Effects on Ecosystems. New York: John Wiley & Sons. 333 p.

Desimone, Steven M. and David W. Hays. 2004. Northern Goshawk *Accipiter gentiles*. In Management recommendations for Washington's priority Species, Volume IV: Birds. Washington Department of Fish and Wildlife, Olympia.

Federal Register / Vol. 71, No. 32 / Thursday, February 16, 2006 / Endangered and Threatened Wildlife and Plants; Removing the Bald Eagle in the Lower 48 States From the List of Endangered and Threatened Wildlife

Fimbel, Cheryl. 2004. Strategies for enhancing Western gray squirrels on Fort Lewis. The Nature Conservancy. Olympia, Washington. March, 2004.

Franklin, J, and Dryrness, C.T.. 1988. Natural Vegetation of Oregon and Washington. Oregon State University Press, Corvallis, OR

Froehlich, H.A., D.E. Aulerich, and R.Curtis. 1981. Designing skid trail systems to reduce soil impacts from tractive logging machines. Research Paper 44. Forest Research Lab, School of Forestry, Oregon State University. Corvallis, Oregon. l5pp.

Gutiérrez, R. J., A. B. Franklin, and W. S. Lahaye. 1995. Spotted Owl (*Strix occidentalis*). *In* The Birds of North America, No. 179 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, and The American Ornithologists' Union, Washington, D.C.

Griffith, Randy S. 1993. Accipiter gentilis. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service,
Rocky Mountain Research Station, Fire Sciences Laboratory (Producer).
Available: http://www.fs.fed.us/database/feis/ [2007, March 23].

Harr, R. D., Warren C. Harper, James T. Kregier, and Frederic S. Hsieh. 1975. Changes in storm hydrographs after road building and clear cutting in the Oregon Coast Range. Water Resource Research 11(3):436-444.

Harr, R. D., Richard Fredriksen, and Jack S. Rothacher. 1979. Changes in stream flow following timber harvest in southwestern Oregon. Research Paper PNW-249. USDA Forest Service, Pacific Northwest Forest and Range Experiment Station. Portland, Oregon. 22pp.

Harr, R. D. 1979. Effects of timber harvest on stream flow in the rain-dominated portion of the Pacific Northwest. In: Process Workshop on Scheduling Timber Harvest for Hydrologic Concerns, Portland, Oregon, November 27-29, 1979. USDA Forest Service, Pacific Northwest Region. Portland, Oregon. 45pp.

Harr, R. D. 1981. Some characteristics and consequences of snowmelt during rainfall in western Oregon. Journal of Hydrology 53:277-304.
Garrett, K. L., M. G. Raphael, and R. D. Dixon. 1996. White-headed Woodpecker (*Picoides albolarvatus*). *In* The Birds of North America, No. 252 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington, D.C.

Hays, David W. and Elizabeth A. Rodrick. 2004. Flammulated owl *Otus flammeolus.* Pages 24-1 – 24-5 *in* E. Larsen, J.M. Azerrad, N. Nordstrom, editors. Management Recommendations for Washington's Priority Species, Volume IV: Birds. Washington Department of fish and Wildlife, Olympia, Washington.

Hays, David W. and Ruth L. Milner. 1999. Peregrine falcon. Pages 11-1 – 11-4 *in* E. Larsen, J.M. Azerrad, N. Nordstrom, editors. Management Recommendations for Washington's Priority Species, Volume IV: Birds. Washington Department of fish and Wildlife, Olympia, Washington.

Helvey, J.D. 1980. Effects of a north central Washington wildfire on runoff and sediment production. Water Resour. Bull. 16:627-634.

Helvey, J.D., A.R. Tiedemann, and T.D. Anderson. 1985. Plant nutrient losses by soil movement after wildfire. J. Soil Water Conserv. 40:168-173.

Hitchcock and Cronquist.1991, Flora of the Pacific Northwest. University of Washgington Press, Seattle, WA.

Huff, Mark H.; Seavy, Nathaniel E.; Alexander, John D.; Ralph, C. John. 2005. Fire and birds in maritime Pacific Northwest. *Fire and avian ecology in North America.* Camarillo, CA : Cooper Ornithological Society. (Studies in avian biology; no. 30 p. 46-62.)

Isaacs, F.B. 2007. Results of peregrine falcon breeding area monitored in Oregon, 2003-2006; Final report. 5 Feb 2007. Oregon Cooperative Fish and wildlife Research Unit, Department of Fisheries and Wildlife, Oregon State University, Corvallis, OR.

Isaacs, F.B. and R.G. Anthony. 2007. Bald eagle nest locations and history of use in Oregon and Washington portion of the Columbia River recovery Zone, 1971 through 2006. Oregon Cooperative Fish and Wildlife Research Unit, Oregon State University, Corvallis, Oregon, USA.

Johnson and T. A. O'Neil (Manag. Dirs.) *Wildlife-Habitat Relationships in Oregon and Washington*. Oregon State University Press, Corvallis, Oregon, USA. 2001.

Jolley, Russ 1988. Wildflowers of the Columbia River Gorge. Oregon Historical Society Press, Portland, OR

Jones, J. A., Gordon E. Grant. 1996. Peak flow response to clear-cutting and roads in small and large basins, Western Cascades, Oregon. Water Resources Research 32 (4): 959-974.

Keinath, Doug and Jason Bennett. 2000. Status and distribution of the Boreal toad (Bufo boreas boreas) in Wyoming. U.S. fish and Wildlife Service, Cheyenne, Wyoming.

Keysey, Patrick D. and w. Mark Ford. 2005. Influence of fire on mammals in Eastern oak forests. *In* Fire in Eastern oak forests: Delivering science to land managers. USDA Forest Service, Northern Research Station. General Technical Report NRS-P-1.

Keyser, Patrick D., David J. Sausville, W. Mark Ford, Donald J. Schwab, and Patrick H. Brose. 2004. Prescribed fire impacts to amphibians and reptiles in shelterwood-harvested oak-dominated forests. Virginia Journal of Science. Volume 55, No. 4, Winter 2004.

Lanham, J. Drew, Patrick H. Brose and Patrick D. Keyser. 2005. Conservation implications for neotropical migratory and game birds in oak-hardwood stands managed with shelterwood harvests and prescribed fire. *In* Fire in Eastern oak forests: Delivering science to land managers. USDA Forest Service, Northern Research Station. General Technical Report NRS-P-1.

Larsen, E.M., E. Rodrick, and R. Milner, eds. 1995. Management recommendations for Washington's priority Species, Volume I: Invertebrates. Washington Department of Fish and Wildlife, Olympia. 82 pp.

Larsen, E.M., editor. 1997. Management recommendations for Washington's priority species, Volume III: Amphibians and Reptiles. Washington Department of Fish and Wildlife, Olympia. 122 pp.

Larsen, E.M., and J. T. Morgan. 1998. Management recommendations for Washington's priority habitat: Oregon white oak woodlands. Washington Department of Fish and Wildlife, Olympia. 37 pp.

Levno, A., and J. Rothacher. 1969. Increases in maximum stream temperatures after slash burning in a small experimental watershed. USDA For. Serv., Pac. Northwest For. Rge. Exp. Sta., Portland, OR. Res. Note PNW-110. 7pLewis, Jeffrey C., and Jeffrey M. Azerrad. 2003. Pileated woodpecker *Dryocopus pileatus.* In Management recommendations for Washington's priority Species, Volume IV: Birds. Washington Department of Fish and Wildlife, Olympia.

Lewis, Jeffrey C. and Elizabeth A. Rodrick. 2002. White-headed woodpecker *Picoides albolarvatus.* Pages 28-1 – 28-4 *in* E. Larsen, J.M. Azerrad, N. Nordstrom, editors. Management Recommendations for Washington's Priority Species, Volume IV: Birds. Washington Department of fish and Wildlife, Olympia, Washington.

Lewis, Jeffrey C., Morie Whalen, and Elizabeth Rodrick. 2002. Lewis' woodpecker *Melanerpes lewis*. Pages 26-1 – 26-5 *in* E. Larsen, J.M. Azerrad, N. Nordstrom, editors. Management Recommendations for Washington's Priority Species, Volume IV: Birds. Washington Department of fish and Wildlife, Olympia, Washington.

Lewis, Jeffrey C., Morie Whalen, and Ruth Milner. 2002. Vaux's swift *Chaetura vauxi*. Pages 25-1 – 25-5 *in* E. Larsen, J.M. Azerrad, N. Nordstrom, editors. Management Recommendations for Washington's Priority Species, Volume IV: Birds. Washington Department of fish and Wildlife, Olympia, Washington.

Linders, M. J., and D. W. Stinson. 2006. *Draft* Washing ton State recovery plan for the Western gray squirrel. Washington Department of Fish and Wildlife, Olympia, Washington. 91 pp.

Marshall, D.B., M.W.Chilcote, and H. Weeks. 1996. Species at risk: sensitive, threatened, and endangered vertebrates of Oregon. 2nd edition. Oregon department of Fish and Wildlife, Portland, Oregon.

McCallum, D. A. 1994. Flammulated Owl (*Otus flammeolus*). *In* The Birds of North America, No. 93 (A. Poole and F. Gill, Eds.). Philadelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union.

McCune, Bruce, and Geiser, Linda. 1997. Macrolichens of the Pacific Northwest. Oregon State University Press, Corvallis, OR.

McMahon, Thomas E. and David S. DeCalesta. 1990. Effects of fire on fish and wildlife. *In* Walstad, John D., Steven R. Radosevich, and David V. Sandberg, (Ed.), Natural and Prescribed fire in Pacific Northwest forests, pp. 233-250. Oregon State University Press, Corvallis, Oregon.

McNabb, David H., and Frederick J. Swanson. 1990. Effects of fire soil erosion. *In* Walstad, John D., Steven R. Radosevich, and David V. Sandberg, (Ed.), Natural and Prescribed fire in Pacific Northwest forests, pp. 159-176. Oregon State University Press, Corvallis, Oregon.

Marshall, David B. 1997. Status of the white-headed woodpecker in Oregon and Washington. Audubon Society of Portland. Portland, OR.

O'Neil, Thomas A., David H. Johnson, Charley Barrett, Marla Trevithick, Kelly A. Bettinger, Chris Kiilsgaard, Madeleine Vander Heyden, Eva L. Greda, Derek Stinson, Bruce G. Marcot, Patrick J. Doran, Susan Tank, and Laurie Wunder. Matrixes for Wildlife-Habitat Relationship in Oregon and Washington. Northwest Habitat Institute. 2001. In D. H.

Palmer, Ralph S. (ed). 1988. Handbook of North American birds. Yale University Press. Binghamton, New York.

Pagel, J.E. and W.M. Jarman. 1991. Peregrine falcons, pesticides, and contaminants in the Pacific Northwest. Journal of pesticide reform, winter 1991, volume 11(4).

Pagel, J.E. 1992. Monitoring protocol for peregrine falcons in the Pacific Northwest. Proceedings; symposium on peregrine falcons in the Pacific Northwest. U.S. Forest Service, Medford, Oregon.

Nedeau, Ethan, Allan k. Smith, and Jen Stone. Freshwater mussels of the Pacific Northwest. U.S. Fish and Wildlife Service, Vancouver, Washington. 43 pp.

Nussbaum, Ronald A., Edmund D. Brodie, Jr., and Robert M. Storm. 1983. Amphibians and reptiles of the Pacific Northwest. University of Idaho press. Moscow, Idaho.

Northwest National Fire Plan Project Design and Consultation Process, Version 2.0. November 20, 2003 (salmonids updated January 2005). USDA Forest Service, USDI Bureau of Land Management, USDI Fish and Wildlife Service, and NOAA Fisheries. http://www.blm.gov/or/fcp/FCP-Home.htm

ODFW. 2006. The Oregon Conservation Strategy. Oregon Department of Fish and Wildlife, Salem, Oregon.

Packer, P.E. 1967. Criteria for designing and locating logging roads to control sediment. Forest Science 13 (1). l8pp.

Reid, L.M., T. Dunne, 1984. Sediment production from road surfaces. Water Resources Research 20:1753-1761.

Renken, Rochelle B. 2005. Does fire affect amphibians and reptiles in Eastern U.S. oak forests? *In* Fire in Eastern oak forests: Delivering science to land managers. USDA Forest Service, Northern Research Station. General Technical Report NRS-P-1.

Rieske-Kinney, Lynne. 2005. Do fire and insects interact in Eastern forests?. *In* Fire in Eastern oak forests: Delivering science to land managers. USDA Forest Service, Northern Research Station. General Technical Report NRS-P-1.

Robichaud, P. R. and R. E. Brown. 1999. What happened after the smoke cleared: onsite erosion rates after a wildfire in Eastern Oregon. Presented at the Wildland Hydrology Conference, Bozeman, MT. American Water Resources Assoc. 419- 426.

Rosgen, D. 1996. Applied River Morphology. Wildland Hydrology, Pagosa Springs, CO: 343 pp.

Ryan, L.A. and A.B. Carey. 1995. Biology and management of the western gray squirrel and Oregon white oak woodlands: with emphasis on the Puget Trough Gen. Tech. Rep. PNW-GTR-348. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 36 pp.

Smith, Jane Kapler, ed. 2000. Wildland fire in ecosystems: effects of fire on fauna. General Technical Report RMRS-GTR-42-vol. 1. Ogden, UT: U.S. Department of Agriculture, forest service, Rocky Mountain Research Station. 83 p.

Spies, Thomas A., Miles A. Hemstrom, Andrew Youngblood, and Susan Hummel. 2005 Conserving old-growth forest diversity in disturbance-prone landscapes. Conservation Biology Volume 20, No. 2, 351-362.

Sterling, J. C. 1999. Gray Flycatcher (*Empidonax wrightii*). *In* The Birds of North America, No. 458 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

St. John, Alan. 2002. Reptiles of the Northwest. Lone Pine Publishing. Renton, Washington.

Stinson, D. W., J. W. Watson, and K. R. McAllister. 2001. Washington state status report for the bald eagle. Washington Dept. Fish and Wildlife, Olympia. 92 pp.

Sullivan, Janet. 1994. Bufo boreas. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences

Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/ [accessed March 22, 2007].

Tobalske, B. W. 1997. Lewis's Woodpecker (*Melanerpes lewis*). *In* The Birds of North America, No. 284 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington, D.C.

Tollefson, Jennifer E.; Swanson, Frederick J.; Cissel, John H. 2004. Fire severity in intermittent stream drainages, western Cascade Range, Oregon. Northwest Science. 78(3): 186-191.

USDA Forest Service. Revised December 1990 (1965). Sivics of North America. Agriculture Handbook 654. U.S. Department of Agriculture, Forest service, Washington, D.C. vol.2, 877 p.

USDA Forest Service. 1994-2001. Columbia River Gorge National Scenic Area Stream Surveys. Columbia River Gorge National Scenic Area, Hood River, OR.

USDA Forest Service, et al. 1994. Record of Decision for amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl, and Standards and Guidelines for Management of Habitat for LateSuccessional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl. Portland, OR.

USDA Forest Service. 1995. Upper Lewis River Watershed Analysis, Gifford Pinchot National Forest, Mount St. Helens National Volcanic Monument, Amboy, WA.

USDA Forest Service and USDI Bureau of Land Management. 2004. Sufficiency Analysis for Stream Temperature. Portland, OR.

USFWS, 1982. The Pacific Coast American peregrine falcon recovery plan. October 12, 1982. Denver, Colorado. 87 pp.

U.S. Fish and Wildlife Service, 1986. Recovery Plan for the Pacific Bald Eagle. U.S. Fish and Wildife Service, Portland, Oregon. 160 pp.

USFWS, 2006. Silvicultural practices supporting Northern spotted owl habitat in dry forest ecosystems. May 16-18, 2006 workshop report. Ashland, Oregon.

Vander Haegen, W. M., G. R. Orth and L.M. Aker. 2005. Ecology of the western gray squirrel in south-central Washington. Progress report. Washington Department of Fish and Wildlife, Olympia. 41 pp.

Vertebrate Distribution Models. The Washington Gap Analysis GIS range maps (accessed 3/20/2007) http://www.wdfw.wa.gov/wlm/gap/dataprod.htm

Wahl, Terence R., Bill Tweit, and Ateven G. Mlodinow (eds). 2005. Birds of Washington: Status and distribution. Oregon State University press. Corvallis, OR.

Warkentin, I. G., N. S. Sodhi, R. H. M. Espie, A. F. Poole, L.W. Oliphant, P.C. James, and I.G. Warkentin (2005). Merlin (*Falco columbarius*). The Birds of North America Online. (A. Poole, Ed.) Ithaca: Cornell Laboratory of Ornithology; Retrieved from The Birds of North American Online database: http://bna.birds.cornell.edu/BNA/account/Merlin/.

WDFW, Washington Herp Atlas, 2005. Washington Natural Heritage Program, Washington Dept. of Fish & Wildlife, U.S.D.I. Bureau of Land Management and US Forest Service. http://www.dnr.wa.gov/nhp/refdesk/herp/

Wemple, B.C., Julia A. Jones, Gordon E. Grant. 1996. Channel network extension by logging roads in two basins, Western Cascades, Oregon. Water Resources Bulletin 32 (6):11951207.

ONLINE Literature Database

Endangered Species Information Network. Pacific Biodiversity Institute. (Last updated 2/2007). http://www.pacificbio.org/ESIN/ESIN.html

Tesky, Julie L. 1994. Aquila chrysaetos. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service,
Rocky Mountain Research Station, Fire Sciences Laboratory (Producer).
Available: http://www.fs.fed.us/database/feis/ [2007, March 23].

Tesky, Julie L. 1994. Falco sparverius. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service,
Rocky Mountain Research Station, Fire Sciences Laboratory (Producer).
Available: http://www.fs.fed.us/database/feis/ [2007, March 23].

Snyder, S. A. 1991. Falco peregrinus. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service,
Rocky Mountain Research Station, Fire Sciences Laboratory (Producer).
Available: http://www.fs.fed.us/database/feis/ [2007, March 23].

Tesky, Julie L. 1992. Strix occidentalis. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service,
Rocky Mountain Research Station, Fire Sciences Laboratory (Producer).
Available: http://www.fs.fed.us/database/feis/ [2007, March 23].

Tesky, Julie L. 1993. Sciurus niger. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service,
Rocky Mountain Research Station, Fire Sciences Laboratory (Producer).
Available: http://www.fs.fed.us/database/feis/ [2007, March 23].

Scenic Resources

McGaughey, R.J 1998, Techniques for visualizing the appearance of forestry operations. J. Forestry, 96(6): 9-14.

USDA, Forest Service, 1974. National Forest Landscape Management Vol. 2 Chapter 1: The Visual Management System. Washington, DC.

USDA, Forest Service Handbook No. 559. National Forest Landscape Management Vol 2, Chapter 5. Washington, DC.

Cultural Resources

Boynton, Michael J.
2002 Cultural Resource Probability Assessment and Inventory Strategy for the Columbia River Gorge National Scenic Area" USDA Forest Service. Manuscript on File with the US Forest Service in Hood River, Oregon.

Dryden, Margaret
2004 Heritage Resource Inventory Report, Burdoin II Vegetation Management Project. Manuscript on file with the US Forest Service in Hood River, Oregon.

2005 Heritage Resource Inventory Report, Catherine Creek – Allen Tract Small Fir Removal and Prescribed Burn Project. Manuscript on file with the US Forest Service in Hood River, Oregon.

2007 Heritage Resource Inventory Report for Catherine Forest Restoration Project. Columbia River Gorge National Scenic Area" USDA Forest Service report number: R2006-06-22-0030. Manuscript on File with the US Forest Service in Hood River, Oregon.

Hess, Sean and Sheila Stump
1995 "An Inventory and Evaluation of Cultural Resources in the Catherine Creek and Major Creek Drainages, Southwestern Klickitat County, Washington". BOAS Research Report No. 9306 for the Columbia River Gorge National Scenic Area under Contract No. R6-93- 613.

Luttrell, Charles T.
1994 A Cultural Resources Survey of the Bonneville Power Administration's Ross-Franklin Fiber Optics Project, Benton, Franklin, and Klickitat Counties, Washington and Wasco County, Oregon. Archaeological and Historical Services, Eastern Washington University. Short Report 423. Submitted to the Bonneville Power Administration for Job No. 94-4. Manuscript on file with the US Forest Service in Hood River, Oregon.

McDaniel, Sarah
2002 Heritage Resource Inventory Report for the Burdoin Mountain Fuels Treatment Project, Klickitat County, Washington. Manuscript on file with the US Forest Service in Hood River, Oregon.

Turck, Thomas
"National Register of Historic Places Nomination form for the Rowland Basin Site (45kl327)". Manuscript on file at the USDA Forest Service office in Hood River, Oregon.

Recreation Resources

BikeRag.Com LLC: 2/2007 entries: GI Going OFF@ Westwoods and Ginger Going OFF at Westwoods!! CT postings and photos of freeriding trips.

Oregon Parks and Recreation Department. 2003. Oregon Statewide Comprehensive Outdoor Recreation Plan 2003-2007.

State of Washington, Interagency Committee for Outdoor Recreation, Salmon Recovery Board. 2003. Estimates of Future Participation in Outdoor Recreation in Washington State.

United States Department of Agriculture, Forest Service (USDAFS) 1992. Management Plan for the Columbia River Gorge National Scenic Area.

APPENDIX A - BIOLOGICAL EVALUATIONS

Biological Evaluation
Of the Potential Impacts to Sensitive Flora and Fauna

U.S. Forest Service
Columbia River Gorge National Scenic Area

Date: March 31, 2007

Project: Catherine Creek Forest Restoration

Pre-field Review
Natural resource GIS data, prior environmental documents, and conversations with state and USFWS biologists were completed to determine known and potential locations of sensitive fish, wildlife and plant species within and adjacent to the planning area.

Field Review
Flora: The project area was been surveyed for sensitive flora over the years by many botanists. A fairly good data base exists for this area. A cursory survey was completed in 1997 on the mid-elevation areas of the Catherine Creek area and a survey of the lower elevation areas, below 1200 feet, was conducted in 1999 following the Catherine Creek fire and re-seeding efforts after the fire. Because no surveys had been conducted on some of the parcels at higher elevations, a survey for all sensitive flora and those species of Survey and Manage (S&M) with suitable habitat was completed immediately prior to implementation during the Spring of 2007. All sites were noted and all protection standards within the EA were implemented to protect all sensitive flora. The data displayed in the table is based on our current data base and all known surveys by local botanists.

Fauna: The project area was surveyed to USFS Region 6 protocol for NW Forest Plan Survey and Manage species in March and April of 2006. Peregrine and bald eagle nest site monitoring occurred within the National Scenic Area as part of a multi-agency nest monitoring program, as coordinated annually by Oregon State University. Fish surveys, including steelhead spawning survey, were completed in spring and summer of 2006 within Major Creek. Stream survey was completed on Catherine creek in spring of 2007. Surveys for spotted owl, goshawk and western gray squirrel will be completed the season prior to project implementation (planned to start in 2007) so as to have the most recent and accurate nest location possible for buffers that may need to be applied.

Findings
Flora: No new populations of sensitive flora were observed during the more recent survey efforts, but several previously noted sites were re-confirmed. Our current data base shows many locations of sensitive flora, most at lower elevations where there will be little to no activities related to this project. Although the orchid, Mountain Lady Slipper (Cypripedium montanum), is not a listed species, it will be protected within the project area. While most of the Project Area was not determined to be suitable habitat for Survey and Manage Species

(S&M), at the higher elevations, some of the area was surveyed. No sites of S&M species were located.

Fauna: Effects to CRGNSA sensitive species from the proposed project are displayed in the summary table of effects, displayed below. There are a total of 90 species or critical habitat on the CRGNSA sensitive species list, with 22 species having potential to be found within the planning area. The proposed project, with the many conservation measures, is not likely to adversely affect any of the 22 species to the point that population impacts could potentially be incurred. Further information on each sensitive species, including the effects rationale, follows in detail below.

The project is not expected to lead to negative impacts to any Threatened, Endangered, Sensitive, and Candidate fish and wildlife species due to the seasonal restriction of implementation outside of the species' nesting/rearing season, implementation restrictions, as well as the small area of treatment per year in the larger context of the untreated surrounding habitat. Roads shall only be reconstructed where there is existing wheeled track. Temporary skid roads shall be constructed on side slopes less than 30%. Erosion control measures will be employed so that no fill material is transported from the road site to other areas.

