



# BURDOIN II FOREST RESTORATION

## Environmental Assessment

Columbia River Gorge National Scenic Area



**March 2009**

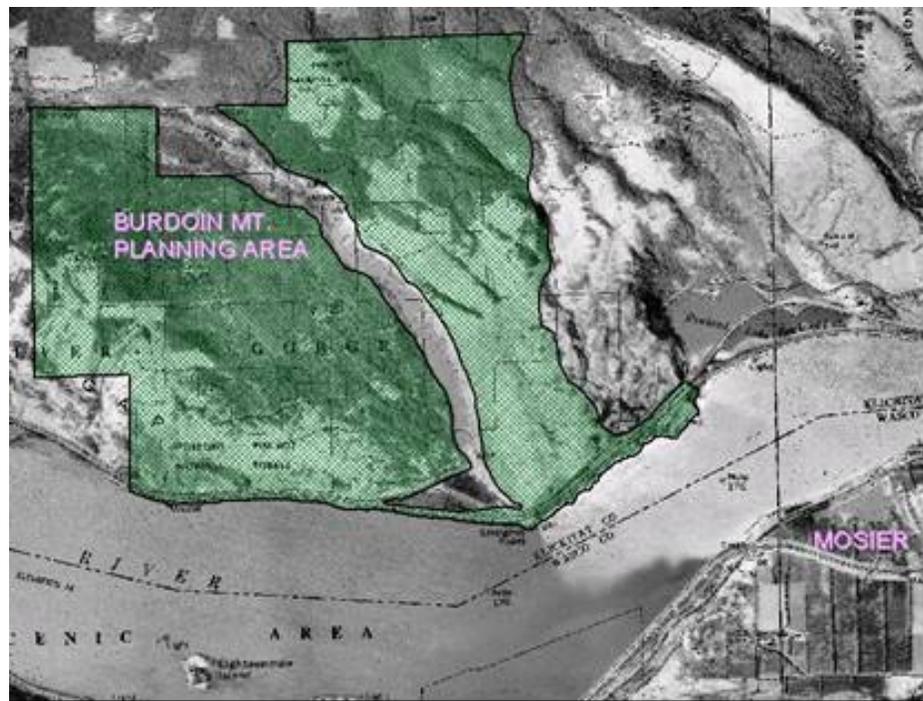
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VICINITY MAPS



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# **CHAPTER 1 - PURPOSE AND NEED FOR ACTION**

## **1.0 Introduction**

The Burdoin II Restoration project was originally developed during a collaborative NEPA process culminating with a Decision Memo in November 2005. In December 2007, the United States Ninth Circuit Court of Appeals ruled against the hazardous fuels reduction categorical exclusion used for Forest Service projects nationally. On November 26, 2008 the Eastern District of California, based on the 9<sup>th</sup> Circuit's opinion, enjoined the Forest Service from using CE's for this purpose and included Burdoin II in a list of projects that could not be implemented. The CRGNSA was advised that an Environment Assessment would be required in order to implement the project. This document takes the information presented in 2005 and reformats it into an Environmental Assessment for the purposes of meeting this requirement. No substantive changes were made to the proposal.

The Burdoin II Restoration project was determined to be consistent with the Columbia River Gorge Scenic Management Plan and Act, in the 2005 Decision Memo as supported by the Findings of Fact– CD-05-02-S (available at the CRGNSA office). The court decision referenced above does not affect these findings.

### **1.1 - Existing Conditions -- Purpose and Need**

The Burdoin Mountain area has undergone significant changes over the last century. Stands that were once open and park-like are now dense with small trees. Tree stands now generally contain less than one-half to one-third the number of large trees in the over-story than existed before 1900. The current condition is a result of over 100 years of fire exclusion and periodic timber harvest of the largest pine, oak, and fir.

Under the pre-1900 fire regime, fires occurred at a frequency great enough to kill younger trees and brush and reduce the fuel loading for the next fire (Wright/Agee, 2003). Fires tended to burn at the surface rather than in the tree crowns, allowing the taller trees to take advantage of the available soil moisture and grow healthy crowns and very large bole diameters. Over the centuries, wildlife and plants became adapted to the frequent surface fires.

The current stand conditions of smaller trees and brush combined with the fuel build-up on the ground has greatly increased the risk of wildfire. Wildfires under these conditions endanger the lives and homes of private property owners on Burdoin Mt. and are a threat to wildlife habitat.

The objectives for the project are to restore, as much as possible, the stand conditions that would support a pre-1900 fire regime that would tend to result in wildfires staying on the ground, thus reducing risk to private property. This would be accomplished by thinning trees so that the stands will be open enough so that prescribed burning could be used to maintain the resiliency of forest habitats associated with a more frequent, surface fire regime. Threatened, endangered or sensitive species such as the western grey squirrel will be protected during the transition.

The stands proposed for treatment are defined by the project description and by the CRGNSA 5-Year Plan for Fire resilient Landscapes as Fire Regime I, condition class 3.

## **1.2- PLANNING AREA LOCATION AND SETTING**

The project is located in T 3N, R 11E, Sections 23, 26, 27, 28, 34, and 35. The planning area is accessed from SR14 on the south via Courtney Road. From the north, the area may be reached by Tunnel, then Cooke Roads.

The western boundary of the project area is 1.3 miles from Bingen, Washington, an at-risk (for impacts from wildland fire) community identified in the Federal Register at Vol. 66 No. 160.

## **1.3 - 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, and slash pile burning. Prescribed fire for this area was covered in the 2007 Catherine Creek Forest Restoration EA.

## **1.4 - 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,
- Take no action at this time

**Guiding Documents:** In addition to the direction given by the National Fire Plan policies, 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).

Guidance is also contained in the Watershed Analysis of the Burdoin- 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).

## **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 April 11, 2005 to interested parties requesting participation in a collaborative effort to design a vegetation management project in the Wildland-Urban Interface including the Burdoin area.

### **Collaboration Meeting Process**

After implementation and effectiveness monitoring was conducted on the work completed under a 2002 environmental assessment, the Area Manager decided not to complete implementation of the 2002 project because the 2004 monitoring report indicated that

limiting the removal of 8” diameter trees did not result in adequately meeting project objectives. On April 11, 2005, the CRGNSA Area Manger sent a letter to interested parties requesting participation in a collaborative effort to design a vegetation management project on Burdoin Mountain to meet the objectives described in the purpose and need section of this document.

From April 26 to June 21, the collaboration team met every other Tuesday. The following individuals and organizations were involved:

1. 12 Private landowners or interested parties
2. Yakama Indian Nation
3. Friends of the Columbia Gorge
4. Gifford Pinchot Task Force
5. Washington Department of Fish and Wildlife
6. USDA, Forest Service

The collaboration team developed a description of what each forest type in the planning area would look like in the future (2105) as a result of the application of a more natural fire regime. The team created the following:

1. Description of Attributes: Description of the character of the overstory tree layer, understory tree layer, shrub/herbaceous layer, and openings that would be present as a result of a more natural fire regime.
  2. Species Composition and Canopy Closure: On average, what % of the sky would be covered by the canopy of trees and how much each type of tree should contribute to this mix?
  3. Average Tree Size (Size Composition): How big would the trees be in 100 years? This is measured in diameter at breast height (in inches).
  4. Prescriptions and implementation requirements: After determining the desired future conditions of each stand type, the team determined the pathway for reaching those conditions with a thinning in 2005.
- 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 Ecosystem 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.

### **What the Burdoin Collaborative Team Developed:**

For each forest type (Oak-pine woodlands, Pine-Oak-Douglas fir, and East Conifer), the team described what it would look like in the future (2105) as a result of the application of a more natural fire regime. To do this, the team determined:

- 1 Description of Attributes: Description of the character of the overstory tree layer, understory tree layer, shrub/herbaceous layer, and openings that would be present as a result of a more natural fire regime.
- 2 Species Composition and Canopy Closure: On average, what % of the sky would be covered by the canopy of trees and how much each type of tree should contribute to this.
- 3 Average Tree Size (Size Composition): How big would the trees be in 100 years? This is measured in diameter at breast height (in inches).

Prescriptions and implementation requirements: After determining the desired future conditions of each stand type, the team determined the pathway for reaching those conditions with a thinning in 2005.

### **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 Herbaceous Layer: Herbaceous 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 Herbaceous 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 - PUBLIC INVOLVEMENT AND CONSULTATION**

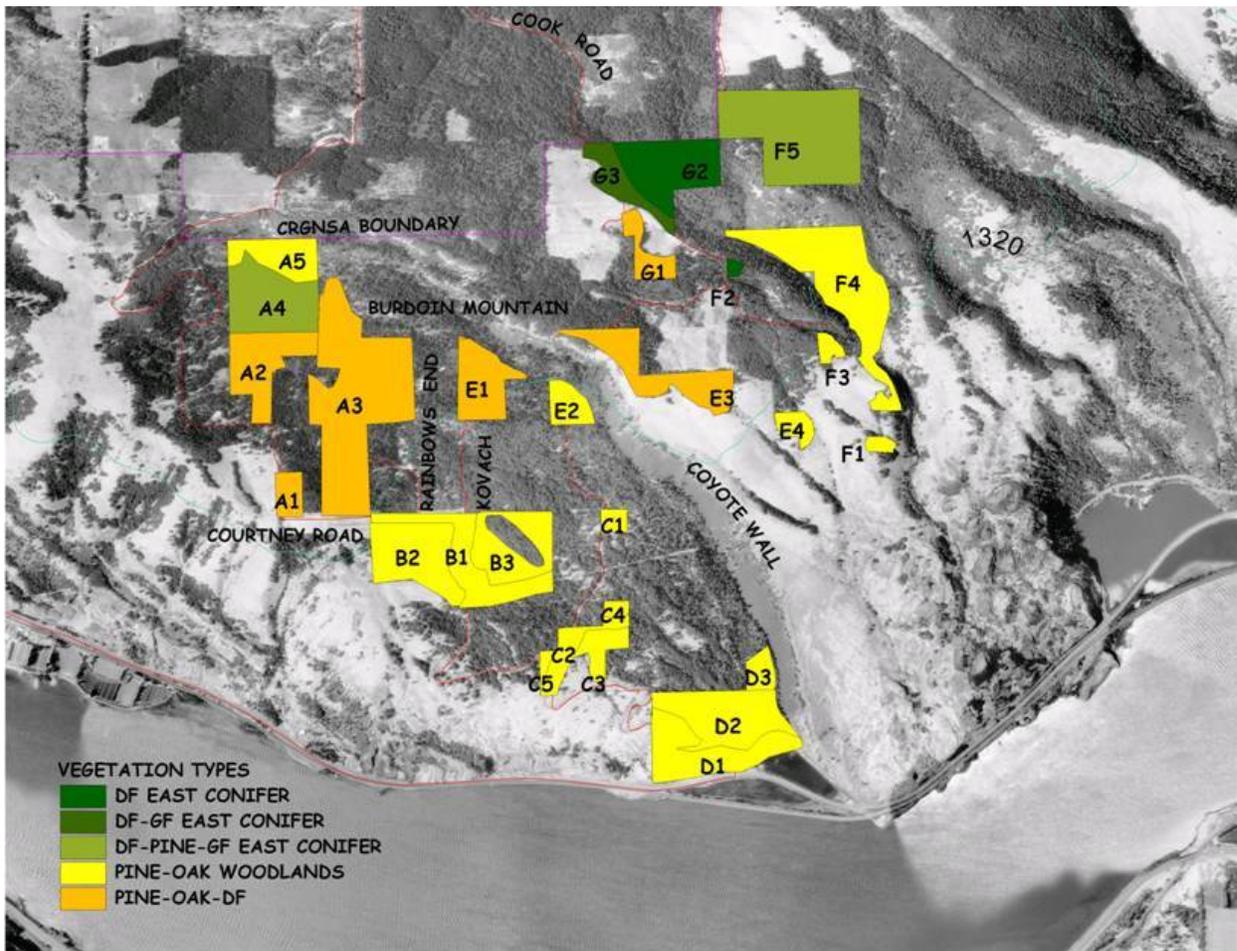
### **Public Scoping and Coordination with the Tribes and other Agencies:**

The draft project description was placed on the CRGNSA website and sent to the collaboration team, the four CRGNSA tribes, the Gorge Commission and other interested parties on June 30, 2005. Four comment letters were received.

An updated project description and draft decision notice and findings of fact were placed on the CRGNSA website and sent to the collaboration team, the four CRGNSA tribes, the Gorge Commission and other interested parties on August 10, 2005. A summary of the comments from the two comment periods is found in Appendix A.

### **THE PROPOSAL**

The Columbia River Gorge National Scenic Area (CRGNSA) proposes to thin 28 treatment areas totaling approximately 479 acres of Fire Regime I, condition class 3 tree stands in the Wildland-Urban Interface on Burdoin Mountain. Thinning will be “from below” meaning that the smallest--mostly understory trees in the stands will be removed to achieve the prescribed canopy closure after treatment. Slash not suitable for firewood will be machine or hand piled and burned using hand-dug fire line. Haul routes will be on existing roads or tracks wherever possible. Less than ½ mile of temporary access will be constructed with this decision. All temporary access will be rehabilitated and seeded with native grasses. The project analysis assumes maintenance of the thinning either through future prescribed underburning or by mechanical means. The project implementation window is from July 1 through February 28 (unless harsh winter range conditions would reduce it) to avoid disturbance to plants and wildlife.



