



United States  
Department of  
Agriculture

**Forest  
Service**

June, 2006



# **Environmental Assessment**

## **Jim's Creek Savanna Restoration Project**

**Middle Fork Ranger District  
Willamette National Forest  
Lane County, Oregon**

**Legal Location: sections 1, 2, 11, and 12, T.24 S, R.3 E. W.M.**

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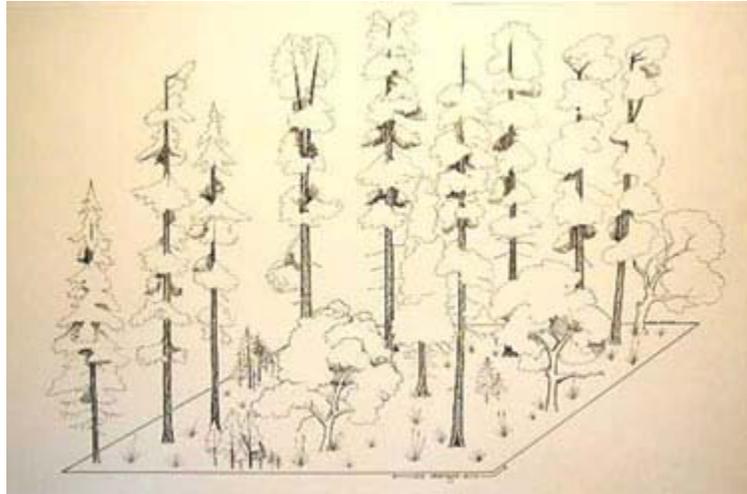
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# Jim's Creek Savannah Restoration Project

## The Jim's Creek Forest ~ Then



100 years ago ~ a savannah...

## The Jim' Creek Forest ~ Now



Today ~ a closed canopy forest ...

This environmental assessment is dedicated to the memory of Carol Winkler, a tireless team member and prime mover of this effort to restore the historic vegetation.

Carol was the archeologist on the interdisciplinary team and passed away late in the development of this project. Carol was aware sometime ago that this area had changed dramatically. She played an integral role in determining the need for restoration and in conveying the importance of this landscape to both historic and current Native American culture. Carol is sincerely missed.

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## Summary

The Willamette National Forest proposes to restore a historic open savanna forest dominated by ponderosa pine, Douglas-fir and Oregon white oak through removal of 100 year old conifer trees that have colonized the area in question subsequent to the commencement of fire suppression. The project area is located in the Hill's Creek Reservoir sixth field watershed which is part of Middle Fork of the Willamette River fifth-field watershed. The project area contains all or portions of sections 1, 2, 11, and 12, T. 24 S., R. 3 E., Willamette Meridian. The project area contains approximately 688 acres and is within the Middle Fork Ranger District, Willamette National Forest, Oregon. This action is needed because biodiversity has significantly decreased and ponderosa pine/Oregon white oak vegetation types have become very rare in the Willamette River basin. Without this action this rare vegetation type will be lost to forest succession.

The proposed action would provide habitat to facilitate persistence of a number of open forest dependant plant and animal species, but would also reduce the amount of late-succession, closed canopy forest habitat in the watershed. The proposed action (Alternative A) would treat about 240 acres with a single entry understory thinning and associated fuels reduction through prescribed burning. It also includes various restoration activities, such as oak and native bunchgrass planting, plantation density reduction, meadow encroachment removal, and prescribed underburning to maintain the savanna. The intent of the thinning is to remove all excess trees at the same time. This would provide for the quickest recovery of bunchgrass and oak regeneration and avoid future ground disturbing activities that could damage recovering vegetation and provide additional risk of noxious weed introduction. The open forest type would then be maintained using prescribed fire.

Approximately 90 percent of the younger age class Douglas-fir, grand-fir, and incense cedar would be removed to leave an average of about 20 trees per acre. The largest of the younger age classed trees would be retained, along with all ponderosa pine and sugar pine, regardless of size, (other than those encroaching upon meadows). Since the largest trees are not evenly distributed across the landscape, the distribution of retained trees would be variable and there could be some open areas up to several acres in size. The alternative also includes other restoration activities, as described in the narrative below.

In addition to the proposed action (Alternative A), the Forest Service also evaluated the following alternatives:

- Alternative B – No Action;
- Alternative C – Staged excess tree removal- on 171 acres;

- Alternative D – Multiple prescription approach- on a total of 171 acres;
- Alternative E – Full restoration – on 455 acres

All the action alternatives provide for some amount of restoration of this important and rare habitat, in compliance with the purpose and need statement, commensurate with the number of acres treated. Alternative C, and to some extent D, do not remove enough trees initially to have many immediate restorative effects. None of the action alternatives would affect stream temperatures or increase peak stream flows. All the action alternatives present a risk of soil erosion, due primarily to the prescribed burning to reduce fuel loading after excess tree removal, and there is some risk for that erosion to enter stream channels and increase stream turbidity. All action alternatives involve some permanent removal of currently suitable northern spotted owl habitat and would reduce the amount of suitable owl habitat within one activity center to less than 40 percent. All action alternatives would reduce fuel loading and eliminate the potential for a stand replacing wild fire. Alternatives A, D and E can be implemented with a positive present net value (PNV). Both Alternatives B and C would result in a negative PNV.

Based upon the effects of the alternatives, the responsible official will decide whether restoration of this former savanna forest is needed, and if so, what alternative to implement in order to best facilitate restoration of this important vegetation type.

# I. Introduction

## A. Document Structure

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The Forest Service has prepared this Environmental Assessment in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. This Environmental Assessment discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives. The document is organized into four parts:

- Introduction: The section includes information on the history of the project proposal, the purpose of and need for the project, the agency's proposal for achieving that purpose and need, and the issues developed to assist in determining environmental effects. This section also details how the Forest Service informed the public of the proposal and an overview of how the public has responded.
- Alternatives, including the Proposed Action: This section provides a more detailed description of the agency's proposed action as well as alternative methods for achieving the stated purpose. These alternatives were developed based on significant issues raised by the public and other agencies. This discussion also includes possible mitigation measures. Finally, this section provides a summary table of the environmental consequences associated with each alternative.
- Environmental Consequences: This section describes the environmental effects of implementing the proposed action and other alternatives. This analysis is organized primarily by the affected environmental components, and secondarily by the Issues. Within each section, the affected environment is described first to provide a baseline for evaluation and comparison of alternatives.
- Agencies and Persons Consulted: This section provides a list of Interdisciplinary Team members and agencies consulted during the development of the environmental assessment.

Chapter VI of this document lists the contents of the Analysis File for this project. This File contains the various reports prepared by the Interdisciplinary Team provide more detailed information to support the analyses presented in this environmental assessment. The Analysis File is in the project planning record located at the Middle Fork Ranger District Office in Westfir, Oregon.

This document contains numerous literature citations the titles of which can be found at the end in section VII. There are also numerous references to Forest Wide (FW) and Management Area (MA) standards and guidelines contained in the Forest Plan (USDA 1990a). These references are typically in parentheses containing numbers as follows: (FW-XXX; MA-XX-XX), and refer to the standards and guidelines that can be found in Chapter IV of the Forest Plan starting on page IV-47. It also contains numerous citations of the Standards and Guidelines contained in the Record of Decision for the Northwest Forest Plan (USDA/USDI 1994). These citations are made as follows; (ROD, page A-XX).