Historically, fires have shaped wildlife habitats, and the relationship of fire in maintaining the health of white oak woodlands is clear. Fire effects to wildlife populations is anticipated to be positive, as animals native to areas with centuries of fire history can undoubtedly persist and thrive in habitat shaped by fires. After thinning, an initial late winter/early spring underburn, followed thereafter by fall underburning will help ensure that prescribed fires burn "cool" and remain low in intensity (flame lengths less then 3'). The cessation of spring underburns by March 15 ensure that ground nesters, such as the Western meadowlark, spotted towhee, Bewick's wren, ruffed grouse and turkey are impacted as little as possible. There are no ground nesters that are on the CRGNSA sensitive species list. Spring underburns would be limited to 1/4 of the planning area or less, per year, to allow for local areas of refugia and replication of mosaic burns that provides for diversity of wildlife habitat. Fires have the potential to injure or kill fauna, but in reality most animals are able to move away from the flames and smoke, either through flight, or underground tunnels and burrows (Kapler, 2000). Direct mortality from low intensity prescribed underburns is documented to be low or non-existent as derived from research literature. The restoration of open oak, pine-oak, and eastside forests from a century of fire suppression is a priority conservation strategy listed in all current state and federal wildlife conservation plans. The restoration of these forests is expected to maintain pine/oak habitat that will directly benefit 10 local sensitive species, such as the Western gray squirrel, Lewis' woodpecker, ash-throated flycatcher, pileated woodpecker, Vaux's swift, flammulated owl, and California Mountain kingsnake.

After a century of fire suppression, the no-action plan would maintain forests in an altered stand composition that does not shelter fire-adapted wildlife species. The risk of stand replacement crown fires is high; with increasing risk each year that fire continues to be suppressed. Whether through stand replacement fire, or continued encroachment by faster-growing conifers, oak stands will eventually be lost.

Seven sensitive species that are declining due to loss of large trees that supply cavities or crevices in bark for nesting include the flammulated owl, pileated woodpecker, pygmy nuthatch, purple martin, Pacific Pallid bat, Silver-haired bat, and the Long-eared myotis. No action within the project area will continue the decline of large trees and the open understory habitat required by these species. The thinning of these forests is expected to directly improve habitat components for these species. Mast production from trees in more open stands is also expected to increase due to greater access to sunlight and reduced competition for available moisture and nutrients.

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FISH, WILDLIFE, AND PLANTS BIOLOGICAL EVALUATION

Summary Table Of Effects
for
Threatened, Endangered, Proposed and Candidate species found in Oregon and WA
as listed by the Federal Endangered Species Act,
and
U.S. Forest Service Regional Forester's Sensitive Species list
for the Columbia River Gorge National Scenic Area
and
Section 1.01 and 1.02, Other "sensitive wildilfe areas and sites" as defined by the
(i) 1992 Management Plan for the Columbia River Gorge National
Scenic Area (Including Oregon and Washington State Endangered,
Threatened, Sensitive and Candidate Species with historic or
suspected range in the CRGNSA)

Project area of analysis: Catherine Forest Restoration *Species with potential habitat or populations within the planning area (Field Review column) are discussed further in the B.E. narrative following this table, as well as in Chapter 3.5 of the E.A.	**County/State:** Klickitat County, WA

SPECIES (population segment)	**STATUS***	**PREFIELD REVIEW Usual Habitat in OR/WA**	**FIELD REVIEW**		**EFFECT DETERMINATION**	
			Habitat Present?*	Species Present?	No Action**	Proposed Action
Bull trout (Columbia R.) *(Salvelinus confluentus)*	T, OR-SC, WA-C	Spawns and rears in cold streams/lakes. Adults will disperse and/or migrate in warmer systems such as the Columbia River mainstem. Presently also documented in Hood R., Drano Lake, and may also use use the Klickitat R and Sandy R for migration within the NSA.	No			
Bull trout (Columbia River) Critical Habitat		Within the NSA: Designated Critical Habitat includes all of the White Salmon and Klickitat River, within the NSA.	No			
Steelhead (Snake R.) and Critical Habitat *(Oncorhynchus mykiss)*	T, WA-C	Anadromous: Habitat and presence within the NSA limited to migration corridor of the Columbia River. Critical Habitat designation limited to Columbia River corridor within the NSA.	No			
Steelhead (Mid-Col. R.) *(Oncorhynchus mykiss)*	T, WA-C	Anadromous: Spawns and rears within Columbia River tributaries between Mosier and Yakima, in both OR and WA.	Yes, Major Creek	Yes, upper distribution unknown	NE	NE
Steelhead (Mid-Col. R.) Critical Habitat		Within the NSA: Designated Critical Habitat includes the Columbia River corridor, as well as White Salmon R (to NW lake) and Klickitat River in WA, with Rock, Mosier, Chenowith, Mill, 3-mile, 5-mile creeks in Oregon.	No			
Steelhead trout (Upper Col. R.) and Critical Habitat *(Oncorhynchus mykiss)*	E, WA-C	Anadromous. Habitat and presence within the NSA limited to migration corridor of the Columbia River. Critical Habitat designation limited to Columbia River corridor within the NSA.	No			
Steelhead (Lower Col. R.) *(Oncorhynchus mykiss)*	T, OR-SC, WA-C	Anadromous: Spawns and rears within Columbia River tributaries between the mouth of the Columbia R east to Hood River, in both OR and WA.	No			
Steelhead (Lower Col. R.) Critical Habitat		Within the NSA: Designated Critical Habitat includes the Columbia River corridor, Sandy, Wind, and the Hood River systems, as well as short lower reaches of Gorge tributaries, located downstream of the Hood River.	No			
Chinook (mid-Col. spring run) *(Oncorhynchus tshawytscha)*	FS	Anadromous: Spawns (late summer/fall) and rears within Columbia River tributaries from the Klickitat River upstream to include the Yakima River (excluding the Snake River Basin), in both OR and WA.	No			
Chinook salmon (Snake R. spring/ summer/fall runs) and Critical Habitat *(O. tshawytscha)*	T, OR-T, WA-C	Anadromous. Presence within the NSA limited to migration corridor of the Columbia River. Critical Habitat designation limited to Columbia River corridor within the NSA.	No			

Chinook salmon (Lower Col. R.) *(Oncorhynchus tshawytscha)*	T, OR-SC (fall run), WA-C	Anadromous: Spawns and rears within Columbia River tributaries between the mouth of the Columbia R east to Hood River, in both OR and WA.	No			
Chinook salmon (Lower Col. R.) Critical Habitat		Within the NSA: Designated Critical Habitat includes the Columbia River corridor, Sandy, Wind, White Salmon (to NW lake) and the Hood River systems, as well as very short lower reaches of Gorge tributaries, located downstream of the Hood River.	No			
Chinook salmon (Upper. Col. R) and Critical Habitat *(Oncorhynchus tshawytscha)*	E, WA-C	Anadromous: Presence within the NSA limited to migration corridor of the Columbia River. Critical Habitat designation limited to Columbia River corridor within the NSA.	No			
Sockeye salmon (Snake R.) and Critical Habitat *(Oncorhynchus nerka)*	E, WA-C	Anadromous. Presence within NSA limited to migration corridor of the Columbia River. Spawning area typically adjacent to or within lakes, where young rear. Critical Habitat designation limited to Columbia River corridor within the NSA.	No			
Chum salmon (Columbia R.) *(Oncorhynchus keta)*	T, OR-SC, WA-C	Anadromous: Spawns and rears in several locations on the Columbia River shoreline as well as within low gradient Columbia R tributaries, in both OR and WA. Historically documented spawning run as far east as the Umatilla/Walla Walla systems, but present pop. largely below Bonneville dam. Some incidental spawning known to occur near the mouths of White Salmon R (WA) and Eagle Creek (OR).	No			
Chum salmon (Columbia R.) Critical Habitat		Within the NSA: Designated Critical Habitat includes the Columbia River corridor, Gibbins, Lawton, Indian mary, Duncan, Hardy, Hamilton, Cedar. Greenleaf, and White Salmon (to NW lake).	No			
Coho (lower Columbia R.) *(Oncorhynchus kisutch)*	T, OR-E	Anadromous: Spawns and rears within Columbia River tributaries between the mouth of the Columbia R east to Hood River, in both OR and WA.	No			
River lamprey *(Lampetra ayresi)*	WA-C	Anadromous: Historically thought to occur throughout the Columbia River system, but little information on current distribution or abundance. Difficult to ID as ammocoetes. Adults not documented in Columbia River system of OR/WA since 1980.	No			
Eulachon *(Thaleichthys pacificus)*	WA-C	Anadromous, with spawning in mainstem Col R & lower reaches of rivers, often within tidal influence. (Sandy R in NSA). Historically migrated as far east as Hood R prior to Bonneville Dam	No			
Leopard dace *(Rhinichthys falcatus)*	WA-C	Disjunct pops in Columbia R. mainstem Yakima, Snake, Similkameen rivers. Habitat in large, slower flowing rivers/lakes. Lay adhesive eggs in riffles, late spring.	No			
Mountain sucker *(Catostomus platyrhynchus)*	WA-C	Historic range in Columbia River system, largely east of Cascades, including the Col R mainstem & lower Klickitat R within the NSA. June/July spawner in riffles.	No			

Cope's giant salamander *(Dicamptodon copei)*	FS, OR-SU	W. WA, NW OR: Clear, cold mountain streams w/rocky substrate	No			
Cascade torrent salamander *(Rhyacotriton cascadae)*	FS, WA-C, OR-SV	Cascade Mtns of southern WA and northern OR: in and adjacent to cold, fast, mountain streams or seeps w/rocky substrate	No			
Dunn's salamander *(Plethodon dunni)*	WA-C	Coast range only WA and Western OR: moss-covered rock rubble, shady stream banks.	No			
Oregon slender salamander *(Batrachoseps wrighti)*	FS, OR-SU	N and Central OR Cascades: Forests with large down logs and moist talus with abundant wood debris	No			
Larch mountain salamander *(Plethodon larselli)*	FS, WA-S, OR-SV	Cascades mountains of S. WA/N. OR: Largely in moss-covered talus slopes, or other rocky substrate, at low-mid elev.	Yes	No	NI	NI
Oregon spoted frog *(Rana pretiosa)*	C, FS, WA-E, OR-SC	The Oregon spotted frog was historically found in the Puget Trough from the Canadian border to the Columbia River and east, as well as both sides of the Cascades. In or near large perennial lakes/marshes with heavy vegetation and shallow warm egg-laying areas. Closest extant population at Crane prairie reservoir in Deschutes county.	No			
Northern leopard frog *(Rana pipiens)*	WA-E, OR-SC	Lowland marsh/ponds with dense vegetation; presently found in Grant county only. Likely extirpated in Gorge.	No			
Western toad *(Bufo boreas)*	WA-C, OR-SV	Widespread distribution in WA and OR:in marshes and ponds (breeding sites in midspring); can travel readily overland and be found along streams/seeps. Known within the Scenic Area near White Salmon, Major and Catherine creeks. There are presently no known sites within the Oregon portion of the Scenic Area.	Yes	Yes	NI	MIIH
Northwestern pond turtle *(Clemmys marmorata)*	FS, WA-E, OR-SC	Streams, lg rivers, slow sloughs, and quiet waters with nesting habitat (open meadow) within ½ mile. Occurs <3000'	No			
Painted turtle *(Chrysemys picta)*	FS (OR), OR-SC	Slow water ponds, marshes, rivers below 3000'. Widely introduced outside CRG and CR basin.	No			
California Mtn king snake *(Lampropeltis zonata)*	FS(WA), WA-C, OR-SV	Main population in CA and Klamath mtns, with disjunct pop. in Col. R. Gorge (Klickitat, Skamania county area): oak/pine woodland, rocky riparian within logs/rocky cover. No confirmed specimens on OR side of NSA, although unconfirmed sightings have been reported at The Dalles and Maupin areas.	Yes	Yes	NI	MIIH (Implementation) BE (long-term habitat)
Sharptail snake *(Contia tenuis)*	FS (WA) WA-C, OR-SV	East slope of WA Cascades, Columbia R. Gorge, W OR: rocky slopes often in open pine/oak woodland w/prey species of small slugs. Often in moist riparian east of Cascades. Largely subterranean during summer, appearing in spring/fall.	Yes	Likely	NI	MIIH
Striped whipsnake *(Masticophis taeniatus*	FS(WA), WA-C	South/central WA (Columbia basin), E. OR: brushy country, open grasslands, and dry rocky sites. Not identified to be in the Scenic Area (WA GAP data)	No			

Bald eagle *(Haliatus leucocephalus)*	T , WA-T, OR-T	Shoreline (generally within 1 mile of large water bodies) with large trees and prey base of primarily fish. Diet also includes some waterfowl, turtles, and carrion	Yes	Yes	NE	NLAA
Northern spotted owl *(Strix occidentalis caurina)*	T, WA-E, OR-T	Mature coniferous forest generally used for nesting, roosting, and foraging. Will disperse in early or mid-seral forests.	Yes, dispersal	Marginal nesting habitat in parts of East Conifer	NE	NE
Northern spotted owl Critical Habitat		Within the NSA: Designated Critical Habitat includes most Oregon FS land between Wahkeena Creek and Hood River, as well as headwater areas of the little Wind River and Brush Creek watershed in WA.	No			
Ferruginous hawk *(Buteo regalis)*	FS(WA), WA-T, OR-SC	Open prairie and shrub steppe in eastern WA and OR.	No			
Peregrine falcon *(Falco peregrinus)*	FS, OR-E, WA-S	Tall (>75'), undisturbed cliff sites with adequate-sized cliff ledges and overhang for nesting, that is within 1 mile of water and is located near areas with abundant small bird prey base.	Yes, in cliff habitat adjacent to planning units	None so far. (Effects determina-tion conserva-tively assumes future use)	NI	MIIH (Implementation) BE (long-term habitat)
Northern goshawk *(Accipiter gentilis)*	WA-C, OR-SC	Typically more common east of Cascades in a wide variety of forest ages, structural conditions, and successional stages. Uses stands of mature forest as nesting sites. Typically found between 1900 and 6100 feet in Oregon.	Yes	Poten-tial in east conifer	NI	NI BE (long-term habitat)
Golden eagle *(Aquila chrysaetos)*	WA-C	Various habitats in open country/forests, often nests on steep cliffs or large trees	Yes, potential	No	NI	NI
Merlin *(Falco columbarius)*	WA-C	Open forests, grasslands, marshes. Nests in N. WA Cascades, NE WA. Winters in all NW U.S. Post breeders (winter) commonly seen in NSA at low elevations.	Yes, winter	Yes, foraging	NI	NI BE (long-term habitat)
Flammulated owl *(Otus flammeolus)*	WA-C, OR-SC	E. Cascades: cavity nester in mature pine/ mixed conifer with open-canopy, at mid-elevations. Prefers mosaic of habitat. Insectivore. Winters S. of US border	Yes, marginal	Potential, but unlikely	NI	NI BE (long-term habitat)
Common loon *(Gavia immer)*	FS(WA), WA-S	Undisturbed lakes and ponds with fish/invert prey base. Spring/fall migrant and winters in NSA.	No			
Western Grebe *(Aechmophorus occidentalis)*	WA-C	open lakes and marshes w/rushes and tules, winters in coastal esturaies/bays	No			
Clark's grebe *(Aechmophorus clarkii)*	FS(WA)	Winters in NSA on large rivers. Breeds in large lakes with tule or rushes.	No			
Horned grebe (OR only) *(Podiceps grisegena)*	FS(OR), OR-SP	Common winter resident on Columbia River within NSA. Breeds on marshes and lakes in E WA/OR	No			
Red-necked grebe *(Podiceps grisegena)*	FS(OR), OR-SC	rare winter migrant on the Col. R. Uncommon breeder in E WA/OR.	No			
Eared grebe *(Podiceps nigricollis)*	FS(WA),	Documented but uncommon winter resident of NSA. Breeds in E OR/WA lakes/reservoirs with rushes/cattails	No			

American white pelican *(Pelecanus erythrorhynchos)*	WA-E, OR-SV	Gregarious birds that nest in large colonies on islands within shallow water and marshes free of human disturbance and mammalian predators. Post breeders sometimes seen in Col R. (such as Klickitat Delta). Winters in S US through Mexico.	No			
Sandhill crane *(Grus canadensis)*	WA-E OR-SV (tabida ssp.)	Riverine wetland, islolated mtn meadows/basins. No current breeding pops in the NSA, some migration.	No			
Yellow-billed cuckoo *(Coccyzus americanus)*	WA-C, OR-SC	Historic range in WA and OR. No reported breeding occurrences since the 1950's, although individuals have been sighted east of Cascades sporadically. Riparian forests, with cottonwood/thick willow; Neotropical migrant. Considered extirpated from WA and OR.	No			
Lewis' woodpecker *(Melanerpes lewis)*	WA-C, OR-SC	Open pine/oak woodland, conifer forests, and riparian woodland; Commonly seen in east areas of NSA in dry forest types of oak and pine. May migrate during harsh winters into areas of milder weather.	Yes	Yes		NI BE (long-term habitat)
White-headed woodpecker *(Picoides albolarvatus)*	WA-C, OR-SC	Central/E. WA/OR open, mature ponderosa pine forest specialist, usually above 2000'. Cavity nester. Not currently documented in NSA.	No			
Black-backed woodpecker *(Picoides arcticus)*	WA-C, OR-SC	Uncommon Cascades resident usu. at higher elvations (>1000'); bulk of range in Canada. Scattered and variable distribution as populations are highly associated with post-fire habitats in mature forests (stand-replacement fires with snags). Dependent on high density of dead and insect-ridden trees. It has not been detected in the NSA, despite regular availability of burned areas.	No			
Pilieated woodpecker *(Dryocopus pileatus)*	WA-C OR-SV	Conifer/mixed conifer forests, as well as decidous stands in valley bottoms with large dead or live trees (or remnants) for foraging and nesting. Primary cavity nester.	Yes	Yes	NI	NI BE (long-term habitat)
Sharp-tailed grouse *(Tympanuchus phasianellus)*	WA-T	Grasslands/sagebrush. Historically found east of the Cascades, including much of Klickitat county, but extirpated in 1950's from most of range in WA and OR. Remnant pop. in NE WA.	No			
Sage sparrow (Amphispiza belli)	WA-C	Eastern WA/OR; flat terrain highly associated with big sagebrush, may also use chaparral, and dry foothills. On periphery of habitat in NSA; in the extreme eastern end. No known current pops.,although migrants may pass through the NSA. Winters in S OR, and SW US states.	No			
Sage thrasher *(Oreoscoptes montanus)*	WA-C	Eastern WA/OR semi-arid sagebrush plains and bottomlands. May have historically been in outlying east portion of NSA, but no current populations.	No			
Loggerhead shrike *(Lanius ludovicianus)*	WA-C	East of Cascades: dry grassland and sagebrush desert habitats. On periphery of habitat in NSA with sightings in east Klickitat county. Neotropical migrant.	No			

Oregon vesper sparrow *(Pooecetes gramineus affinis)*	WA-C	Lowland valleys of W WA and OR: (Willamette, Klamath, Puget sound) sparsely vegetated grasslands with scattered tall structures used for song perches, including ag. lands. On periphery of habitat in NSA. Ground nester.	No			
Gray flycatcher *(Empidonax wrightii)*	FS	SE WA and E OR: Sagebrush and pinyon juniper woodlands, ponderosa pine-oak-DF woodlands with open understory. On periphery of habitat in NSA. Winters in SW US and southward.	Yes	No	NI	NI
Ash-throated flycatcher *(Myiarchus cinerascens)*	FS(WA)	Open oak, pine and juniper woodlands. Nests in cavities of large oak. Readily accespts artificial boxes. Winters in SW US, and southward.	Yes	Yes	NI	NI BE (long-term habitat)
Vaux's swift *(Chaetura vauxi)*	WA-C	Found in forests and urban areas where their need for hollow trees/bark or chimneys for nesting sites are met; neotropical migrant	Yes, overhead foraging. Limited nesting habitat.	Yes	NI	NI BE (long-term habitat)
Purple martin *(Progne subis)*	OR-SC, WA-C	W WA/OR up through Gorge to W Wasco County: cavity/crevice nester, often near water. Forages over open water/fields/ forest canopy. Winters in S. America.	No			
Grizzly bear *(Ursus arctos)*	T, WA-E	Historically in lower 48 states, presently restricted to areas with low human pops., such as North Cascades Range.	No			
Gray wolf *(Canis lupus)*	E, WA-E	Historically found in almost all habitats in lower 48 states; presently in steppe, woodland, and forest where reintroduced.	No			
California wolverine *(Gulo gulo)*	FS, WA-C, OR-T	Conifer Forests. Intolerant of human encounters/disturbance. Require very large home ranges. One sighting in last several decades from road-killed juv male on I-84, near Starvation Creek, Jan 1990.	No			
Pacific fisher *(Martes pennanti)*	C, FS, WA-E, OR-SC	Found in low and mid-elevation late successional conifer forest, with high canopy cover and large down logs for nesting. Requires large home ranges. Likely extirpated in NSA and adjacent forests; undetected in multi-year surveys.	No			
Columbian white-tailed deer (Lower Col. R pop only) *(Odocoileus virginianus leucurus)*	E, WA-E, OR-SV (OR = coast pop only)	Historic distribution in floodplains and bottomland riparian of Willamette and Lower Col. R. east to the Klickitat River. Severe riparian habitat loss presently limits this sub-population to a small area between Skamokawa, W.A. and Clatskanie, Oregon.	No			
White-tailed jackrabbit *(Lepus townsendii)*	WA-C, OR-SU	East of Cascades: open areas with native bunchgrass, sagebrush plains, can also be found in coniferous forests and subalpine meadows. On periphery of habitat in NSA at the Dalles/Dallesport.	No			
Washington ground squirrel *(Spermophilus washingtoni)*	WA-C, OR-E	Presently found in Columbia basin of WA state in sagebrush/grassland w/ sandy soils; also Giliam, Morrow and Umatilla counties, OR. May have historically been within the eastern edge of NSA.	No			

Western gray squirrel *(Sciurus griseus)*	FS(WA), OR-SU WA-T	Open mixed oak/conifer woodland, typically within ½ mile of water source. Core range for WA in Klickitat county. Known to occur in Hood River and areas east within OR. Easily confused with the non-native and invasive Eastern gray squirrel.	Yes	Yes	NI	MIIH BE (long-term habitat)
Gray-tailed vole *(Microtus canicaudus)*	WA-C	Endemic to Clark County, WA and OR Willamette Valley: Grassy and agricultural lands, meadows. On periphery of habitat in NSA. Common in OR.	No			
Townsend's big-eared bat *(Corynorhinus townsendii)*	FS(WA), WA-C, OR-SC	Throughout Western US. Roost and hibernaculum sites within caves, buildings, mines and bridge undersides, with exacting temp, humidity, and physical requirements. Very intolerant of human disturbance which results in loss of critical fat reserves during torpid period.	No			
Pacific Fringe-tailed bat *(Myotis thysanodes vespertinus)*	FS	Nursery colonies and roosts in mines, caves, buildings and similar. Intolerant of human disturbance. Documented in Little W.Salmon subbasin in 1996	No			
California floater mussel *(Anodonta californiensis)*	WA-C	Shallow areas of lakes, ponds, reservoirs, and large rivers with muddy or sandy substrate. Historically found throughout the western US, but presently known to occur as remnant populations in Columbia, Okanogan, and lower Willamette river systems. Intolerant of fluctuating water levels that decimate local populations.	No			
Giant Columbia River limpet *(Fisherola nuttalli)*	WA-C	Historically in almost the entire Columbia R. basin, now restricted to a few remant sites. In WA, confirmed in Hanford Reach of the Columbia R., as well as the Okanogan, Wenatchee and Methow rivers. In OR, only documented in Deschutes R.	No			
Great Columbia River spire snail *(Fluminicola columbiana)*	WA-C	Historically, widespread throughout the Lower Snake and Columbia Rivers, and their larger tribs. Now limited to a few reaches of the Columbia R.system that remain free-flowing, colder, and with high oxygen content. Confirmed in a few sites along the Columbia (Hanford Reach), Okanogan, Wenatchee and Methow Rivers in WA, and the Deschutes River in OR.	No			
Puget Oregonian *(Cryptomastix devia)*	FS	Western Cascade Range in Low/Mid elevations (CRGNSA, GPNF, Clackmas RD. HR RD, ZZ RD, OlympicNF, Salem BLM, Hebo RD, Wenatchee NF, MBSNF): Moist conifer forests, associated with bigleaf maple. Often found on or under hardwood logs, leaf litter, or under sword fern, moist rocks/talus. Yound devia may be under mosses on trunk of big-leaf maple.	No			
Columbia Oregonian *(Cryptomastix hendersoni)*	FS, WA-C	Low to Mid elevations Gorge in Wasco, Sherman, Skamania and Klickitat counties (CRGNSA, MHNF, Naches RD, Mt. Adams RD): Within 100 m. of streams, seeps, & springs (low elev) in steppe communities. May also be in mid elev. mature closed canopy forests among moist talus, leaf litter, or shrubs, or under logs or other debris.	Yes	No	NI	NI