## 1.7 - 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.

### **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.

## **1.8 - 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 Burdoin collaborative group can be found on the CRGNSA website <http://www.fs.fed.us/r6/columbia/forest/projects/>

## **1.9 -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 Herbaceous 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.

## **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 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 proposed.

### **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 Burdoin Planning Area to improve fire resilience or restore ecosystem components to a pre-1900 fire regime. No treatments would be taken to reduce the risk of wildfires on adjacent private lands and to wildlife habitat.

#### **Alternative 2- Proposed Action**

This alternative proposes to thin 28 treatment units totaling 479 acres of Fire Regime I, condition class 3 tree stands in the Wildland-Urban Interface on Burdoin Mountain. Design elements of this alternative follow. A map with treatment units is located on page 5.

## **Implementation Requirements**

### **Air Quality**

1. Minimize the amount of material burned by making it available for other uses such as 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 some 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**

3. Off road equipment shall be minimized to the maximum extent possible to minimize impacts to resources.
4. The alignment of new haul routes will be pre-designated and agreed to by the CRGNSA hydrologist, engineer, and ecologist prior to piling activities.
5. Track-mounted piling equipment shall operate on top of slash to minimize soil disturbance where possible.
6. Ground based slash piling methods will not be allowed on slopes steeper than 30%. These steeper areas will be hand piled if fuel reduction is necessary.
7. All haul routes having detrimental soil compaction will be ripped to a depth of 18", water-barred, seeded with native grass seed, and mulched with fine slash. Haul routes with access to any main roads will be closed off to eliminate use of the road after project completion.
8. 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.
9. The access road for unit B3 will have pre and post-project maintenance that will correct existing drainage problems on the road. This maintenance will help reduce existing erosion and resulting sedimentation.
10. No mechanized slash piling equipment will be allowed within 200 ft. of perennial streams. This material will either be removed by hand or lopped and scattered in the riparian area. Any cut material that ends up in a stream channel will be removed from the channel and placed at least 15' away. This will ensure channel stability will be maintained by minimizing disturbance in the riparian area and keeping small, unstable material out of the channel.
11. A 200' no-treatment buffer will be maintained for the perennial streams.
12. Mechanized equipment will not be allowed to operate within 20' of ephemeral channels except to cross them at designated crossings.
13. Activities within 50 feet of any stream shall be carefully monitored to ensure that the integrity of the immediate buffer area is not compromised. Treatment should be kept to a minimum in this zone.
14. All wetland-dependent vegetation will be left undisturbed.
15. Haul route crossings of ephemeral draws will have culverts installed if the trail is to stay in place over the winter. This will allow any runoff to pass through the crossing unimpeded. All fill material in draws will be removed from the ephemeral draw crossings after hauling is completed.
16. All noxious weed infestations will be located and avoided as much as possible to avoid potential spread.

17. Clean equipment before entering National Forest System lands and before moving to each treatment area in a manner that will ensure that it is not contributing to the spread of noxious weeds.
18. Existing dead and down large (>20" dbh) woody material shall remain and be protected. To supply habitat for small mammals living in the project areas, 120 linear feet of course wood for every acre of habitat treated will be maintained. Course wood should be at least six inches in diameter or greater (if available), and includes that which is currently on the ground, and trees that are cut during the project implementation.
19. Snags and large woody debris shall be created where deficient as per Management Plan requirements where stand conditions provide opportunity.
20. Project activities will occur outside of the growing season of plants and the general nesting/rearing season for birds, grey squirrel and other wildlife species (March 1 to June 30).
21. 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 to March 31 to reduce cumulative disturbance to deer/elk on their designated winter range.
22. All active squirrel nest sites shall have a 50 ft. no entry buffer around the nest tree.
23. 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.
24. 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.
25. Opportunities exist to enhance habitat for native wildlife species after treatment by re-vegetating all disturbed areas with desired native bunch grass, forb and shrub species. Appropriate forage species for big game winter range includes bluebunch wheatgrass (*Agropyron spicatum*), Idaho fescue (*Festuca idahoensis*), Serviceberry (*Amelanchier alnifolia*), arrowleaf balsamroot (*Balsamorhiza sagittata*), deerbrush (*Ceanothus integerrimus*), and others.
26. Open grassy meadows will be disturbed as little as possible (CRGNSA Botanist will help identify potential slash burn pile locations).
27. 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**

28. Visible stumps greater than 8" DBH within the near Foreground (100 ft.) of Courtney Road and SR-14 will be flush cut. No slash will be piled within the near foreground (100 ft.) of Courtney Road or on trails.
29. Leave islands (if necessary for scenic resources) will be combined with leave islands for natural resources where possible. A CRGNSA landscape architect shall be consulted for location of leave clumps near the FS boundary and SR-14.
30. No permanent tree marking shall be used except the marking of boundary trees near the base of each tree.

#### **Recreation and Recreational Facilities and Access**

31. For public safety purposes, the user-made mountain bike trail and the immediate area the trail serves will be closed to the public during treatment activities.
32. Trail users and general public will be notified by posting warning signs at key trail intersections, corral area and along Courtney road. Post message explaining the

- reason for treatment activities at the Courtney Road trailhead. Develop and distribute press release/key messages to local press and web site.
33. Notify the Columbia Gorge Area Mountain Biking Association (CAMBA) prior to project implementation.
  34. Before project commences, pursue necessary agreements with landowners for access to E1, E2.

### **Cultural Resources**

35. Archeological sites shall be identified in the field and taken out of the treatment boundaries, including the appropriate buffers.
36. Should any historic or prehistoric cultural resources be uncovered during project activities, the applicant shall cease work and immediately notify the CRGNSA office and the Washington Office of Archeology and historical Preservation. The applicant should also notify the Indian Tribal governments within 24 hours if the resources are prehistoric or otherwise associated with Native American Indians.

### **Vegetation Management**

37. Prescriptions or marking guides shall describe the attributes of a healthy oak tree that will respond to release by thinning and shall ensure tree spacing variability for aerial-pathways and interlocking canopies.
38. Treatment areas shall be reviewed for snag creation needs as part of this project.
39. Snags and down wood shall not be taken for firewood. Firewood permits and signs at cutting areas shall state this prohibition.
40. The project shall be monitored after implementation and any disturbed soil shall be seeded with vegetation native to the area at the start of the following wet season.

## **CHAPTER 3 - ENVIRONMENTAL EFFECTS**

### **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. Discussions of the effects were brought forward from the November 18, 2005 Consistency Review and Finding of Facts – CD-05-02-S. Resource specialist reports and evaluations are contained in the Project File at the Columbia River Gorge National Scenic Area office. Readers will also find additional cumulative effects discussions in the 2007 Catherine Creek Forest Restoration EA.

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**

<b>PROJECT NAME/ TYPE</b>	<b>ACTIONS</b>	<b>LOCATION/DATE</b>
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
Land acquisitions	Purchase SMA lands	After 1986-present
Historic Forest Practices	Historic Harvests large oak, pine, Douglas-fir	Planning area/ circa 1860-1920
Catherine Creek Forest Restoration	Thinning & under burning 2510 acres	On-going

**Reasonably Foreseeable Future Projects or Actions within the Planning Area**

<b>PROJECT NAME/ TYPE</b>	<b>ACTIONS</b>	<b>LOCATION/DATE</b>
Coyote wall FS trails	Designated trails and decommissioning unwanted trails	After 2008
Land acquisitions	Purchase SMA lands	Unknown
Invasive Plant treatments	Herbicide or Mechanical Treatment	On-going

### ***Land Use Designations***

The Burdoin area lies within the Agricultural land use designation. The Management Plan defines a forest practice as “any activity conducted on or directly pertaining to forested land and relating to forest ecosystem management including, but not limited to, growing, thinning or removing live or dead forest tree or shrub species, road and trail construction, reforestation, fertilizing, brush control, prevention of wildfire, and suppression of diseases and insects...” The project is a forest practice and an allowed use.

## *Scenic Resources*

1. The project area is located in the Oak-pine Woodland landscape setting and Forest and Agriculture land use designations. The scenic standard that the project must meet is visually subordinate from Key Viewing Areas (KVAs) which is defined as “A description of the relative visibility of a structure or use where that structure or use does not noticeably contrast with the surrounding landscape... **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.**” The Gifford Pinchot Forest Plan requires (in the foreground) that stumps be flush cut or otherwise concealed if they are visible.

Diana Ross, CRGNSA landscape architect provided the following scenic analysis:

<b>REQUIRED SMA SCENIC STANDARDS</b>		
<b>LANDSCAPE SETTING</b>	<b>LAND USE DESIGNATION</b>	<b>SCENIC STANDARD</b>
Coniferous Woodland, Oak-Pine Woodland	Forest, Agriculture, Residential, Public Recreation	Visually Subordinate

Key Viewing Areas: The project is topographically visible from the Columbia River, I-84, Tom McCall Point, the Historic Columbia River Highway (HCRH) at Mosier, Memaloose Overlook in Rowena, and SR-14.

SR-14 is an important view because parts of the thinning will be visible in the foreground distance zone. However, the view is not expansive because topography (treatment areas above the viewer at an acute angle) blocks all but the views of the “D” treatment areas which will need very little thinning.

Viewpoints from the west are the Columbia River, HCRH, and I-84 near Mosier. They are all similar. The view from I-84 from Mosier has been chosen for analysis because it is close to the project area and highly traveled. The views from the east are represented by Memaloose Overlook viewpoint on the HCRH, the Columbia River, and I-84. They are similar. The view from Memaloose Overlook has been chosen for analysis because it a potentially long duration view on an important historic highway.

The project will meet the required scenic standard from the rest of the KVAs from which it is visible due to distance, the size and scope of the thinning, and the location of the treatment areas. All pictures were taken with a telephoto rather than a wide angle lens:

Project area from KVAs West of the Project Area

Looking directly into the project area from I-84 at Mosier:

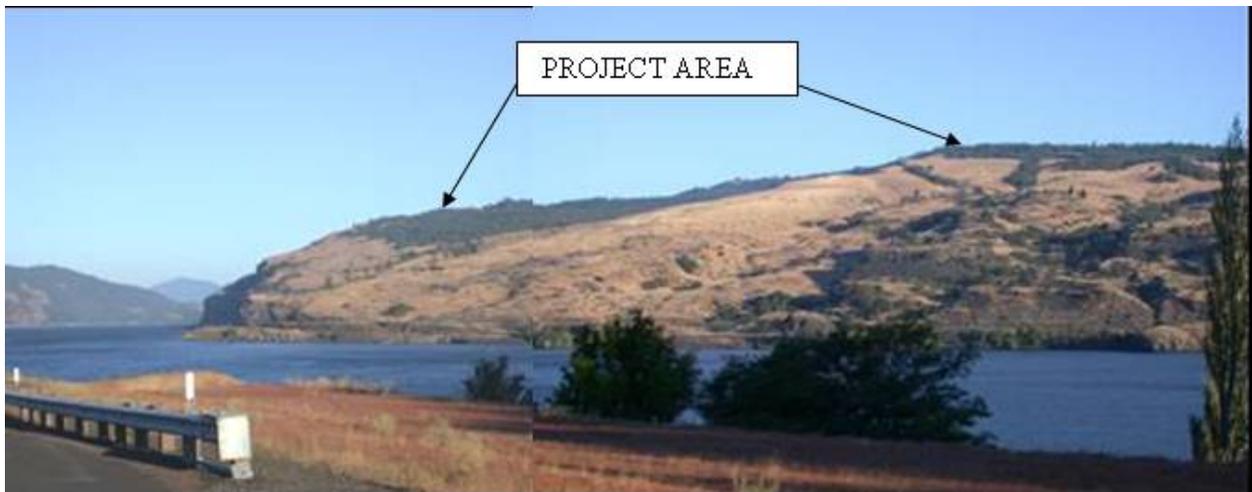


Looking from the HCRH just east of the east portal of the twin tunnels near Mosier:



Project area from KVAs East of the Project Area

Looking directly into the project area from I-84 east of Mosier:



Note that the viewer is looking at the back of Coyote Wall which is not visible.

Looking west from Memaloose Overlook on the HCRH east of Mosier:



**Form, Line, Color, or Texture Common to The Natural Landscape**

The following chart summarizes findings concerning the elements described in the definition of visual subordination for forest practices. The short-term negative factors require mitigation in order to be visually subordinate and not dominate--especially the foreground views:

<b>LANDSCAPE ELEMENT</b>	<b>NATURAL</b>	<b>EXISTING</b>	<b>AFTER TREATMENT</b>	<b>DEGREE CHANGE (From Natural)</b>
<b>LANDSCAPE PATTERN (Form/Line)</b>	MOSAIC	MOSAIC (probably fewer openings)	MOSAIC (no change from existing)	MINIMAL (due to existing conditions rather than treatments)
<b>LANDSCAPE STRUCTURE (Form, Line, Color)</b>	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. May be less screening for existing development	Short Term: MEDIUM (but caused by existing condition more than by treatment)  Long Term: MINIMAL, Prescribed fire would help create park-like, cathedral conditions.
<b>GROUND PLANE (Color, Texture)</b>	Grasses Wildflowers Short Shrubs	Many areas grass and wildflower layer shaded out. Shrubs overgrown.	Short Term: Disturbed Long-term: Grasses, Wildflowers, Short Shrubs Disturbed ground, stumps, slash, spindly trees, boundary marks	Short Term: MEDIUM Long Term: MINIMAL Concern for Foregrounds only

**Effects of No Action to Scenic Resources**– The major possible effect of no action comes from the impacts of a catastrophic wildfire should one occur and severely damage the existing scenery of the landscape.