## **B. Background**

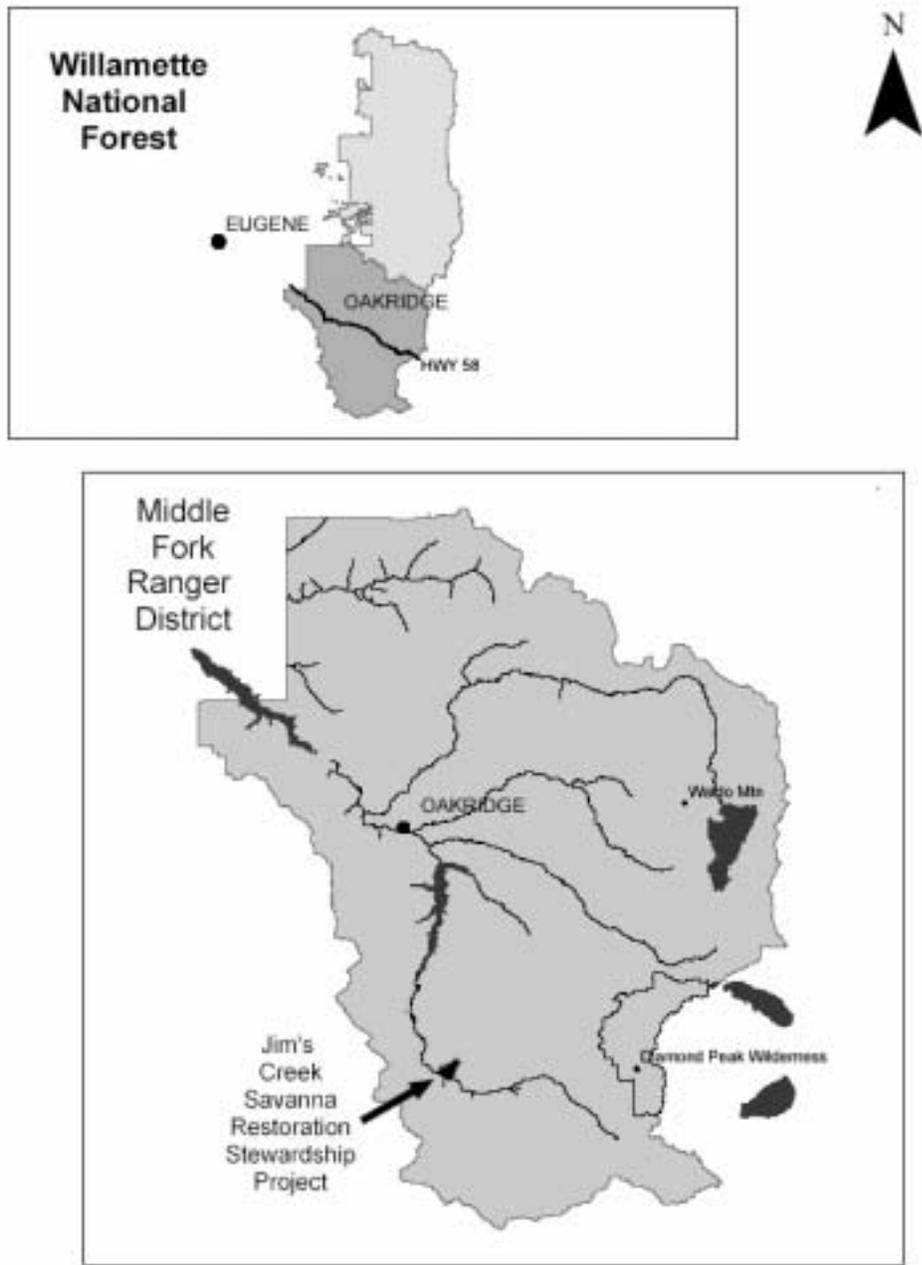
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### **1. Location and General Planning Area Description:**

The Jim's Creek Savanna Restoration Project has been proposed to return a dense, mostly young forest to its historically more open character in order to maintain ecosystem biodiversity. The project area is located in the Coal Creek and Buck Creek sixth field watersheds, which are the upper portions of the Hill's Creek Reservoir fifth- field watershed of the Middle Fork of the Willamette River. The project area contains all or portions of sections 1, 2, 11, and 12, T. 24 S., R. 3, Willamette Meridian. The entire project area contains approximately 688 acres (see the following map) which are all tributary to the Middle Fork of the Willamette River.

Elevations in the project area range between 2000 and 3300 feet. Topography is mostly gentle but ranges from nearly flat to over 50 percent in slope. The project area is lightly roaded with a mosaic of mature forest stands dominated by Douglas-fir ranging from 90 to about 400 years of age with a smaller component of ponderosa pine of both age classes. These mature forests contain an average of about 160 trees per acre, about 152 of which are around 100 years old. The remaining trees range in age from about 200 to over 400 years. These older trees are remnants from when this portion of the landscape was a much more open, savanna-like forest which at one time contained a component of large Oregon white oak. These forests have a more or less closed canopy due to the cessation of prescribed fire that was practiced by native Americans (see Bailey and Kertis, 2002, Winkler and Bailey, 2002), a cessation of grazing that likely kept these stands open during the early settlement period, and fire suppression over the last 80 years. The project area contains 63 acres (9 percent) of younger stands created by past regeneration harvest. About two thirds of these managed stand acres are in two shelterwood harvested areas, which have from 20 to 25 large trees per acre and a 20 year old understory. The other third is composed of young plantations, primarily ponderosa pine about 20 years of age.

# Jim's Creek Savanna Restoration Project Vicinity Map



**Figure 1 - Vicinity Map**

One recreation trail, the Young's Rock trail, traverses the project area. At the bottom of the slope is Forest Road 21, which has scenic allocations along it. The Campers Flat campground is also located in the southeastern corner of the planning area between Road 21 and the Middle Fork of the Willamette River.

As will be more completely discussed and supported in the Purpose and Need section below, this forest was once much more open than it is now, and that more open condition at one time provided for a greater plant and animal species diversity than currently exists.

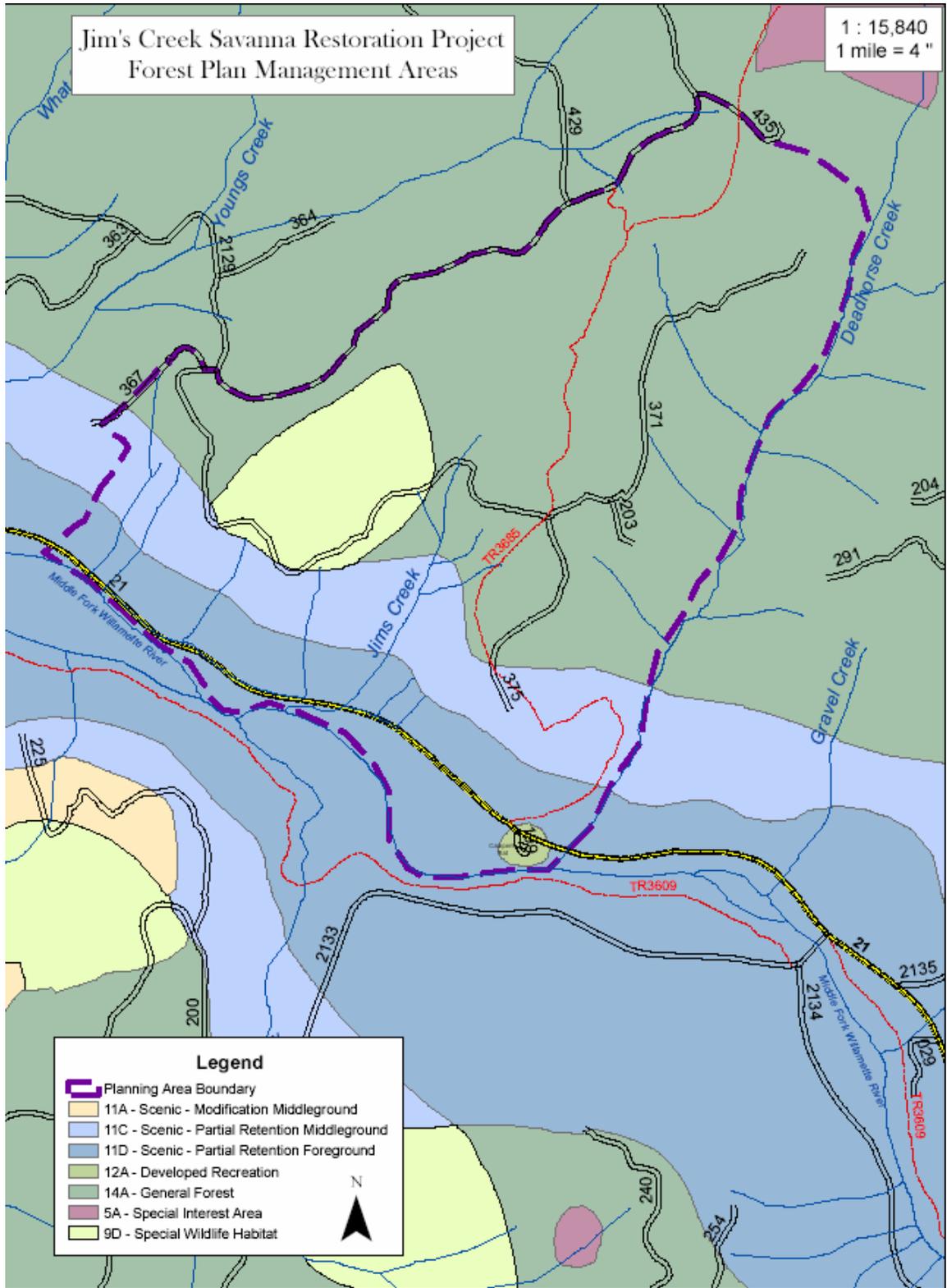
The Willamette National Forest has received Stewardship Contracting Authority for the Jim's Creek restoration project from the Pacific Northwest's Regional Forester, should an action alternative be selected. This special contracting authority is limited to projects with a restoration component that have strong public support and collaborative efforts. The authority provides for the use of special contracts in accomplishing restoration activities, and any receipts generated from the sale of forest products can be retained by the Forest Service for use in funding additional restoration projects in an identified stewardship contracting area not limited to the initial project area.

## **2. Forest Plan Direction:**

The Willamette National Forest Land and Resource Management Plan and Final Environmental Impact Statement (USDA, 1990a and b) as amended by the Record of Decision of April 1994 for the Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species within the Range of the Northern Spotted Owl (North West Forest Plan; USDA/USDI 1994) provides management direction, land allocations, and standards and guidelines for the management of forest lands in this planning area. To distinguish between the two plans, this document will refer to them as the Forest Plan and the Northwest Forest Plan (NWFP), respectively. The Northwest Forest Plan provides a regional strategy for management of federal lands and the old-growth and late-successional forest ecosystems they contain. The Northwest Forest Plan amends land allocations established in the Willamette Forest Plan. These new land allocations build the framework for maintaining a functional and interconnected late-successional forest ecosystem throughout the Northwest Region.