Malone's jumping slug *(Hemphilia malonei)*	FS-WA	<4600'. Benton Cnth northward into W OR Cascades and into SW Cascades of WA. CRGNSA, GPNF, MHNF excp Barlow, Salem BLM Cascades, Olympic NF Hood CanalRD, WillametteNF DetroitRD): Moist forest stands, generally >50 yrs, with >50% canopy cover, esp. where dense sword fern and LWM exist. Some found near marshy areas w/low veg cover.	No			
Columbia Duskysnail *(Lyogyrus n. sp. 1)*	FS	CRGNSA, GPNF, MHNF. Counties include Klickitat, Skamania, Cowlitz, Clark, Wash, Mult, Clack, Hood R): Spring and Spring outflows in cold, clear, and well-oxygenated water. Usu. slow flow with moss substrate.	Yes	No	NI	NI
Dalles sideband *(Monadenia fidelis minor)*	FS, WA-C	Central and East Gorge; Wasco and Klickitat Counties. CRGNSA, MHNF Barlow and Hood R RD, GPNF Mt Adams RD): Within 200 m. of streams, seeps, or springs, in steppe or dry forest plant communities (within talus and moist rocky areas). May be found among rocks, shrubs/veg. and down wood.	Yes	No	NI	NI
Blue-gray taildropper *(Prophysaon coeruleum)*	FS-WA, WA-C	Widespread. Western Cascades and puget trough, south to N. CA. Occurs on both sides S. OR Cascades. Suspected on E slopes of Casacdes in WA: Moist conifer and mixed conifer/hardwood forest, where litter is moist and shaded. Associated with decayed logs, leaf litter, mosses and bigleaf maple/sword fern.	No			
Columbia River tiger beetle *(Cicindela columbica)*	WA-C	Known to occur only in sandbars of Snake and Columbia river riparian area, east of Cascades.	No			
Yuma skipper butterfly *(Ochlodes yuma)*	WA-C	Main pop. in Great Basin area w/outliers in central and eastern OR/WA: near freshwater marshes, streams, ponds, linked with *Phragmites* reeds. The only record within CRGNSA, in 1999, found at Maryhill on ornamental *Miscanthus (Pyle, 2002)*.	No			
Chinquapin hairstreak butterfly *(Habrodais grunus herri)*	WA-C	North-central OR, Skamania County, WA: Obligate with *Chrysolepis chrysophylla*. One known location near Stevenson, WA.	No			
Johnson's hairstreak butterfly *(Callophry[Mitoura] johnsoni)*	WA-C	Cascades, Coast, Siskiyou, Blue, Wallowas mtns: coniferous forest old-growth obligate.	No			
Mardon skipper *(Polites mardon)*	C, WA-E	Historic distrubution unknown. Present known distribution is disjunct: N CA, Puget sound and south Cascades of WA. Habitat of open fescue grasslands, riparian, or meadows with nectar plant source. No known populations in the NSA but surveys by NSA office continues. Species decline likely due to loss of native grass meadows and prairie habitat throughout NW.	Marginal	No	NI	NI
TES Plants						
Agoseris elata	OR-2 WA-S FS-S	Meadows and open woods to mid-elevations.	NO			

Agrostis howellii	OR-1 FS-S Endemic	Moist rocks on south side of Gorge (Multnomah and Hood River counties).	NO			
Arabis sparsiflora var. atrorubens	OR-2 FS-S	Eastside, low elevation . Open areas.	YES	NO	MIIH	BI
Artemesia campestris spp borealis	OR-1 WA-1 FS-S US-C	Gravely beach areas of Columbia. Miller Island in Gorge	NO			
Astragalus hoodianus	OR-2 Endemic	Dry open areas of east Gorge	Marginal	NO	MIIH	BI
Bolandra oregana	WA-2 FS-S	Wet basalt cliffs	NO			
Botrichium lanceolatum	OR-2 FS-S	Moist, wet areas in mountains.	NO			
Botrichium lunaria	OR-2 FS-S	Moist wet areas but rarely in meadows.	YES	NO	NI	MIIH
Botrichium montanum	OR-2 FS-S	Forested/open areas in conifer forest zones	NO			
Calamagrostis breweri	OR-2 FS-S	Stream banks, lake margins, sub-alpine to alpine meadows.	NO			
Calamagrostis howellii	Endemic	Rocky banks and crevices of cliffs within the Gorge.	NO			
Calachortus longebarbaus var. longebarbatus	OR-2 WA-2 FS-S	East slope of Cascades.	Possibly	NO	MIIH	BI
Carex densa	WA-1 FS-S	Wet areas on both sides of Cascades.	NO			
Carex heteroneura (carex atrata var. erecta)	WA-2 FS-S	Montaine	NO			
Carex livida	OR-2 FS-S	Willamette Valley.	NO			
Carex macrochaeta	OR-2 FS-S	Moist open places, coastal but suspected in CRG	NO			
Carex vernacula	OR-2 FS-S	Alpine to sub-alpine. Dwarf size.	NO			
Castilleja levisecta	OR-1 FS-S	Open fields west side of Cascades.	NO			
Castilleja rubicola	OR-2 FS-S	Rocky cliffs at low to moderate elevations.	NO			
Chrysolepis chrysophylla	WA-2 FS-S	Open to closed forest openings Low to mid elevations.	No			
Cicuta bulbifera	OR-2 WA-2 FS-S	Wet places to standing water. Low elevations	NO			
Cimicifuga elata	OR-1 WA-2 FS-S	Hardwood and mixed forest on west side	NO			
Collinsia sparaiflora var. bruceae	WA-1 FS-S	Dry slopes with sparse vegetation on east side of Cascades. Low elevations.	YES	YES	MIIH	MIIH
Copsis trifolia	OR-2 WA-1 FS-S	WASCO	possibly	NO	MIIH	MIIH implementation BI (longterm)

Corydalis aqua-gelidae	OR-1 WA-2 FS-S	Along cold streams on west side of Cascades.	NO			
Cryptantha rostellata	WA-2 FS-S	Dry open areas, east side Cascades.	YES	NO	MIIH	MIIH
Cyperus bipartitus	WA-2 FS-S	Wet places. Low elevation	NO			
Cypripedium fasiculatum	OR-2 WA-3 FS-S	Open to closed forested woodlands/forest. East side of Cascades.	YES	NO	MIIH	MIIH implementation BI Longterm
Damasonium californicum	WA-1 FS-S	Sloughs, marshes and other standing waters.	NO			
Delphinium leucophaeum	OR-1	West side (Mult.)	NO			
Delphinium nuttallii	OR-2	Westside	NO			
Douglasii laevigata var. laevigata	OR-3 Endemic	Basalt cliffs and rocky out-crops, low elevation through the Gorge	NO			
Erigeron howellii	OR-2 WA-1 Endemic FS-S	Open areas on ridges and rocky areas.	NO			
Erigeron oreganus	OR-1 WA-2 Endemic FS-S	Over hanging basalt cliffs	NO			
Eryngium petiolatum	WA-1 FS-S	Dry ephemeral wetlands in east Gorge	Possibly	NO	NI	MIIH
Euonymus occidentalis	WA-1 FS-S	In woods in west Cascades	NO			
Fritillaria camschatcensis	OR-1 WA-2 FS-S	Moist areas west Cascades from coast to mountains.	NO			
Heuchera grossularifolia var. tenuifolia	WA-3 FS-S	Cliffs, often shaded, along streams or rivers in East Gorge	YES	NO	NI	NI
Hieracium longiberbe	Endemic	Open areas throughout Gorge.	NO			
Howellia aquatilis	OR-1 WA-2 FS-S	Westside	NO			
Lewisia columbiana var. columbiana	OR-2 FS-S		NO			
Linanthus bolanderi	WA-2 FS-S	Dry open areas in East Gorge	YES	YES	NI	NI
Liparis loeselii	WA-1 FS-S	Wet or damp areas within forest	NO			
Lomatium laevigatum	OR-2 WA-2 FS-S Endemic	Basalt cliffs in east Gorge	NO			
Lomatium salmoniflorum	OR-2	Wasco	NO			
+ Lomatium suksdorfii	OR-2 WA-3 FS-S Endemic	Open wooded or open areas in east Gorge	YES	NO	MIIH	BI MIIH

Lomatium watsonii	OR-2 FS-S		NO			
Lupinus latifoius var thompsonianus	Endemic	Open areas in pine/oak woodlands.	YES	YES	MIIH	BI MIIH
Luzula arcuata	OR-2 WA-1 FS-S	Hood	NO			
Lycopodiella inundata (Northeren bog clubmoss)	OR-2 WA-2 FS-S	Westside	NO			
Lycopodium complanatum	OR-2 FS-S	Westside	NO			
Meconella oregana	OR-1 WA-2 FS-S	Oak woodlands in east Gorge	YES	No	MIIH	MIIH Implementation BI longterm
Microseris borealis	WA-2 FS-S		NO			
Mimulus jungermannioides	WA-1` FS-S	Wet areas in east Cascades.	Possibly	NO	NI	MIIH
Mimulus pulsiferae	WA-2 FS-S	Wet areas.	NO			
Mimulus suksdorfii	WA-2 FS-S		NO			
Montia diffusa	WA-2 FS-S	Up-turned root disturbances within the forest of Cascades.	NO			
Montia howellii	FS-S		NO			
Navaretia tagetina	WA-1 FS-S	Dry, open areas in east Gorge	YES	YES	NI	MIIH
Ophioglossum pusillum	OR-1 WA-1 FS-S	Meadows and woods.	Possibly	NO	MIIH	MIIH Implementation BI longterm
Parnassia frimbriata var. hoodiana	WA-1 FS-S	Bogs, stream banks, wet areas (Mult., Hood, and Washington Counties, Oregon)	NO			
Penstemon barrettiae	OR-1 WA-2 FS-S Endemic	Rocky cliffs, talus slopes in east Gorge	YES	YES	NI	NI
Phlox hendersonii	OR-2 FS-S	Hood	NO			
Pityopus californica	WA-1 FS-S		NO			
Platanthera sparsiflora	WA-1 FS-S	Wet, boggy areas	NO			
Plagiobothrys figuratus ssp. corallicarpus	OR-1 FS-S		NO			
Platanthera sparsiflora	WA-1 FS-S	Wet, boggy areas	NO			
Poa gracillima var. multnomae	Endemic	Mostly on s. side of Columbia Gorge in rocky, shaded cliff near water falls	NO			
Poa laxiflora	WA-2 FS-S	Moist woods to open rocky slopes up to mid-elevations	NO			
Poa nervosa var. nervosa	WA-2 FS-S	Limited to lower Col. River and adj. tribs. Open slopes, ridges and talus slopes.	NO			
Polemonium carneum	WA-1 FS-S		NO			

Potentilla breweri	WA-1 FS-S		NO			
Potentilla diversifolia var. perdissecta	WA-1 FS-S		NO			
Potentilla villosa var. parviflora	OR-2 FS-S	Hood	NO			
Ranunculus populago	WA-2 FS-S		NO			
Ranunculus reconditus	OR-1 WA-1 FS-S Endemic	Open grasslands or open areas in pine/oak woodlands. East Gorge.	NO			
Romanzoffia thompsonii	FS-S		NO			
Rorippa columbiae	OR-1 WA-1 FS-S	Mud flats along Columbia River	NO			
Scheuchzeria palustris var. americana	OR-1 FS-S		NO			
Scirpus subterminalis	OR-2	Wasco	NO			
Scribneria bolanderi	WA-1 FS-S		NO			
Sidalcea hirtipes	OR-2 WA-1 FS-S		NO			
Sisyrinchium sarmentosum	OR-2 WA-1 FS-S	Wet/dry meadows at mid to high elevations	NO			
Spiranthes porrifolia	WA-2 FS-S	Open moist meadows.	YES	YES	NI	NI
Streptopus streptopoides	OR-2		NO			
Suksdorfia violacea	OR-2 FS-S		Possibly	NO	NI	NI
Sullivantia oregana	OR-1 WA1 FS-S Endemic	Wet basalt cliffs	NO			
Synthyris stellata	Endemic		NO			
Tauschia stricklandii	OR-2 FS-S	Mult.	NO			
Utricularia intermedia	WA-2 FS-S	Slow moving water or streams	Possibly	NO	NI	NI
Utricularia minor	OR-2		Possibly	NO	NI	NI
Veratrum insolitum	WA-1 FS-S		NO			
Wolffia borealis	FS-S		NO			
Wolffia columbiana	OR-2		NO			
FUNGI						
Albatrellus ellisii (WA only)	S&M		NO			
Bridgeoporus nobilissimus	WA-1 OR-1` S&M	On boles of noble firs	NO			
Cordyceps capitata (Former S&M)	S&M	OR/WA	NO			

Cortinarius barlowensis (OR only)	S&M		--			
Cudonia monticola	S&M	OR?	NO			
Gomphus kauffmanii	S&M	OR/WA	NO			
Gyromitra californica	S&M	OR/WA	NO			
Helvella crassitunicata	OR-2	Hood	NO			
Hygrophorus caeruleus	OR-2	Hood	NO			
Leucogaster citrinus	S&M		NO			
Macowanites mollis	OR-1	Mult. co	NO			
Mycena monticola (Former S&M)	S&M	OR/WA	NO			
Otidea smithii	S&M	OR/WA Forests with conifers	NO			
Phaeocollybia attenuata	S&M	OR	NO			
Phaeocollybia californica (OR only)	OR-1 S&M		--			
Phaeocollybia olivacea (OR only)	S&M	OR	--			
Phaeocollybia oregonensis	OR-1 S&M	OR	NO			
Phaeocollybia piceae	S&M	OR?	NO			
Phaeocollybia pseudofestiva	S&M	OR	NO			
Phaeocollybia scatesiae	S&M	OR	NO			
Ramaria amyloidea	S&M	OR	NO			
Ramaria cyaneigranosa (WA only)	S&M	WA	NO			
Ramaria gelatiniaurantia	S&M	OR/WA	NO			
Ramaria rubrievanescens (WA only)	S&M	WA	NO			
Sarcodon fuscoindicus (WA only)	S&M	WA	NO			
Sowerbyella rhenana	S&M	OR/WA Conifer forests	NO			
Spathularia flavida (WA only)	S&M	WA	NO			
LICHENS						
Cetrelia cetrarioides (WA only)	S&M	WA	NO			
Chaenotheca subroscida	S&M	WA, OR?	NO			
Collema nigrescens (WA only)	S&M	WA	NO			
Dendriscocaulon intricatulum (WA only)	S&M	WA Both in old-growth western forests and in open oak balds	Possibly	NO	MIIH	MIIH Implementation BI longterm
Dermatocarpon luridum	S&M	WA, OR? Aquatic on submerged or seasonally emergent rocks	NO			
Hypogymnia duplicata (OR only)	S&M	OR Western Cascade forests at mid-elevations !000-5500’	--			

Leptogium burnetiae var. hirsutum	S&M	OR?/WA? Epiphytic on trees, logs, rocks, mosses	NO			
Leptogium cyanescens	S&M	OR?/WA? Tree bark both conifers and hardwoods, logs, rocks in cool, moist sites	NO			
Lobaria linita (OR only)	S&M	OR Cool, humid old-growth forest on boles of silver firs and boulders	--			
Nephroma bellum (WA only)	S&M	WA w. Cascades, mostly on conifer branches	NO			
Nephroma occultum	S&M	OR/WA	NO			
Pannaria rubiginosa	S&M	OR/WA? Epiphyte on Hooker's willow at low elev. In old-growth western forests	NO			
Peltigera neckeri (Former S&M)	S&M	OR?/WA? Mossy logs, soil and tree bases in moist forests	NO			
Peltigera pacifica	S&M	OR/WA Same as P. neckeri	NO			
Pilophorus nigricaulis (Former S&M)	S&M	WA/OR? On rocks in talus slopes, cliffs within old-growth forests	NO			
Platismatia lacunosa (WA only)	S&M	WA Western conifer forest	NO			
Pseudocyphellaria rainierensis	S&M	OR/WA On conifers in cool, humid, old-growth western forests	NO			
Ramalina pollinaria (Former S&M)	S&M	1) OR? 2) CA only	NO			
Tholurna dissimilis	S&M	OR/WA High elev. Wind swept trees	NO			
Usnea longissima	S&M	OR/WA Wet moist forest	NO			
BRYOPHYTES						
Conostomum tetragonum	OR-2	Moss, Hood	NO			
Encalypta brevicolia var. crumiana (Former S&M)	S&M	WA?	NO			
Gymnomitrion concinnatum	OR-2	LIVERWORT	NO			
Polytichium sphaerothecium	OR-2	Moss, hood	NO			
Rhizomnium nudum (OR only)	OR-2 S&M	OR Very moist humus or soil, typically near see page in conifer forest	NO			
Schistostega pennata	S&M	OR/WA Mineral soil in shaded pockets of overturned tree roots, or at entrances to caves, or animal burrows	NO			
Scouleria marginata (Former S&M)	S&M	OR?/WA? Semi-aquatic on rocks along edges of streams	NO			
Tetraphis geniculata	OR-2 S&M	OR/WA Moist forests with large down logs	NO			

NOTE: RATIONALE FOR CONCLUSION OF EFFECTS IS CONTAINED IN THE NEPA DOCUMENT.
** All effects for the No Action alternative do not take into account the impacts to the habitat that may occur should a replacement fire occur or more and more oak/pine woodland habitat is lost over time. While short

term impacts to the species themselves are not significant because they can move, the risk of impacts to their habitats increase over time under the No Action alternative.

*Key to table abbreviations

FS = Forest Service Region 6 (OR/WA) sensitive species,

Endangered Species Act (federal) listed species:

E = Endangered
Th = Threatened
S = Sensitive
C = Candidate
P = Proposed

WA = Washington State listed species, E = Endangered, T = Threatened, S = Sensitive, C = Candidate

OR = Oregon state listed (E, T, or S_, see below)

SC = Sensitive Critical
SV = Sensitive Vulnerable
SP = Sensitive Peripheral or naturally rare
SU = Sensitive Undetermined status

NI/NE = No Impact/No Effect
MIIH = May impact Individuals Or Habitat, But Will Not Likely Contribute To A Trend Towards Federal Listing or Loss Of Viability To The Population Or Species
WIFV = Will Impact Individuals Or Habitat With A Consequence That The Action May Contribute To A Trend Towards Federal Listing Or Cause A Loss Of Viability To The Population Or Species
BI = Beneficial Impact
NLAA = May affect, but is Not Likely to Adversely Affect.
LAA = May affect, and will Likely Adversely Affect

Species with potential habitat within or adjacent to the project area are discussed in further detail in the following section.

Mid-Columbia Steelhead
Federal Threatened, Washington State Candidate

Steelhead and coho are the 2 anadromous salmonid species that are known to regularly spawn in Major Creek, below the natural falls at river mile 0.3. The falls is comprised of 3 tiers that total 17' in height. Since their arrival coincides with high spring flows, steelhead can intermittently pass upstream of these falls in some years, dependent on the flow levels. All of the mainstem Major Creek as well as the lower 1.2 miles of each fork (west and east forks) of Major Creek are passable by steelhead, although spawning gravel accumulations are scarce and use is likely very low. The upper extent of steelhead spawning reaches from this system has not been quantified due to the checkerboard ownership of the stream channel. Catherine creek does not contain fish due to its intermittent nature, combined with an impassable culvert near its confluence with the Columbia River. Please refer to the hydrology subsection, chapter 3.4 for a more detailed description of the stream habitat, and potential physical effects from the 2 alternatives proposed in this E.A.

Effects from the Proposed alternative

The various restrictions to actions within the riparian buffer (reference chapter 2.3, alternative 2) are expected to prevent adverse effects to the stream habitat from the proposed action alternative due to the retention of intact vegetation streamside. The limited hand-thinning, and underburning within patches of the riparian reserve is expected to lower the intensity of fires that may enter the riparian canyon area of Major Creek due to the reduction in ladder fuels. This will directly aid in the maintenance of large overstory trees that are a vital component to the riparian area. The patchiness in planned treatment is intended to mimic the burn patterns from naturally occurring wildfires (Agee, 2003; Johnson, 1994).

Effects from the No-action alternative

The no-action alternative will also continue to provide for vegetated areas that filter and buffer the stream and riparian habitat. The no-action alternative incurs a higher risk for measurable negative impacts to the stream at a later time, when a wildfire burns into forested areas with high fuel loading. This is especially true for Major Creek, where the canyon walls could act as a natural "chimney" for fires. Once ignited, fires in this steep-sided canyon would be extremely difficult to control. The moderate to high severity burns that will result from the high fuel loading will have high potential to cause acute and chronic sediment input to adjacent surface water through increased surface and bank erosion, and sediment bulking from ash deposits (McNabb and Swanson, 1990; McMahon et. al., 1990; USFS, 2003). The sediment input from a moderate to high severity fire in the watershed will likely cause degraded fish spawning and rearing habitat downstream, where anadromous fish are known to occur, for multiple years. A 17 year study on the Boise National Forest that followed a high-intensity fire's effect to a stream noted degraded conditions for 5-10 years after wildfires (higher stream temperature, fine sediment), with improved

conditions thereafter, due to import of large amounts of gravel, woody debris and nutrients from upslope erosion areas (Burton, 2005).

Bald Eagle

Federal Threatened (proposed for federal de-listing since 1999), W.A. State Threatened, Oregon State Threatened.

The bald eagle has a large distribution throughout North America, and is known to live and nest within the CRGNSA. In Washington State, the last statewide surveys conducted in 1998 recorded 664 occupied nest sites; with growth rate of 16.7% per year for eastern Washington and 9.5% for western Washington annually. Presently, the population may be near carrying capacity, modeled at approximately 4000 eagles state-wide, including non-breeders (Stinson, et. al, 2001). In the lower 48 states, the species has increased from a population estimated at less than 500 breeding pairs in 1967, when the birds were first listed, to a conservative estimate of at least 7,066 nesting pairs (Federal Register, 2006).

Locally, within the Columbia River Gorge, almost all nests are in relatively undisturbed sites, located on large trees within ½ mile of the Columbia River or a direct tributary. Primary prey species is fish, as well as some waterfowl. Bald eagles often construct multiple nests in one area, although only one is used per season. Twenty-two nest sites are known to have been active in 2006 in the National Scenic Area, with a subset of 14 nests (64%) on Forest Service managed land (Isaacs and Anthony, 2007). Bald eagles often forage around five to seven miles away from their nest sites. Courtship and nest building can start as early as January, with eggs laid by late February to early March. In general, adult eagles become less sensitive to nest disturbance once the young develop by mid-June.

Effects from the Proposed alternative

One active bald eagle nest site is on the NW edge of the planning area. The nest site will have a ¼ mile no-entry buffer from January 1 to August 15 to minimize risk of nest disturbance (Effects Determination Criteria Instructions for Bald Eagle, from Northwest National Fire Plan Project Design and Consultation Process, 2003). The tree will also be protected from damage during thinning (see Natural Resource Mitigation Plan, Chapter 2). The table below breaks down the action activity into work elements and resultant effects to bald eagles:

Work Element	Window of operation	Effect Determination (due to disturbance)
Thinning outside of ¼ mile nest buffer	July 1 to February 28	No Effect
Thinning anywhere (including within ¼ mile of nest)	August 16 – December 31	No Effect
Prescribed fire anywhere (including within ¼ mile of nest)	August 16 – December 31	No Effect
Prescribed fire outside ¼ mile nest buffer, with wind blowing smoke away from the nest, and no smoke will settle around nest tree.	July 1 to March 15	NLAA (May Affect, Not Likely to Adversely Affect)

The proposed action of under-story thinning and regular prescribed fire will favor the maintenance and growth of large trees that will continue to provide quality habitat for nesting and roosting bald eagles.

Effects from the No-action alternative
The no-action alternative will continue to provide for habitat in the short-term, but risks the complete or partial loss of habitat (large dominant trees for nesting and perching) due to uncharacteristically large crown fires.

Northern Spotted Owl
Conservation status: Federal Threatened, Washington State Endangered, Oregon State Threatened.

The spotted owl was listed as a federally threatened species in 1990. At the time of federal listing the primary causal factor for its decline was attributed to the loss and fragmentation of late successional forest habitat. The Northwest Forest Plan was implemented in 1994. Despite this protection, the results of intensive monitoring of several spotted owl populations for over a decade suggest a continuing range-wide decline (4.1% per year, over the last ten years) even though rates of timber harvest have declined dramatically on federal lands. Compared to other states, the decline is steepest in Washington state (Buchanan and Swedeen, 2006). The cause of the decline has not been pinpointed, but possible causes have been postulated that include the high density of barred owls moving into (and displacing) spotted owl habitat, loss of habitat from wildfire, private land harvest, lag effects from earlier loss of habitat (low reproductive capacity), and forest defoliation from insect outbreaks (Anthony, 2004).