**Cumulative Effects-** Friends’ July 29 comment letter stated that the Forest Service must “include consideration of the cumulative effects of the proposed project”. The viewsheds analyzed have a high visual absorption capability due to the existing mosaic landscape pattern. Therefore, it is unlikely that the proposed prescriptions if planned for similar areas in the foreseeable future to meet scenic standards would cumulatively create visual dominance within these viewsheds. There is currently no known visible evidence of past timber harvests or proposed SMA forest practices on non-NFS lands in the viewsheds analyzed. Additional effects from the Catherine Creek Restoration project would be similar to those described for Burdoin. Most of the acreage of both projects is in the middle-ground or background distance zone from key viewing areas. Should adjoining private land be treated for fuels reductions, the projects would be reviewed for consistency with the Management Plan to ensure that scenery impacts are minimized. Cumulative positive effects of these projects would be to reduce the overall fire risk in the Gorge and to increase the grassy meadow and wildflower prevalence under the trees.

The project description stipulates the following requirements to meet scenic standards:

- Visible stumps greater than 8” DBH within the near Foreground (100 ft.) of Courtney Road and SR-14 will be flush cut. No slash will be piled within the near foreground (100 ft.) of travel-ways or trails.
- Leave islands (if necessary for scenic resources) will be combined with leave islands for natural resources where possible. A CRGNSA landscape architect shall be consulted for location of leave clumps near the FS boundary and SR-14.
- No permanent tree marking shall be used except the marking of boundary trees near the base of each tree.

With the above requirements, the project will meet scenic standards.

## 2. Created Opening Chapter 2 (Forest Land) SMA Guidelines Review uses, **1.X.(4) b-g**

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.”

No created openings are proposed and no created openings will result from this project. Prescriptions for the east conifer and oak/pine vegetation types require average canopy closures of 42-73 percent which falls within the desired limits required by the Management Plan as indicated below with an excerpt from the Desired Forest Pattern and Structure table below:

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

## *Cultural Resources*

The project area was surveyed by the CRGNSA archeologist Marge Dryden and Sarah F. McDaniel in 2003 with concurrence from the State of Washington Archeology and Historic Preservation Office on June 30, 2005. Several sites were found. The Indian tribal governments were notified On June 23 by Marge Dryden and on June 30 by the CRGNSA planning staff. No written comments were received.

**Effects of No Action on Cultural Resources-** There would be fewer potential impacts to known and unknown cultural resources from not taking any management actions. However, the risk to the resources from catastrophic wildfire would be greater.

In order to avoid adverse effects, Marge Dryden recommended requiring that the archeological sites be identified in the field and taken out of the treatment boundaries, including the appropriate buffers. Thinning, piling and burning the project area outside of the archaeological sites will have no effect on any significant prehistoric or early historic cultural resources, according to Ms. Dryden.

An additional requirement was added in Chapter 2 stating that should any historic or prehistoric cultural resources be uncovered during project activities, the applicant shall cease work and immediately notify the CRGNSA office and the Washington Office of Archeology and historical Preservation. The applicant should also notify the Indian Tribal governments within 24 hours if the resources are prehistoric or otherwise associated with Native American Indians.

**Cumulative Effects -** Since no effects determinations have been made for this project, Catherine Creek Restoration and other local projects under the regulations of the Management Plan, there would be no cumulative effects to cultural resources.

## *Natural Resources*

### Vegetation

The Management Plan discusses two vegetation types for the area: East Conifer and Ponderosa Pine/Oregon Oak. The collaboration team used more finely described vegetation types in order to be more precise about desired conditions and silvicultural prescriptions. East Conifer remains the same as discussed in the Management Plan. The Oak/pine woodlands vegetation type is the same as the Management Plan Ponderosa Pine/Oregon Oak

type. The Pine/Oak/Douglas-fir type described by the collaboration team is “between” East Conifer and Ponderosa Pine/Oregon Oak and contains some characteristics of both.

Taking no management action in the planning area would preclude the opportunity to return the landscape to a more naturally occurring setting because of continued fire exclusion and encroachment by fir.

Oak/pine woodlands—The Management Plan requires a total canopy of between 25-60% with the understory layer (oaks) greater than 25% of the canopy. The project desired condition calls for total canopy of 25-60% and oaks would be from 50-75% of that canopy.

The post-treatment total canopy average is 42%, ranging from 25% to 80%. The existing conditions include canopies that exceed 100%. The post treatment canopy is more closed than required by the Management Plan. Friends’ comment letter indicated that getting to the desired condition in one treatment is too fast. According to the applicant, treatment is not intended to reach desired conditions immediately following the thinning. It will take more than 100 years to reach the desired conditions. Prescribed fire is needed to complete the stand restoration.

Savanna areas will not be created by the treatments. The GP Task Force comment letter indicated concern about where savannas would be located. According to the applicant, savannas will remain where healthy large oaks exist, currently with no in-growth, or where small oaks have grown in around them. A condition should be placed requiring that the prescriptions or marking guides describe the attributes of a healthy oak tree that will respond to release by thinning.

Pine/Oak/Douglas-fir— The Pine/Oak/Douglas-fir type described by the collaboration team is “between” the East Conifer and Ponderosa Pine/Oregon Oak Management Plan descriptions and contains some characteristics of both. The Management Plan requires a total average canopy closure of 25-60% for Ponderosa Pine/Oregon Oak and 40-80% for East Conifer. The project desired condition calls for total canopy of 30-70% which shows that it is a gradation between the two stand types.

The Collaboration team developed a project prescription calling for total canopy of 25-60% with an overall average of 48% where large overstory pine and releasable oak are present in the stand. Where large ponderosa pines or releasable oaks are not present, the canopy will take on the characteristics of East Conifer with an average canopy of 65%. The post treatment average total canopy requirements are within the Management Plan limits for East Conifer (average 40-80%) at 48-65% and would also fit the Management Plan Ponderosa Pine/Oregon Oak type which requires 40-60%--even though the 65% is a bit too closed for the pine types, it would only be applied in areas where pine is not present.

East Conifer—The Management Plan requires a total average canopy closure of 40-80% for East Conifer. The project desired condition calls for total canopy of 50-70%.

The Collaboration team developed a project prescription calling for total canopy of 54% where large overstory pine and releasable oak are present in the stand. Where large ponderosa pines are or releasable oak are not present, the canopy average will be 73%. The average total canopy requirements for after-treatment are within the Management Plan limits for East Conifer.

The collaboration team decided not to create openings for pine regeneration which would require at least a one-acre opening to allow enough sunlight. The GP Task Force comment recommended ½ acre openings. These types of openings are common in old growth forests and regenerate shade tolerant species, not shade intolerants such as pine and Douglas-fir.

No created openings are proposed. See findings under scenic resources above.

The project does not include removal of any existing dead and down material. No existing trees greater than 20” are proposed for removal to create new down wood. A requirement in Chapter 2 calls for existing dead and down large woody material to remain. In addition it is also required that the treatment areas be reviewed for snag creation needs as part of this project. Comment by GP Task Force indicated that firewood areas tend to lose snags and down wood. A requirement was thus created that fire permits and signs protect snags and down wood.

**Air Quality** - The project description lists the following for protection of air quality:

- Minimize the amount of material burned by making it available for other uses such as post and poles and habitat restoration projects as a first priority.
- 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 some 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. An individual commented that the Forest Service should not risk even burning piles and should consider a no-burn option. This risk was considered by the collaboration team and the project includes a provision for hand-dug fire line to protect the slash piles during burning in addition to the mitigations mentioned above.

**Cumulative Effects** - Cumulatively, this project and the nearby Catherine Creek Restoration project would have few long lasting effects to general natural resources because the impacts from management activities to vegetation, soils and air quality are minimized by numerous design criteria built into the project. For instance, under burning on Burdoin Mountain and Catherine Creek would not take place at the same time. See the 2007 Catherine Creek Forest Restoration EA for more details.

**Water Resources**  
**(Wetlands, Streams, Ponds, Lakes, And Riparian Areas)**

A Mitigation Plan for water resources has been completed and is located in the project file; the mitigations are listed below:

- Off road equipment shall be minimized to the maximum extent possible to minimize impacts to resources.
- The alignment of new haul routes will be pre-designated and agreed to by the CRGNSA hydrologist, engineer, and ecologist prior to piling activities.
- Track-mounted piling equipment shall operate on top of slash to minimize soil disturbance where possible.
- Ground based slash piling methods will not be allowed on slopes steeper than 30%. These steeper areas will be hand piled if fuel reduction is necessary.
- All haul routes having detrimental soil compaction will be ripped to a depth of 18”, water-barred, seeded with native grass seed, and mulched with fine slash. Haul routes

with access to any main roads will be closed off to eliminate use of the road after project completion.

- 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.
- The access road for unit B3 will have pre and post-project maintenance that will correct existing drainage problems on the road. This maintenance will help reduce existing erosion and resulting sedimentation.
- No mechanized slash piling equipment will be allowed within 200 ft. of perennial streams. This material will either be removed by hand or lopped and scattered in the riparian area. Any cut material that ends up in a stream channel will be removed from the channel and placed at least 15' away. This will ensure channel stability will be maintained by minimizing disturbance in the riparian area and keeping small, unstable material out of the channel.
- A 200' no-treatment buffer will be maintained for the perennial streams.
- Mechanized equipment will not be allowed to operate within 20' of ephemeral channels except to cross them at designated crossings.
- Activities within 50 feet of any stream shall be carefully monitored to ensure that the integrity of the immediate buffer area is not compromised. Treatment should be kept to a minimum in this zone.
- All wetland-dependent vegetation will be left undisturbed.
- Haul route crossings of ephemeral draws will have culverts installed if the trail is to stay in place over the winter. This will allow any runoff to pass through the crossing unimpeded. All fill material in draws will be removed from the ephemeral draw crossings after hauling is completed.
- All noxious weed infestations will be located and avoided as much as possible to avoid potential spread.
- Clean equipment before entering National Forest System lands and before moving to each treatment area in a manner that will ensure that it is not contributing to the spread of noxious weeds.
- Existing dead and down large (>20" dbh) woody material shall remain. To supply habitat for small mammals living in the project areas, 120 linear feet of course wood for every acre of habitat treated will be maintained. Course wood should be at least six inches in diameter or greater (if available), and includes that which is currently on the ground, and trees that are cut during the project implementation.
- Snags and large woody debris as per Management Plan.
- Project activities will occur outside of the growing season of plants and the general nesting/rearing season for birds, grey squirrel and other wildlife species (March 1 to June 30).
- 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 to March 31 to reduce cumulative disturbance to deer/elk on their designated winter range.
- All active squirrel nest sites shall have a 50 ft. no entry buffer around the nest tree.
- 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.
- 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.

- Opportunities exist to enhance habitat for native wildlife species after treatment by re-vegetating all disturbed areas with desired native bunch grass, forb and shrub species. Appropriate forage species for big game winter range includes bluebunch wheatgrass (*Agropyron spicatum*), Idaho fescue (*Festuca idahoensis*), Serviceberry (*Amelanchier alnifolia*), arrowleaf balsamroot (*Balsamorhiza sagittata*), deerbrush (*Ceanothus integerrimus*), and others.
- Open grassy meadows will be disturbed as little as possible (CRGNSA Botanist will help identify potential slash burn pile locations).
- 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.

**The following buffer zone widths shall be required:**

**(a) A minimum 200 foot buffer on each wetland, pond, lake, and each bank of a perennial or fish bearing stream, some of which can be intermittent.**

**(b) A 50-foot buffer zone along each bank of intermittent (including ephemeral), non-fish bearing streams.**

There are two perennial non-fish bearing streams in the project area. The project proposal does not include thinning with the water resource buffer zones. The perennial stream buffers will be excluded from the project boundary.

In addition to the CRGNSA water resource buffer requirements, the streams are subject to the requirements of the Gifford Pinchot Forest Plan, as amended by the Northwest Forest Plan. The buffer width requirement for perennial non-fish bearing streams is 150'. The Management Plan buffer exceeds this requirement. Fish and wildlife habitat restoration and enhancement activities are allowed in riparian reserves.

When a buffer zone is disturbed by a new use, it shall be replanted with only native plant species of the Columbia River Gorge.