The Northwest Forest Plan has designated all of this area as Matrix lands, aside from the riparian reserves mentioned below. Matrix lands are where most timber harvest and other silvicultural activities are to occur (NWFP Standards and Guidelines, page C-39).

The Willamette Forest Plan allocates this project area to Management Areas (MA), as follows: General Forest (MA-14A; 57 percent), Scenic-Partial Retention-Midground (MA-11C; 17 percent), Scenic-Partial Retention-Foreground (MA-11d; 17 percent), and



**Figure 2 - Project Area Forest Plan Management Areas**

Special Wildlife habitat (MA-9d; 9 percent), as shown on the following map. The area also contains about 167 acres of riparian reserves (24 percent of the project area). See the Forest Plan (pages IV-, 177, 205, 207, and 231) for full description of the Standards and Guidelines for Management Areas 9d, 11c, 11d, and 14a, respectively. See page C-30 of the NWFP for a descriptions of the standards and guidelines for riparian reserve management and protection. Both these plans also contain general standards and guidelines that apply to all land allocations (Forest Plan, starting on page IV-45; NWFP, page C-1). Of particular relevance to this proposed action are those standards relating to forest and stand level diversity, as fully discussed below under the Purpose and Need for Action.

The Desired Future conditions stated in the Forest Plan for these land allocations are as follows: MA 9d - to have a well distributed network of high quality habitats that provide unique characteristics and diversity to the landscape; natural processes will prevail without human intervention. MA 11c - will be managed to maintain a near natural setting; management activities will be noticeable in the middleground and background; MA 11d – will be managed to maintain a near natural setting; management activities will remain subordinate to the characteristic landscape; MA 14a – the landscape will be a patchwork of ages classes and species of trees, timber will be available for sale on a non-declining even-flow basis on lands suitable for timber production; Riparian reserves (MA-15) are to be managed (NWFP page B-13) to maintain and restore riparian structures and functions, riparian dependant species, provide dispersal corridors for terrestrial plants and animals and provide watershed connectivity. See the Land Management Objectives (Section II) of the Silvics Background Paper (Bailey, 2005; contained in this project's Analysis File) for a more in-depth discussion of Management Area standards and guidelines, and some of the inconsistencies they contain regarding the accomplishment of biodiversity objectives.

The project area is not within an inventoried roadless area, nor any other area identified as being unroaded.

### **C. Purpose and Need for Action**

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The purpose of the proposed project is to restore and develop an open, low density forest dominated by large ponderosa pine, Douglas-fir, and Oregon white oak with a significant component of native bunchgrass and other disturbance dependant herbaceous plants in the understory. An associated purpose of the project is to create a forest condition sustainable through time by either naturally ignited or prescribed frequent, low intensity fires. This type of vegetation would be less likely to experience stand replacement mortality from wildfire. The further purpose of these restoration actions is to achieve

biodiversity objectives by providing habitat for a number of plant and animal species that are no longer common in the Willamette River watershed.

Vegetation within the Jim's Creek project area consists of a 100 to 120 year old forest with about 160 trees per acre averaging 17 inches in diameter (Bailey, 2005b). -This forest is principally composed of Douglas-fir, with some ponderosa pine and incense cedar, and a widely scattered overstory of older ponderosa pine and Douglas-fir with an average diameter of about 35 inches that were present during the past savanna conditions. Approximately five of these older trees per acre remain in the stand. The bunchgrass that historically grew in dense patches under the sparse tree canopy (Kerchholtes, 2006) has declined and disappeared in most places.

The large ponderosa pine that used to dominate this forest are slowly dying due to competition from the dense secondary canopy trees. The shade cast by the 100 year-old canopy does not allow for the development of pine regeneration. This closed canopy of 100 year-old trees presents some risk of losing the entire stand, including savanna legacy trees, to wildfire. Since the crowns of these trees touch, a fire event occurring certain weather conditions could result in a crown fire which would likely kill all vegetation on the site, thereby diminishing any restoration potential that exists.

The Desired Future Condition (DFC) of this area (see Bailey and Kertis, 2002 and the DFC section of Bailey, 2005b) is its historic condition of an open forest with an understory of native grasses and herbs. One hundred twenty years ago this forest contained approximately 14 large ponderosa pine, Douglas-fir, and Oregon white oak trees per acre (in about equal amounts) and the ground was probably covered by a more or less contiguous stand of native bunchgrass (Kirchholtes, 2006). It is apparent from the characteristics of the remaining legacy trees (see pages 11-15 of Bailey, 2005b, and Bailey and Kertis, 2002) that fire played an important role in maintaining this open forest with a grassy understory.

Most of the large Oregon white oak that were in these forests have died. They persist mostly within or along the edges of several natural openings. Oregon white oak vegetation types have declined dramatically in the Willamette watershed (ODF, 2004; Oregon Biodiversity Project, 1998), as have the open ponderosa pine forests in the Middle Fork watershed. There is a need to restore or maintain biodiversity consistent with direction set forth in the Willamette Forest Plan as amended by the Northwest Forest Plan (see the discussion for Forest Plan biodiversity standards and guidelines below). In order to achieve the above purposes, the following specific needs should be met:

- There is a need to maintain the potentially unique genetic resource represented by the Oregon white oak and ponderosa pine which are growing at the edge of their ranges and which may be uniquely adapted to dry conditions. These remnant

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populations could serve as a center for recolonization of the larger landscape should climatic conditions change;

- There is a need to proactively provide native bunchgrass, other native and culturally important herbaceous plants, and Oregon white oak regeneration to assure all plants key to restoring the original savanna are established in adequate amounts;
- In order to provide for the first two needs, as well as to accomplish the over-all purpose of maintaining and restoring important biodiversity, there is a need to dramatically reduce the number of trees occupying these sites so that there will be enough sunlight available to provide for reestablishment of native grasses and herbs, as well as provide for oak and ponderosa pine regeneration. Specifically, about 140 trees per acre need to be removed;
- There will be a need to reduce the amount of woody fuels generated by the above removal of trees, should the proposed action be implemented;
- There is a need to provide an adaptive learning opportunity on this small piece of the landscape in order to determine if similar actions are appropriate across the 25,000 acre mixed conifer forest type, within which the Jim's Creek area is centered;
- There is a need to do restoration at the landscape level, which creates habitat patch sizes more in keeping with the natural disturbance regime. While there are many small pockets of remaining oak and pine habitat scattered across the Middle Fork Ranger District, it is clear by the absence of various species (such as the acorn woodpecker and Lewis's woodpecker) which require open oak and pine forest that these small patches do not provide all the functions of a larger habitat pattern;
- There is a need to create conditions where periodic prescribed fire can be applied to the sites where tree density is reduced to maintain this area in an open forest condition and sustain native grasses;
- There is a need to reduce the fire regime condition class from a III (many missed natural fire cycles) to a I (natural fire regime is unchanged) in order to reintroduce the natural disturbance process and ensure this important habitat element is less threatened by wildfire and more resilient should wildfire occur (see Hays, 2005 and Bailey, 2005b);
- There is a need to accomplish the above purposes in an economically efficient manner. There is little funding allocated for restoration work and commercial removal of forest products would facilitate restoration and potentially generate

funding. Such funding can be used for other restoration projects in and around the Jim's Creek planning area which would not generate commercially valuable products.

The following narrative explains in greater detail why these purposes and needs are important in general and why this particular piece of the landscape has been proposed within which to achieve them.

### **1. Purpose and Need Rationale:**

Recent public interest in, and concern for the persistence of oak and pine forests in the Willamette Valley has developed, as these vegetation types have become quite rare (Tolle, 1982; Oregon Biodiversity Project, 1998; USDA/USDI, 2000; Chappell and Kagen, 2001; Whelan, 2004) . The vegetation type that used to exist in the Jim's Creek vicinity has many values as described below. Restoration of the historic vegetative structure and composition would address the biodiversity objectives of providing habitat for a number of plant and animal species that are no longer very common in the Willamette River watershed. Restoration would also provide a number of educational and recreational opportunities, and protect and enhance cultural components of the ecosystem important to Native American communities. Restoration would provide for the preservation of an important genetic reserve, as the oak and pine on these sites are on the edge of the species' range (Wright, 1976) and the populations may have a unique genetic composition.

Over the past decade or more the maintenance or restoration of biodiversity has become an important consideration when developing management prescriptions for National Forest lands. Such objectives are reflected in the Willamette National Forest Plan's Standards and Guidelines for forest, landscape, and stand level diversity (pages IV-78 and 79). Specifically, Standards and Guidelines FW-199, 201, 207, and 211, as described below, encourage the maintenance and restoration of biodiversity and plant habitats:

**FW-201:** "Biological diversity shall be maintained or enhanced by providing ecologically sound distribution and abundance of plant and animal communities and species of all age classes at the Forest, basin, and stand level. This distribution will contribute to the goal of maintaining all native....species and communities".

**FW-207:** "During project planning, site-specific analysis shall consider biological diversity and ecosystem function".