The spotted owl is known to nest, roost, and forage within the CRGNSA. Northern spotted owls have large home ranges, with the reported median home range of 6,610 acres (>10 square miles) in the eastern Cascade Mountains of Washington state (Buchanan and Swedeen, 2006). Within these home ranges, owls use both old-growth forest structure, as well as a substantial amount of younger forests that contain complex structures, such as large snags, down wood, and residual (remnant) large trees. Spotted owl habitat is composed of four components: (1) Nesting, (2) roosting, (3) foraging, and (4) dispersal. The components of suitable nesting, roosting, and foraging habitat typically include moderate to high canopy closure (60 to 80 percent), a multilayered, multi-species canopy dominated by large (> 30 inches dbh) overstory trees, a high incidence of large trees with various deformities, numerous large snags, large accumulations of fallen trees and other woody debris on the ground, and sufficient open space below the canopy for owls to fly through. Dispersal-only habitat generally consists of mid-seral stage stands between 40 to 80 years of age with canopy closure of 40 percent or greater, and trees with a mean dbh of 11" or greater (USFWS, 2002). Spotted owls do not build nests but rather prefer to nest in existing natural cavities in large-diameter trees with broken tops, abandoned goshawk nests, or open platforms created from accumulations of debris atop mistletoe infestations (Tesky, 1992). This type of feature is generally lacking within the planning area, but will be improved by the creation of snags as a part of the proposed project. The breeding and rearing (young to full independence stage) period for the spotted owl is March 1 to August 31. Nesting

spotted owl, and their young, are more likely to be disturbed during the time period between March 1 and June 30; the period when the young are still in the nest.

The planning area is not within spotted owl designated critical habitat unit (USFWS), late successional reserve (USFS Northwest Forest Plan), or Spotted Owl Special Emphasis Area (WA Forest Practices Rules). The planning area units located within upper Major Creek watershed are near the Washington state core habitat delineation for the spotted owl (NE and east conifer forest types). The nearest known pair was located 1.5 miles to the north, in 1994. In addition, three records of single owls were documented within 1.5 to 2 miles away from the northernmost planning area (N. East conifer), in 1994-1996 (WDFW Database, 2006). Within the planning area, none of the stands currently meet the typical structure that would be defined as quality nesting, roosting, and foraging habitat (typically defined as stand average dbh of 16", and at least 4 trees over 30" dbh per acre). Important structural components, such as large snags, down logs, and open flight space under the canopy are also lacking in the young and dense understory. The current habitat may provide some limited foraging, and clearly some dispersal, habitat in its present seral state. The NE and east conifer habitat types are classic examples of east-side forests that are shifting to a tree composition and forest structure that are considered unstable or are highly vulnerable to stand-replacing events. The habitat degradation and potential loss of these dry eastside forest types that have developed an unnaturally high canopy closure and dense understory characteristics due to fire suppression, are a concern that have been noted in several recent owl briefing or management reports (Buchanan and Swedeen, 2006; USFWS, 2006). Although unlikely to be nesting habitat, protocol surveys will be completed by USFS Scenic Area staff during the 2007 season to conclusively determine spotted owl use within the planning area.

Effects from the Proposed alternative

The proposed action alternative has thinning activities restricted to occur between July 1 to February 28, and underburning restricted to occur between July 1 to March 15 as to be outside of the general breeding season for most native fauna. If paired owls are detected within the east conifer planning unit, the nest area shall have a ¼ -mile no-action buffer for all action, for the period between March 1 and June 30, so as to have no effect to spotted owl (USFWS correspondence September 28, 2001, and December 6, 2006). The implementation of this project will have no-effect on short-term habitat for the northern spotted owl and will result in the long-term development and maintenance of large over-story trees and creation of habitat components (snags) that may provide quality foraging and dispersal habitat. The thinning of dense under-story trees will result in beneficial effects for owl habitat in the long-term as the older canopy trees gain reductions in competition and provide better quality habitat for spotted owl and other mature forest species. The proposed action follows the recommendations of the latest USFWS workshop to protect the long-term sustainability of spotted owl and their habitat within dry forest ecosystems (USFWS, 2006).

Effects from the No-action alternative

The no-action alternative will continue to sustain a forest that does not have structural components that would be beneficial for spotted owl dispersal or foraging habitat. This alternative will not implement the recommendations from the USFWS workshop on silvicultural practices that support northern spotted owl habitat in dry forest ecosystems (USFWS, 2006). Most spotted owl habitat on the eastside of the Cascade crest owes its

structure and species composition to fire. Historically, spotted owls occupied a dynamic landscape that often consisted of large areas of burned and unburned forest (Tesky, 1992). Today, however, habitat is greatly reduced and fragmented, and owl populations have become increasingly vulnerable to loss of large tracts of habitat due to unnaturally high intensity stand-replacement fires. Wildfire has resulted in the loss of 2.3 percent of spotted owl habitat due to uncharacteristically large stand-replacement wildfires in the last decade (Courtney et. al, 2004). The no-action will, initially, have no effect to the spotted owl. In the long-term, this alternative will perpetuate the degradation of potential habitat, to the extent that it will eventually be unsuitable, or lost through high intensity fire.

California Mountain King Snake

FS Sensitive (in WA only), Washington State Candidate, Oregon Sensitive - Vulnerable

As its name implies, the main population of CA mountain king snake reside in California and the Klamath mountains. Its habitat preference is open pine and oak forests, avoiding dense coniferous forests (St. John, 2002). It is active diurnally during the spring and fall, but becomes nocturnal during the heat of summer. The disjunct population here in the Scenic Area has mostly been found in open oak/pine woodland, as well as nearby rocky riparian areas, from White Salmon River to the Klickitat River. King snakes are secretive in habit, and known sightings are often opportunistic in nature. There have been specimens chanced upon in backyards and urban areas of White Salmon, with several other specimens found dead along roads and highways. Little is known of its habitat requirements or population status, specific to Washington State. It was listed as a Candidate species due to its extremely limited range within Washington. Its habitat and presence is confirmed in the planning area. In WA, this snake is typically found at elevation under 400', under rocks and rotting logs (Larsen et. al., 1997). Much less commonly, several specimens have been noted around the 900-1100' elevation band.

Effects from the Proposed alternative

The CA mountain kingsnake is a native species that has long evolved to live in oak-pine habitat that has been maintained by low-intensity fires. The thinning activity that will need to occur to reintroduce ground fires to the landscape will likely disturb some individuals of this species since they are known to occur within the area. The snake's secretive nature and their propensity to seek shelter under large rocky substrate and logs will, in itself, keep the snake removed from most of the surface activity that takes place. Project restrictions that should further minimize impacts to the local population include:

- Seasonal restriction from March 1 to June 30 to allow over-wintering individuals to recover body weight and complete breeding activities without concentrated human disturbance.
- Restricted treatment of riparian corridor (50' no treatment buffer), and hand-thinning only methods planned within all the oak-pine woodland habitat (includes all the riparian reserve of Catherine and Major Creeks).

During thinning activities, all down logs and large rocks will be left undisturbed. Prescribed underburn activities during the fall and winter is unlikely to impact individuals, again, due to their propensity to seek cover and live in areas of mesic riparian zones that will likely reduce individual injury from low intensity ground fires (Smith, 2000). Research studies are in

general agreement that low-intensity prescribed fires have little effect to herptofauna abundance and diversity (Keyser et. al., 2004; Renken, 2005; Lyon et. al., 2005; Ford, 1999). The lack of measurable effects was attributed to the retention of moisture-holding litter, duff and coarse woody debris that provided snakes with underground refugia, as well as the retention of canopy and quick regrowth of ground vegetation after a low-intensity fire. Due to their limited distribution, there may be some localized impacts to individuals of this species due to mechanical thinning activities. This disturbance due to the increased human activity (mechanical and hand thinning) to the planning area, warrants a May Impact Individuals or Habitat, but will Not Likely Contribute to a Trend Towards Federal Listing (MIIH) for the CA mountain king snake. Again, the species long association with pine-oak habitat types, and thus their inherent resilience to not only survive, but thrive, in areas of repeated low-intensity ground fires, is apparent. Actions that work to maintain this habitat type through natural disturbance patterns (fires) will be beneficial, and may be crucial, to the species in the long term.

Effects from the No-action alternative

The continued program for fire suppression in the pine-oak, and pine-oak-DF habitat will allow for the conversion of these stands to a dense coniferous forest. This forest-type does not provide for habitat for the CA mountain king snake. The no-action alternative will have no-effect to this species in the short-term, but will gradually degrade and remove habitat for this species in the long-term within the project area. The risk of high-intensity ground fires increase with this alternative, and again will remove habitat associated with the king snake, if it occurs. Due to their extremely limited distribution in Washington, high intensity wildfire(s) in their current habitat may have severe impacts to this disjunct population, depending on the extent and intensity of the habitat burned and lost.

Sharp-tailed Snake

FS Sensitive (in WA only), Washington State Candidate, Oregon Sensitive - Vulnerable

Another secretive snake species, with habitat that overlaps the CA mtn kingsnake within the WA portion of the NSA. Unlike the king snake, this species has a much wider distribution in the Northwest; including Wasco county, central Washington, as well as the Willamette Valley and southward.

Effects from the Proposed alternative

This snake has not been formally documented in Catherine and Major creek watersheds, but the rocky riparian of both streams provides suitable habitat and this species is assumed to be present in the project area in this analysis. It is documented near Balch lake/Lyle area just to the east of the planning area. Much like the king snake, except more so, this species leads a largely subterranean existence in search of its slug prey. This fossorial habit will provide this species refugia during prescribed burns. Research studies are in general agreement that low-intensity prescribed fires have little effect to herptofauna abundance and diversity (Keyser et. al., 2004; Renken, 2005; Lyon et. al., 2005; Ford, 1999). The lack of measurable effects was attributed to the retention of moisture-holding litter, duff and coarse woody debris that provide underground refugia, as well as the retention of canopy and quick regrowth of ground vegetation after a low-intensity fire. Disturbance from mechanical thinning activities may occur in the fall, when snakes are near the surface during rainy or

cool, overcast days. The proposed action may impact invididuals or habitat, but is not likely to cause a trend toward federal listing (MIIH).

Effects from the No-action alternative

The no-action alternative will have no-effect to this species in the short-term. It is uncertain how high intensity fires will affect this species. The degree of effects to the local population depends largely on the location and extent of the wildfire. It's fossorial habits will likely keep it safe during most wildfires.

Peregrine falcon

FS Sensitive, Washington State Sensitive, Oregon State Endangered

The peregrine falcon is distributed worldwide, and ranges throughout North America (Wahl, 2005). American peregrine falcon was listed as endangered by the U.S. Fish and Wildlife Service (USFWS) in October 1970. At that time, the peregrine falcon was essentially considered extirpated from Oregon and Washington due to reproductive failure from organochlorine pesticides (Pagel and Jarman, 1991). The species recovered rapidly at a national level and was federally de-listed on August 25, 1999 (Fed. Reg. August 25, 1999, 64(164) 46541-46558). Although peregrine populations are recovering, reproductive success of the subspecies in the Pacific Northwest is still being impacted by residual organochlorines. The peregrine falcon is a small, crow (male) to raven-sized (female), bird known for its fast and powerful diving flight and foraging habitats over large open areas. Having a water source available is the major attractant for open-country prey, such as waterfowl and shorebirds, as well as passerines. Nest sites are typically located in deep ledges (with overhangs), on sheer cliffs over 150' in height, that are out of reach of mammalian predators and is within ½ mile to riparian, lacustrine, or marine habitat (Hays and Milner, 1999, Pagel, 1992, USFWS, 1982). The nest site is usually located at the 40-80% height of the cliff. Pacific Northwest falcons have recently taken the opportunity to locate nests on suitable bridges, and tall buildings.

In 2006 within the NSA, there were 12 known nests, or eyries, of peregrine falcons monitored within Oregon (Issacs, 2007). An additional 3 eyries are known and monitored in Washington State. Falcons have not been noted within the planning area but there is suitable habitat present in the cliff area of Coyote Wall, a distance of alittle over ½ mile from the nearest thinning unit. Presently the high recreation use, consisting of hikers and mountain bikers, immediately adjacent (both above and below) to the cliff area likely discourage peregrine falcon use. Survey will continue in this area by the USFS Scenic Area office in 2007 to determine level of use. There are approximately 102 acres of prescribed fire units within ½ mile of this cliff habitat. These units are roughly clustered near the top and bottom of the Wall. The proposed action as well as no-action alternatives will not impact habitat of the peregrine falcon, as no cliff habitat will be treated, and high intensity fires will not impact cliff area habitats. Direct and indirect impacts to peregrine falcon are limited to potential disturbance to the species during nesting preiods, and impacts to prey species from the proposed action.

Similar to bald eagle and other raptors, peregrines are most susceptible to human disturbance during courtship and incubation, with nest tenacity by adults increasing as incubation progresses and hatching occurs (USFWS, 1982). The level of impact that a

certain disturbance factor may have on peregrine falcons depends upon the familiarity of an individual or nesting pair to that particular disturbance. If peregrines are accustomed to a certain disturbance as a normal or routine occurrence, and the disturbance offers no known direct threat, then the peregrines will ignore it. If the disturbance is new, intermittent, or unexpected within their nesting territory, then the peregrines will be less tolerant of that disturbance. When peregrines have not experienced a human disturbance, or the activity is intermittent (e.g. log skidding, aircraft, or distant rockfall) then they can become noticeably concerned (ranging from curiosity fly-overs to intense territorial defense). Nesting success will depend on the duration, distance, and timing of the distance to nest.

Effects from the Proposed alternative
Thinning activities are expected to have no effect to future use of Coyote wall peregrine falcon suitable habitat due to a combination of factors:

- no thinning treatments are proposed within the cliff habitat
- thinning activity is at least ½ mile away from potential habitat, and
- timing of activity restricted to July 1 to February 28.

Prescribed fire effects on peregrine falcons has been little studied. Presently, there is no documented use of Coyote Wall by peregrine falcons. Potential nesting habitat does exist, and it is prudent to analyze the project with assumptions that peregrines may be present in the future. There are units below the cliff where late winter/spring fires could potentially disturb a peregrine nesting pairs if smoke disperses to the NW, immediately over the cliff face. In a worse case scenario, the smoke would discourage or disrupt breeding for the year. In a likely scenario, the short duration of smoke (hours) would disturb the birds, but courtship, and or incubation of eggs would continue successfully. This would only have potential to occur during the initial winter/spring burn, while later, fall-only burns would have no-effect to nesting birds. The proposed prescribed fire window is from July 1 to March 15. Smoke created by fires from July 1 to Dec 31 will have no effect to potential peregrine use at Coyote Wall. Prescribed fires that occur between Jan 1 to March 15 have some potential to disturb nesting pairs, and may impact individual breeders during the initial spring burn (MIIH). Future prescribed fires, in the fall, will have no- effect to peregrine falcons at Coyote Wall.

Because peregrine falcons require open areas for hunting, fires that create these open areas would probably be beneficial, provided burning led to an increase of avian prey species. The maintenance of a mosaic of habitats, as well as open areas, would maintain abundant prey, thus favoring the peregrine falcons (Snyder, 1991, Smith 2000). A factor that may limit peregrine falcon use of the area is the high level of human presence (hikers and mountain bikers) in this area during spring and summer.

<u>Western gray squirrel</u>
FS sensitive (in Washington State only), Washington State Threatened, Oregon State Sensitive - Undetermined
Western gray squirrels are distributed from Washington to California in mixed oak and conifer forests. Currently within Washington, gray squirrels are limited to 3 isolated populations; Puget Trough (Fort Lewis), Klickitat and eastern Skamania County, and Chelan/Okanogan Counties (Linders and Stinson *in draft*, 2006). Although Klickitat County

contains the largest population of the 3 areas, it is also believed to be declining (Vander Haegen et. al., 2005). In 1993, the state of Washington listed the western gray squirrel as 'threatened' due to declining populations resulting from: habitat loss and conversion, fluctuating food supplies, disease, interspecific competition, road kills and illegal shooting. In the Klickitat region, habitat for the Western gray squirrel occur in the where oak woodlands and pine forest converge, an ecotone between the upland Douglas-Fir forests and the lowland grassland/oak savanna. Stand composition is typically Oregon white oak, ponderosa pine, and Douglas-Fir, with riparian area that may include bigleaf maple, Oregon ash, black cottonwood, and quaking aspen. Optimum stands are conifer-dominated of large diameter, mast producing trees, usually of pine and oak. A diversity of trees species, and the presence of oak were also important habitat components (Linders and Stinson *in draft*, 2006). Mature trees produce more mast (acorn, pine/fir seeds) than younger stands; a critical winter food item. Leaf nests are generally found in pine or Douglas-fir trees, with cavities in oaks used whenever available. High-use stands in the Puget Trough included a mix of conifers, oaks, and other hardwoods such as big leaf maple and Oregon ash in the canopy. Large, healthy oaks and conifers (especially ponderosa pine) are more likely to provide greater quantities of mast foods and more nest and den sites compared with smaller trees of the same species. Proximity to water may also be important, with more nests generally found from 540' to 1800' of a water source.

Effects from the Proposed alternative

The proposed action alternative follows the recommendation of all available management plans for the pine/oak habitat type (ODFW, 2006; Larsen and Morgan, 1998; Altman, 2000), as well as specific management plans for the western gray squirrel (Linders and Stinson *in draft*, 2006; Fimbal, 2004; Ryan and Carey, 1995). All plans unanimously agree on the urgent need to restore, as much as is possible, the pine-oak forests to pre-fire suppression vegetation types to sustain native wildlife species. Habitat restoration to benefit the gray squirrel has occurred, or is on-going, at Fort Lewis (Nature Conservancy), WDFW Klickitat wildlife area, and Columbia Land Trust (BLM). All treatments include thinning, followed by prescribed underburns to maintain open forest structure. As 77% of Western gray squirrel habitat in Klickitat County is privately owned, much area will remain unchanged and be a source for comparison of control versus restoration treatments nearby.

Although adaptive management and restoration has been initiated in many different locations of Northwest oak/pine woodland, the newness of the restoration technique has caused a lag in information on the long-term effect of restoration actions specific to the western gray squirrel populations. Many studies have been completed that described no impacts to small mammals populations after prescribed fire in pine/oak forests, regardless of season (Ford et. al., 1999; Monroe and Converse, 2006; Rowan et. al., 2005; Lyon et. al., 2000; McMahon and deCalesta, 1990). The most important factor was the low intensity (flame lengths less than 3 feet and mosaic burn pattern) of the prescribed burn, rather than the season of burn. Small mammal survival of these low intensity burns is attributed to the inherent adaptations of these species to the frequent fire regimes for this habitat type. Small mammals had fossorial habits and readily took refuge in underground burrows, spaces under rocks, as well as large down wood. Tree squirrel species escape into the forest canopy (Kaprowski et. al., 2006).

The following paragraphs summarize fire effects to the Eastern fox squirrel. The information was clipped directly from the Fire Effects Information System (FEIS) online database of the U.S. Forest Service Rocky Mountain Research Station (Tesky, 1993). All references for this report are available on-line.

Fire effects to the Eastern fox squirrel, *Sciurus niger*.

DIRECT FIRE EFFECTS ON ANIMALS:

Eastern fox squirrels would probably not be able to escape fast-moving (high severity) fires. However, they could probably easily escape low-severity ground fires. Kirkpatrick and Mosby found no evidence that prescribed burning caused significant direct mortality among eastern fox squirrels. Wildfires could destroy leaf nests, nest trees, and eastern fox squirrel nestlings. However, cavities used for denning and leaf nests are usually above the impact zone of prescribed fires.

HABITAT RELATED FIRE EFFECTS :

Fire often has a positive effect on eastern fox squirrel habitat. Fire maintains the pine-oak habitat preferred by eastern fox squirrels and has a direct effect on eastern fox squirrel foods. Under presettlement conditions longleaf pine savannas (preferred eastern fox squirrel habitat) may have burned at average intervals of 3 to 5 years, usually between April and October. The open stands produced by fire result in better pine cone and mast production. Pines and oaks growing in the open receive more light, maintain more branches at lower levels, and produce heavier crops of cones and nuts. Additionally, nutrient availability and the enhanced vigor of burned pine forest are associated with larger crops of fungi, which are also important eastern fox squirrel foods. A lush, grassy understory maintained by fire is important as protective cover.

Fire has probably been a determining factor in the niche separation between gray and eastern fox squirrels on the Coastal Plain. Both exist in mixed pine-oak forests and feed heavily on acorns, but the more competitive gray squirrel dominates where the overlap of oak crowns allows tree-to-tree travel throughout the canopy. Eastern fox squirrels are more abundant where patches of oaks comprise less than 30 percent of pine-hardwood stands and do best in fire-type pine forests with scattered hardwood inclusions. Fire could be a deciding factor in determining the availability of suitable habitat and resources for one or the other species.

FIRE USE:

Prescribed fire can be used to maintain eastern fox squirrel habitat. Prescribed burning at 2- to 5-year intervals can be beneficial to eastern fox squirrels by maintaining an open understory and better foraging habitat. According to Humphrey, ground fires are valuable in maintaining habitats of Big Cypress fox squirrels. In the habitat of this subspecies, future fire

management plans call for an increase in prescribed burning to 50,000 acres a year. Pinelands are expected to be burned on a 5- to 7-year rotation.

In summary, the Western gray squirrel is expected to benefit from thinning and prescribed underburning activities within the planning area as this will begin to return their oak woodland habitat to the more open and mixed age stand that they likely evolved in. Thinning of stands, as occurred with low intensity fires, should result in accelerated growth in the older oaks and pines, which will be retained. The survey of and protection of squirrel nests within the planning area, as well as seasonal restriction of thinning and underburning activities are expected to reduce potential impacts to the western gray squirrel to very low levels. These conservation measures are listed under subsection 2.3 of this document. The unavoidable increase in human and loud machinery within their range may still disturb some individuals, but is not expected to impact the local population (MIIH). In the long-term, the habitat should improve markedly for persistence of this State threatened species.

Effects from the No-action alternative

The no-action alternative would have no short-term effects on the western gray squirrel, as increased human and machinery presence would not occur. The continued fire suppression and the resultant shift in oak-pine-DF habitat to dense stands of DF with remnant pines would slowly eliminate squirrel habitat, as presence of oak seem to be associated with squirrel presence. Moderate to high intensity fires that, may later, become reality due to the unnaturally high fuel load will likely cause direct mortality of squirrels (Kaprowski et. al., 2006). The optimal habitat of large mast producing trees would take 100-200 years to replace, depending on fire intensity and resultant soil damage.

<u>Western toad</u>

Washington State Candidate, Oregon State Sensitive - Vulnerable

Western toads have a broad distribution from Alaska to Mexico, across all of the western states (Marshall, 1996). Declines of this species have been noted range-wide, and many theories exist, but the cause(s) has yet to be positively identified. Western toads occur in a wide variety of terrestrial habitats including forests, meadows and brush; absent only from shrub-steppe habitat. Breeding usually occurs in permanent ponds, shallow lake edges (<18” depth), spring pools, and slow-moving portions of streams, in mid to late spring. Tadpoles rear in areas with the warmest temperatures, typically the shallowest areas. Transformed toads are primarily terrestrial, but often occur near water bodies, especially in drier climates (Corkran and Thoms, 2006). In Wyoming, summer post-breeding habitat includes adjacent meadow or forest usually around 100-300m away from breeding areas (Keinath and Bennett, 2000). At low elevations, toads are primarily nocturnal and seek shelter from desiccation under rocks, logs, or in underground rodent burrows. Similar habitat is used for over-wintering shelter (Nussbaum et. al., 1983). Foraging may occur diurnally during overcast or wet days. Western toads are documented within the Washington portion of the Scenic Area, in the White Salmon River area and east to Major/Catherine creeks. They are likely found in other areas west of White Salmon where there are patches of suitable habitat. Although historically documented in Multnomah and Hood River counties within the NSA, there are presently no known sites within the lowlands

of Hood River County and it is uncertain if sites in Multnomah County still harbor western toads.

Effects from the Proposed alternative
Western toads are principally seen in the lower 1 mile of Catherine and lower 1/2 mile of Major Creeks, where water pools and becomes warm enough for breeding. This population is near the eastern-most extent of this species presence in the Gorge. Due to the hot and dry weather experienced in the planning area during the summer, it is expected that toadlets and adult toads would stay relatively near permanent water sources during summer and early fall. Areas near permanent water have little to no thinning treatment in the proposed action. Further, since toads take shelter in burrows or other cover and are otherwise less active during the day, it is unlikely that individuals would encounter workers or be affected by the hand-thinning activities near the riparian areas. The general seasonal restriction (March 1-June 30) further assures that breeding migration can take place, to lower stream areas, without disruption by thinning activity. The thinning of understory trees is expected to have no effect to terrestrial or stream habitat that supports the western toad, as the habitat is moving toward a forest composition where this population has persisted in the past. Although no machine thinning is proposed within the riparian reserve, hand-thinning activities in the fall may overlap with toad foraging activity on wet or overcast days, and thus impact to individuals cannot be ruled out. This is especially the case since few studies have been completed to document the extent of terrestrial habitat use (from nearby water bodies) by western toads in Washington State. This potential for incidental disturbance and mortality from getting crushed underfoot or by fallen trees will be at the individual, rather than the population level impact.