**Buffer zones shall be undisturbed unless the following criteria have been satisfied:**

**(1) The proposed use must have no practicable alternative as determined by the practicable alternative test.**

A Practicable Alternatives Test has been completed:

The proposal is an enhancement project and the enhancement activities are desirable and needed within the buffer zones of the ephemeral streams. Therefore, entry into these buffers is required and there is no practicable alternative if the buffer zones are to be treated. The need to accomplish this work relates to enhancing the oak/pine woodlands and the East conifer zone, and requires entry into the ephemeral buffer zones, and those of other sensitive resources, such that the enhancement efforts can be accomplished within those selected areas. The ephemeral streams have more in common with an upland vegetation zone than riparian. The amount of work within the buffer will be kept to as little as required to get the project completed in a satisfactory manner as proposed in the natural resources mitigation plan (such as limiting entry by equipment). The need to treat these buffers outweighs the benefits of leaving them untreated.

The perennial streams and their buffers will be outside of the project boundary. The perennial streams will have a 200 ft. no-entry buffer due to steep terrain and/or the presence

of riparian vegetation and in order to mitigate wildlife disturbance. The need to treat these buffers is outweighed by the benefits of leaving them untreated.

**Cumulative Effects to Aquatic Resources** - No detrimental cumulative effects from this project, Catherine Creek Restoration and local private projects are expected because of various design criteria and mitigation measures required by Management Plan standards and guides. The analysis prepared for the Catherine Creek Restoration EA detected no measurable cumulative effects in the Burdoin-Catherine areas as a result of projects.

### **Wildlife and Plants**

**A. Protection of sensitive wildlife/plant areas and sites shall begin when proposed new developments or uses are within 1000 ft of a sensitive wildlife/plant site and/or area.**

Forest Service botanist Robin Dobson determined no sensitive flora are recorded for the area and no sensitive flora were found during surveys by Mr. Dobson in 2002 and in April and July of 2005 during preparation of the project biological evaluation. The natural resource mitigation plan includes a stipulation for protection if plants are found during project implementation.

Forest Service biologist Chuti Fiedler surveyed the planning area in 2002 and July of 2005 during preparation of the project biological evaluation. Ms. Fiedler determined that some sensitive wildlife species are known to use this area. The California Mountain King snake, and the state threatened western grey squirrel. Habitat is present for several other species as described in the biological evaluation. The natural resources mitigation plan includes the following stipulations (see page 14) for coarse woody debris for small mammals, implementation season limits minimizing disturbance, and a buffer for active squirrel nests.

### **Biological Evaluation Conclusion of Effects:**

The CRGNSA Wildlife Biologist and Botanist/Ecologist evaluated the proposed action with regard to the Endangered Species Act as documented in the Biological Evaluation. It was determined that this project would have no adverse effects on any federally listed wildlife or plant populations.

No sensitive species are expected to be adversely affected by this project. While a few individuals of a sensitive species may be impacted, this action, as a result of design criteria and mitigation measures, was determined to not contribute towards federal listing of any species.

### **Effects of the Proposal on Wildlife**

According to the biological evaluation, this proposal strives to mimic the stand conditions that resulted from low-intensity, high frequency fires that occurred historically on Burdoin Mountain. This project shall thin understory trees (oaks < 12", pine < 8", and Douglas-fir/Grand fir < 21" dbh-- mean <10"), with a DFC of maintaining well spaced, large trees; a forest resilient to fire. The short term effects will be the noise and related disturbance to wildlife species and area habitat as a result of machine thinning.

The Friends August 30 comment letter expressed concern that the analysis did not adequately consider Vaux swifts, the western grey squirrel, and the Northern spotted owl.

Chuti Fieldler, CRGNSA wildlife biologist, discusses these and other sensitive species in the project Biological Evaluation.

The western grey squirrel, and other acorn dependent species, is expected to benefit from the “thinning from below” prescription within the planning area when the stands shift to sustain more large mast producing trees and a more open stand that they likely evolved to prefer (Ryan and Carey, 1995, Vander Haegen et. al., 2005). As stated in Vander Haegen’s 2005 report, “western grey squirrels likely would benefit from thinning the dense stands of young pine and oak...” In another study by Foster in 1992, data from 21 nest stands in the Columbia River Gorge found that nests were situated in stands with canopy closures that ranged from 15 to 69%. The thinning of stands (mimicking low intensity fires) should result in the retention and accelerated growth of the remaining older oaks and pines. These large mature trees produce more mast (acorns or cones) than smaller diameter trees, as referenced in an on-going oak study (Olympia Forestry Sciences Laboratory, USDA, Forest Service). The proposed thinning will encourage larger oaks and pines while removing a very small percentage of the mast production.

Vaux’s swifts (listed as a Washington state candidate species) were not noted during extensive multi-year surveys of the project area, but are commonly seen elsewhere in the Columbia River Gorge. There is a well known and large roosting site 6 miles to the east, on the Klickitat River. Although swifts may forage in flight over the project area, habitat requirements of large (average dbh of 27”) hollow trees for roosting/nesting is largely absent from the project area. Trees, including standing snags, that are over 20” will be left undisturbed by the Burdoin II project. The thinning of competing understory trees will allow the older overstory trees to reach a larger diameter more quickly and may eventually provide for roosting/nesting habitat for the Vaux’s swift.

As mentioned in the BE on page 20, the northern units (A, G, F units) within the Burdoin II project contain second-growth (mid-seral) coniferous stands may support dispersal habitat only for the Northern spotted owl. Nesting, roosting and foraging habitat is not present within the project area. As with the Vaux’s swift, the reduction of understory trees is expected to accelerate the growth of large trees that may provide some habitat for the spotted owl in the long-term (2 to 3 decades).

Wildlife may be forced to take cover or be displaced into neighboring habitats during the day when workers are in the area during the project, but it is unlikely to be significant for the species in the overall planning area, due to habituation from current human activities in the 1,845 acre planning area in the form of roads, scattered homes and recreation trails. All machine work will be outside of the general breeding period of March 1 to June 30 to reduce this disturbance to nursing mothers with litters.

Burn piles will cause short-term localized soil damage and vegetation loss. Since these areas will be limited in size and the vegetation is composed largely of non-native annual grasses in open areas, this action is not likely to reduce native habitat measurably. These burned areas will be rehabilitated and seeded with a native grass/forb mix and/or shrub plugs with select big game forage species as an opportunity to increase the long-term quality of deer/elk winter range.

In the long-term, this project 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 be reverted back to a more ecologically stable condition that is resistant to catastrophic fire damage.

### **Cumulative Effects**

The proposed thinning of under-story vegetation in the Burdoin Mountain and Catherine Creek areas will help slow the 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 maintain populations at sufficient levels to re-colonize nearby oak habitats as they are retained or improved in the future.

Most effects to wildlife by management actions in the area are disturbances to animals that are short-term in duration. No cumulative disturbances would occur and wildlife will quickly return to treated areas.

### **Effects of No Action**

According to the Biological evaluation, the direct effect of taking no action is the continued existence of dense tree stands and non-native grasses/forbs that do not reflect the historic conditions wherein native wildlife evolved for survival. In all stands, the dense young trees resulting from fire exclusion are reducing the vigor of the older “legacy” oak and pines that provide important cover and mast for wildlife. In mixed oak/conifer stands, mature oak trees will continue to be overtopped and killed by the faster growing Douglas and grand fir trees. Acorn production from the dying large and mature trees will correspondingly decline, further reducing forage for oak woodland dependent wildlife species. Eventually, species that have evolved with high fire frequency regimes, such as the Oregon White Oak and Ponderosa Pine, will be largely replaced by dense conifer stands dominated by Douglas fir and grand fir.

The indirect effect of taking no action, is that potential for a catastrophic fire is much higher. 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. As detailed in the planning area modeling projections for future wildfires, the 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 cheat grass, 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. Deer and elk winter range would have degraded forage values for an extended period, with slow recovery to pre-burn levels. Big game numbers in the local and immediately adjacent areas will be adversely affected from this loss of forage and cover.

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.

Sensitive Wildlife Areas are those areas depicted in the wildlife inventory ... including all Priority Habitats listed in this Chapter. The approximate locations of sensitive wildlife and/or plant areas and sites are shown in the wildlife and rare plant inventory.

The chart below list the priority habitats found in the planning area:

<b>PRIORITY HABITATS FOUND IN THE BURDOIN PROJECT AREA</b>	
<b>Priority Habitats</b>	<b>Criteria</b>
Oregon white oak woodlands	Comparatively high fish and wildlife density, species diversity, declining availability, high vulnerability
Riparian	High fish and wildlife density, species diversity, breeding habitat, movement corridor, high vulnerability, dependent species.
Snags and logs	High fish and wildlife density, species diversity, limited availability, high vulnerability, dependent species.
Talus	Limited availability, unique and dependent species, high vulnerability.
Cliffs	Significant breeding habitat, limited availability, dependent species.

The wildlife biologist and botanist conducted field surveys in 2002 and 2005. The biological evaluation concluded that the appropriate buffer for active squirrel nests is a 50 foot no entry buffer.

**Published guidelines-** The CRGNSA wildlife biologist Chuti Fiedler and Ecologist/Botanist Robin Dobson coordinated with state experts and reviewed published guidelines and new unpublished guidelines for the management of the western grey squirrel.

**History and Physical characteristics, existing condition, habitat components-**The interdisciplinary team reviewed research literature, the 2002 Burdoin environmental assessment, and updated and reviewed the Catherine-Major Watershed Analysis, and worked with the collaboration team in order to develop a good understand of the area's characteristics.

**Disturbance-**The project description limits implementation to a window of time between July 1 to February 28 to avoid disturbance to wildlife and plants.

**Fish and wildlife passage-**There are no fish bearing streams in the project area and the project will not impede wildlife passage.

**Maintain, protect, and enhance the integrity and function of Priority Habitats-**The project is intended as restoration for the priority habitats present in the area. The natural resource mitigation plan includes protection for these areas.

### **Soil Productivity**

The natural resource mitigation plan stipulates the following for protection of soil:

- The alignment of new haul routes will be pre-designated and agreed to by the CRGNSA hydrologist, engineer, and ecologist prior to piling activities.
- Track-mounted piling equipment shall operate on top of slash to minimize soil disturbance where possible.
- Ground based slash piling methods will not be allowed on slopes steeper than 30%. These steeper areas will be hand piled if fuel reduction is necessary.
- All haul routes having detrimental soil compaction will be ripped to a depth of 18", water-barred, seeded with native grass seed, and mulched with fine slash. Haul

routes with access to any main roads will be closed off to eliminate use of the road after project completion.

- 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.
- The access road for unit B3 will have pre and post-project maintenance that will correct existing drainage problems on the road. This maintenance will help reduce existing erosion and resulting sedimentation.

With these stipulations, the soil guidelines will be met.

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. The project design will meet this standard. For instance, 10% of the project area would equate to 47.9 acres. Using a typical burn pile size of 10 ft by 10 ft (or .002 acres); over 23,000 burn piles could be created and meet the standard.

Alternative 2 requires monitoring of the project after implementation and any disturbed soil seeded with vegetation native to the area at the start of the following wet season.

If no management action is taken, the effects to soils or risks to soils go away. Catastrophic fire has the potential to scorch soils and reduce their productivity.

**Cumulative Effects to Soils** - Design elements and mitigation measures will prevent detrimental cumulative effects to soils from compaction, erosion or displacement. Soil productivity in Burdoin and Catherine Creek projects will be maintained.

## ***Recreation Resources***

There are no existing developed recreational developments in the vicinity of the project area. However, Burdoin Mt. is used by mountain biking groups and individuals. The project implementation requirements stipulate the following:

- For public safety purposes trail and the immediate area the trail serves will be closed to the public during treatment activities.
- Trail users and general public will be notified by posting warning signs at key trail intersections, corral area and along Courtney road. Post message explaining the reason for treatment activities at the CourtneyRoad trailhead. Develop and distribute press release/key messages to local press and web site.
- Notify the Columbia Gorge Area Mountain Biking Association (CAMBA) prior to project implementation.

Therefore, the project will neither overly disturb nor displace the existing recreation use.

**Effects of No Action to Recreation Resources-** The lack of management action would eliminate the possibility for disturbances to trails, however, the risk to the trails and general setting in the Burdoin-Catherine Creek areas from a catastrophic wildfire would remain high. Many mountain bike trails would remain in a more brushy condition.

**Cumulative Effects** - Cumulative effects to recreation should be positive. The overall recreation setting in the Burdoin and Catherine Creek areas would be enhanced by moving more of the landscape toward a desired future condition. Mountain bike users would be treated to less brushy conditions that offer better viewing of the landscape and also make for safer riding conditions given the visibility.

### **3.2 - 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 United 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 Irrecoverable 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. Irrecoverable commitment applies to losses of production, harvest or use of renewable natural resources. No significant irreversible nor irrecoverable commitment of resources has been identified with the implementation of any alternative proposed.

## **CHAPTER 4**

### **CONSULTATION AND COORDINATION**

#### **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)**

The summary table of Biological Effects is located in the Project File at the CRGNSA office 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 will not be required for the Burdoin II Restoration project.

#### **4.2 - STATE HISTORIC PRESERVATION OFFICER**

An evaluation of the Burdoin II Restoration with recommended mitigations was submitted by CRGNSA archeologist, Marge Dryden, to the Washington State Historic Preservation Office and concurrence was received from that office.