**FW-211:** "Special wildlife and plant habitats....shall be maintained....examples of special habitats include.... unique plant associations".

In addition, standards and guidelines for Management Area 9d – Special Wildlife Habitat direct the District to maintain habitats of native wildlife and plants (MA-9d-07). The

desired future conditions for the management areas within this planning area are discussed above (and on pages 7 to 9 of Bailey, 2005b).

The Northwest Forest Plan Aquatic Conservation Strategy Objectives (USDA/USDI, 1994, page B-11) also provide direction relevant to restoration of changing vegetation types at the landscape level. Specifically, Objectives 1. (“maintain and restore the distribution, diversity, and complexity of watershed and landscape-scale features ...”) and 8 (“maintain and restore the species composition and structural diversity of plant and animal communities...”) address the need to restore altered components of the ecosystem. These guidelines are to be met at the 5<sup>th</sup> field watershed level and this project would contribute to achieving the objectives above.

Both the Middle Fork Willamette Viewshed Corridor Study (USDA, 1988) and the Middle Fork Watershed Analysis (USDA, 1995) specifically recognize the uniqueness of this forest type and the threat under which it currently exists, and both analyses recommend these originally open stands be managed to maintain or restore their open character. The Watershed Analysis specifically presented a priority recommendation to assess and develop management strategies to maintain functions of the open forest habitats in the ponderosa pine area (page 6-2). Also, A First Approximation of Ecosystem Health – National Forest Lands. (USDA, 1993) concluded that the mixed conifer stands in the Middle Fork watershed are some of the vegetation types furthest outside their natural range of conditions within the Willamette watershed.

Additionally, the Integrated Natural Fuels Management Strategy (USDA/USDI, 2000) identifies the rare nature of pine and oak vegetation types in the Willamette Basin, observes that such vegetation types on Federal lands show considerable encroachment by Douglas-fir, and establishes the desired future condition of maintenance and restoration for these vegetation types.

Considering the above current condition and general recommendations, there is a need to markedly reduce the number of trees on these sites and to develop a stand structure and ground vegetation that would provide for the use of periodic fire to maintain the area as a savanna or open forest in the future. Maintenance of this vegetation type is important because it provides the following values:

- It would provide for the maintenance of plant and animal species that require an open forest and periodic fire, in particular Oregon white oak which has become quite rare in the Willamette Valley (less than one half of one percent of these open oak forests remain; USDA, 1993), an area where open oak stands used to be quite common.
- In addition to the above general biodiversity objectives, there may also be an additional need to restore this area in relation to the potential for future climate

change. Should the future climate become warmer and drier, as has occurred periodically in the distant past, it would be very important to have a healthy and reproductive ponderosa pine and Oregon white oak forest adapted to dry conditions which could serve as a center for re-colonization of the larger landscape.

- It would provide for the maintenance of historical and current cultural needs of the native American populations that have used and continue to use this landscape (Boyd, 1999).
- It provided important wildlife forage and native American food supplies, both in terms of the grass, camas, and other herbaceous plants that grew under the scattered conifer understory, and the acorns produced by the more abundant and healthy oak;
- It would create fuel conditions which markedly reduce the likelihood that a crown fire would be able to develop, and would help ensure the continued existence of the live legacy trees.
- It would present a variability in the landscape for the overall visual experience;

## **2. Why Here; Why Now?**

This question is addressed because a concern that there may be other areas with a higher restoration priority was identified during some of the public field trips over the past four years. Once it was recognized the Jim's Creek area had once contained a savanna vegetation type with such a relatively high abundance of large Oregon white oak, other areas within the mixed conifer forest type were searched to determine how unique the Jim's Creek area was in that context. To date, no other areas on the Middle Fork Ranger District have been found that have or had as large an area occupied by large, open-grown oaks, nor which have as many remaining, large diameter oaks capable of providing a seed source for restoration efforts. If we are to embark on a restoration effort to restore the open forest that used to be so common on the Middle Fork of the Willamette watershed, the Jim's Creek area seems to be the place to start. Efforts here would have benefits in terms of providing for both ponderosa pine and oak regeneration, as well as the whole host of ground vegetation plants which also still remain on the site.

The Jim's Creek planning area has lost approximately half of the savanna-form ponderosa pine and more than 90 percent of the open-grown Oregon white oak (Bailey, 2005b, Bailey and Kertis, 2002). Delay of restoration actions would likely result in an increased risk of losing the remaining unique genetic and structural legacies on the site. Ideally, restoration should have begun on this site decades ago, before many of the larger oak and pine succumbed to competition mortality.

This area provides some especially unique restoration opportunities in addition to the legacy vegetation that it still contains. The area is entirely in public ownership. Air quality concerns are less compared to other oak habitat areas closer to the Willamette Valley and residential areas (responding to the need to return fire to its original frequency and function). Other areas containing remnant oak and pine (such as the City of Oakridge and its surroundings) contain land uses that may not be compatible with restoration or periodic burning. The project area also presents climatic conditions which facilitate application of prescribed fire during the winter months when risk of escape and unacceptable air quality impact are considerably lessened.

Though complete restoration in this area will take a long time, there is little vegetation present that could seriously compete with re-establishing grasses, oaks, and pines. There are few of the very aggressive noxious weeds such as Himalayan blackberry and Scots broom occurring on this site, such as those that threaten many other oak and pine types lower in the Willamette Valley. Therefore, restoration in this area, even though conditions have changed so much, presents a greater likelihood of success without incurring a high risk of noxious weed invasion or expansion.

Additionally, this area contains an abundance of cultural sites (in particular the many culturally modified ponderosa pine) from past Native American use. The proposed restoration would re-create the cultural landscape that was maintained, if not created, by the prehistoric use and management of the land's resources. While restoration of an open mixed conifer forest could be done in other areas, the Jim's Creek area may provide the best opportunity to accomplish both biodiversity and cultural objectives.

#### **D. Proposed Action**

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The action proposed by the Middle Fork Ranger District of the Willamette National Forest is implementation of the following activities to begin restoration of a savanna vegetation type in the Jim's Creek area in order to meet the above Purpose and Need. Effects of these actions have been addressed in this analysis (see the following map included under Alternative A).

Removal of most of the younger age class of trees on about 240 acres of the project area. This proposed action is the most direct approach to restoration. Removal of about 140 trees per acres from the 100 year age class would open up the stand to provide for reestablishment of the native bunchgrass and provide for the potential for natural or managed ponderosa pine and Oregon white oak regeneration. Tree removal would also reduce competition to extend the life of existing oak and pine legacy trees. The excess tree removal would be accomplished with a commercial timber sale that would be sold in FY 2007. Cable and aerial logging systems would be used to removal the trees from the site.

Reconstruction and maintenance of Roads 2129, 2129.369, 371, and 375 to facilitate removal of the excess trees. These activities would include ditch line improvement, surface rock replacement, culvert replacement (including the Young's Creek culvert on road 2129) and brushing, and would occur prior to removal of timber in 2007 or after;

Plantation restoration: The four 20 year old plantations in the Jim's Creek stand (two clearcuts and two shelterwoods) have already experienced some restoration of original conditions; all have developed a relatively dense and healthy stand of bunch grass (California fescue), oaks have regenerated to some extent, and retained overstory trees have survived and are more vigorous. Treatments needed to provide for continued restoration of historic conditions in these areas include reduction of fuels generated by the recent pre-commercial thinning, young conifer thinning, oak regeneration, snag creation, the application of light prescribed fire to maintain these areas as an open forest, and possibly culturing the bunchgrass for seed collection. These activities would occur after funding is generated by timber harvest payments, in 2008 or after.

Reduction of fuels created by the above excess tree removal by hand piling and burning in the late fall or winter, after logging has been completed. This would begin to occur in 2008;

Noxious weed abatement along the road system and within meadows;

Closure of road 2129.371 (and all tributary spurs) by gating to reduce wildlife disturbances, after slash disposal and planting have been completed, some time in 2010;

Prescribed underburning would occur, starting about 2015, to maintain an open forest in the future. The first application of this maintenance prescribed fire would not occur until a dense grass layer has developed (This would be the fuel to carry the fire) and the planted oaks have attained a stature sufficient to survive the fire. It is estimated this could take 10 to 12 years once the grass is seeded and oaks are planted. Since such a long period of time would elapse before the prescribed burning would occur, this NEPA analysis would not cover its implementation, since not enough is known about the future conditions under which it would be implemented to accurately estimate its environmental effects. Supplemental environmental analysis would have to be conducted in the future prior to implementation of a prescribed burning regime. This periodic underburning would be essential for successful long-term implementation of this restoration project and it is mentioned here even though it would be covered by a future analysis to indicate our intent that such activities do take place in the future. This underburning is intended to occur every five to ten years as necessary to reduce the density of conifer seedlings.

Meadow restoration on 30 acres, including removal of invading conifers, removal of invasive species, burning, and seeding of native meadow vegetation. These activities would occur after funding is generated by timber harvest payments, in 2008 or after;

Planting of native ground vegetation across all the areas to be treated. This would include native grasses and other culturally important plants, including Oregon white oaks. These activities would occur in 2008, after slash has been burned.