Western toads occupy diverse habitats across the Western United States, some of which experience fire relatively frequently (pine-oak and east-side forests), and some of which rarely experience fire (riparian zones tend to act as fire breaks but will burn during extended dry conditions). Until recent history, the project area had a frequent fire return interval of which the toads have adapted and persisted. No specific information describing the response of western toads and their habitat to fire was available in the literature, although many research studies have studied the effects of other amphibian and reptile species to prescribed fire. These studies are in general agreement that low-intensity prescribed fires have little effect to herptofauna abundance and diversity (Keyser et. al., 2004; Renken, 2005; Lyon et. al., 2005; Ford, 1999). The lack of measurable effects was attributed to the retention of moisture-holding litter, duff and coarse woody debris that provided refugia, as well as the retention of canopy and quick regrowth of ground vegetation after a low-intensity fire. In the longer term there are differential responses to fire among prey organisms; for example, ant populations were one-third higher in burned areas than in unburned areas, but beetles tend to decrease on burned areas (Sullivan, 1994). Other studies note a decrease in abundance in soil and litter dwelling arthropod, but not diversity and richness of taxa (Riesle-Kinney, 2005). Return in abundance followed the regrowth of lush vegetation (Lyon, 2000).

The first underburn, planned in early spring, followed by fall/winter-only prescribed fires is planned at those seasons to be of low intensity and thus minimize impacts to hibernating toads that can take shelter under rocks, large logs, or in underground burrows. These fires are not expected to change runoff rates or increase stream sedimentation that would degrade

stream habitat for the western toad. The limited area of prescribed burn each year within the watershed, as well as the natural ability of toads to take shelter underground, limits the impacts to individuals, rather than at the population scale.

Effects from the No-action alternative
The no-action alternative will initially have no effect to the western toad or its habitat. Assumptions of habitat changes are derived from fuel modeling in chapter 3.1 of this E.A. (Fire resilience chapter, Environmental consequences subheading). Fuel modeling predicts that in 50 years, 60-75% of the project area will be in fuel model 10, an increase from 44% at current conditions. The increased risk of high intensity fires in the watershed, including the riparian area, may affect western toad habitat, depending on the intensity of burn within the riparian area and the extent of riparian burned within the watershed. The 2 components affected would be ground cover components, such as large logs, snags and the shrub/forb layer. This component provides for critical shelter cover from predators as well as evaporation. The other component affected would be water quality related, such as sediment input, which may affect the juvenile (tadpole) phase of the population through gill clogging and reduced forage. The no-action alternative places some risk to local western toad population, depending on the season and severity of fire effects, but the species affinity for to the riparian area and stream habitat should shelter them from all but the most severe area fires.

<u>White-headed woodpecker</u>
Washington State Candidate, Oregon State Sensitive - Critical
This species is an open canopied, mature ponderosa pine forest specialist, ranging from south-central BC to southern California (Garrett et. al., 1996). In Washington and Oregon, white-headed woodpecker are mainly found >2000' elevation on the east slope of Cascades (Marshall, 1997). Their diet consists largely of pine seeds, wood-boring larvae and insects, surface foraged on branches, trunk and some cones of trees, as well as occasionally on the ground. White-headed woodpeckers are a year-round resident of Oregon and Washington forests, although there may be some movements into lower elevations during the winter. This species excavates and nests in snags. There are currently no records of this species within the Scenic Area, although they have been documented at higher elevations in Klickitat and Wasco counties.

<u>Black-backed woodpecker</u>
Washington State Candidate, Oregon State Sensitive - Critical
This species is closely associated with dead or dying forests in boreal and (>1000') montane coniferous forests, east of the Cascades. This woodpecker's main diet is larvae of wood-boring beetles gathered from under bark of trees. Its irruptive occurrence is associated with availability of bark beetles that occur after stand stressing events, such as fires. It ranges largely within Canadian forests, with a southern limit into the northern tier states of the United States. The black-backed woodpecker is a year-round but sporadic resident in eastern Washington and Oregon. This species can be locally common but has a patchy distribution (Marshall et. al., 1996). It has not been documented in the Scenic Area despite suitable habitat of burned forests that occur nearly every year.

Pilieated woodpecker

Washington State Candidate, Oregon State Sensitive - Vulnerable

This species is a year-round resident through forested eastern North America and into Canada, then south into montane regions of w. Montana, n. Idaho, and ne. Oregon; in the Pacific Northwest from central British Columbia south through Washington and Oregon west of the Cascades to central California. This is the largest woodpecker species in the Pacific Northwest, and nests locally in all coniferous forest types, except for juniper and monotypic lodgepole pine (Marshall et. al., 1996). Nesting habitat is typically in mature forests, or forest with remnant large snags or live trees. Mean diameter of trees excavated for nest cavities vary from 27 to 38 inch dbh in Oregon and Washington (Bull and Jackson, 1995). Large trees are also excavated for roosting at night and in inclement weather. Roost trees in western Oregon and NE Oregon ranged from 16-82 inch dbh (Lewis and Azerrad, 2003). Foraging can occur in much younger forests, as well as deciduous riparian areas, in search for prey species of ants, termites, beetle, and other insects. The pileated woodpecker excavates into primarily dead standing or down wood for prey species, as well as scaling and chipping bark. Timber harvest has been the most significant impact on its habitat through the removal of large-diameter trees, snags, and downed woody material that supports nest and roost sites, foraging habitat, and cover. Nesting occurs around late March to early July (Lewis ands Azerrad, 2003).

Effects from the Proposed alternative

Pileated woodpeckers are present within the planning area, and nesting may potentially occur within the east conifer forest stands. Foraging may occur in any of the forested stands. Management recommendations from Washington state (WDFW) includes the retention of multiple canopy layers, large standing and dead trees, as well as dead and down wood. Oregon management recommendations include the maintenance and creation of large hollow diameter trees, snags and logs during forest management (ODFW, 2006). The proposed action will meet all of the management recommendations through retention of large overstory trees, retention and creation of snags, as well as the retention and creation (tops of trees dropped when creating short snags) of large down wood. The seasonal restriction for activity will avoid all potential breeding season disruptions. Although this species is tolerant of human activity near nests and roost trees, thinning and underburning noise and activity during the fall and winter may cause individual birds to move from the area being treated to a different portion of their home range (average of 1,006 acre home ranges). It is expected that the short duration of activity in a given area, versus the large amount of refuge habitat in adjacent areas, will minimize winter-time impacts to this species and is not expected to reach a level that would cause negative impacts.

Effects from the No-Action alternative

The no-action alternative will have no effect to this species, as no human activity and associated machine noise would occur within the planning area. In the long-term, the dense young trees will stress the existing large trees so that mortality may regularly occur and produce abundant insect prey for the pileated woodpecker. A moderate to large stand replacement fires may remove roosting and nesting habitat when the canopy layer is lost. Foraging habitat may still be provided if there are adjacent forest stands that weren't

affected by the fire. Roosting and nesting habitat of large diameter snags would take from 100-200 years to re-grow, depending on the severity of soil damage from the fire.

Northern goshawk

Washington State Candidate, Oregon State Sensitive - Critical

The Northern goshawk has a wide distribution in North America, Europe and Asia in forested areas. In Oregon, most breeding areas are to the east of the Cascades, while in Washington, the species also occupies some sites in the Western Cascades and the Olympic peninsula. In the Northwest, the goshawk is associated with coniferous forests, especially ponderosa pine and higher elevation mixed conifer forests. Goshawk home range territories are often categorized into 3 primary areas: nest stand (20-30 acres), post-fledging family area, and foraging habitat. Breeding home ranges generally have the following characteristics overall: a high density of large trees, > 50% canopy cover, multiple canopy layers, and low understory/shrub density (Desimone and Hays, 1994). Within this home range, canopy cover within the nest stand varied from 60-88% in east-central WA and eastern Oregon studies. Goshawks forage in a wide variety of forest types. Goshawk prey varies by region and consists of a variety of small to large birds, chipmunks, squirrels, hares, and sometimes reptiles as the opportunity arises.

Presently, no nest sites are documented in the NSA, although suitable habitat occurs. Within the planning area, some limited nest habitat is present in the NE and east conifer units in the Major creek headwaters. The habitat is considered limited due to the dense understory of young trees contained in the stand. Surveys for this species will be completed within the upper elevation NE and east conifer habitat types. Any nests detected will be protected with a ½ mile buffer during March 1 to September 30, or as collaborated with WDFW biologists.

Effects from Proposed Action alternative

Understory thinning prescriptions, coupled with prescribed fire, is a conservation action that is recommended for the goshawk to address the decline of its suitable nest habitat in Oregon (ODFW, 2006). WDFW management recommendations largely highlight protection of key habitat components, such as retention of ≥ 60% canopy cover in eastside stands (70-80% in nest areas), snag and down wood, as well as maintenance of forest structure in later stages of structure (Desimore and Hays, 2004). The proposed action will improve breeding area habitat for the Northern Goshawk, as forest stand components will be shifted toward the preferred habitat range for this species in terms of retention of overstory large trees, canopy closure, snag retention/creation, as well as the opening of the understory. Prescribed fire will maintain this stand type and continue to retain suitable stand characteristics. Any existing goshawk nests detected during survey will be protected with appropriate seasonal restrictions to have no impact to this species during project implementation.

Effects from No Action alternative

The no-action alternative maintains the action of fire suppression. In its current condition, the stand supports foraging habitat for the goshawk. Nesting habitat is limited due to the young and thick understory that is unnaturally maintained by fire suppression. The current condition supports foraging habitat, and will continue in this component. The continued recruitment of dense young sprouts will further move the stand away from suitable habitat for the goshawk, and place the stand at high risk of high-intensity fire. The loss of large

blocks of this habitat contributes to the range-wide reduction of suitable nesting habitat for the goshawk (Griffin, 1993).

Golden eagle

Washington State Candidate

The golden eagle ranges throughout much of western North America in a variety of habitats. It is locally most common in open shrub steppe habitats (for foraging) with nearby cliffs (for nest sites) that provide protection from mammalian predators (Tesky, 1994). Large trees are also known to be used by golden eagles for nesting, although much less commonly than cliff sites. This species subsists primarily on large rodents such as rabbits, hares, ground squirrels, and prairie dogs. Golden eagles are most efficient predators in open areas where winds and thermal updrafts aid flying. They are less efficient where shrub and/or tree cover increases. Abundant shrub cover provides hiding and escape cover for prey. Physical obstructions close to the ground make hunting difficult. Habitat management for the golden eagle primarily consists of protecting areas used for nesting, resting, and foraging, and protecting habitat used by the prey base.

All known nest sites within the Scenic Area are in open habitat; located from the Klickitat River and eastward. Although suitable habitat is present, there is no known golden eagle use of the planning area. Cliff habitat at Coyote Wall provides potential habitat for nesting golden eagles, especially coupled with the open grassland nearby. There are currently no golden eagle nests within this habitat. The area may not be chosen by golden eagles, similar to the peregrine falcon, due to the disturbance from high recreation use both above and below this cliff habitat. Unlike the peregrine falcon, golden eagles are not known to be as readily habituated to human disturbance.

Effects from the Proposed and No-Action alternatives

As there are currently no golden eagles known to use the planning area, the proposed action alternative, as well as the no-action alternative, will have no effect to the golden eagle. The golden eagle forages successfully in open fire-dependent plant associations in the western United States: grassland, semidesert grassland-shrub, sagebrush-grassland, pinyon-juniper woodland, and ponderosa pine-Douglas-fir (Pseudotsuga menziesii) forests. Regular, low-intensity burning helps to keep habitats in a suitable condition for many prey species of the golden eagle and increases its hunting efficiency. Golden eagles have been observed taking advantage of abundant prey associated with the growth of new vegetation on a burned site. In a case study in the Appalachian Mountains, historic open areas used by golden eagles for foraging in those mountains were maintained by fire. After full suppression policies began, the openings reverted to brush and eventually to forest. Today, there are few openings in the Appalachian Mountains; as a result, the golden eagle has almost disappeared (Tesky, 1994).

Merlin

Washington State Candidate

The Merlin is a small falcon that breeds throughout the northern forests and prairies of North America, Europe, and Asia. Locally, this species is a nomadic and occasional winter resident in southern Washington, including the Scenic Area. Known breeding areas are in Northern Washington and the Puget trough in semi-open areas that facilitate mid-air capture

of small bird prey. Wintering habitat within the Scenic Area is considered to be any open area <1000' elevation, where there is abundant prey of small birds. Merlins are very tolerant to nearby human activity; foraging near grain elevators and in major cities where small birds congregate in winter (Warkentin et. al., 2005). Like the peregrine falcon, this species is readily nesting in urban areas.

Effects from Proposed and No-Action alternatives
The project area provides suitable foraging habitat for the Merlin, and it is likely used occasionally by wintering individuals. The increase in open habitat and understory vegetation from the proposed action will have beneficial effects for the Merlin by maintaining the open and semi-open habitat in which it prefers to forage. Thinning and underburning activity within the project area is expected to have no effect to foraging Merlins due to the short-duration of underburning activity, the limited areas that will be treated per day (birds can easily forage in another location within the planning area), as well as the high tolerance that Merlins have for human activity near their winter foraging sites. The no-action alternative will also have no-effect to wintering Merlins.

Flammulated owl
Washington State Candidate, Oregon State Sensitive - Critical
Flammulated owls are distributed in mid-elevation western pine forests from southernmost B.C. to Mexico (McCallum, 1994). In Oregon and Washington, this small owl occurs east of the Cascade crest during the nesting season (May to mid-August) in a mosaic of open forests containing mature ponderosa pine, patches of dense forest growth, and grasslands (Marshall et. al. 1996). Cavity nests are used that have been excavated by other species. In the fall, this owl migrates south for the winter, presumably as far as central America (Hays and Rodrick, 2004). The flammulated owl is strictly nocturnal and catches insect prey, such as moths and grasshoppers, beetles, spiders and crickets, in flight as well as on the ground.

Effects from Proposed and No-Action alternatives
Within the Scenic Area, 2 nest trees of this species have been documented, located 2 miles to the east from the planning area. The species is potentially present in areas adjacent to the Burdoin, Catherine Creek, and Balfour treatment sites. Currently flammulated owl appears common in North America and in no danger of extinction, but crucial population growth rates are not yet available. Greatest intrinsic source of danger may be low reproductive rate. Human activities perhaps most likely to endanger it are (1) incremental decreases in longevity or fecundity (owing to pesticides, pollution, subtle habitat change) that might tip what may already be delicate balance, (2) outright habitat destruction (McCallum, 1994). The proposed project will maintain and restore long-term habitat suitable for this species, including open ponderosa pine forest, grasslands, snag retention/creation, and patches of dense forest (untreated areas in riparian areas, and steep slopes). Since the owls nest so late in the season, some disturbance may occur to nestling in July and early August if thinning activity occurs adjacent to the cavity nest. Several factors will reduce the risk of this disturbance causing nest failure, including:

- the owl is largely nocturnal (owls and thinning activity are temporally separated),
- snags will be left untouched, so cavity nest trees will be left undisturbed,

- the thinning activity will be limited in duration; likely lasting for 1-2 days in a particular area as thinners move through a stand,
- thinning activity will be further limited during July and August by fire season restrictions. These restrictions stipulate that machinery (including chainsaws) will either need to be shutdown by 1 PM, or will not be allowed to operate at all untill fall rains arrive and reduce fire danger,
- adult owls are not likely to abandon a nest that late in the season, with nestlings so close to fledging.

In summary, the proposed action is extremely unlikely to result in measurable impact to flammulated owl nesting success. Any flammulated owl cavity nests detected during project layout will be protected with seasonal buffers during thinning operations. Prescribed fire and thinning activities in winter and early spring will have no effect to flammulated owl as they will be on their winter range, in the southern US or Mexico. The no-action will have no impacts to the flammulated owl, as no potential for disturbance will occur. The gradual loss of open pine forest and available cavities may reduce habitat for this species in the future and remain the species limiting factor.. Components of its habitat, such as grassland and dense thickets will not likely change substantially.

Lewis' woodpecker

Washington State Candidate, Oregon State Sensitive - Critical

The Lewis' woodpecker ranges throughout the western United States. Originally abundant throughout Washington and Oregon state, the species has experienced a dramatic decline due to loss (conversion) of its riparian and pine-oak woodlands, as well as decline in open habitat due to fire suppression. It is now only locally abundant east of the Cascades in open forests consisting of oak woodland, mixed oak – ponderosa pine forests, and riparian cottonwood corridors that provide them with the combination of tree cavities, and diverse food sources (ODFW, 2006, Marshall et. al, 2006, Lewis et. al, 2002). Populations tend to be year-round residents within the Scenic Area, but may also seasonally migrate to lower elevations or to milder climate during winter. Birds are often colonial. This species will also use orchards, burned stands of Douglas fir-mixed conifer, and can also be found among urban areas adjacent to pine-oak woodland habitat. Lewis' woodpeckers nest in large snags, often adjacent to water courses. This species takes insects on the wing or gleans from vegetation, eating carpenter ants, bees, wasps, mayflies, beetles and grasshoppers, and stashing mast of acorn, pine nuts and berries for winter use. It is an opportunistic feeder; eating insects in spring and summer and fruits and acorns in fall and winter. A year-round resident of pine/oak forests in Klickitat and Wasco counties within the Scenic Area, it is found in habitats within Catherine Creek planning area.

Effects from the Proposed alternative

Threats to the long-term persistence of Lewis' woodpecker include the loss of breeding and wintering habitat in the form of open oak, ponderosa pine, and riparian cottonwood habitat as well as available snags (ODFW, 2006, Lewis et al, 2002). Fire suppression in oak and pine stands has resulted in increased stem densities, reduced shrub and grass understory and increased canopy closure that has degraded breeding habitat for the Lewis' woodpecker (Abele et. al., 2004). To restore these habitats, management recommendations include

thinning and prescribed burning (Abele et. al., 2004, Marshall et. al., 1996, Altman, 2000). The proposed action alternative directly addresses and incorporates these recommendation actions and will result in beneficial effects for the long-term persistence of the species and its habitat. Although very tolerant of human presence near nest trees, the proposed action may cause some short-term disturbance of resident individuals during the fall to early spring thinning and prescribed burning actions due to machine noise (chainsaws and ground-based equipment). The season of implementation is largely outside of this species primary breeding period of April to mid-July so no breeding disturbance is expected (Tobalske, 1997). The noise disturbance effects in fall and winter may cause individual birds to move from the area being treated to a different portion of habitat but it is expected that the short duration of activity in a given area, versus the large amount of untreated habitat that birds will be able to move to in adjacent areas, will thus not cause impacts to this species. This species wintertime movement into lower elevation or areas of milder weather further minimizes potential impact from thinning or underburning activity.

Effects from the No-Action alternative
In the short-term, the no-action alternative will have no-effect to the species or habitat, as no extra activity or human presence will occur within the planning area. This alternative contributes to the long-term loss of open breeding and wintering habitat that has caused the species range-wide decline. The increased risk of moderate to high intensity fire in this landscape will further remove habitat for this species, until the open forest and mast-producing trees reestablishes; a time period of 100-200 years depending on the fire severity.

<u>Ash-throated flycatcher</u>
Forest Service Region 6 (Pacific Northwest) sensitive (Washington state only)
This neotropical migrant ranges throughout the SW U.S. and into central America in open arid habitat, with Washington State at the most northern edge of its breeding distribution. Within Washington State, it is limited in distribution to central and south-central Washington; mainly in Klickitat County, with some populations up to Okanogan/Wenatchee area (Cardiff and Dittman, 2002). The ash-throated flycatcher is a secondary cavity nester. In Klickitat County, its habitat association is oak-pine woodland, especially with large diameter trees of both species (Altman, 2000). This species does not breed in dense forested montane habitat. Within these general requirements, main necessities are presence of shrubs or trees with trunks or branches thick enough to serve as nest-cavity substrates, presence of ≥1 woodpecker species to excavate cavities, and relatively dry and open woodland or scrub habitat for foraging. Diet is almost exclusively arthropods, such as spiders, leafhoppers, wasps, flies, beetles, and other prey gleaned from branches.

This species is locally common, with the North American population shown to be increasing (Wahl et. al., 2005). It's limited distribution and concerns for available habitat in Washington led to its monitor status. In Washington, preferred Oregon white oak woodland breeding habitat is increasingly rare and local (Altman, 2000). One study in Klickitat County found ash-throated flycatchers used oak for 90% of its nesting, with average diameter of nest trees being 14" dbh. Nesting landscape habitat was characterized by tall, wide oak trees. Breeding season is approximately from late April to mid-July. Breeders are relatively tolerant of human disturbance at nest without deserting (Cardiff and Dittman,

2002). This species leaves the local area by late July to August to return to its southern wintering grounds.

Effects from the Proposed action alternative
The proposed action alternative directly addresses and incorporates conservation strategies from the recent Partners in Flight publication "Conservation strategy for landbirds of the east-slope of the Cascade Mountains in Oregon and Washington" (Altman, 2000). Recommendation actions will result in beneficial effects for the long-term persistence of this species and its associated habitat. As the implementation window (for both thinning and underburning) is largely outside of this species primary breeding period of April to mid-July, no breeding disturbance is expected, and the proposed action will have no effect to this species.

Effects from the No Action alternative
In the short-term, the no-action alternative will have no-effect to the species or habitat. With no-action, other than continued fire suppression, this alternative will eventually cause a long-term decline in preferred nesting substrate of large (>14") oak trees, as oaks becomes overtopped by encroaching conifers, and is eventually killed. This mortality is chronically occurring within the planning area. The increased risk of moderate to high intensity fire in this landscape will also remove habitat for this bird species, at least until large oaks reestablishes; a time period of 150-200 years depending on the fire severity.

<u>Vaux's swift</u>
Washington State Candidate
This swift is a neotropical migrant that breeds from southwestern Canada through the western United States to Mexico, Central America, and northern Venezuela. Arriving in Washington by May, and leaving around mid August to late September, this species migrates out of the country, into the southern portion of its range, to winter (Lewis et. al., 2002). They can occur as singles, but are much more commonly noted in communal colonies. The Vaux's swift requires large (>21" dbh) snags and hollow trees for nesting and roosting habitat. This habitat is most commonly found in mature forests, where this species is found at its highest density. This requirement was the reason for their placement on the State's candidate species list, due the limited supply of this habitat feature in second-growth forests (Wahl et. al., 2005). Swifts have taken to using available residential and industrial chimneys as nest and roost sites, especially during migration. Breeding season is around May to early August in the local area. The Vaux's swift forages for insects, in flight, over a wide variety of habitats; urban areas, water, open fields and forested areas. Foraging is typically within 3.4 miles of the nest site (Bull and Collins, 2007).

In late spring and summer, Vaux's swift are present within the planning area while foraging. Large (>21' dbh) trees with hollow centers are generally lacking within the planning area, but could potentially be present and harbor nesting or roosting swifts.

Effects from the Proposed action alternative
The proposed action alternative is expected to have no effect to Vaux's swifts in the short term due to the combination of seasonal restrictions, nest locations, and species behavior.

Prescribed underburning activities in the fall to early spring will not occur while the swifts are in the area, thus will have no effect to local swifts. Some thinning activity may occur during July and August, which may overlap the latter part of nesting season, but is unlikely to disrupt breeding success due to their tolerance for nearby human activity as well as location of nests in mid and upper portions of large trees that are high overhead. No nest or roost trees will be disturbed or removed as no large trees are proposed to be thinned within the planning area. Any observations of Vaux's swift concentrations, or potential nest/roost trees, will be documented and protected with appropriate noise and disturbance restrictions. The proposed action will have long-term benefits to swifts through maintenance and development of large overstory trees, as well as creation of snags, that would increase available nest/roost habitat.

Effects from the No-action alternative
The no-action alternative will have no-effect to the Vaux's swift as no potential for disturbance would occur and a low density of large trees would still be available for nesting/roosting. Moderate to high intensity fires resulting from the increased fuel load could have various effects to swift nest/roost habitat depending on the intensity and pattern of burn. Effects would be beneficial if large trees were killed and hollowed out by fire activity, but nearby patches were available to harbor insect prey. Effects would probably be detrimental if most large trees were killed in the local area due to the long amount of time (80-150 years) that would need to take place for large (>20" dbh) trees to regrow and take on the characteristics (hollow, with entrance hole excavated by primary cavity nester) required by nesting swifts.

Species Surveyed but not found within the planning area
Protocol surveys were completed in the spring and summer of 2006 for certain mollusk and amphibian species on the USFS sensitive species list and/or Northwest Forest Plan survey and manage list, as well as one butterfly species on the federal candidate/Washington State endangered list. None of the species were found in or adjacent to the planning area, including The Columbia Oregonian snail, Columbia duskysnail, The Dalles sideband, the Larch Mountain salamander, and the Mardon skipper butterfly.