#### **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:

- Adjacent land owners
- 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
- Burdoin 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:

<b><u>ID Team</u></b>	<b><u>Title</u></b>
Diana Ross	Vegetation Team Leader/Landscape Architect
Darren Kennedy	Fire/Fuels Specialist/AFMO
Robin Dobson	Botanist/Ecologist
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:

##### **Collaboration Team**

Peter Cornelison, Friends of the Columbia Gorge  
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##### **Forest Service and other Agencies**

Bruce Hostetler	Entomologist, Westside Forest Insect & Disease Service Center
Bruce Holmson	Silviculturist, Gifford Pinchot NF
Mike Ferris	CRGNSA Public Affairs
Dan Harkenrider	Area Manager, CRGNSA
Tom Mulder	Facilitator, Gifford Pinchot National Forest

## APPENDIX A

### PUBLIC AND COLLABORATIVE GROUP SCOPING COMMENTS

A scoping letter was sent to the general public in June 2005, and a second opportunity for comments was opened after the CRGNSA and a collaboration team modified and finalized a proposed action for the Burdoin area. The updated project description was also placed on the CRGNSA website. Four comment letters were received from the initial scoping and two others were received in August. The comments received and where in the EA they were addressed are summarized below:

Note: Implementation Requirements mentioned in comment Resolution below are included in the proposed action description in Chapter 2.

Comment	Resolution
Oak woodlands should leave more – at least 70% canopy for western grey squirrel.	EA, p. 18-19
Limit pine and fir removal to 12” diameter	EA p. 22
Not enough buffer and protection is allowed for grey squirrels and spotted owls.	EA. P. 22-23
Oregon White Oak woodland is important habitat	EA, p. 22-23
Failure to survey for many state and federal listed species. Risky to rely on buffering only active squirrel nests. Plan must show location of sensitive species and consider time of year for disturbances.	EA, p. 22
Aerial pathways for birds and squirrels were not considered.	See implementation requirement #37; EA 10-12
Removal of large numbers of oaks may reduce acorn production and may affect species that rely on acorns	EA, p. 22-23
Project should consider Vaux swift	EA, p. 23
Stream buffers are inadequate	EA, p. 21
Not enough consideration given to rare plants and a 200 ft. buffer is needed when they are found	EA, p. 22
FS should follow WDFW’s recommendations for snag retention and recruitment.	Imp Requirements # 19, 38; EA 10-12

Comment	Resolution
Scenic analysis must consider cumulative effects	EA,. P. 16
From WDFW – Female squirrels use oak cavities on open slopes with less than 25% canopy. Make sure not to space trees evenly and have some interlocking crowns.	Implementation Requirement #37; EA, 10-12
Prioritize treatment for stands less than 65 years old and avoid anything over 21” diameter	EA, p. 20
Make sure oaks will release when you cut around them	Implementation Requirement #37
80% desired canopy for East Conifer	EA, p. 18-19
Have at least 60% canopy for pine-oak/Douglas fir	EA, p. 18-19
Leave small ½ ac gaps for down logs from wood cutters	Implementation Requirement #39; EA, 10-12

## **APPENDIX B**

Burdoin II Thin Project Description (September 8, 2005)

(Attached separately in landscape format with original graphic images).

# APPENDIX C

## Burdoin II Fish, Wildlife and Plants Biological Evaluation

Columbia River Gorge National Scenic Area

Date: September 7, 2005

### BE Conclusion of Effects:

It was determined that this project would have no adverse effect on any listed or sensitive wildlife or plant populations. While a few individuals of a sensitive species may be impacted, this action, as a result of design criteria and mitigation measures, was determined to not contribute towards listing of any species. While the No Action Alternative would continue to put sensitive habitats at increased risk of catastrophic fire, the action alternative is designed to reduce this risk creating more fire resilient woodlands with long term stability for the sensitive species. For more details read the Effects Analysis below.

### Effects Analysis

Table 1. List of Threatened, Endangered, Proposed, Candidate, and Sensitive species as listed by Washington State, U.S. Forest Service Regional Forester's Sensitive Species list, and the Federal Endangered Species Act found on the Columbia River Gorge National Scenic Area and addressed under this Biological Evaluation:

Project Name: <b>Burdoin II</b>			County/State: Klickitat			
SPECIES (population segment)	STATUS*	PRE-FIELD REVIEW Usual Habitat in OR/WA	FIELD RECON.		EFFECTS DETERMINATION	
			Habitat Present?	Species Present?	Alt1 (No Action)	Alt2 (Action)
Bull trout (Columbia R.) ( <i>Salvelinus confluentus</i> )	<b>T</b>	Cold streams/lakes	no			
Steelhead trout (Snake R.) ( <i>Oncorhynchus mykiss</i> )	<b>T</b>	Streams/rivers	no			
Steelhead trout (Mid-Col. R.) ( <i>Oncorhynchus mykiss</i> )	<b>T</b>	Col. streams/rivers (Mosier to Yakima)	no			
Steelhead trout (Lower Col.a R.) ( <i>Oncorhynchus mykiss</i> )	<b>T</b>	Col. streams/rivers (mouth east to Hood R.)	no			
Sockeye salmon (Snake R.) ( <i>Oncorhynchus nerka</i> )	<b>E</b>	Streams/rivers/lakes	no			
Chinook salmon (Snake R. spring/ summer/fall runs) ( <i>O. tshawytscha</i> )	<b>T</b>	Streams/rivers	no			

Chinook salmon (Lower Col. R.) ( <i>Oncorhynchus tshawytscha</i> )	<b>T</b>	Col. streams/tribs (mouth east to Hood R.)	no			
Chum salmon (Columbia R.) ( <i>Oncorhynchus keta</i> )	<b>T</b>	Col. R and lower tribs from mouth E. to Bonneville dam)	no			
Bald eagle ( <i>Haliaeetus leucocephalus</i> )	<b>T, WA-T</b>	Shoreline (generally within 1 mile of large water bodies) with large trees and prey base of primarily fish, also waterfowl, carrion	<b>marginal</b> moderate human disturbance	no	NE	NE
Northern spotted owl ( <i>Strix occidentalis caurina</i> )	<b>T, WA-E</b>	Mature coniferous forest (generally with Douglas Fir or Hemlock components)	<b>No</b> nesting, some dispersal	potential	NE	NE
Grizzly bear ( <i>Ursus arctos</i> )	<b>T, WA-E</b>	North Cascades Range		no		
Woodland caribou ( <i>Rangifer tarandus</i> )	<b>E, WA-E</b>	Boreal forests/foothills		no		
Columbian white-tailed deer ( <i>Odocoileus virginianus leucurus</i> )	<b>E, WA-E</b>	Coastal/foothills floodplains		no		
Oregon silverspot butterfly ( <i>Speyeria zerene hippolyta</i> )	<b>T, WA-E</b>	Coastal salt-spray meadows		no		
Canada Lynx ( <i>Lynx canadensis</i> )	<b>T, WA-T</b>	Subalpine/boreal forests		no		
Marbled Murrelet ( <i>Brachyramphus marmoratus</i> )	<b>T, WA-T</b>	Coastal mature forests		no		
Gray wolf ( <i>Canis lupus</i> )	<b>E, WA-E</b>	steppe, woodland, forest		no		
Pygmy rabbit ( <i>Brachylagus idahoensis</i> )	<b>PE, WA-E</b>	Dense stands of big sagebrush with loose soils for burrows	no			
Coastal cutthroat trout ( <i>Oncorhynchus clarki clarki</i> )	<b>P</b>	Col. river/tribs; mouth east to Klickitat R	no			
Chinook (mid-Col. spring run) ( <i>Oncorhynchus tshawytscha</i> )	<b>FS</b>	Col. river/tribs (Mosier to Yakima)	no			
Coho (lower Columbia R.) ( <i>Oncorhynchus kisutch</i> )	<b>C, FS</b>	Col. river/lower tribs (mouth east to Hood R.)	no			
California Mtn king snake ( <i>Lampropeltis zonata</i> )	<b>FS, WA-C</b>	Disjunct pop. in Col. R. Gorge (Klickitat, Skamania county area): oak/pine woodland, rocky riparian within logs/rocky cover	<b>Yes</b>	<b>Yes</b>	NI	MIH
Cope's giant salamander ( <i>Dicamptodon copei</i> )	<b>FS</b>	W. WA, NW OR: Clear, cold mountain streams w/rocky substrate	no			
Cascade torrent salamander ( <i>Rhyacotriton cascadae</i> )	<b>FS, WA-C</b>	Cascade Mtns of southern WA and northern OR: in and adjacent to cold, fast, mountain streams w/rocky substrate	no			
Townsend's Big-Eared bat ( <i>Corynorhinus townsendii</i> )	<b>FS, WA-C</b>	desert scrub/coniferous forests w/caves or mines	no			
California Wolverine ( <i>Gulo gulo</i> )	<b>FS, WA-C</b>	Forests/open plains	no			

Oregon Spotted Frog ( <i>Rana pretiosa</i> )	<b>C, FS, WA-E</b>	9 acre+ perennial lakes/marshes (Conboy)	no			
Mardon skipper ( <i>Polites mardon</i> )	<b>C, WA-E</b>	Puget sound and south Cascades of WA: Open fescue or other grasslands with nectar plant source	<b>no</b>	<b>no</b>		
Washington ground squirrel ( <i>Spermophilus washingtoni</i> )	<b>C, WA-C</b>	East of Columbia River from center of WA state & southward:Sagebrush/ grassland w/ sandy soils, also Giliam, Morrow and Umatilla counties, OR	no			
Streaked horned lark ( <i>Eremophila alpestris strigata</i> )	<b>C, WA-C</b>	W. WA/OR: native prairies /sparsely veg short grass areas. Ground nester.	no			
Pacific Fisher ( <i>Martes pennanti</i> )	<b>FS, WA-E</b>	Optimum habitat is dense mature conifer forest	no			
Peregrine falcon ( <i>Falco peregrinus</i> )	<b>FS, WA-S</b>	cliff (nest) sites with sm. bird prey base	<b>yes,</b> outside of treatment units	<b>no</b>	NI	NI
Northwestern pond turtle ( <i>Clemmys marmorata</i> )	<b>FS, WA-E</b>	streams, lg rivers, slow sloughs, and quiet waters	no			
Western gray squirrel ( <i>Sciurus griseus</i> )	<b>FS, WA-T</b>	Oak & mixed oak woodland, core range Klickitat county	<b>yes</b>	<b>yes</b>	NI	MIH/ long-term BE
Common loon ( <i>Gavia immer</i> )	<b>FS, WA-S</b>	Undisturbed forest lakes	no			
Sandhill crane ( <i>Grus canadensis</i> )	<b>WA-E</b>	Riverine wetland, isolated mtn meadows/basins	no			
Upland sandpiper ( <i>Bartramia longicauda</i> )	<b>WA-E</b>	Grasslands/migratory	no			
Northern leopard frog ( <i>Rana pipiens</i> )	<b>WA-E</b>	Marsh/ponds, presently in Grant county only	no			
Aleutian Canada goose ( <i>Branta canadensis leucopareia</i> )	<b>WA-T</b>	Migrate thru coastal areas	no			
Ferruginous hawk ( <i>Buteo regalis</i> )	<b>WA-T</b>	open prairie/shrub steppe	no			
Sage grouse ( <i>Centrocercus urophasianus</i> )	<b>WA-T</b>	Sagebrush grasslands	no			
Sharp-tailed grouse ( <i>Tympanuchus phasianellus</i> )	<b>WA-T</b>	Grasslands/sagebrush	no			
Larch mountain salamander ( <i>Plethodon larselli</i> )	<b>WA-S FS S&amp;M</b>	Cascades mountains of S. WA/N. OR: Largely in moss-covered shady Talus slopes, low-mid elev.	<b>yes,</b> outside of treatment units	<b>Yes,</b> adjacent <b>No, in treatment units</b>	NI	NI
Olympic mudminnow ( <i>Novumbra hubbsi</i> )	<b>WA-S</b>	Quiet waters/mud substrates Olympic penins	no			
Margined Sculpin ( <i>Cottus marginatus</i> )	<b>WA-S</b>	Blue Mountains of OR and WA. In WA only in stream pools of Tucannon, Walla Walla	no			