Implementation of these proposed actions would require a site-specific, non-significant Forest Plan amendment. There are several Forest Wide and Management Area standards and guidelines with which this proposal may not fully comply (see a more detailed explanation of this situation in section II. F. of this document). Specifically, Forest Wide trail management guidelines may have to be modified for this specific area, as well as timber harvest guidelines for scenic Management Areas 11c and 11d. The trail guidelines (FW-046 to 048) are essentially scenic in nature and they restrict even-aged timber harvest within trail corridors and trail frontage. While the proposed restoration harvest would not constitute even-aged harvest (see Bailey, 2005b), the proposed excess tree removal would substantially change the visual character of the area, even though it is designed to re-create the characteristic landscape. Similarly, the scenic management guidelines for timber harvest (MA-11c-04 to 08 and MA-11d-07 to 16) do not directly address the potential for extensive, uneven-aged harvest for the purpose of restoring the characteristics landscape. Again, these scenic guideline apply specifically to even-aged regeneration harvest, but the size of the proposed harvested area in this proposed action would exceed harvest unit restrictions by a factor of 30.

### **Decision Framework**

1. The deciding official, the Willamette National Forest Supervisor, will review the proposed action and the other alternatives, given the purpose and need, in order to make the following decisions and determinations:
2. What the optimal method of accomplishing the purposes and needs for this project should be, while resolving issues associated with the planning area, and which actions alternative, if any, should be implemented;
3. Whether other restoration activities, such as prescribed burning, should be applied;
4. Whether or not a Forest Plan Amendment is necessary, should an action alternative be selected, and what specifically would have to be amended;
5. Whether the selected alternative should be modified in any way;
6. What mitigating measures should occur along with any restoration activity;
7. How the road system in this area should be managed;
8. Whether this action is in compliance with the Forest Plan (USDA, 1990a, USDA/USDI, 1994).

### **Relation To Other Documents and Analyses**

This environmental assessment is tiered to The Final Environmental Impact Statement for the Willamette National Forest Land and Resource Management Plan (USDA, 1990b) as amended by the Record of Decision of April 1994 for the Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species within the Range of the Northern Spotted Owl (Northwest Forest Plan; USDA/USDI 1994) The above actions have been proposed to implement the objectives and guidelines of these two plans.

The Watershed Analysis for the Middle Fork of the Willamette Downstream Tributaries (USDA, 1995) is incorporated by references throughout this document. The Watershed Analysis recommends the needed activities and mitigation measures to comply with the Aquatic Conservation Strategy Objectives, determines the width for riparian reserves, and establishes the need for and benefit of thinning stands within the riparian reserves (see Recommendations section, page 5 and Appendix K). The Willamette National Forest Road Analysis Report (USDA, 2003.) is also referenced. The proposed actions and other alternatives addressed in this document are also in compliance with guidance provided by the Middle Fork District Supplemental Road Analysis (USDA 2004b), which specifies system roads that should remain open to facilitate management and public use or that should be closed to reduce maintenance costs and resources risk.

### **E. Public Involvement**

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Public scoping is an ongoing process used to determine the scope and significance of a proposed set of actions, the issues that should be addressed in analyzing proposed actions, and the alternatives that need to be addressed to provide for a well-considered decision. Agency and public comments are solicited throughout the project planning period to help determine the above items, in conjunction with review of existing landscape analyses which assessed the current condition of the planning area. Scoping for this project began in December, 2001 after an extensive field survey was completed to document the large changes that have occurred on this landscape over the last 100 years.

The November, 2003 Willamette National Forest "Forest Focus", a quarterly planning newsletter, included the first formal announcement of the Jim's Creek Savanna Restoration proposal. Updated information on this proposal has been included in each subsequent Forest Focus edition through Spring, 2006. This newsletter is the initial vehicle used to inform interested parties about this and similar project proposals and is routinely sent to a 150 plus person mailing list, in addition to being available on the Willamette National Forest's web site.

The public outreach efforts for this project began in 2002 with a series of public field trips. The first of these trips were to give people an overview of the area's characteristics and conditions to solicit thoughts as to whether or not there was a need for action and what, if anything, needs to be done to address the habitat changes that have occurred in this area over the last 100 years. A total of ten public field trips to the project area have been conducted to date.

A total of six public meetings and presentations were conducted to inform various groups of the project, and to solicit comments. The Siletz, Klamath, Cow Creek Band of the Umpqua, Grand Ronde, and Warmer Spring tribes were all sent notification of the project proposal. Representatives of the Grand Ronde Tribe have visited the project area on two occasions. The Middle Fork Watershed Council was given presentations on this project on three separate occasions and several of the field trips were attended by Watershed Council members. Presentations were also made to the Oregon Hunter's Association. A meeting on February 1, 2003 for all those who had visited the project area was the venue from which the proposed action was developed, based upon attendees' input and the vision they expressed for what they would like to see this area look like 50 years from now.

An electronic mailing list was developed over the course this project which at this time includes about 80 names (including some local Forest Service employees and representatives of other Federal agencies). These are people who have visited the project area and expressed a desired to receive periodic updates and/or continue to be involved in the development of this proposal, who listened to presentations, or who had heard about the project by word of mouth. Notes from every Interdisciplinary Team meeting (totaling about 18) have been sent to this mailing list, as well as electronic copies of the various background, NEPA, and scoping documents that have been prepared to date. The mailing list and a list of the various field trips and public meetings can be found in the Public Involvement section of the project's Analysis File.

Additionally, the Dead Mountain Echo (Oakridge weekly newspaper) ran a two part series on the project, highlighting the May 12, 2004 field trip. On March 1, 2005, a one page flyer announcing the project and asking for comments was also placed on the Young's Rock trail head above Campers Flat campground, and where the trail leaves the north end of the planning area.

The first formal announcement of a specific proposed action was made in a Scoping Letter mailed to a list of 23 people, agencies, and tribes that have expressed interest in similar past projects on April 2, 2004. This Scoping Letter was also sent electronically to the 80 person project mailing list mentioned above.

In early November, 2004 the Middle Fork Ranger District sponsored a five day community collaboration workshop (put on by James Kent Associates) which used the Jim's Creek Savanna Restoration Project as a case study and opportunity to generate local collaborative interest and efforts. Workshop participants went into the communities of Oakridge/Westfir, Lowell, Dexter, and to a lesser extent Eugene/Springfield to census the community's interest in the Jim's Creek project.

In general, public reaction to this restoration proposal has been favorable. Just about everyone who has participated in public field trips or meetings has expressed general support for the project objectives and the proposed actions. All issues raised by the public during the outreach processes are addressed in some fashion within this analysis. Some have expressed some reservations in terms of how much land to initially treat. This is fully discussed under the vegetation portion of Chapter III, Environmental Consequences of this document, and specifically addressed in the restoration efficacy discussion.

## **F. Issues**

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The scoping process for this project area identified the following specific issues around which alternatives were developed and analyzed. All the people and organizations participating in the scoping efforts detailed above helped to determine the issues. Significant issues are those around which alternatives are developed. Alternatives can be compared by how well they respond to these issues.

Non-significant issues are not necessarily unimportant. They can be those issues which are so important that all alternatives need to respond to them equally, for example protection of cultural resource sites, and in that sense would not help to differentiate between alternatives.

Non-significant issues may also be those which are mitigated by standards and guidelines in the Forest Plan or decided upon by laws and regulations. Generally these non-significant issues can be addressed through resource prescriptions or by following the procedures established by laws and regulations.

**1. Water Quality/Fish Habitat – Significant Issue** - The Middle Fork of the Willamette River is at the bottom of the slope that is proposed for restoration to a savanna. This river has been designated as critical habitat for Chinook salmon and bull trout. This river has been listed by the Oregon Department of Environmental Quality under Section 303d of the Clean Water Act as being water quality limited due to elevated summer temperatures. The proposed activities have a potential to impact water quality, either by producing sediment by altering hydrologic functions, or by increasing water temperatures. The planning area is in the Coal Creek and Buck Creek 6th field watersheds. This issue will

serve to address the effects on fish habitat as well as water quality. Because no activities are proposed that would have any direct effect to the physical aspects of aquatic habitat, potential water quality changes will be used to assess fisheries effects.

Evaluation criteria:

- change in temperature in the Middle Fork of the Willamette River below the project area
- potential for an increase in peak flow, as measured by change in the Aggregate Recovery Percentage
- potential for turbidity increases, as measured by potential soil erosion

**2. Late-Successional Wildlife Habitat – Significant Issue** - Restoration of savanna conditions would change the wildlife habitat from a closed canopy forest slowly approaching late-successional conditions to a much more open forest that would not provide late-successional habitat as long as savanna conditions are maintained. The proposed actions are designed in part to restore a type of wildlife habitat that has all but disappeared in the Willamette River watershed. Making this forest more open at any scale will have an impact on the suite of species that may currently be using the area, in particular northern spotted owls. This area now provides spotted owl dispersal, foraging, and roosting habitat and one area of nesting habitat; habitat that did not likely exist on these lands 100 years ago. The proposed action would eliminate suitable spotted owl nesting habitat from a portion of this area. This is a purposeful tradeoff between maintaining closed canopy, late-successional forest and restoring the scarce oak/pine savanna habitat.