Mardon Skipper
Federal Candidate, State Endangered
The mardon skipper is currently known to occur in 4 small disjunct populations within Washington, Oregon and California (Potter, 1999). In the southern W.A. Cascades, the mardon skipper is found in open, fescue grasslands within Ponderosa pine savanna/woodland, at elevations ranging from 1900' to 5100'. Sites vary in size from small, ½ acre or less meadows, to large grassland complexes, and site conditions range from dry, open ridgetops, to areas associated with wetlands or riparian habitats. Within these grassland environments, a variety of nectar source plants are important. The short, open stature of native, fescue bunchgrass stands allows mardon skippers to access nectar and oviposition plants. During the past 150 years, native grasslands have been developed, fragmented, and degraded. Fire historically played an important role in maintaining grassland plant communities. More than 95% of the original prairie grasslands are gone from western

Washington. Mardon skippers were likely more widespread and abundant prior to large-scale loss of their open, fescue dominated, grassland habitat.

Protocol surveys from March to June of 2006 did not detect this species within the planning area. This was expected, as the grassland habitat within site is more xeric than areas of known distribution. The implementation of either alternative will have No Impact on mardon skipper butterflies.

Larch Mountain salamander

FS Sensitive, Washington State Sensitive, Oregon State Sensitive (Vulnerable), CRGNSA Sensitive Site, FS Northwest Forest Plan Survey and Manage species

The Larch Mountain salamander is found solely along a 36 mile stretch of the Columbia River, and in isolated populations to the north in the Washington Cascades. Known Oregon populations are within 14 miles of the Columbia River, roughly between the towns of Troutdale and Hood River within the Columbia River Gorge. In Washington their range extends to about 120 miles north of the Columbia River Gorge. Due to recent intense surveys, their range has recently been expanded north where they have been found in non-talus habitats. Although suitable habitat is patchily distributed, populations can be locally abundant across the majority of their range (Crisafulli, 1999). Within the National Scenic Area in Washington, the range goes from Lawton Creek (Mt. Pleasant) to the Klickitat River (Crisafulli, 1999). Local habitat for this species is almost always talus habitat. Their dependence on this naturally discontinuous habitat type, coupled with the species limited range, makes the species vulnerable to further loss of habitat from human disturbance. They are surface active only during short periods in spring and fall, and are usually deep into the talus during the summer and winter.

Although this species is documented in talus fields within 1 mile of the project area, protocol surveys in March and April of 2006 did not detect this species within the planning area. This was expected, as there are no talus patches that are planned to be treated. The implementation of either alternative will have No Impact on Larch Mountain salamanders or their habitat.

Columbia Oregonian

FS Sensitive, Washington State Candidate

Generally found within 100 meters of streams, seeps, and springs, this snail is known from the Columbia River Gorge from The Dalles to near Rufus. It is found among moist talus, leaf litter and shrubs, or under logs and other debris. This species was originally known from areas that had few trees, but more recent mid-elevation records are from mature hemlock forests with relatively closed canopies. Exotic vegetation in riparian zones reduce the supply of native herbaceous vegetation needed by this species.

This species was not found within the planning area. The implementation of either alternative will have no impact on this species.

Dalles sideband

FS Sensitive, Washington State Candidate

The Dalles sideband is known from the Columbia River Gorge near The Dalles and up the Deschutes River. It inhabits talus or moist rocky areas around streams, seeps and springs within steppe or dry forest plant communities. It is not considered a talus obligate. This species is active only during dawn and dusk during the spring and fall seasons. Large woody debris and rocks provide refugia during summer and late winter. Forest litter and woody debris are considered necessary to provide food and cover while foraging. Loose soil is necessary for egg laying. The Dalles sideband has been found with the Larch Mountain salamander (*Plethodon larselli*).

This species was not found within the planning area. The implementation of either alternative will have no impact on this species.

Columbia Duskysnail

Forest Service Sensitive

This minute aquatic snail species is found in springs and spring outflows, from low to high elevations, in cold, pure, well-oxygenated water. It is found most often in small springs and in slow flows on soft substrates, often composed of mosses. This species is endemic to the Columbia River Gorge, on both sides of the river, and was found west of the Cascade crest. It is currently found sporadically in the central and eastern Columbia River Gorge.

This species was not found within the planning area. The implementation of either alternative will have no impact on this species.

APPENDIX B
PUBLIC AND COLLABORATIVE GROUP SCOPING COMMENTS

The scoping letter and project description, dated September 2 with an extension on September 18, was mailed or e-mailed to approximately 263 individuals, organizations and agencies. The collaborative group met with the Forest Service on September 21 to offer comments and to recommend the riparian prescription. On March 13, the Forest Service sent out a consistency review application to interested parties, adjacent landowners, the CRGNSA tribes, and the collaborative group for a 30-day comment period with comments due on April 16. This notice was also added to the CRGNSA website. A total of two telephone calls, three e-mails, and 4 comment letters were received.

The comments received and how they were used are summarized below:

Note: Implementation Requirements mentioned in comment Resolution below begin on page 36.

Comment	Resolution
Stream buffers should be delineated in the EA and the no practicable alternative test must be applied.	Stream buffers were delineated and a no-practicable alternatives test was applied in Chapter 2.
EA should adequately address the effect of the recommended proposed action on sensitive habitats and species including Lewis' woodpecker.	Biological evaluations were prepared and the project was reviewed for compliance with Management Plan requirements for sensitive habitats. See Chapter 3, effects to wildlife and plants and Appendix A, Biological Evaluations.
CRGNSA Management Plan Consistency Review needs a site plan map.	There were many maps, aerial photos, and diagrams provided in the application. One site plan is not practical for a forest restoration of this size.
The EA should consider effects to scenic resources from Key viewing areas.	Effects to Key Viewing Areas were reviewed in Chapter 3, Effects to Scenic Resources.
Invasive plant sites should be monitored. Post-project treatment should be mentioned. A timeline must be developed. It is best that weeds are killed before treatment of stands. (2 separate commentors).	We agree. Implementation requirements #13 and 14 state that invasive plant issues will be part of project effectiveness monitoring and the yearly CRGNSA eradication program shall prioritize needs in the planning area. It is also required that contractors clean equipment before entering NFS lands and before moving to each treatment area in a manner that will ensure that it is not contributing to the spread of invasive plants. Known patches of invasive plants will be avoided to forestall spread until eradicated.
WA Dept. Fish and Wildlife guidelines for the western gray squirrel should be followed.	An implementation requirement in Chapter 2 (Natural Resources Mitigation Plan) requires this.

Comment	Resolution
The EA should adequately address the effects of the recommended proposal on soils.	The effects of the proposal on soils were discussed in Chapter 3 of the EA under Effects to Natural Resources, effects to Soils.
The EA should discuss the basis for the fire regimes discussed.	Chapter 1 of the EA discusses the basis for the fire regimes and condition classes. Other references used are located in Chapter 4, references cited.
Skid roads and temporary road should be designated.	Implementation requirement #9 reads on page 36 states "Scenic Area Management Plan standards for soil productivity will be met in the project area. These state that not more than 15% of an activity area will be detrimentally disturbed. This includes compaction, displacement, puddling and removal of organic layers exposing mineral soil. This will require the designation of skid trails". Only one temporary road is proposed and is described in Chapter 2 and Appendix C.
There should be a regulatory overview.	The EA, consistency review, and decision notice provides the required regulatory overview**.**
The collaborative group would like to see some sample tree marking before implementation takes place.	We agree that this would be valuable.
The EA should contain delineation of stand types.	The EA contains the latest delineation of stand types. Further work on stand delineation will be necessary before implementation.
Adjacent land owners concerned about notification of underburning actions.	Chapter 2 contains a requirement for notification under Implementation Requirements.
Adjacent land owner concerned about revealing the BPA line from the vantage point of their property.	A scenic implementation requirement has been added to address this concern in Chapter 2**.**
Plan does nothing to protect the forest on the steep slopes of Major and Catherine Creeks. Fire breaks should be created.	Most of the steep slopes will benefit from hand (chain-saw only) treatments to prescription. They will take longer to accomplish due to expense and the need to keep fuel loadings to reasonable levels, but the steep slopes are proposed for careful treatment except within the applicable no-cut buffers near Catherine and Major Creeks. See Chapter 2 for a description of treatments in these areas.
Catherine and Burdoin Mt. thinning must be considered together under NEPA.	The cumulative effects of Burdoin added to the Catherine project were analyzed in this document. See Chapter 3, cumulative effects for all resources.

Comment	Resolution
The consistency review application must be complete. The application should include details regarding the location, size, and necessary grading for the proposed temporary roads, haul routes, skid roads, etc. to provide the public with a meaningful opportunity to review the project.	The only proposed temporary road was described in the application details (road to landing off Snowden road). The location and size of landings were indicated in the application. Where grading is not mentioned in the application, no grading will be required. Proposed haul routes and necessary maintenance or reconstruction were described in detail in the application. Skid roads and trails are required to be designated on site in order to meet the detailed requirements of the work at hand. They are not "constructed" and entail no grading. We made every effort to include necessary detail in the application.
The Forest Service should consider excluding the use of mechanized equipment except chainsaws.	We would consider such an exclusion if there was a better and more cost-effective way to remove trees >10" according to the prescriptions.
Ensure that elk and deer winter range protections and restriction on timing protect plant growth and nesting species.	There are several implementation requirements concerning timing to protect plants and nesting species in Chapter 2.
Mitigate effects on hypogeous fungi, etc. in oak woodlands by requiring burn piles to be located to minimize impacts to oak root systems.	We agree that piles should be placed to minimize damage to oak root systems and tree canopies. Our contracts require specific placement for piles. However, an implementation requirement was added to address this.
Protect cultural and recreation resources according to Management Plan guidelines.	An evaluation (in accordance with Management Plan guidelines) of the Catherine Forest Restoration with recommended mitigations was submitted by CRGNSA archeologist, Marge Dryden, to the Washington State Historic Preservation Office and concurrence was received on April 9, 2007. See Chapter 3, effects to Recreation and Chapter 2, implementation requirements for findings and mitigation for recreation.

Comment	Resolution
Include a stewardship plan in the consistency review application as per requirements.	A stewardship plan is not required unless the applicant proposes snag, down wood, and forest openings other than those specified in the Management Plan. The Forest Service does not propose any changes and therefore is not required to include a stewardship plan. Although a stewardship plan is not required in this case, this environmental assessment would qualify as meeting the standard of "thinking about the future" that is the point of a stewardship plan.
Follow guidelines for created openings, snags, and down woody material.	See above.
Concerned about surveying for Northern Goshawk and the effects to its habitat.	According to the biological evaluation and implementation requirements, before project implementation, the area treated will be surveyed for goshawk nests and they will be protected if found. See Appendix A, biological evaluations and Chapter 3, effects to wildlife and plants for effects to its habitat.
The very large fir in the Oak-pine Douglas fir stand on Snowden and Bates road were clearly there as long as the legacy pine. Disagree with a FS statement that "growing in a much younger cohort than the pine and oak was Douglas-fir".	We agree that the largest Douglas-fir in this stand are as old as the pine and oak. Our statement would have been more properly stated as "There were plentiful Douglas-fir growing in a much younger cohort than the pine, oak, and legacy Douglas-fir."
4100 acres is a very large project area. Uncomfortable with the idea of treating the entire project area. Need to learn from mistakes. There should be untreated skips and gaps other than the buffered areas.	We agree-- see proposed schedule in Chapter 2. We did not think the whole project area could or would be treated all at once. In addition to the limiting factors discussed in Chapter 2, we also think monitoring is an important learning tool. The planning area is not contiguous. There are large "skips and gaps" in the private and state lands. In addition, some of the steepest and most inaccessible slopes may take longer to treat due to access and cost issues.
(re reference conditions and fire regimes) We believe that there were mixed mosaics of different fire intensities, leaving some forests very open and others quite thick.	We have seen little evidence of this in the planning area. Ages of trees suggest a large comparatively recent influx of in-growth in the area. See Chapters 1 and 3, fire resilience and ecosystem components. The "quite thick" are youngsters.

Comment	Resolution
We don't believe the fire regime is correct at 0-35 years but we trust Darren Kennedy.	We do too, but we have other sources for the information. See references cited under fire resilience in Chapter 4 and Chapter 1, Fire Resilience
The forest service should consider collaboratively hiring a marking crew	We will look into this idea.
Friends (of the Columbia Gorge) supports the collaborative work process that resulted in the subject forest restoration projects.	We appreciate it.
Friends (of the Columbia Gorge) also supports projects that restore and enhance natural resources such as unique oak woodlands so long as such efforts comply with the requirements of the Management Plan.	
…on behalf of the Gifford Pinchot Task Force and our 3,000 members…we are strongly supportive of fire resilience and ecosystem restoration for the Catherine project areas, and we are strongly supportive of the collaborative process that the scenic area has begun…	
The RMP guidelines lack substantive criteria to apply to the proposed activity and may violate the Scenic Area Act.	RMP sufficiency is out of the scope of this project EA.
There should be a scenic condition of approval to limit haul routes, temporary roads, and slash piling areas to locations that are not topographically visible from KVAs.	Forest practices (and associated actions) are required to meet the applicable scenic standard. There is no requirement to be topographically invisible.
The project should meet the visual quality objectives and requirements for the landscape settings.	See Effects to Scenic Resources in Chapter 3.
Clarification is warranted as to whether firewood offered would involve a commercial sale.	Our firewood opportunities are for personal use. However, if the need to remove fuels exceeds the capacity of personal use, commercial removal may be considered in some areas.
Protect Recreation Resources with mitigation measures.	The implementation requirements include recreation mitigation measures.
The air quality protection measures should be clarified to provide clear instructions on when burning will be allowed.	Mitigation measures are not regulations. It is not possible to define every word used. The mitigation measure gives examples to explain the types of methods that are used to reduce effects from smoke.

Comment	Resolution
Forest Service should not propose commercial helicopter harvesting as a method of thinning because they would likely cause a dramatic increase in the impacts to sensitive species.	We disagree that helicopter harvesting would likely cause "a dramatic increase to impacts to sensitive species". There are implementation requirements restricting activity to times outside breeding seasons of sensitive species (July 1throught February 28). No loud activity will occur within 400 ft. of active western gray squirrel nest trees from March 1 through August 31. In addition, helicopter use only causes ground disturbance at landings--so is generally considered a good solution where new roads are not desireable. See also biological evaluations in Appendix A.
Friends (of the Columbia Gorge) opposes the commercial sale of timber as a means of accomplishing a habitat enhancement project.	We are contracting in order to get the habitat restoration work accomplished. It is not much different than paying a contractor to remove blackberries. It would not be economically sound to pay a contractor to remove wood that has value to that contractor. Stewardship contracting allows us to use the value of the wood (in excess of the cost to the contractor of removing it) to pay for other work such as thinning oaks or reseeding disturbed soils. There are some areas that are not reachable by existing roads or any other means except by foot. This is more expensive for the tax payer and will require leaving valuable wood on the ground--and only to a certain fuel load level. See Chapter 2 for costs.
CRGNSA managers should not be limited by the usual ideas for what makes a project commercially viable. Stewardship contracting should be used to make the project more affordable and attractive to contractors.	We agree.
It is not clear whether the development of temporary roads, skid trails, etc. are roads for the purposes of NSA review.	Temporary roads and skid trails are reviewed as part of an SMA forest practice. They are not intended as a permanent travel-way and are to be removed after tree removal is completed as required in the Natural Resources Mitigation Plan.

Comment	Resolution
Specific Comments on Stand Prescriptions **Oak-pine woodlands**	
We are comfortable and supportive of these prescriptions.	We appreciate it.
Pine-oak-Douglas fir	
We are uncomfortable with reducing Douglas-fir to 10% of the canopy. Uncomfortable with the removal of Douglas-fir trees>20" dbh.	According to the prescriptions in Chapter 2, the <u>understory</u> Douglas-fir canopy can only be reduced to 10% if there are sufficient numbers of other tree species to contribute to the required average total canopy of 50%. Otherwise, they must remain at a higher level to provide the required total canopy cover. Larger Douglas-fir would only be removed under the unlikely situation of a very heavily canopied stand containing only larger trees that required further spacing to allow fire back into the landscape. We do not anticipate nor did we encounter much of this condition but the collaborative group recommended that the prescription allow for this.
We are uncomfortable with considering oak trees with less than 10% live canopy for release.	Adaptive management is indicated. Trees can be monitored for release. Prescriptions can then be adjusted if necessary.
East Conifer	
We are comfortable and supportive of these prescriptions.	We appreciate it.
Oak trees not given realistic protection. Increase clearing radius from 25 to 40-50 feet and limit to saving 3-4 per acre.	Adaptive management monitoring will be conducted to determine whether increased radii are required. Additional thinning could then occur once it is established that the oak are responding to treatment.
(Gifford Pinchot Task Force is) strongly opposed to wholesale stand conversion. Stand conversion at the Snowden and Bates stand is inappropriate because it currently functions as habitat for species such as the western gray squirrel.	The prescriptions do not constitute wholesale stand conversion. Note stand changes in diagrams in Chapter 3, effects to ecosystem components. The prescription does not change the stand's inherent composition. It will retain its habitat function. See Appendix A, Biological Evaluations, and Chapter 3, effects to wildlife and plants.

Comment	Resolution
Areas that fall within the desired canopy range should not be treated and oak release language should be amended to read what was agreed to at the collaborative group meetings-->10" dbh oaks will be released.	We agree. Clarification on the oak release language was made. Stands meeting DFC will not be treated and areas within treated stands that do not meet the "cut" tree requirements will not be treated. Canopy range is only one factor in meeting the DFC. There may be other factors requiring treatment. For example, understory trees can be thinned without affecting the total canopy cover.
Northern East Conifer	
Uncomfortable with low canopy closures for this stand type as well as with the wide spacing for the Douglas-fir trees in the desired condition.	The desired conditions reflected the higher site potential (more water for tree growth) in this area. That is, evidence at the site indicated that VERY large trees once grew here. While the desired condition hopes for very wide spacing, the prescriptions do not call for this type of spacing at this time. Over time, as the trees grow and their canopies widen, the spacing will naturally increase due to repeated underburns and understory mortality. The prescriptions call for caution with regard to the canopy change in that they require no more than a 20-30% reduction in existing canopy.

APPENDIX C-ACCESS AND LANDS INFORMATION

T.3N, R.11E, section 2

Landownership: Properties are surrounded by DNR and private land.

Boundary: Property boundaries have **not** been surveyed. USA ownership is **not** shown correctly on project map. Need document recorded 4/10/1939 in Book 78, Page 611, Klickitat County Deed records to determine whether BPA strip is easement or fee, and the width of the strip (assumed for now to be 300').

Improvements: BPA transmission line.

Third Party Rights: No known third party rights other than BPA **if** strip is an easement.

Access: No legal access; physical access exists.

Reference: SDS exchange (GIP122)

T.3N, R.11E, section 3

Landownership: NFS properties are surrounded by DNR and private land.

Boundary: Property boundaries have **not** been surveyed. **Caution: the western boundary of the SE¼SE¼ and the NE¼SE¼ do not align.**

Improvements: Improvements consist of a natural gas pipeline in NE¼ SE¼

Third Party Rights:

1. Access rights across the south 15' of NW¼SW¼SE¼; unknown who is beneficiary of this right.
2. Northwest Pipeline Corp. – 75' wide gas line easement across N½NE¼ SE¼.

Access: There **may** be legal but no physical access from Snowden Road to parcel in SE¼SE¼, however title research would need to be conducted to verify this. There may be physical access across DNR land however no legal access.

Reference: Summerhill (GIP301) and Walker (GIP197) purchases.

T.3N, R.11E, section 13

Landownership: Property is surrounded by DNR and private land except on the S boundary where it abuts NFS land.

Boundary: Property boundaries have been partially surveyed.

Improvements: No known improvements.

Third Party Rights: None known.

Access: Legal and physical access provided by Major Creek County Road

Reference: Lauterbach purchase (GIP182), TPL Lauderbach purchase (GIP65), Allen purchase (GIP331), and Kreps purchase (GIP106).

T.3N, R.11E, section 14

Landownership: Property abuts private land to the N, S & W, and abuts NFS land on the E.

Boundary: Property boundaries have been partially surveyed. There are survey monuments in the NW and NE corner, and the section corner along the S

boundary of the former Allen property. **NFS ownership is not shown correctly in the Klickitat County database or on the project map.**

Improvements: No known improvements. All structures, wells, power lines and other improvements have been removed from the site.

Third Party Rights:

1. Klickitat County PUD right of way. This is a floating easement of unspecified width affecting the N½NW¼SE¼.

Access: Legal and physical access provided by Allen Oaks Road. Access is administrative only by deed.

Reference: Allen purchase (GIP331) and SDS Exchange (GIP122)

T.3N, R.11E, section 15

Landownership: NFS property abuts private land to the N, S & W, and abuts NFS land on the E.

Boundary: Property boundaries have been partially surveyed.

Improvements: No known improvements.

Third Party Rights:

1. Reserved road right of way for an existing road in favor of SDS affecting the N½SE¼. Road width unknown.

Access: Legal and physical access was supposed to have been granted to the US by SDS in the exchange. The road, which existed at the time of the exchange and which crossed SDS land from Bristol County Road across the N½SW¼ of section 15, was omitted from the deed however and so the grant was not made. The Exchange Agreement is a legally binding document, so a case can be made that SDS needs to grant the easement (NOTE: this is one of many roads that were omitted in the deed; grants both to and from SDS and the US were never made).

Reference: SDS Exchange (GIP122)

T.3N, R.11E, section 23

Landownership: NFS property abuts private land to the N, S & W, and abuts NFS land on the E.

Boundary: Property boundary with private land has been surveyed.

Improvements: BPA transmission lines.

Third Party Rights:

1. Transmission line easements (2) to BPA. Easements are 300' wide, plus there is the right to fell danger trees 100' on either side of the easement. All felled trees belong to BPA. Easements are together with right to enter. Easements are silent on landowner rights to use road(s) along power line. (Ref. LVF Exchange & Quigg).
2. A reserved nonexclusive right by Champion International Corp. to use all existing roads on lands sold to LVF for access and timber haul. It is unlikely Champion could claim any current road use rights. (Ref. LVF exchange).
3. Reserved easement right to place utilities within 10' of all parcel boundaries. Affects E½ E½SW¼. (Ref. McVeigh & Quigg)

Access: Legal and physical access to the southern portion of section 23 is provided from Bristol Rd (County) to Bristol Land (private), then easterly across the former LaBelle, Goss and Steffen parcels. Reference is made to correction deed, Auditors File 159878 from Handy acquisition.

Reference: SDS exchange (GIP122), Longview Fibre exchange (GIP123), TPL Lauderbach purchase (GIP65), Quigg purchase (GIP303), McVeigh purchase (GIP133), Steffen purchase (GIP259), Goss purchase (GIP441), & LaBelle purchase (GIP143).

T.3N, R.11E, section 24

Landownership: Section is almost entirely surrounded by NFS land except a small portion in the NE corner which abuts private land.

Boundary: Property boundary with private land has not been surveyed.

Improvements: No known improvements with the possible exception of flume remnants.

Third Party Rights:

1. 66' right of way for a flume across the N½NE¼. This was a 1912 document which also granted riparian rights to Major Creek. There is no known flume in existence. Grant was from landowner to Dorr.
2. There was a 1916 grant of a fee strip 16' wide for an existing flume across the N½NE¼, together with right of ingress and egress, and also together with the right to construct and maintain dams on Major Creek. Grant was from Dorr to Major Creek Lumber Co. This right is likely invalid because Dorr did not own the land but only an easement as indicated in no. 1 above.
3. Right of way for a flume across the SW¼NW¼, the NW¼SW¼, and the E½SW¼. ROW was of unspecified width or location, but flume existed at the time of the grant (1918).

Access: Major Creek County Road (unimproved native surface portion)

Reference: Kreps purchase (GIP106) and TPL Lauderbach purchase (GIP65)

T.3N, R.11E, section 25

Landownership: Section abuts NFS land to the N, E & W, and abuts private/state land on the S.

Boundary: Property boundary with private land has not been surveyed.

Improvements: BPA transmission line. There may be 2 developed springs and water diversion pipe in the SW¼SW¼.

Third Party Rights:

1. A right of way for an electric transmission line of unspecified width together with a right of ingress and egress to Pacific Power and Light Co. All rights cease when said line has been abandoned. Affects the SE¼ and the SE¼SW¼ (floating easement). Ref. 67/66.
2. A right of way for an electric transmission line of unspecified width together with a right of ingress and egress to Pacific Power and Light Co. All rights cease when said line has been abandoned. Affects the SW¼SW¼ (floating easement). Ref. 69/460.