Pygmy Whitefish ( <i>Prosopium coulteri</i> )	WA-S	Cold lakes/streams, of Northern WA	no			
Merriam's shrew ( <i>Sorex merriami</i> )	WA-C	East of Cascades: Sagebrush scrub, woodlands, grasslands	yes	potential	NI	NI
Keen's myotis bat ( <i>Myotis keenii</i> )	WA-C	Olympic Peninsula: Densely forested areas	no			
Brush prairie pocket gopher ( <i>Thomomys talpoides douglasi</i> )	WA-C	Western WA Cascades open habitats	no			
Mazama (western) pocket gopher ( <i>Thomomys mazama</i> )	WA-C	West of Cascades OR/WA: prairies and meadows	no			
Gray-tailed vole ( <i>Microtus canicaudus</i> )	WA-C	Clark County, WA and OR Willamette Valley: Grassy and agricultural lands	no			
Black-tailed jackrabbit ( <i>Lepus californicus</i> )	WA-C	E OR, SE WA: Prairies, dense mixed sagebrush communities, cultivated fields	no			
White-tailed jackrabbit ( <i>Lepus townsendii</i> )	WA-C	East of Cascades: open areas with native grass, some sagebrush habitat	no			
Western Grebe ( <i>Aechmophorus occidentalis</i> )	WA-C	open lakes and marshes w/rushes and tules, winters in coastal estuaries/bays	no			
Northern goshawk ( <i>Accipiter gentilis</i> )	WA-C	Mature forest mosaic with large nest trees, largely over 1900' elev.	Yes, marginal	unlikely	NI	MIIH
Golden eagle ( <i>Aquila chrysaetos</i> )	WA-C	Various habitats, open country/forests, often nests on steep cliffs or large trees	marginal moderate human disturbance	possible	NI	MIIH
Merlin ( <i>Falco columbarius</i> )	WA-C	Open forests, grasslands, marshes; detected most often near large water. Nests in WA Cascades, NE WA. Winters in all NW U.S.	yes	Undocumented but potential	NI	NI
Yellow-billed cuckoo ( <i>Coccyzus americanus</i> )	WA-C	riparian forests, with cottonwood/thick willow; Neotropical migrant	no			
Flammulated owl ( <i>Otus flammeolus</i> )	WA-C	E. Cascades: cavity nester in mature pine in mixed woodland Winters S. of US border	yes	potential	NI	MIIH
Burrowing owl ( <i>Athene cunicularia</i> )	WA-C	E. WA/OR: Open sagebrush country/ some in grass fields; winters SW US	no			
Vaux's swift ( <i>Chaetura vauxi</i> )	WA-C	Woodlands near water, nests in large hollow trees or chimneys; neotropical migrant	yes foraging, no nesting		NI	NI/ Long term BE
Lewis' woodpecker ( <i>Melanerpes lewis</i> )	WA-C	open pine/oak woodland, conifer forests, and riparian woodland; neotropical migrant.	yes	potential	NI	MIIH/ long-term BE

White-headed woodpecker ( <i>Picoides albolarvatus</i> )	WA-C	central/E. WA/OR: Mature coniferous forests, esp. ponderosa pines, cavity nester	yes, portions	Undocumented but potential	NI	MIIH/ long-term BE
Black-backed woodpecker ( <i>Picoides arcticus</i> )	WA-C	Highly associated with post-fire habitats in mature forests (stand-replacement fires with snags), dependent on high density of dead and insect-ridden trees	Potential, but marginal	Unlikely with stands in present condition	NI	MIIH/ long-term BE
Pileated woodpecker ( <i>Dryocopus pileatus</i> )	WA-C	Mature conifer, mixed conifer forests.	yes, portions	potential	NI	MIIH
Slender-billed white-breasted nuthatch ( <i>Sitta carolinensis aculeata</i> )	WA-C	West Cascades/Coast range lowlands: Highly associated with open, mature oak woodlands	no			
Sage thrasher ( <i>Oreoscoptes montanus</i> )	WA-C	Eastern WA/OR semi-arid sagebrush plains and bottomlands	no			
Loggerhead shrike ( <i>Lanius ludovicianus</i> )	WA-C	East of Cascades: dry grassland and sagebrush desert habitats, Neotropical migrant	yes, outside of treatment units	possible	NI	NI
Sage sparrow ( <i>Amphispiza belli</i> )	WA-C	Flat terrain in sagebrush, chaparral, dry foothills	no			
Sharptail Snake ( <i>Contia tenuis</i> )	WA-C	East slope of WA Cascades, Columbia R. Gorge, W OR: rocky slopes and open pine and oak woodland w/prey species of small slugs	yes	likely present	NI	MIIH/ long-term BE
Striped whipsnake ( <i>Masticophis taeniatus</i> )	WA-C	South/central WA, E. OR: dry rocky sites, oak woodland, pine forests	yes	likely present	NI	MIIH/ long-term BE
Columbia torrent salamander ( <i>Rhyacotriton kezeri</i> )	WA-C	Coast Range of sWA, nOR: cold, fast, mountain streams w/rocky substrate	no			
Dunn's salamander ( <i>Plethodon dunni</i> )	WA-C	W. WA/OR: moss-covered rock rubble, shady stream banks	no			
Van dyke's salamander ( <i>Plethodon vandykei</i> )	WA-C	Olympic Mountains, Willapa Hills, and Cascade Mountains of southern Washington: need large logs in riparian areas	no			
Columbia spotted frog ( <i>Rana luteiventris</i> )	C, WA-C	In or near permanent bodies of water, (lakes, ponds, slow streams, marshes) with thick sedges, rushes and grasses	no			
Western Toad ( <i>Bufo boreas</i> )	WA-C	Most common near marshes and small lakes (breeding sites), can travel overland	no			
River lamprey ( <i>Lampetra ayresi</i> )	WA-C	Anadromous, coastal rivers	no			
Eulachon ( <i>Thaleichthys pacificus</i> )	WA-C	Marine, with spawning in lower reaches of rivers, often within tidal influence	no			

Lake chub ( <i>Couesius plumbeus</i> )	<b>WA-C</b>	Upper Columbia R. drainage of WA: general water body	no			
Leopard dace ( <i>Rhinichthys falcatus</i> )	<b>WA-C</b>	Columbia River drainages of both WA and OR: slow streams, rivers	no			
Umatilla dace ( <i>Rhinichthys falcatus</i> )	<b>WA-C</b>	Columbia R. drainage both WA and OR: large rivers	no			
Mountain sucker ( <i>Catostomus platyrhynchus</i> )	<b>WA-C</b>	Columbia R. drainage both WA and OR: creeks, rivers	no			
California floater mussel ( <i>Anodonta californiensis</i> )	<b>WA-C</b>	Shallow, low-elevation areas of clean lakes, ponds and large rivers with soft, silty substrate. Limited to a few sites in Curlew Lake (Ferry County) in WA. In OR, can still be found in lower Willamette and lower Columbia R.	no			
Giant Columbia River limpet ( <i>Fisherola nuttalli</i> )	<b>WA-C</b>	Historically in almost the entire Columbia R. basin, now restricted to a few remaining sites. In WA, confirmed in Hanford Reach of the Columbia R., as well as the Okanogan, Wenatchee and Methow rivers. In OR, only found in the Deschutes R.	no			
Great Columbia River spire snail ( <i>Flumicola columbiana</i> )	<b>WA-C</b>	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 and colder. Confirmed in a few sites along the Columbia, Okanogan, Wenatchee and Methow Rivers in WA, and the Deschutes River in OR.	no			
Beller's ground beetle ( <i>Agonum belleri</i> )	<b>WA-C</b>	Sphagnum bogs adjacent to lower elevation (below 1000m) lakes. The only known population located at King's Lake Bog in King County WA.	no			
Mann's Mollusk-eating Ground Beetle ( <i>Scaphinotus manni</i> )	<b>WA-C</b>	Confined to riparian strips in canyons of lowland tribs of the Snake R.	no			
Long-horned leaf beetle ( <i>Donacia idola</i> )	<b>WA-C</b>	North Puget Sound	no			
Columbia River tiger beetle ( <i>Cicindela columbica</i> )	<b>WA-C</b>	Restricted to sandbars and dunes in riparian zones of large lowland rivers.	no			
Hatch's click beetle ( <i>Eanus hatchii</i> )	<b>WA-C</b>	North Puget Sound	no			
Yuma skipper butterfly ( <i>Ochlodes yuma</i> )	<b>WA-C</b>	Northcentral WA, Sherman County OR: near freshwater marshes, streams, seeps	no			
Shepard's parnassian butterfly ( <i>Parnassius clodius shepardii</i> )	<b>WA-C</b>	Eastern 1/3 of Washington state	no			

Makah (Queen Charlotte) Copper butterfly <i>(Lycaena mariposa charlottensis)</i>	WA-C	Coastal WA state	no			
Chinquapin hairstreak butterfly <i>(Habrodais grunus herri)</i>	WA-C	Oak woodland, canyons, mountain ridges of SW and central WA	yes, on edge of known range	possible	NI	MIIH/ long-term BE
Johnson's hairstreak butterfly <i>(Callophry[Mitoura] johnsoni)</i>	WA-C	Western WA/OR: coniferous forests, esp. old-growth	no			
Juniper hairstreak butterfly <i>(Callophyr [Mitoura] grynea barryi)</i>	WA-C	Central and E. WA/OR: old fields, bluffs, juniper/ pinyon-juniper woodlands, and cedar breaks	yes	possible	NI	NI
Puget blue butterfly <i>(Plebejus icarioides blackmorei)</i>	WA-C	Puget Sound/Coastal WA	no			
Valley silverspot butterfly <i>(Speyeria zerene bremnerii)</i>	WA-C	West WA/OR: Conifer forests, sagebrush, coastal meadows and dunes	no			
Silver-bordered fritillary butterfly <i>(Boloria selene atrocotalis)</i>	WA-C	North central and Eastern WA	no			
Taylor's (Whulge) checkerspot butterfly <i>(Euphydryas editha taylori)</i>	WA-C	West WA/OR: diverse habitats inc. coastal chaparral, meadows, foothills, open woods	no			
Great arctic butterfly <i>(Oeneis nevadensis gigas)</i>	WA-C	North Puget Sound	no			
TES Plants						
Agroseris elata	S		No			
Astragalus hoodianus	endemic	Dry open areas of east Gorge	Yes, marginal	No	MIIH	MIIH/BI
Agrostis howellii	S		No			
Arabis sparsiflora var. atrorubens	S		No			
Artemesia campestris spp borealis	E	Gravelly beach areas of Columbia	No			
Aster gormanii			No			
Astragalus tyghensis			No			
Bolandra oregana	S	Wet basalt cliffs	No			
Botrichium spp.	S	Forested/open areas in conifer forest zones	Yes	No	MIIH	MIIH
Calamagrostis breweri			No			
Calamagrostis howellii			No			

Calachortus longebarbaeus var. longebarbatus	<b>Th</b>	Wet seeps in East Gorge	No			
Carex densa	<b>S</b>		No			
Carex heteroneura (carex atrata var. erecta)			No			
Carex livida			No			
Carex macrochaeta	<b>S</b>	Moist open places, coastal but suspected in CRG	No			
Carex stenophylla (C. eleocharis)			No			
Chrysolepis chrysophylla	<b>S</b>	Dry slopes in open or in forested areas	Possibly	<b>No</b>	MIIH	MIIH
Cicuta bulbifera			No			
Cimicifuga elata	<b>Th</b>	Hardwood and mixed forest on west side	No			
Collinsia sparaiflora var. bruceae	<b>S</b>		Yes	<b>No, not in units</b>	MIIH	MIIH
Copsis trifolia			No			
Corydalis aqua-gelidae	<b>Th</b>		No			
Cryptantha rostellata		Barren, south facing slopes in E. Gorge	Yes	<b>No</b>	MIIH	MIIH
Cyperus bipartitus	<b>S</b>		No			
Cyperus rivularis			No			
Cyripedium fasciculatum	<b>Th</b>	Dry brushy areas, in wooded areas in mid and E Gorge	Yes	<b>Not in units but near by.</b>	MIIH	MIIH, BI
Damasonium californicum			No			
Draba douglasii var. douglasii		Open gravelly flats in E. Gorge	No			
Douglasii laevigata var. laevigata		Basalt cliffs, rocky areas, low elev. In W. and mid Gorge	No			
Erigeron howellii	<b>Th</b>	Open areas	No			
Epipactis gigantea		Seasonally wet seeps in E Gorge	No			
Erigeron howellii		Open rocky flats at mid elev. In W Gorge	No			
Erigeron oreganus	<b>Th</b>	Over hanging basalt cliffs	No			
Eryngium petiolatum	<b>Th</b>		No			
Euonymus occidentalis			No			
Fritillaria camschatcensis						
Githopsis specularioides	<b>S</b>	Dry, open slopes in east Gorge	Yes, Nearby.	<b>No</b>	MIIH	MIIH

<i>Hackelia diffusa</i> var. <i>diffusa</i>			No			
<i>Heuchera grossularifolia</i> var. <i>tenuifolia</i>	<b>S</b>	Basalt cliffs or rocky outcrops in mid and E Gorge	No			
<i>Hieracium longiberbe</i>		Open dry rocky areas in mid-E Gorge	No			
<i>Howellia aquatilis</i>	<b>Th</b>		No			
<i>Lewisia columbiana</i> var. <i>columbiana</i>		Rocky areas in W Gorge	No			
<i>Linanthus bakeri</i>	<b>S</b>	Dry open areas in East Gorge	Yes	<b>No, but near by</b>	MIIH	MIIH/BI
<i>Liparis loeselii</i>	<b>E</b>		No			
<i>Lomatium laevigatum</i>	<b>Th</b>	Basalt cliffs in east Gorge	No			
+ <i>Lomatium suksdorfii</i>	<b>S</b>	Open wooded areas	Yes	<b>No</b>	MIIH	MIIH
<i>Lupinus latifolius</i> var. <i>thompsonianus</i>	<b>Endemic</b>	Grass/Oak/pine woodlands, Hood River to The Dalles	Yes	<b>No, but near by</b>	MIIH	MIIH
<i>Luzula arcuata</i>			No			
<i>Lycopodiella inundata</i>			No			
<i>Lycopodium complanatum</i>			No			
<i>Machaerocarpus californicus</i>		Seasonally wet areas	No			
<i>Meconella oregana</i>	<b>Th</b>	Oak woodlands in east Gorge	Yes, nearby	<b>No</b>	MIIH	MIIH/BI
<i>Microseris borealis</i>			No			
<i>Microseris douglasii</i> ssp. <i>douglasii</i>			No			
<i>Mimulus jungermannioides</i>			No			
<i>Mimulus pulsiferae</i>			No			
<i>Mimulus suksdorfii</i>			No			
<i>Montia diffusa</i>	--		No			
<i>Montia howellii</i>			No			
<i>Navaretia tagetina</i>	<b>Th</b>	Dry, open areas in east Gorge	Yes, nearby.	<b>No</b>	MIIH	MIIH
<i>Ophioglossum pusillum</i>	<b>Th</b>		No			
<i>Orthocarpus bracteosus</i>			No			
<i>Oxytropis borealis</i> var. <i>viscida</i>			No			
<i>Parnassia frimbriata</i> var. <i>hoodiana</i>	<b>Th</b>		No			
<i>Penstemon barrettiae</i>	<b>Th endemic</b>	Rocky soils, talus, rock quarries in Mid-Gorge.	Yes, nearby	<b>No</b>	MIIH	MIIH