Evaluation criteria:

- amount of modified habitat;
- amount of closed canopy habitat eliminated
- acres of suitable northern spotted owl suitable habitat removed or degraded
- acreage of suitable habitat northern spotted owl habitat within home ranges, as measured by acres of suitable habitat within 1.2 miles of activity centers

**3. Maintenance of Biodiversity – Significant Issue** - This issue is directly related to the purpose and need for savanna restoration. The Forest Wide Standard and Guideline FW-201 (page IV-78) directs that “biological diversity **shall** be maintained or enhanced by providing an ecologically sound distribution and abundance of plant and animal communities and species of all age classes at the Forest, basin and stand level” and FW-

211 (page IV-79) directs that “wildlife and plant habitats not currently identified in non-harvest management areas **shall** be maintained” (emphasis added). Much of the original diversity that existed on these slopes has been lost, especially in terms of wildlife species that use open pine and oak habitat, and various plant species requiring more open conditions. The structural characteristics of this forest have changed with the increasing canopy closure. Continuation of the status quo will result in continued reduction in landscape biodiversity compared to what used to exist on these lands.

Evaluation criteria:

- change in Habitat Effectiveness Index for big game
- Species that would be favored or not favored by restoration
- acres of meadow habitat improvement
- acres of savanna/open forest created
- likelihood that treatment will achieve the desired future condition
- average patch size of savanna, as an approximation of historic landscape conditions
- change in fire regime condition class

**4. Fuel Accumulation and Fire Risk – Significant Issue** – The vegetation structure and composition in this area has changed considerably from what it was about 100 years ago due to fire suppression and the apparent cessation of prescribed burning. These slopes have missed from four to 12 fire cycles over that period of time, resulting in the development of a closed canopy forest. This could result in a crown fire over an area that previously did not have dense enough coniferous vegetation to support severe fires. Should such a fire event happen in the future (as it did in 1996 just north of the project area) most of the existing trees including the residual savanna oaks and pines would likely be killed. A stand replacing fire event would also have a negative impact on the scenic qualities of the area. Though the area currently does not have a great amount of ground fuel accumulation compared to other closed canopy forests, this fuel loading continues to increase as the stands thin themselves. Restoration activities could also generate fuels that could put remaining and adjacent vegetation at risk of fire mortality in the short-term, unless treated.

Evaluation criteria:

- change in fuel structure
- fuel loading; tons per acre
- likelihood of the forest to carry a crown fire

**5. Cultural Resources**– This savanna landscape was likely maintained by native Americans through use of prescribed fire. The burning was likely done to maintain a vegetative assemblage containing plants useful to that culture. There is an opportunity to enhance a traditional cultural landscape by preserving and cultivating a number of traditional cultural plants, such as camas, yampa, ponderosa pine, and Oregon white oak, including the culturally modified trees scattered throughout the stands. The proposed activities have the potential to impact culturally modified trees. Lack of restoration would eventually result in disappearance of a number of culturally important plant species from the site, and would not provide for the continued vigor of the still remaining, culturally modified trees.

Evaluation criteria:

- acres of cultural traditional plants created or enhanced

**6. Maintenance of Soil Productivity** – Depending upon how restoration activities, in particular tree removal, slash disposal and subsequent future burning are conducted, soil productivity could be reduced.

Evaluation criteria:

- percent of the area with detrimental soil conditions (as per page IV- 60 of the Forest Plan)

**7. Air quality** - Burning to reduce ground fuels after certain restoration activities, as well as periodic underburning used to maintain the savanna condition, have the potential to reduce air quality by generation of particulates. Smoke could also cause temporary scenic degradation. The Diamond Peak Wilderness, about 13 miles east of this project area, is designated a class I airshed and no smoke intrusion is allowed.

Evaluation criteria:

- amount of particulates produced by prescribed fire.

**8. Economics** – Some of the potential alternative actions and proposed restoration activities would be expensive, and funding for restoration activities is limited. It is important to develop cost-effective actions and to minimize the cost of future actions. Conversely, restoration activities involving the reduction in tree density could generate money through the sale of excess trees. The money generated by such a sale could be used to fund other restoration activities. This issue is addressed because there is little funding available for restoration of biodiversity. Alternatives which do not generate some amount of income and which include considerable costs are unlikely to be implemented.

Evaluation criteria:

- income generated to the government (Present Net Value)

- total amount of funding available for future restoration projects

**9. Noxious Weeds** – Though some the more aggressive woody species of non-native plants (such as Himalayan blackberry and Scots broom) do not exist in this area, there are a number of perennial and annual herbaceous species of non-native plants now growing along the road and within the meadows. Disturbance of vegetation and soils by some of the proposed actions could potentially allow these species to colonize new areas. Vehicle and equipment movement into the area could bring in non-native species not currently in the project area, in particular the two woody species mentioned above.

Evaluation criteria:

- acres of ground disturbance
- amount of road adjacent to disturbed areas

**10. Recreation** – Implementation of some of the proposed actions could change the setting for recreational activities in this area. Restoration of the savanna vegetation would likely improve hunting success through increasing the number of big game animals using the area and improving site distance for hunters. Closure of Road #2129.371 would also provide for a higher quality hunt by limiting the number of hunters that would traverse the area and reducing the degree of disturbance to animals by vehicle travel. Restoration done along the Young’s Rock trail would affect the scenic experiences of trail users; in the short-term that effect could be perceived as negative since the ground would be bare and stumps would be visible. Once the savanna ground vegetation becomes re-established the trail experience could be scenically very pleasant, with well visible old pine and oak trees and a dense stand of bunchgrass, providing visual diversity.

Evaluation criteria:

- subjective discussion of potential disturbance to recreational activities

**11. Scenic Conditions** - This area is visible from Forest Road 21 and The Young’s Rock trail. A portion of the area, in general the lower third of the slope, has been allocated as either Scenic – partial retention foreground or middleground by the Willamette Forest Plan (see pages IV-205 to 209) as part of the scenic corridor centered on Road 21. The Young’s Rock trail is a class III trail within the Jim’s Creek area. Class III trails are to be managed to maintain a visual quality objective of partial retention (page IV-54). The Forest Plan specifies for both the viewshed and the trail that form, line, color and textural contrasts with the character of the landscape should be minimized when harvesting is to occur. The Forest Plan guidelines for both viewsheds and trails are focused in the effects of limiting the impacts of even-aged regeneration harvest on the appearance of the characteristic landscape (page IV-54, 205, 27). Since the proposed

actions do not include even-aged regeneration harvest (see Bailey, 2005b) and have been proposed to restore the characteristic landscape, these standards are met by this proposal. Restoration activities could change the current scenic qualities of the area and there would be some short-term degradation of scenic value while the cover of native bunchgrass and other plants are becoming re-established.

Evaluation criteria:

- a general, qualitative discussion of the efficacy of restoring the characteristic landscape, as well as the number of acres over which the characteristic landscape is restored.

## **II. Alternatives, Including the Proposed Action**

This chapter describes and compares the alternatives considered for the Jim's Creek Savanna Restoration Project. It includes a description and map of each alternative and presents the alternatives in comparative form, sharply defining the differences between each alternative and providing a clear basis for choice among options by the decision maker and the public. Some of the information used to compare the alternatives is based upon the design of the alternative (i.e., the number of acres treated or the number of entries to remove excess trees) and some of the information is based upon the environmental, social and economic effects of implementing each alternative (i.e., the amount of income produced or degree of effects to recreation, etc.).

### **A. Alternative A – Proposed Action**

This alternative would return about half of the Jim's Creek project area to its pre-European settlement/pre-fire suppression condition. It would open up a portion of the forest, as shown on the adjacent map, to provide for reestablishment of the native bunchgrass and provide the potential for natural or managed ponderosa pine and Oregon white oak regeneration. About 240 acres would be treated initially with a single entry excess tree removal. The alternative also includes other eventual restoration activities, as described in the narrative below. The intent of the understory density reduction is that any given acre will only be disturbed by harvest once. The excess trees in a given area would all be removed at the same time to provide for the quickest recovery of bunchgrass and oak regeneration and to avoid future ground disturbing activities that could damage recovering vegetation, including young oaks, and provide additional risk of introducing noxious weeds.

Approximately 90 percent of the younger age class Douglas-fir, grand-fir, and incense cedar would be removed to leave an average of about 20 trees per acre. The largest of the younger age classed trees would be retained. Oregon white oak and ponderosa pine, regardless of size, (other than young pine encroaching upon meadows) would be retained. Since the largest trees are not evenly distributed across the landscape, the distribution of retained trees would be variable and there may be some areas up to an acre in size which would have no retained large trees in the areas treated by tree removal. It is estimated that up to two percent of the area treated would be in openings from one quarter to one acre in size and less than one percent would remain more or less at its current density. The intent is to retain all of the live, older savanna legacy trees. About 10 of the largest 100 year age class trees would be retained pre acre to provide for replacement of savanna trees which have died or for those that will die in the next several decades.

The fuels generated by the harvest would be reduced by hand piling and burning. Snags would also be created throughout the areas proposed for harvest if natural mortality does not create sufficient number within five years.