3. A right of way for an electric transmission line of unspecified width together with a right of ingress and egress to Pacific Power and Light Co. All rights cease when said line has been abandoned. Affects all that part of the SE¼SW¼ & SW¼SE¼ lying west and south of the rimrock (floating easement). Ref. 75/160.
4. A perpetual easement and right to flood to the 95.5' contour line and the right to enter to remove timber, brush & driftwood in favor of the United States (COE). Affects the SW¼SW¼ and that portion of the SE¼SW¼ lying west and south of the rimrock. Ref. 78/452.
5. Reserved rights to subsurface minerals, gas and oil but with no right of surface entry. Ref. 115/27 & 230/713.
6. A 25' wide easement for travel and driving stock over and across a portion of the SW¼SE¼, the S½SW¼ and the NW¼SW¼. Grant was from DuBois to Lauderbach; US is likely successor in interest to this ROW. Ref. 99/25.
7. Transmission line easement to BPA. Easement is 300' wide, plus the right to fell all danger trees (BPA owns such felled trees). Easements are together with right to enter. Affects the S½N½ & NW¼NW¼. ALSO – a 14' wide road ROW across a significant portion of the section, however the landowner (now USA) retained the right to use and cross the road as long as it didn't interfere with BPA's use of the road. This road runs from Hwy 8 northwesterly to Atwood County Road. Ref. 115/201.
8. Lauderbach reserved all minerals in the conveyance to TPL but has no right of surface entry.

Access: Legal and physical access if provided through the BPA road between Hwy 8 and Atwood Road as noted in No. 7 above.

Reference: TPL Lauderbach purchase (GIP65) & BLM Transfer

T.3N, R.11E, section 26

Landownership: Section abuts NFS land to the E and abuts private/state land on all other sides. Complex ownership with inholdings. Complex access rights.

Boundary: Property boundary with private land has been surveyed and posted.

Improvements: BPA line in NE¼NE¼; Klickitat PUD power line in SW¼. Possible PPL power line in S½SE¼.

Third Party Rights:

1. An easement of unspecified width for electric transmission in favor of Pacific Power and Light Co, together with the right of ingress and egress. Rights cease when line is abandoned. Affects S½SE¼. Ref. Lauderbach 67/179.
2. Ownership of all subsurface minerals, gas and oil but with no right of surface disturbance (current owner unknown). Affects S½SE¼. Ref. Lauderbach 99/25 & 230/173.
3. Transmission line easement to BPA. Easement is 300' wide, plus the right to fell all danger trees (BPA owns such felled trees). Easements are together with right to enter. Affects the NE¼NE¼. Ref. Lauderbach 115/201.

4. Lauderbach reserved all minerals in the conveyance to TPL but has no right of surface entry. Note Lauderbach did not own the mineral rights on some of the conveyed lands. Ref. Lauderbach 143/372.
5. 10' wide easement for drainage and utilities along all exterior boundaries. Affects NW¼NE¼. Ref. Handy 178/396.
6. 30' easement for egress, ingress and utilities. Affects north 30' of west 1900 feet of N½S½SW¼. Ref. Kornman 161/687 & 162/667.
7. 60' **fee strip** to Klickitat County for road purposes (Cooke Road). Affects the N½SW¼NW¼. Ref. Johnson 229/113.
8. Permanent, nonexclusive easement for ingress, egress, and utilities over the "Old County Road" and existing logging roads. The Old County Road is now believed to be the Atwood Road. Affects the E½ sec. 26. Ref. Johnson 158/529.
9. A perpetual easement of unspecified width over, under and across said parcel for electric transmission in favor of Klickitat PUD No. 1, together with the right of ingress and egress. Affects the N½SW¼NW¼. Ref. Johnson 247/704.
10. A right of way easement for construction and maintenance of utility systems (electric, communication, water, sewer), plus the right of ingress and egress, in favor of Klickitat PUD No. 1. Affects the SW¼SW¼. Ref. Warren 180/142 and Clouse 180/133.
11. A perpetual 20' wide easement over, under and across said parcel for electric transmission in favor of Klickitat PUD No. 1, together with the right of ingress and egress. Affects that portion of the SW¼SW¼ lying NW of a straight line running between the NE and SW corners. Ref. Warren 242/694.
12. A right of way easement for construction and maintenance of utility systems (electric, communication, water, sewer), plus the right of ingress and egress, in favor of Klickitat PUD No. 1. Affects the S½SE¼SW¼. Ref. Finzer 180/137. Poles do exist on the ground.

Access: Legal access to the northern portion of section 26 is provided from Bristol Rd (County) to Bristol Land (private), then easterly across the former LaBelle, Goss and Steffen parcels. Reference is made to correction deed, Auditors File 159878 from Handy acquisition. Also Cooke County Road to Atwood County Road. Reference is made to Maxon file, document 161/606. There appears to be no physical access to the SW¼SW¼ or the SE¼ of the section. Legal and physical access to the SE¼SW¼ of the section is via an unmaintained 4WD native surface private road. BPA road north of Atwood Road as noted in No. 3 above.

NOTE: There are three water rights associated with the Warren purchase (portion of the SW¼SW¼). One right is associated with a well (believe to have been capped) and two associated with intermittent streams. The latter two have minor dam structures at the point of diversion, but no water available for diversion.

Reference: TPL Lauderbach purchase (GIP65), Handy purchase (GIP241), Goss purchase (GIP441), Steffen purchase (GIP259), Johnson purchase (GIP25), Kornman purchase (GIP349), Warren (GIP116), Clouse (GIP167), Finzer (GIP422), Ibsen (GIP202), Hiatt (GIP351).

T.4N, R.11E, section 36

Landownership: NFS property is surrounded by DNR and private land except E boundary which abuts NFS land.

Boundary: Property boundaries have **not** been surveyed. US ownership is **not** shown correctly on project map.

Improvements: No known improvements.

Third Party Rights:

1. Mineral rights belong to the State of WA
2. 15' road right of way to two private landowners; USFS is successor in interest to one of the two landowners (Eaton purchase).

Access: Legal and physical access provided as successor in interest to rights obtained under document recorded 10/16/1981 in Book 210, Page 279, File No. 183615.

Reference: Broughton exchange (GIP121)

T.3N, R.12E, section 19

Landownership: NFS property abuts private land to the N, BIA & private land to the E, and NFS land to the S and W.

Boundary: Property boundaries have not been surveyed.

Improvements: None known.

Third Party Rights:

1. A 16.5' wide right of way for a flume in favor of Major Creek Lumber Company. This 1913 document also granted riparian rights to Major Creek including the right to locate a dam and lateral flume. It also granted the right of ingress and egress for constructing, maintaining, and operating the flume. It is unknown whether there is or ever was a flume in existence. Ref. TPL Lauderbach 38/223.

Access: Legal and physical access would be by Major Creek Road, an un-maintained county road.

Reference: TPL Lauderbach purchase (GIP65), and Kreps purchase (GIP106).

T.3N, R.12E, section 30

Landownership: NFS property abuts NFS & BIA land to the N, County & private land to the E, NFS & County land to the S, and NFS land to the W.

Boundary: Property boundaries have not been surveyed.

Improvements: BPA transmission line; possible PUD electric lines and possible phone line.

Third Party Rights:

1. Transmission line easement to BPA. Easement is 300' wide, plus the right to fell all danger trees (BPA owns such felled trees). Easements are together with right to enter. Affects Gov. Lots 1 & 2. ALSO – a 14' wide road ROW, however the landowner (now USA) retained the right to use and cross the road as long as it didn't interfere with BPA's use of the road. This road runs from Hwy 8 northwesterly to Atwood County Road. Ref. TPL Lauderbach 115/201.

2. Access road right of way issued to BPA by BLM. Affects Gov. Lot 4. Ref. BLM transfer WASH01048. Details of ROW are unknown (need to obtain document WASH01048)
3. A right of way easement of unspecified width and location for construction and maintenance of an electric transmission line, plus the right of ingress and egress, in favor of Pacific Power and Light. Affects the NE¼SW¼ and N½SE¼. Existence of power line is unknown. Ref. Sauter 67/20.
4. Electric transmission line easement in favor of Klickitat County PUD No. 1 plus the right of ingress and egress. Location and width of line is unspecified. Affects those portion of the SE¼ and the E½SW¼ lying north of the Hwy. Existence of power line is unknown. Ref. Sauter 114/611.
5. Electric transmission line easement in favor of Klickitat County PUD No. 1 plus the right of ingress and egress. Location and width of line is unspecified. Affects the NE¼ SW¼ and that portion of tax lot 4 lying west of Major Creek and north of the Old Lyle Hwy. Existence of power line is unknown. Ref. Sauter 144/52.
6. A telephone right of way easement in favor of United Telephone Co of the Northwest plus the right to use the private road. Affects an existing road located in the E½SE¼ which begins at the Old Lyle Hwy and proceed northerly 1210 feet then easterly 250 feet. Existence of line is unknown. Ref. Sauter 246/244.

Access: Legal and physical access is from a county road (Old Lyle Hwy/Old Hwy 8) to an existing BPA road that FS has existing rights to use. Note the FS has NO legal access across BIA land.

Reference: TPL Lauderbach purchase (GIP65), BLM Transfer, and Sauter (GIP296)

T.4N, R.12E, section 30

Landownership: NFS property is surrounded by private land except S boundary which abuts NFS land.

Boundary: Property boundaries have **not** been surveyed. US ownership is **not** shown correctly on project map.

Improvements: No known improvements.

Third Party Rights: None known.

Access: No legal access except that provided through T.4N, R.12E, section 36. No physical or legal access south of Major Creek.

Reference: SDS exchange (GIP122) and Broughton exchange (GIP121)

T.4N, R.12E, section 31

Landownership: NFS properties are surrounded by DNR, BPA and private land except N boundary which abuts NFS land.

Boundary: Property boundaries have **not** been surveyed.

Improvements: No known improvements.

Third Party Rights: None known. There appears to be an encroachment of an agricultural field by the Graves Family Trust in the S½NE¼NE¼ .

Access: No legal access except that provided through T.4N, R.12E, section 36. No legal or physical access south of Major Creek.
Reference: Broughton exchange (GIP121) and Graves purchase (GIP254).

ADJACENT PARCELS WITHIN 200 FEET OF PROJECT PROPERTY:

Parcel	Name	Address		City	State	Zip
West Fork Major Creek						
04113555000400	CLARK COLLEGE FOUNDATION TR USTEE	1800 E MCLOUG HLIN BLVD		VANCOUVER	Washington	98663
04113555000300	HENDRY, JOHN	PO BOX 961		BINGEN	Washington	98605
04113500002100	SDS COMPANY LLC	PO BOX 266		BINGEN	Washington	98605
03110200000300	SDS COMPANY LLC	PO BOX 266		BINGEN	Washington	98605
03110200000400	STATE FORESTRY	PO BOX 47014		OLYMPIA	Washington	98504-7014
03110300000100	STATE FORESTRY	PO BOX 47014		OLYMPIA	Washington	98504-7014
03110300001800	STATE FORESTRY	PO BOX 47014		OLYMPIA	Washington	98504-7014
03111000000100	DEPT OF NATURAL RESOURCES	PRODUCT SALES & LEASING	PO BOX 47014	OLYMPIA	Washington	98504-7014
03111100000200	DEPT OF NATURAL RESOURCES	PRODUCT SALES & LEASING	PO BOX 47014	OLYMPIA	Washington	98504-7014
03111000001400	HOUSE,ARTHUR	319 BATES RD		WHITE SALMON	Washington	98672
03110300001200	DUGGER,STEPHEN	PO BOX 258		HUSUM	Washington	98623
03110300002500	GOHL, LAVERNE	725 SNOWDEN RD		WHITE SALMON	Washington	98672
03110300001300	SKAKEL,NANCY	687 SNOWDEN RD		WHITE SALMON	Washington	98672
03111100000400	NICOLAI, TOM, 320 BATES LLC	900 SW FIFTH A VE STE 2600		PORTLAND	Oregon	97204
03111100000500	BLILIE,JAMES	5997 TURTLE CREEK RD		SHOREVIEW	Minnesota	55126
03110351000100	BERNHARDT, MICHELLE	PO BOX 781		ENUMCLAW	Washington	98022
03110300001100	SDS COMPANY LLC	PO BOX 266		BINGEN	Washington	98605
East Fork Major Creek						
04113600000200	DEPT OF NATURAL RESOURCES	PRODUCT SALES & LEASING	PO BOX 47014	OLYMPIA	Washington	98504-7014
04113600000300	EATON, MARTY	242 ACME ROAD		WHITE SALMON	Washington	98672
04113600001000	EHRHART, EDWARD	EHRHART TRUS T	63 MCC ARTHY RD	WHITE SALMON	Washington	98672
04112500001400	ALBRIGHT,GLORIA	4058 F CIRCLE		WASHOUGAL	Washington	98671
04112500001500	BROUGHTON LUMBER CO	92 Office Rd		UNDERWOOD	Washington	98651
04123000000600	BROUGHTON LUMBER CO	92 Office Rd		UNDERWOOD	Washington	98651
04123000000400	SDS COMPANY LLC	PO BOX 266		BINGEN	Washington	98605
04123000000200	SDS COMPANY LLC	PO BOX 266		BINGEN	Washington	98605
04123000000100	BROUGHTON LUMBER CO	92 Office Rd		UNDERWOOD	Washington	98651
04122900000200	BROUGHTON LUMBER CO	92 Office Rd		UNDERWOOD	Washington	98651
04122900000400	SDS COMPANY LLC	PO BOX 266		BINGEN	Washington	98605
04123200000300	GRAVES LIVING TRUST	40 STEVE GRAVES RD		LYLE	Washington	98635
04123100000100	GRAVES LIVING TRUST	40 STEVE GRAVES RD		LYLE	Washington	98635
04123100000300	DEPT OF NATURAL RESOURCES	PRODUCT SALES & LEASING	PO BOX 47014	OLYMPIA	Washington	98504-7014
Confluence Major Creek						
03111100000100	BOLES,BRUCE	1404 NW OVERTON		PORTLAND	Oregon	97209
03111200000300	BOLES,ENID	1404 NW OVERTON		PORTLAND	Oregon	97209

03111200000200	COCHENOUR,DANIEL	315 MCGOWEN RD		LYLE	Washington	98635
03111200000800	DEPT OF NATURAL RESOURCES	PRODUCT SALES & LEASING	PO BOX 47014	OLYMPIA	Washington	98504-7014
03111200000500	DEPT OF NATURAL RESOURCES	PRODUCT SALES & LEASING	PO BOX 47014	OLYMPIA	Washington	98504-7014
03111100000200	DEPT OF NATURAL RESOURCES	PRODUCT SALES & LEASING	PO BOX 47014	OLYMPIA	Washington	98504-7014
East Side of Area Along Major Creek						
03111300000100	TUTHILL RANCH INC	100 TUTHILL RD		LYLE	Washington	98635
03121800000000	TUTHILL RANCH INC	100 TUTHILL RD		LYLE	Washington	98635
03121900000100	TUTHILL RANCH INC	100 TUTHILL RD		LYLE	Washington	98635
03121900000200	MILES, LARRY AND MODINE	160 MAJOR CREEK RD		LYLE	Washington	98635
03121900000500	TRIBAL LANDS				No State	
03123000000100	TRIBAL LANDS				No State	
03123000000400	SAUTER,JOHN	381 OLD HWY		LYLE	Washington	98635
03123000001100	SAUTER,DAVID	PO BOX 42		LYLE	Washington	98635-9310
03122900001800	SAUTER,DAVID	PO BOX 42		LYLE	Washington	98635-9310
03122900000600	KROESKOP,CAROL	323 OLD HWY		LYLE	Washington	98635
03122900000800	BURRIS,NEVA	115 BALCH RD		LYLE	Washington	
03122900001100	BOEN,STEPHANIE	31 SAUTER RD		LYLE	Washington	98635
03122900001600	SAUTER,THEODORE	33 SAUTER RD		LYLE	Washington	98635
03123200000300	SAUTER,THEODORE	33 SAUTER RD		LYLE	Washington	98635
South of Area near SR14 to Locke Lake						
03123200000600	DEPT OF TRANSPORTATION	PO BOX 1709		VANCOUVER	Washington	98668
03123100000200	DEPT OF TRANSPORTATION	PO BOX 1709		VANCOUVER	Washington	98668
03123100000300	DEPT OF TRANSPORTATION	PO BOX 1709		VANCOUVER	Washington	98668
03123000000500	DEPT OF TRANSPORTATION	PO BOX 1709		VANCOUVER	Washington	98668
03123000000800	DEPT OF TRANSPORTATION	PO BOX 1709		VANCOUVER	Washington	98668
03123100000600	DEPT OF TRANSPORTATION	PO BOX 1709		VANCOUVER	Washington	98668
03113600000600	DEPT OF TRANSPORTATION	PO BOX 1709		VANCOUVER	Washington	98668
03113600000100	JOHNSTON, HOWARD & JEANETTE	486 OLD HWY		LYLE	Washington	98635-9311
03113600000300	STINGL,DANIEL	7171 HWY 14		LYLE	Washington	98635
	STINGL,DANIEL	PO BOX 2741		BONITA SPRINGS	Florida	34133
03113600000400	DEPARTMENT OF WILDLIFE	600 N CAPITOL WAY		OLYMPIA	Washington	98501-1091
03113500000100	DEPARTMENT OF WILDLIFE	600 N CAPITOL WAY		OLYMPIA	Washington	98501-1091
03113500000800	DEPT OF TRANSPORTATION	PO BOX 1709		VANCOUVER	Washington	98668
03113500000700	BURLINGTON NORTHERN, INC	PO BOX 961089		FORT WORTH	Texas	76161-0089
03113500000900	BURLINGTON NORTHERN, INC	PO BOX 961089		FORT WORTH	Texas	76161-0089
03113400001600	DEPT OF TRANSPORTATION	PO BOX 1709		VANCOUVER	Washington	98668
03112500000200	DEPARTMENT OF WILDLIFE	600 N CAPITOL WAY		OLYMPIA	Washington	98501-1091
North of Allen Oaks - outside NSA						
03111100001500	ALLEN,RODERICK	PO BOX 514		WHITE SALMON	Washington	98672
03111400000100	VANMETER,WILLIAM	15643 VAIL RD SE		YELM	Washington	98597-9563
03111400000200	JENNY,RICHARD	9304 NE 249TH ST		BATTLE GROUND	Washington	98604-9512
03111400000300	VANLEUVEN,SUSAN	9304 NE 249TH ST		BATTLEGROUND	Washington	98604-9512
03111400000600	BINKLY,JERRY	9804 NE 4TH CIRCLE		VANCOUVER	Washington	98664
03111400000700	REBELLO,JOHN	10916 NE 119TH ST		VANCOUVER	Washington	98662
03111400000800	BINKLY,JERRY	9804 NE 4TH CIRCLE		VANCOUVER	Washington	98664

03111400000500	FREE,BRUCE	12770 SE WINSTON RD		BORING	Oregon	97009
03111400001300	FORTANEL,EDUARDO	PO BOX 784		WHITE SALMON	Washington	98672
03111400001400	MOREAU,JACQUELINE	21 CATHERINE CREEK RD		WHITE SALMON	Washington	98672
03111400001600	PAINTER,TROY TRUSTEE	26 N MAJOR CREEK RD		WHITE SALMON	Washington	98672
03111500000501	SDS COMPANY LLC	PO BOX 266		BINGEN	Washington	98605
03111500001000	CROSMAN,CHARLES	PO BOX 1216		WHITE SALMON	Washington	98672
03111500001001	CROSMAN,CHARLES	PO BOX 1216		WHITE SALMON	Washington	98672
03111500001200	LOEB,DOUG	20 W GARFIELD ST		SEATTLE	Washington	98119
03111500000500	SDS COMPANY LLC	PO BOX 266		BINGEN	Washington	98605
Top of Coyote Wall						
03111400001700	SDS COMPANY LLC	PO BOX 266		BINGEN	Washington	98605
03112300000200	SDS COMPANY LLC	PO BOX 266		BINGEN	Washington	98605
03112300000500	THESENGA,BRUCE	144 STAR RIDGE RD		BOZEMAN	Montana	59715
03112300000600	GAUL,WILLARD	7301 SW 26TH AVE		PORTLAND	Oregon	97219
3112350000100	GAUL,TERESA	7301 SW 26TH AVE		PORTLAND	Oregon	97219
3112350000200	GAUL,WILLARD	7301 SW 26TH AVE		PORTLAND	Oregon	97219
3112350000300	GAUL,TERESA	7301 SW 26TH AVE		PORTLAND	Oregon	97219
3112350000400	GAUL,WILLARD	7301 SW 26TH AVE		PORTLAND	Oregon	97219
03112600000400	ALLEN FAMILY RLT	40475 SE HWY 26		SANDY	Oregon	97055

CATHERINE FOREST RESTORATION

COLUMBIA RIVER GORGE NATIONAL SCENIC AREA

Proposed Road Work Sketch

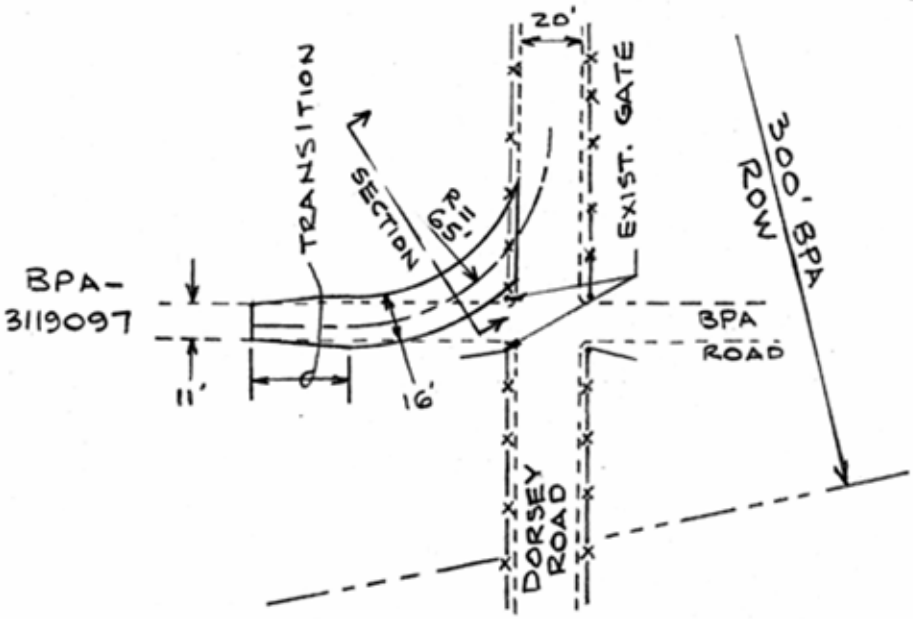
Road BPA-3119097 at the junction with Dorsey Road

Sec. 2, T.3N., R.11E., Dorsey Road Milepost 0.7

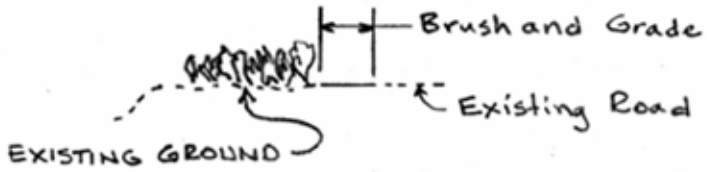
Legend:
R = Radius
ROW = Right of Way

Symbols:
-----x-----x-----x---- = Existing Fence Line
- - - - - - = Edge of Existing Road, gravel or native surface
—— – —— – = Centerline of Proposed Road Work
———————— = Edge of Proposed Road Work

Scale: 1"=50'



PLAN



SECTION
(NO SCALE)