Penstemon deustus var variabilis		Dry open slopes in east Gorge	No			
Phlox hendersonii			No			
Pityopus californica			No			
Plagiobothrys figuratus ssp. corallicarpus			No			
Platanthera sparsiflora			No			
Poa gracillima var. multnomae			No			
Poa laxiflora			No			
Poa nervosa var. nervosa			No			
Polemonium carneum			No			
Ranunculus populago			No			
Ranunculus reconditus			No			
Romanzoffia thompsonii			No			
Rorippa columbiae	<b>E</b>	Mud flats along Columbia River	No			
Scheuchzeria palustris var. americana			No			
Scribneria bolanderi			No			
Sidalcea hirtipes			No			
Sisyrinchium sarmentosum	<b>Th</b>	Wet/dry meadows at mid to high elevations	No			
Spiranthes porrifolia		Seasonally wet areas	No			
Suksdorfia violacea			No			
Sullivantia oregana	<b>E</b>	Wet basalt cliffs	No			
Synthyris stellata			No			
Tauschia stricklandii			No			
Utricularia intermedia	<b>S</b>		No			
Veratrum insolitum			No			
Wolffia borealis			No			
Wolffia columbiana			No			
Fungi						
Albatrellus ellisii (WA only)	<b>S</b>		No			
Bridgeoporus nobilissimus	<b>S</b>	On boles of noble firs	No			
Cordyceps capitata (Former S&M)	<b>S</b>		No			
Cortinarius barlowensis (OR only)	<b>S</b>		No			
Cudonia monticola	<b>S</b>		No			
Gomphus kauffmanii	<b>S</b>		No			
Gyromitra californica	<b>S</b>		No			

Leucogaster citrinus	S		No			
Mycena monticola (Former S&M)	S		No			
Otidea smithii	S	Forests with conifers	No			
Phaeocollybia attenuata	S		No			
Phaeocollybia californica (OR only)	S		No			
Phaeocollybia olivacea (OR only)	S		No			
Phaeocollybia oregonensis	S		No			
Phaeocollybia piceae	S		No			
Phaeocollybia pseudofestiva	S		No			
Phaeocollybia scatesiae	S		No			
Ramaria amyloidea	S		No			
Ramaria cyaneigranosa (WA only)	S		No			
Ramaria gelatiniaurantia	S		No			
Ramaria rubrievanescens (WA only)	S		No			
Sarcodon fuscoindicus (WA only)	S		No			
Sowerbyella rhenana	S	Conifer forests	No			
Spathularia flavida (WA only)	S		No			
<b>LICHENS</b>						
Cetrelia cetrarioides (WA only)	S		No			
Chaenotheca subroscida	S		No			
Collema nigrescens (WA only)	S		No			
Dendrocopaulon intricatum (WA only)	S	Both in old-growth western forests and in open oak balds	Yes potential	No	MIIH	MIIH
Dermatocarpon luridum	S	Aquatic on submerged or seasonally emergent rocks	No			
Hypogymnia duplicata (OR only)	S	Western Cascade forests at mid-elevations 1000-5500'	No			
Leptogium burnetiae var. hirsutum	S	Epiphytic on trees, logs, rocks, mosses	No			
Leptogium cyanescens	S	Tree bark both conifers and hardwoods, logs, rocks in cool, moist sites	No			
Lobaria linita (OR only)	S	Cool, humid old-growth forest on boles of silver firs and boulders	No			
Nephroma bellum (WA only)	S	w. Cascades, mostly on conifer branches	No			
Nephroma occultum	S		No			
Pannaria rubiginosa	S	Epiphyte on Hooker's willow at low elev. In old-growth western forests	No			
Peltigera neckeri (Former S&M)	S	Mossy logs, soil and tree bases in moist forests	No			
Peltigera pacifica	S	Same as P. neckeri	No			

Pilophorus nigricaulis (Former S&M)	S	On rocks in talus slopes, cliffs within old-growth forests	No			
Platismatia lacunosa (WA only)	S	Western conifer forest	No			
Pseudocypbellaria rainierensis	S	On conifers in cool, humid, old-growth western forests	No			
Ramalina pollinaria (Former S&M)	S	CA only	No			
Tholurna dissimilis	S	High elev. Wind swept trees	No			
Usnea longissima	S	Wet moist forest	No			
<b>BRYOPHYTES</b>						
Encalypta brevicolia var. crumiana (Former S&M)	S		No			
Rhizomnium nudum (OR only)	S	Very moist humus or soil, typically near seepage in conifer forest	No			
Schistostega pennata	S	Mineral soil in shaded pockets of overturned tree roots, or at entrances to caves, or animal burrows	No			
Scouleria marginata (Former S&M)	S	Semi-aquatic on rocks along edges of streams	No			
Tetraphis geniculata	S	Moist forests with large down logs	No			

**Abbreviations/ Acronyms:**

NE No Effect  
 NLAA May Affect, Not Likely to Adversely Affect  
 LAA May Affect, Likely to Adversely Affect  
 Unk Species presence unknown but suspected  
 NI No Impact  
 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

**Written by:** **Chuti Fiedler, Fish/Wildlife Biologist**  
/s/ Chuti Fiedler Date: 09/07/05  
 \_\_\_\_\_ Date: \_\_\_\_\_  
**And**  
**Robin Dobson, Botanist/Ecologist**  
/s/ Robin Dobson Date: 09/07/05

## **Table of Contents (if needed)**

### **I. INTRODUCTION**

Forest management activities that may alter fish and wildlife habitat or affect individuals or populations of PETS (Proposed, Endangered, Threatened, and Sensitive) fish and aquatic species require a Biological Evaluation to be completed (FSM 2671.44 and FSM 2670.32) as part of the National Environmental Policy Act process and Endangered Species Act to determine their potential effects on sensitive, threatened or endangered species. The Biological Evaluation process (FSM 2672.43) is intended to conduct and document analyses necessary to ensure proposed management actions will not likely jeopardize the continued existence or cause adverse modification of habitat for:

1. Species listed or proposed to be listed as endangered (E) or threatened (T) by the USDI-Fish and Wildlife Service or USDC-NOAA Fisheries, and their listed or proposed listed critical habitat.
2. Species listed as sensitive (S) by USDA-Forest Service Region 6.
3. Species listed under Washington State Species of Concern (SOC) list as endangered (E), threatened (T), Sensitive (S), or Candidate (C).

#### Applicable Standards and Guidelines

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

1. 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.

## 2. Columbia River Gorge National Scenic Area Management Plan

Minimum natural resource protection standards include:

A buffer zone shall be created around sensitive flora and fauna

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.

Maintain, protect and enhance the integrity and function of Priority Habitats (old-growth forest, talus, wetlands, caves, cliffs etc).

Forest practices shall maintain species composition at existing proportions in the activity area.

A mix in age and size of hardwoods shall be maintained to provide for vertical diversity and replacement.

This Biological Evaluation addresses the 2 alternatives presented in the Burdoin II Environmental Document.

## **II. PROJECT AREA**

The Burdoin Mountain planning area is dominated by grassland, oak savannah, mixed oak, and Ponderosa pine/Douglas fir vegetation types. Many of the areas historically were oak dominated but have become, with fire exclusion, dominated with Douglas and grand firs. The entire planning area is in mapped deer/elk winter range, and also contains the state priority habitat type of Oregon white oak woodland (Washington Priority Habitats). Increase in housing, and corresponding roads and human disturbance, within this area may lessen the overall quality of this area for winter range as compared to undisturbed ranges. Several unnamed ephemeral streams and 2 small perennial (non-fish bearing) streams flow through the planning area. The streams are presently well shaded and vegetated. No known water quality problems occur within these streams.

Oak and mixed oak woodlands provide feeding, resting and breeding habitat for more than 200 vertebrate species, including federal and state listed Endangered, Threatened and Candidate species (Larsen and Morgan, 1998). Oak-associated wildlife species and groups include woodpeckers, western gray squirrel, neo-tropical migrant birds, turkeys, deer, reptiles (CA mountain king snake, sharptail snake, southern alligator lizard) and invertebrates (moths, butterflies, gall wasps and spiders). This habitat type is declining throughout its historic range due to conversion to residential/agricultural areas or other human uses. Suppression of fires and alteration of its return frequency has decreased the habitat value for native species. Historically frequent, but low-intensity fires in this

community has controlled stand density, regenerated the grass and herbaceous layer, and kept fuel accumulations low. The stability of the ecosystem has declined with fire suppression in the Burdoin area.

The Burdoin area was thinned by removing most of the 8" and less dbh trees as per the NEPA document of 2002. This thinning helped to alleviate the loss of oak habitat by encroaching firs but was not adequate to fully realize the DFC that would bring this area into a fire resilient condition.

### **III. DESCRIPTION OF ALTERNATIVES**

Alternative 1 – No Action

Alternative 2 – Burdoin II project, as planned

Detailed project descriptions and modeling of forest stands, through time, with both alternatives is provided in the Burdoin II Categorical Exclusion report.

### **IV. COMPARISON OF ENVIRONMENTAL CONSEQUENCES BY ALTERNATIVE**

#### **Direct and Indirect, Short & Long Term Effects of Alternative #1 - No Action**

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 conditions that native wildlife evolved to survive in. In all stands, the dense young trees resulting from fire exclusion are reducing the vigor of the older "legacy" oak and pines that provide important cover and mast for wildlife. In mixed oak/conifer stands, mature oak trees will continue to be overtopped and killed by the faster growing Douglas and grand fir trees. Acorn production from the dying large and mature trees will correspondingly decline, further reducing forage for oak woodland dependent wildlife species. Eventually, species that have evolved with high fire frequency regimes, such as the Oregon White Oak and Ponderosa Pine, will be largely replaced by dense conifer stands dominated by Douglas fir and grand fir.

The indirect effect of taking no action, is that potential for a catastrophic fire is much higher. 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. As detailed in the planning area modeling projections for future wildfires, the 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 cheat grass, 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. Deer and elk winter range would have degraded forage values for an extended period, with slow recovery to pre-burn levels. Big game numbers in the local and immediately adjacent areas will be adversely affected from this loss of forage and cover.

#### **Cumulative Effects of Alternatives #1 – No Action**

No action on Burdoin Mountain would cumulatively contribute to the range-wide decline of

ecologically stable Oregon white oak woodlands within Oregon, Washington and California. Quality wildlife habitat and oak-woodland dependent species would continue to decline correspondingly with this loss.

### **Direct and Indirect, Short & Long Term Effects of Alternative #2 – Burdoin II project, as planned**

This alternative strives to mimic the stand conditions that resulted from low-intensity, high frequency fires that occurred historically on Burdoin Mountain. This project shall thin understory trees (oaks < 12”, pine < 8”, and Douglas-fir/Grand fir < 21” dbh-- mean <10”), with a DFC of maintaining well spaced, large trees; a forest resilient to fire. The short term effects will be the noise and related disturbance to wildlife species and area habitat as a result of machine thinning. Wildlife may be forced to take cover or be displaced into neighboring habitats during the day when workers are in their area during the project, but it is unlikely to be significant for the species in the overall planning area, due to habituation from current human activities in the 1,845 acre planning area in the form of roads, scattered homes and recreation trails. All machine work will be outside of the general breeding period of March 1 to June 30 to reduce this disturbance to breeding pairs. Burn piles will cause short-term localized soil damage and vegetation loss. Since these areas will be limited in size and the vegetation is composed largely of non-native annual grasses in open areas, this action is not likely to reduce native habitat measurably. These burned areas will be rehabilitated and seeded with a native grass/forb mix and/or shrub plugs with select big game forage species as an opportunity to increase the long-term quality of deer/elk winter range.

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 be reverted back to a more ecologically stable condition that is resistant to catastrophic fire damage.

### **Cumulative Effects Alternatives #2 - Burdoin II project, as planned**

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. Thinning of under-story vegetation 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 maintain populations at sufficient levels to re-colonize nearby oak habitats as they are retained or improved in the future.