Clumped green tree retention, as per page C-41 of the NW Forest Plan (USDA/USDI, 1994) would occur on the north edge of the project area as shown on the Alternative map. This area contains more large, older trees, provides for a late-successional habitat connection, and would be protected from the prescribed fire since it is on the north side of a ridge. Based upon the net acres of harvest (not including riparian buffers and meadows) Alternative A would require retention of at least 22 acres of green tree retention clumps. The green tree retention areas delineated on the following map encompasses 48 acres.

The removal of the understory trees described above would be accomplished using a timber sale. Trees would be removed by cable machinery capable of suspending at least one end of the logs above the ground surface where it is feasible to do so from the existing road. In areas where that kind of cable removal is not feasible while retaining the legacy trees, helicopters would be used to achieve full suspension of logs. The tree removal would generate about 6.2 million board feet of merchantable timber products

No new roads would be built. Existing roads 2129.371, 375, and 367 would be maintained before and after use, then closed once all activities covered in this analysis are completed. Maintenance of Road 2129 would occur to facilitate log removal. The culvert through which Young's Creek crosses Road 2129 would be replaced since this culvert is undersized and is starting to deteriorate.

The four plantations in the Jim's Creek stand (two clearcuts and two shelterwoods) have already experienced some restoration of original conditions. All plantations have developed a relatively dense and healthy stand of bunchgrass (California fescue). Oaks have repopulated, the area, and retained overstory trees have survived and are more vigorous. Further treatments in the plantations would reduce fuels generated by the recent pre-commercial thinning. Prescribed underburning would be done to favor native grasses, keep brushy species reduced, and to keep fuels accumulations low. Young conifer thinning would occur if the prescribed underburning does not sufficiently reduce their density. Bunchgrass would be cultivated for seed collection. Snag creation would also occur in portions of the two shelterwood stands, which currently contain more than the desired average number of trees per acre.

This alternative would also include the regular application of prescribed fire to maintain the savanna. This prescribed fire would burn the reestablished bunchgrass cover and would be applied to reduce the density of shrubs and young conifers that will thrive in the open forest conditions. Prescribed fire would be applied across all harvest areas,

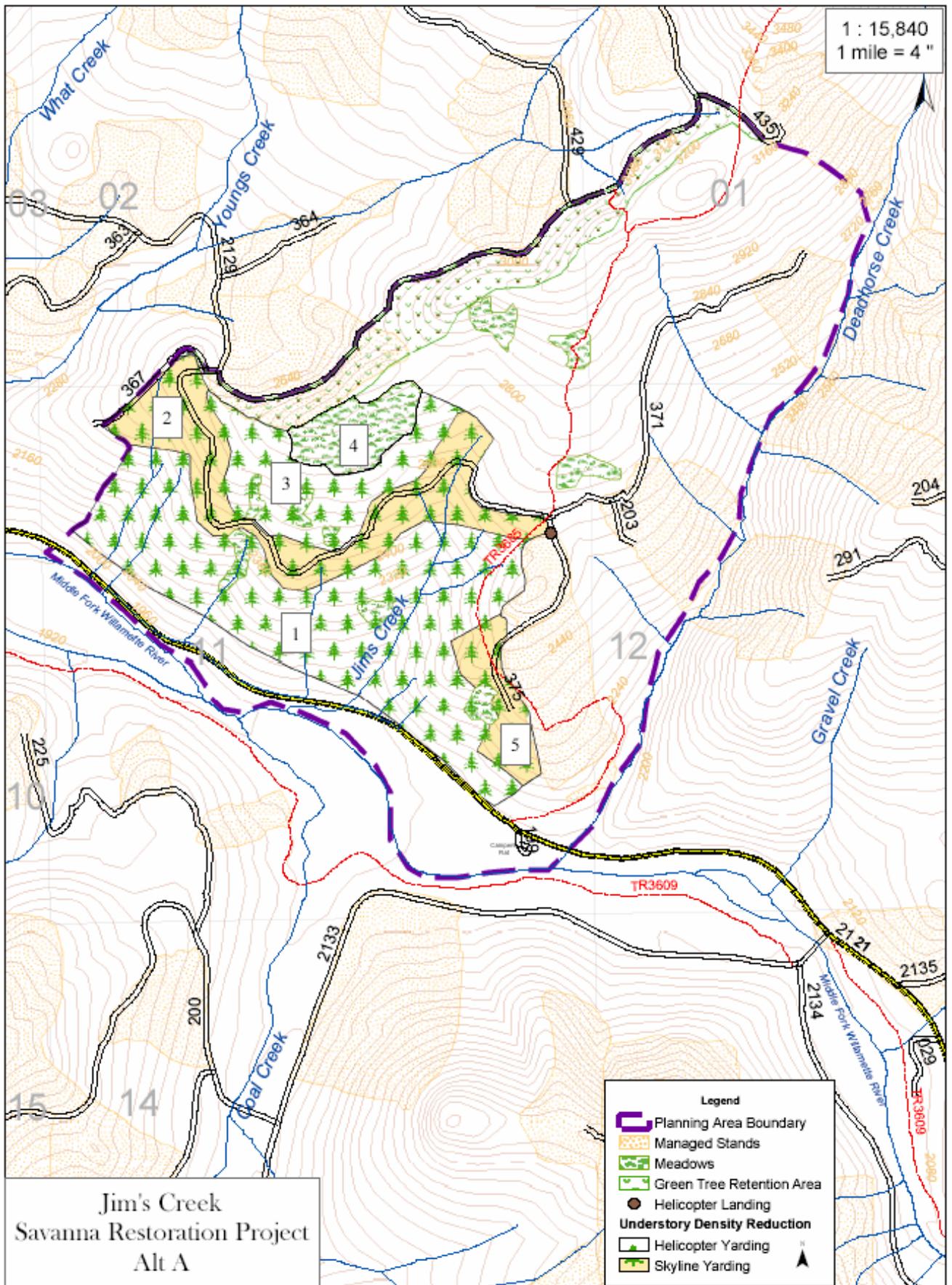


Figure 3 - Alternative A

including those portions of riparian areas to be treated. Application of this maintenance underburning would not begin until the bunchgrass is adequately established and young oaks are large enough to survive. It is not known at this time how long that may take, but it is currently thought such a prescribed fire regime would not begin until 10 years or more after bunch grass and oak planting occurs.

The proposed excess tree removal would occur within all class III and IV riparian areas (as those areas were also part of the original savanna) with the exception of an average 50 feet either side of stream channels. A full two tree height untreated buffer would be maintained to protect all fish bearing stream channels.

Implementation of this alternative would require a site-specific, non-significant Forest Plan amendment, as described above for the Proposed Action in Section I. There are several Forest Wide and Management Area standards and guidelines with which this proposal may not fully comply. Specifically, Forest Wide trail management guidelines may have to be modified for this specific area, as well as timber harvest guidelines for scenic Management Areas 11c and 11d.

Activities that would occur in addition to the harvest and fuels reduction (either before, after or concurrently) would include:

- grass seeding of California fescue
- Oregon white oak planting.
- underburning in five to ten years, once grass has become established, depending upon the development of the Oregon white oak seedlings, and upon what we learn from recent underburning tests (USDA, 2004 and Bailey 2005)
- noxious weed abatement,
- native plants important to cultural use would be planted (such as camas, bunch grass, yampa, etc.), primarily by direct seeding
- existing meadows would be restored through removal of encroaching small conifers and reintroduction of fire,
- existing plantation restoration including reduction of fuels generated by the recent pre-commercial thinning, young conifer thinning, oak regeneration, snag creation, the application of light prescribed fire to maintain these areas as an open forest, and possibly culturing the bunchgrass for seed collection.
- Closure of roads 2129.375, 371, 367 and 435 once management activities are completed,

- Snag creation if it is determined that natural leave tree mortality has not occurred or has not generated adequate numbers or qualities of snags.

**Table 1 - Alternative A: Proposed Action**

Unit	Ac.	Harvest method	Yarding method	Soil Type.	Forest Plan Mgmt. Area	Plant Assoc.	Crown Cover % post treat.
1	123	Partial Cut 20 TPA*	helicopter	316,310U	11c,11d,14	PSME/HODI/GRASS CDS2 12	20%
2	52	Partial Cut 20 TPA	skyline	310U,316,233	14a, 9d	PSME/HODI/GRASS CDS2 12	20%
3	36	Partial Cut  20 TPA	helicopter	310U, 316	9d, 14a	PSME/HODI/GRASS CDS2 12	20%
4	16	thinning	helicopter	2	9d	Blue wildrye – brome GM41 21	10%
5	14	Partial Cut  20 TPA	skyline	316	11d,11c,14a	PSME/HODI/GRASS CDS2 12	20%
Total	241						

\*TPA = trees per acre retained

## **B. Alternative B - No Action**

Under the No Action alternative, current management plans would continue to guide management of the project area. No activities would be implemented to accomplish the project purpose and need.

Consideration of the No Action alternative is required by the National Environmental Policy Act and provides a baseline for estimating the effects of other alternatives (Forest Service Handbook 1909.15 – Environmental Policy and Procedures, Chapter 10, 14.1)

This alternative would not provide for any restoration of historic savanna conditions.

Removal of most of the younger age class of trees would not occur and there would be no need to reduce activity created fuels.