CATHERINE FOREST RESTORATION

COLUMBIA RIVER GORGE NATIONAL SCENIC AREA

Proposed Road Work Sketch

Landing, Sec. 3 at the junction with Snowden Road

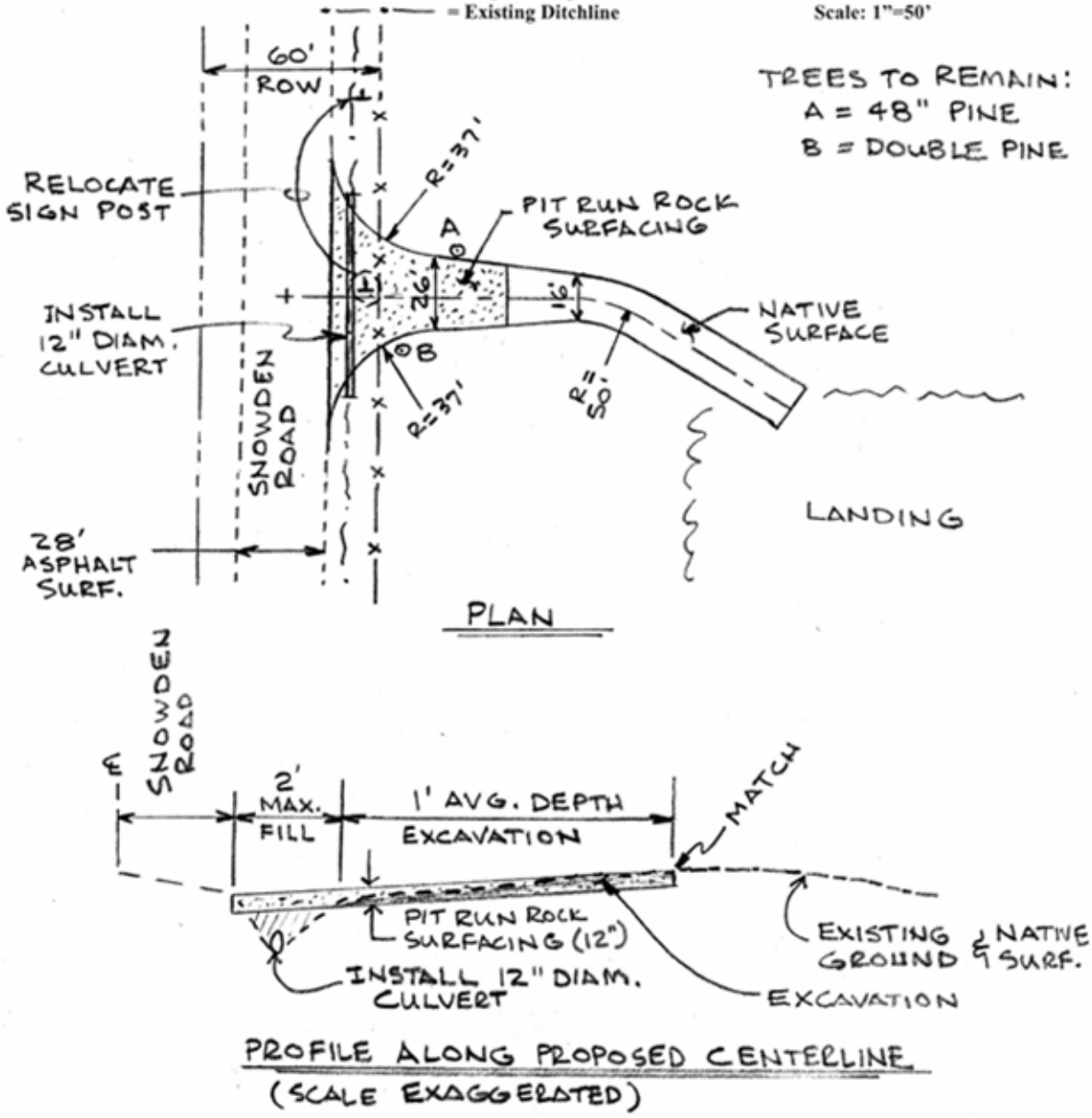
Sec. 3, T.3N., R.11E., Snowden Road Milepost 7.3

Legend:
R = Radius
ROW = Right of Way

Symbols:
-----x-----x-----x---- = Existing Fence Line
- - - - - - = Edge of Existing Road
= Centerline of Proposed Road Work
= Edge of Proposed Road Work
= Existing Ditchline

N

Scale: 1"=50'



CATHERINE FOREST RESTORATION

COLUMBIA RIVER GORGE NATIONAL SCENIC AREA

Proposed Road Work Sketch

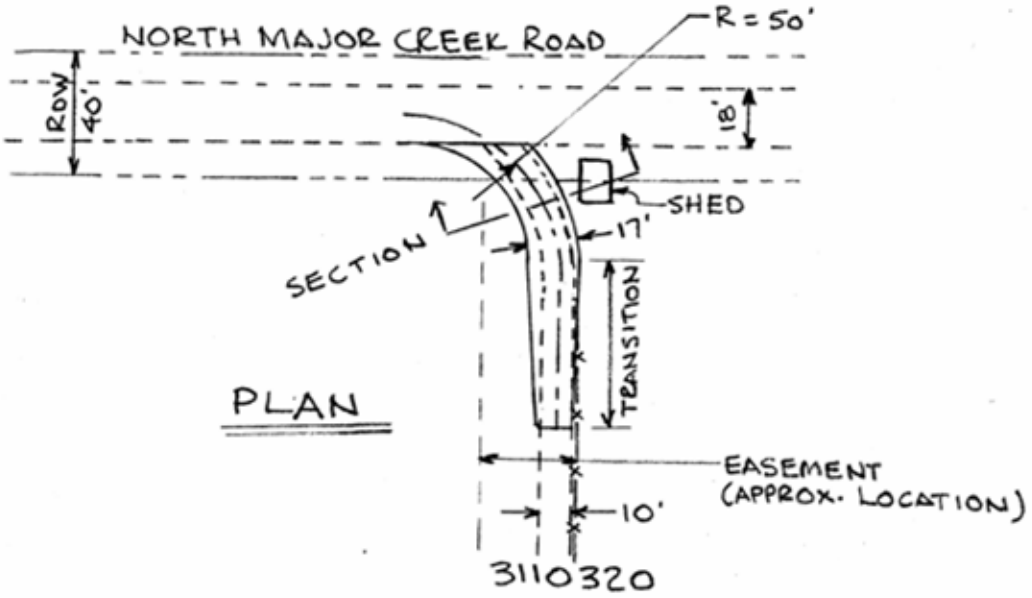
Road 3110320 at the junction with North Major Creek Road

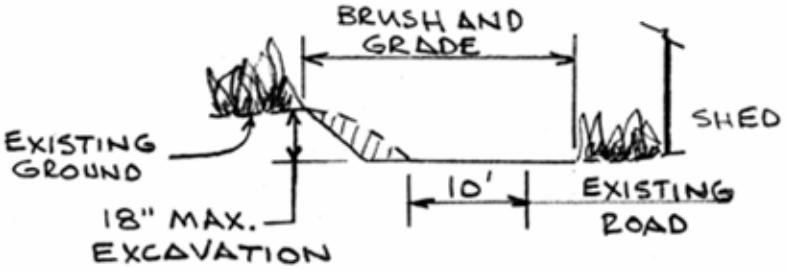
Sec. 14, T.3N., R.11E., North Major Creek Road Milepost 0.6

Legend:
R = Radius
ROW = Right of Way

Symbols:
-----x-----x-----x---- = Existing Fence Line
- - - - - - = Edge of Existing Road, gravel or native surface
—— – —— – = Centerline of Proposed Road Work
———— = Edge of Proposed Road Work

Scale: 1"=50'





SECTION
(NO SCALE)

CATHERINE FOREST RESTORATION

COLUMBIA RIVER GORGE NATIONAL SCENIC AREA

Proposed Road Work Sketch

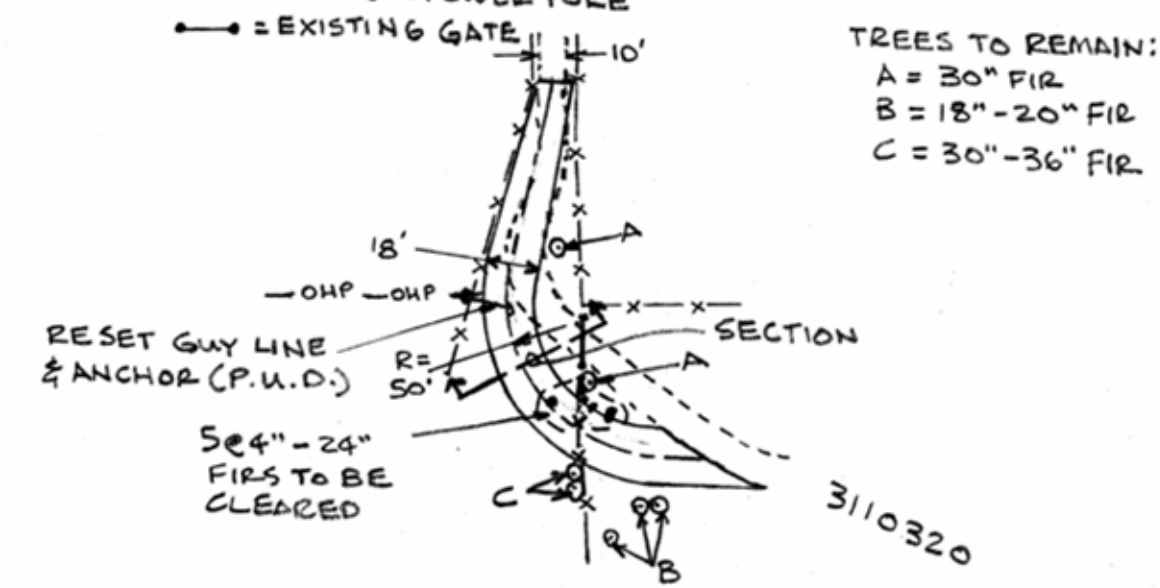
Road 3110320, Milepost 0.5

Sec. 14, T.3N., R.11E.

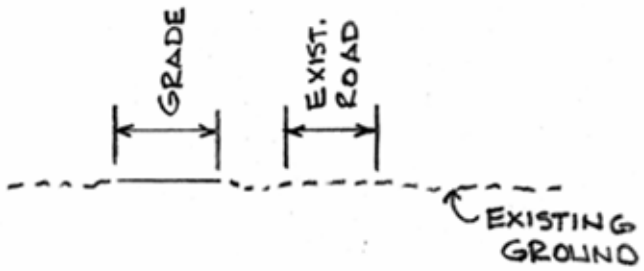
Legend:
R = Radius
ROW = Right of Way

Symbols:
-----x-----x-----x---- = Existing Fence Line
- - - - - - = Edge of Existing Road, native surface
—— – —— – = Centerline of Proposed Road Work
———————— = Edge of Proposed Road Work

Scale: 1"=50'



PLAN



SECTION
(NO SCALE)

CATHERINE FOREST RESTORATION

COLUMBIA RIVER GORGE NATIONAL SCENIC AREA

Proposed Road Work Sketch

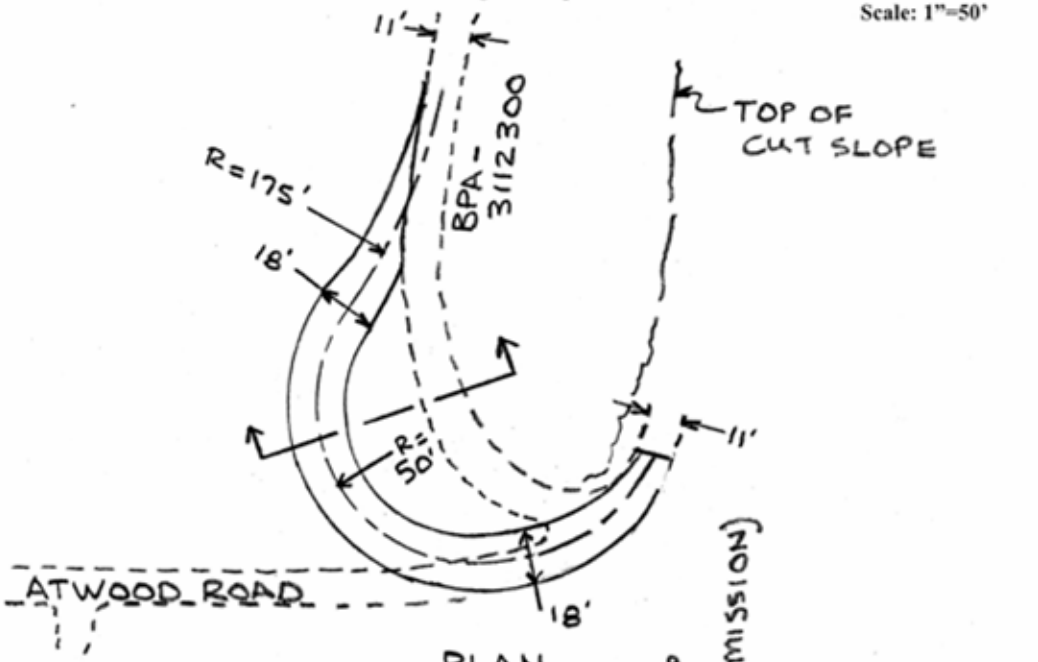
Road BPA-3112300 at the junction with Atwood Road

Sec. 25, T.3N., R.11E., 1.9 miles from Old Hwy. No. 8

Legend:
R = Radius
ROW = Right of Way

Symbols:
-----x-----x-----x---- = Existing Fence Line
- - - - - - = Edge of Existing Road, native surface
—— – —— – = Centerline of Proposed Road Work
———————— = Edge of Proposed Road Work

Scale: 1"=50'



* DEPTH OF EXCAVATION VARIES FROM 3' – 0' WITH AN AVERAGE DEPTH OF 18" AT THIS SECTION.

SECTION
(NO SCALE)

CATHERINE FOREST RESTORATION

COLUMBIA RIVER GORGE NATIONAL SCENIC AREA

Proposed Road Work Sketch

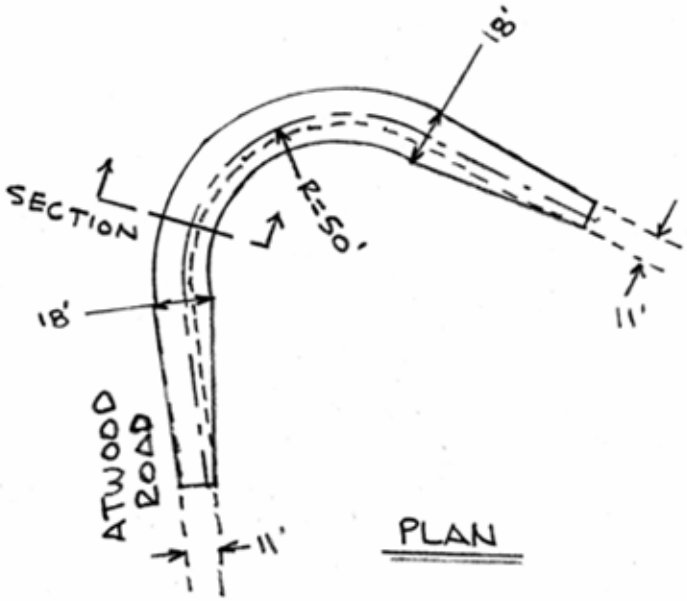
Atwood Road

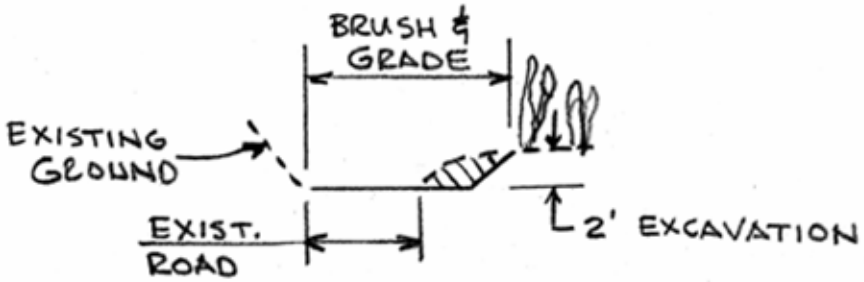
Sec. 25, T.3N., R.11E., 1.65 miles from Old Hwy. No. 8

Legend:
R = Radius
ROW = Right of Way

Symbols:
-----x-----x-----x---- = Existing Fence Line
- - - - - - = Edge of Existing Road, native surface
—— – —— – = Centerline of Proposed Road Work
———————— = Edge of Proposed Road Work

Scale: 1"=50'





SECTION
(NO SCALE)

CATHERINE FOREST RESTORATION

COLUMBIA RIVER GORGE NATIONAL SCENIC AREA

Proposed Road Work Sketch

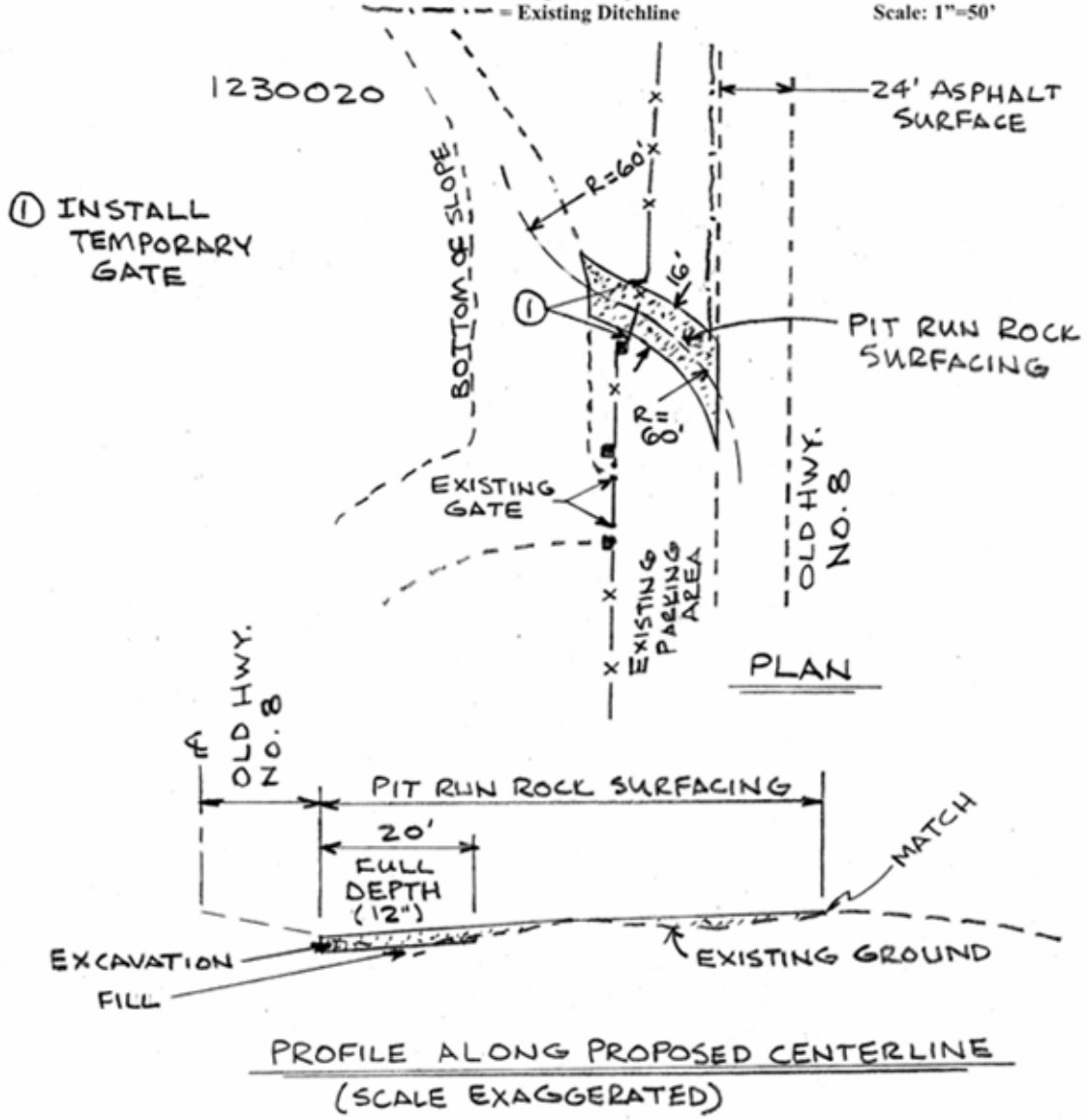
Road 1230020 at the junction with Old Hwy. No. 8

Sec. 25, T.3N., R.11E., Old Hwy. No. 8 Milepost 1.5

Legend:
R = Radius
ROW = Right of Way

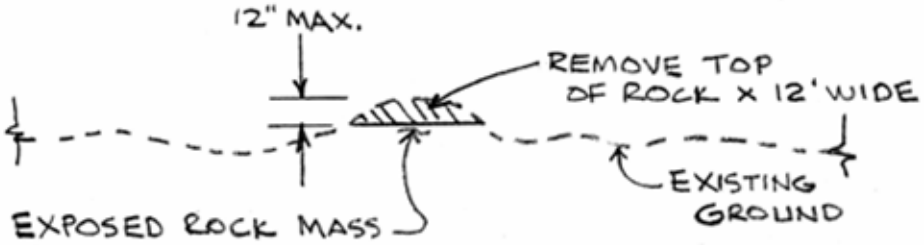
Symbols:
-----x-----x-----x---- = Existing Fence Line
- - - - - - = Edge of Existing Road
— – — – = Centerline of Proposed Road Work
———— = Edge of Proposed Road Work
—·—·— = Existing Ditchline

Scale: 1"=50'



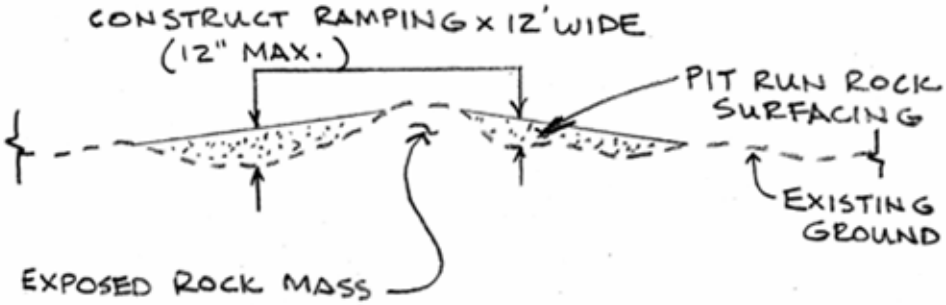
CATHERINE FOREST RESTORATION
COLUMBIA RIVER GORGE NATIONAL SCENIC AREA
Proposed Road Work Sketch

Road 1230020 "Bumps" Milepost 0.05 to Milepost 0.15
Sec. 30, T.3N., R.12E.



TYPICAL PROFILE, TOP OF ROCK REMOVAL
(NO SCALE)

OR



TYPICAL PROFILE, RAMPING
(NO SCALE)

CATHERINE FOREST RESTORATION

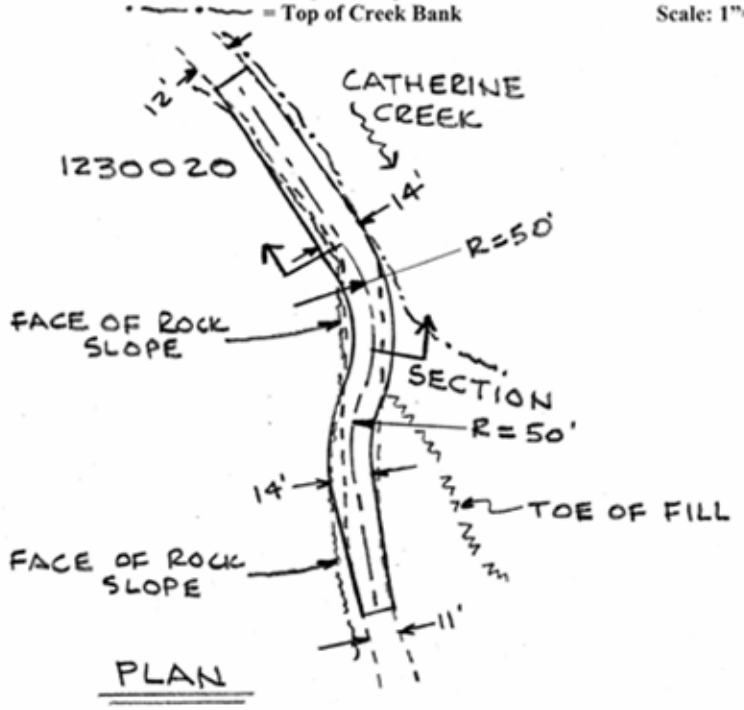
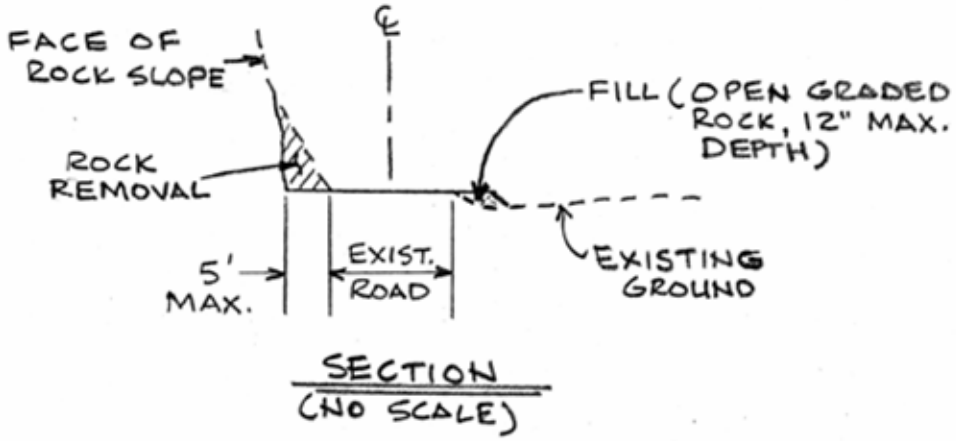
COLUMBIA RIVER GORGE NATIONAL SCENIC AREA

Proposed Road Work Sketch

Road 1230020 Milepost 0.2

Sec. 30, T.3N., R.12E.

Legend:
R = Radius
ROW = Right of Way

Symbols:
-----x-----x-----x---- = Existing Fence Line
- - - - - - = Edge of Existing Road
— — — — = Centerline of Proposed Road Work
———— = Edge of Proposed Road Work
• — • — = Top of Creek Bank

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