## **V. Documentation of effects to Endangered, Threatened, Sensitive, and Candidate Fish, and Wildlife Species**

This section documents the potential effects to Fish and wildlife species on the following lists:

Federally listed Endangered, Threatened, Proposed and Candidate species,  
Forest Service Regional Foresters sensitive species list,  
Washington State listed Endangered, Threatened, Sensitive and Candidate species, and  
Columbia River Gorge National Scenic Area Sensitive Wildlife Areas and Sites.

The summary table provided earlier in this report (pages 1-9) provides information on all potential TES species in relation to this project area. Only species or areas which have potential to be affected by the project will be discussed further in the following narrative.

Federal T&E Species, including proposed and candidate species

Bald Eagle *Haliaeetus leucocephalus*

Federal Threatened, Washington State Threatened

The bald eagle has a large distribution throughout North America, and is known to live and nest within the CRGNSA year-round. They typically choose to nest in relatively undisturbed sites on large trees adjacent to waterways, which supply them with prey species of primarily fish as well as some waterfowl. Annual surveys for nesting bald eagle pairs are conducted within the Scenic Area as coordinated by Frank Issacs of Oregon State University. At least 11 nest sites are known to be active in the Scenic Area in 2005. There are no known eagle nests within 1 mile of this project area. Activities at this site will not affect known eagle nesting activities. There are a few large (20-28" dbh) pines and Doug fir in vegetation type D within the planning area that can provide nesting or roosting habitat for the Bald Eagle, although present dispersed and chronic human activities (housing, roads) in this area may discourage use of this habitat. The thinning of undergrowth and encroaching vegetation will favor the large trees that will continue to provide potential habitat for nesting and roosting eagles. The implementation of this project will have No Effect on bald eagles or their habitat.

Northern Spotted Owl *Strix occidentalis caurina*

Federal Threatened, Washington State Endangered

The spotted owl is known to be present year-round within the CRGNSA. Northern spotted owls generally have large home ranges and use large tracts of land containing significant acreage of older forest to meet their biological needs. Northern spotted owl habitat consists of four components: (1) Nesting, (2) roosting, (3) foraging, and (4) dispersal. The attributes of superior nesting and roosting habitat typically include a moderate to high canopy closure (60 to 80 percent closure); a multi-layered, multi-species canopy with large overstory trees; a high incidence of large trees with various deformities (e.g., large cavities, broken tops, mistletoe infections, and debris accumulations); large accumulations of fallen trees and other debris; and sufficient open space below the canopy for owls to fly. 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). The project area is near the easternmost edge of its range for this species in the Pacific Northwest. The nearest documented owl pair was located 8.3 miles to the northwest, and the nearest single owl was documented 6.5 miles to north. There is no spotted owl habitat in B, C, D, or E units. Habitat within the planning area in A, G, and F units (specifically A2, A3, A4, G2, G3, and F5) are in second-growth coniferous (mid-seral) stands that may provide north-south dispersal habitat for the spotted owl. These stands may eventually provide some nesting, roosting and foraging habitat for the northern spotted owl,

but are still at least 2-3 decades away in its present seral state. No known spotted owls have been observed or documented in or adjacent to the planning area, and no protocol surveys have been completed due to the lack of nesting/roosting habitat components in the project area.

The implementation of this project will have no effect on the spotted owl, and will not degrade their habitat (as consistent with programmatic Biological Opinion by US Fish and Wildlife Service dated September 8, 2001, Lacey, WA). The thinning, from below, of understory trees (oaks < 12", pine < 8", and Douglas-fir/Grand fir < 21" dbh-- mean <10") is expected to result in improvement to 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 late-seral forest species.

#### Mardon Skipper *Polites mardon*

Federal Candidate, State Endangered

The mardon skipper is currently known to occur in 4 small disjunct populations within Washington, Oregon and California; WA Puget sound, south-central WA Cascades, OR Siskiyou Mtn, and CA north coast (Potter et al, 1999). The historic range and abundance of this species is unknown. In 2001, 31 locations in south-central and SW Washington was surveyed for the Mardon Skipper by USFWS, USFS, and WDFW personnel, including 2 sites in the Scenic Area (Harke, 2001). Thirteen of the 31 locations located mardon skipper populations. All but one of the thirteen location were located near Mt. Adams in the grand fir zone, east of the Cascade crest; there are currently no known occupied sites in the Scenic Area. Characteristics of the occupied habitat include elevation range of 1,850-5,600 feet, in habitat with low tree cover and relatively high ground cover of grasses and forbs; typically classed as meadow, prairie, sedge marsh, or grassy young tree plantation. 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 2001 survey noted mardon skippers using strawberry and common vetch as nectar sources.

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 (Potter, 1999). Mardon skippers were likely more widespread and abundant prior to large-scale loss of their open, grassland habitat.

Within the project area, units B, C, and D contain some small scattered patches of open grassland, though largely dominated by non-native grasses or weed species. The elevation in these units range from 100' to 1200', and is outside the elevation range of known mardon skipper populations. The implementation of this project, specifically burn piles in open areas, is not expected to impact butterflies, since their habitat is not known to be present within the planning area. Post-project, this area will be seeded with native bunchgrasses and be able to carry low-intensity fires that will maintain this ecotype.

#### **Forest Service Regional Foresters sensitive species**

##### California Mountain King Snake *Lampropeltis zonata*

FS Sensitive, Washington State Candidate

The California mountain king snake lives in open oak/pine woodland and rocky riparian areas within Klickitat and Skamania counties. Its habitat and presence is confirmed in the

planning area. This snake is typically found under or inside rotting logs, as well as rocks. Units B, C, D, and F, as well as E3 and E4, contain typical habitat for this species. The large forested strip to the west of Coyote Wall (not in stands for thinning treatment) is also quality habitat, and may provide refugia for the local population during project implementation. During thinning activities, all large down logs will be left in place to reduce risk of disturbance or injury to this species. There may be some localized impacts to individuals of this species due to thinning activities causing ground disturbance and transmitted vibrations. The skidding of logs has the potential to displace large rocks or physically crush snakes hiding underneath them. Project implementation may injure or kill a few individuals due to rock and duff displacement, but it is not expected to impact the population due to the limited size of the units within the planning area, as compared to its range. The open character of its preferred oak-pine woodland habitat, with down logs, is expected to be maintained in the long-term by this project.

Peregrine falcon *Falco peregrinus*

FS Sensitive, Washington State Sensitive

Peregrine falcons have not been noted within the planning area but habitat is present in the cliff area of Coyote Wall. No thinning treatments are proposed within or adjacent to the cliff habitat. This project is not expected to impact future use of this area by peregrine falcons.

Western gray squirrel *Sciurus griseus*

FS Sensitive, Washington State Threatened

Klickitat county is a core area for the western gray squirrel in Washington state. This species is closely associated with pine/oak woodland within the Columbia River Gorge. Critical habitat components for western gray squirrels is considered to be (Vander Haegen et al., 2004):

1. stands of large ponderosa pine (for mast production)
2. clusters of mature conifer trees with interconnecting crowns (for nesting)
3. mature Oregon white oak (mast and den sites)
4. hypogeous fungi (food)
5. free-standing water

Mature trees produce more mast (acorn, pine/fir seeds) than younger stands; a critical food item. This species is expected to benefit from the “thinning from below” prescription within the planning area as the stands shift to again sustain large mast producing trees and a more open stand that they likely evolved in (Ryan and Carey, 1995, Vander Haegen et. al., 2005). Thinning of stands, mimicking low intensity fires, should result in the retention and accelerated growth of the remaining older oaks and pines. The most local data, from the Klickitat Wildlife Area, report mean young emergence from year 2000 to 2004 as June 15 (Vander Haegen et al., 2005). Thinning activities will occur outside this window for young rearing activity (March 1-June 30) to reduce risk of disturbance to female with litter. The project work window, from July 1 to February 28, is expected to distribute the disturbance within the planning area so that only 1 to 2 units may have machinery at the same time. As squirrel maybe in the local area year-round, some disturbance, and incurred stress, to individuals with the noise and increased human traffic will inevitably occur as compared to the no action alternative, but is expected to be only short-term, during project implementation. Nest surveys have been completed in all units within Burdoin Planning area using WDFW protocols. Large oak trees that would also harbor natal den sites was lacking throughout the planning area, although a few small cavities were noted during the surveys. All located western gray squirrel nest sites were numbered and a GPS location

logged. Almost all of the nests detected were inactive; dark brown and/or falling out of the tree. All active nests will retain a 50' no-entry buffer around the nest tree. Trees adjacent to the nest will also be directionally felled away from the nest tree to prevent damage to the nest and the adjacent microhabitat. With this activity plan, it is expected that disturbance to the western gray squirrel will occur short-term (project implementation) and may impact some individuals, but will not likely contribute to a trend toward Federal listing (MIIH). In the long-term, the habitat is expected to improve markedly for persistence of this species in the planning area.

### **State Sensitive species**

Larch mountain salamander *Plethodon larselli*

Washington Sensitive, FS, CRGNSA Sensitive Site

Larch mountain salamander distribution is largely restricted to the Cascades range within southern Washington and northern Oregon, as well as the Columbia River Gorge. This species is well distributed within the CRGNSA in areas of suitable habitat; cool, moist, shady talus and rock slopes. Larch Mountain salamanders are active during the spring and fall, but retreat deep into the talus during the summer and winter. This species has been found within and adjacent to the Burdoin project area in the past, largely within Coyote Wall. Surveys in 2001 and 2002 did not locate this species within planning units (Kennedy, 2002). The implementation of this project will have No Impacts on Larch Mountain salamanders or their habitat.

### **State Candidate species**

Northern goshawk *Accipiter gentilis*

Golden eagle *Aquila chrysaetos*

Flammulated owl *Otus flammeolus*

White-headed woodpecker *Picoides albolarvatus*

Black-backed woodpecker *Picoides arcticus*

Pileated woodpecker *Dryocopus pileatus*

Vaux's swift *Chaetura vauxi*

These species have a wide distribution and may potentially be present in the planning area, although none have been documented nesting or roosting in the planning area. They are grouped due to their shared habitat association of mature coniferous/mixed forests, or large tree requirements for nesting. The pileated woodpecker is the only species that is expected in the area as habitat requirements are only marginally suitable for the other species.

Vegetation Type A, E, F, and G of mixed conifer/oak within the project area contains some of this habitat. Thinning from below (understory oaks < 12", pine < 8", and Douglas-fir/Grand fir < 21" dbh-- mean <10") in this habitat outside the breeding season (March to June), is expected to minimize disturbance to these species if they happen to occur in the planning area. Individuals may be disturbed temporarily by the limited thinning activity, especially when considered cumulatively with the regular disturbance due to scattered homes in the area, but it is unlikely to result in nest or brood loss (Bull et. al., 1995). The thinning of undergrowth and encroaching vegetation will favor the large trees that will eventually provide preferred habitat for this group of wildlife species (Bunnell et. al., 2002). For this species group, the implementation of this project has potential to have some slight displacement impacts to individuals during project implementation (MIIH-May Impact Individuals or Habitat, but will Not Likely Contribute to a Trend Towards Federal Listing). In the long term, thinning activities of the understory is expected to improve growth of remaining large trees due to reduction in competition. This is expected to be beneficial to these species' habitat needs in the long term.

Lewis' woodpecker *Melanerpes lewis*

Sharptail Snake *Contia tenuis*

Striped whipsnake *Masticophis taeniatus*

Chinquapin hairstreak butterfly *Habrodais grunus herri*

These species are associated with, or are commonly found within, open oak woodland. This habitat is targeted for treatment within the planning area. These species have a fairly wide distribution and thus disturbance impacts in late summer through late winter within the planning units may disturb or displace individuals into adjacent areas but will not likely degrade the population within the local area. These species are expected to benefit from thinning 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.

Loggerhead shrike *Lanius ludovicianus*

Merlin *Falco columbarius*

Juniper hairstreak butterfly *Callophyr [Mitoura] grynea barryi*

These species are often found in open grassland, sparsely vegetated areas, or mixed grass/woodland. This habitat is present in the planning area, but it will not be in treatment units. Since thinning activities will not occur in this habitat, there will likely be no impact to these species from the proposed project.

#### Sensitive Plant Species.

Only two species are known to occur within the treatment units and these are found in the open grassy areas. Their protection lies largely in not placing burn piles upon them and keeping large machinery off more open slopes and curtailing them to existing roads as much as possible. The habitats within the treatment units are designed to improve with the proposed treatments and, therefore, should be beneficial. As a result the impacts to these species are expected to be small and will not contribute to loss in their population viability over the long-term, even though some individuals plants may be impacted.

#### **Sensitive Areas and Sites within Col. R. Gorge Nat. Scenic Area**

##### Deer and elk winter range

The project area is located between 100' to 1900' in elevation and is interspersed with residential homes. The U.S. Forest Service will cooperate with the WDFW biologists to suspend mechanized equipment in several or all units if severe winter weather occurs for extended periods that may critically impact big game populations. In the long-term, this project is expected to improve cover and forage (shrub layer) components for big game. The use of native grasses and forbs to seed in areas with disturbed soils, such as skid roads, will also improve forage quality.

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