Planting of native ground vegetation;

Plantation restoration, including reduction of fuels generated by the recent pre-commercial thinning, young conifer thinning, oak regeneration, snag creation, the

application of light prescribed fire to maintain these areas as an open forest, and possibly culturing the bunchgrass for seed collection would not occur .

Noxious weed abatement along the road system and within meadows would not occur;

Road closures responding to the District Roads Analysis (USDA, 2004b) would not occur;

Prescribed underburning would not occur, since there would be no savanna to maintain

Meadow restoration including removal of invading conifers, removal of invasive species, burning, and seeding of native meadow, and planting of native ground vegetation would not occur;

### **C. Alternative C**

This alternative would begin restoration on a somewhat smaller area than addressed in Alternative A, and would implement a different strategy of treatments. Excess understory trees in the 100 year age class would be removed in two stages to address the concern that removal of all excess trees at once might create a problem (see the restoration discussion under the vegetation section of Chapter 3). This alternative responds to public concerns which have been expressed that rapid restoration of a more open forest conditions could harm the retained trees, possibly by making them more susceptible to windthrow. The objective of this alternative would be ultimately to leave about 20 of the largest trees, but the initial treatment this analysis will analyze would retain about 40 trees per acre. It also includes all the associated restoration activities mentioned in Alternative A.

Should this alternative be selected for implementation, the remainder of the excess trees would be removed in a separate action some time in the future if it is determined that the initial density reduction is successful and continued reduction of the 100 year old age class density is needed to provide for adequate establishment of Oregon white oak and native bunchgrass.

The fuels generated by the harvest would be reduced by hand piling and burning. Snags would also be created throughout the areas proposed for harvest if natural mortality does not create sufficient number within five years.

The removal of excess trees described above would be accomplished using a timber sale. Trees would be removed by cable machinery capable of suspending at least one end of the logs above the ground surface where it is feasible to do so from the existing road. In areas where that kind of cable removal is not feasible, helicopters would be used to achieve full suspension of logs. Altogether, excess tree removal would occur on about

171 acres. The initial tree removal entry would generate about 3.6 million board feet of merchantable timber products.

The proposed overstory canopy reduction would occur within all class III and IV riparian areas (as those areas were also part of the original savanna) with the exception of an average 50 feet either side of stream channels. A full two tree height untreated buffer would be maintained to protect all fish bearing stream channels.

No new roads would be built; the existing Road 2129.371 would be maintained before and after use, then closed once all cultural activities are completed. Maintenance of Road 2129 would occur to facilitate log removal.

Green tree retention, culvert replacement, activities within the plantations, snag creation, application of prescribed fire to maintain the savanna, and all other associated restoration activities would occur as described fully under Alternative A. Based upon the net acres of harvest (not including riparian buffers and meadows) Alternative C would require retention of at least 15 acres of green tree retention clumps. The green tree retention area delineated on the following map encompasses 48 acres.

Implementation of this alternative would require a site-specific, non-significant Forest Plan amendment as described above for the Proposed Action in Section I. There are several Forest Wide and Management Area standards and guidelines with which this proposal may not fully comply. Specifically, Forest Wide trail management guidelines may have to be modified for this specific area, as well as timber harvest guidelines for scenic Management Areas 11c and 11d.

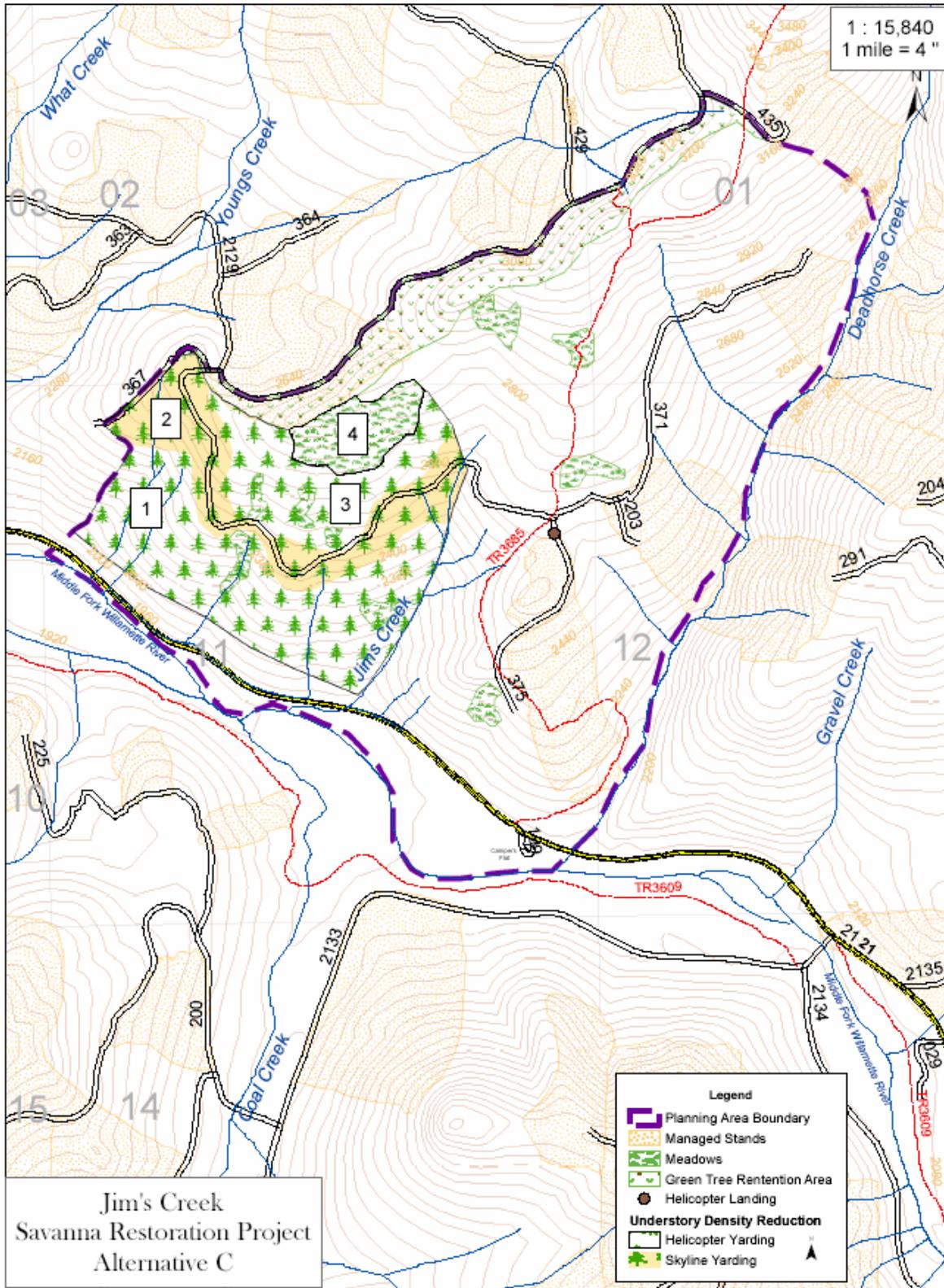


Figure 4 - Alternative C

**Table 2 - Alternative C: staged entry**

Unit	Ac.	Harvest type	Yarding method	Soil Type	Forest Plan Mgmt. Area	Plant Assoc.	Canopy Cover % post treat.
1	77	Partial Cut 40 TPA*	helicopter	316, 310U	11c, 11d	PSME/HODI/GRASS CDS2 12	40%
2	43	Partial Cut 40 TPA	skyline	310U	11c, 14, 9d	PSME/HODI/GRASS CDS2 12	40%
3	35	Partial Cut  40 TPA	helicopter	310U, 316	9d, 14a	PSME/HODI/GRASS CDS2 12	40%
4	16	thinning	helicopter	2	9d	Blue wildrye – brome GM41 21	10%
Total	171						

\*TPA = trees per acre retained

## **D. Alternative D**

This alternative proposes excess tree removal on about the same area as Alternative C, but with differing prescriptions. This alternative responds to the uncertainty some have expressed regarding what type of restoration treatment may be most successful. It provides three different approaches to making the residual pines and oaks more vigorous, with the idea that with the passage of time it will become apparent which alternative treatment is the most successful, and adaptive management can then be employed to determine which technique should be applied over the entire area. It also includes all the associated restoration activities mentioned in Alternative A.

On 65 acres (units 1A, B, and C as shown on the following map), understory trees would be removed to result in an average retention of 5 to 15% of the stand (about 20 trees per acre, similar to the removal prescribed in Alternative A). In this area it is estimated that up to two percent would be in openings from one quarter to one acre in size and less than one percent would remain more or less at its current density. On another 49 acres, (units 3A, B and C) from 20 to 25 % of the stand would be retained (again the largest trees in the stands, ) similar to that proposed in Alternative C, with the idea that more trees would be removed in the future if the heavier removal iteration performed well. On about 42 acres (units 2A, B, and C, that area containing most of the meadows where most of the larger oaks remain) trees competing with live oaks would be removed (generally within a radius equal to the height of the trees to be released). Unit four, 16 acres of meadow pine thinning, would be the same as proposed under alternatives A, C, and E.

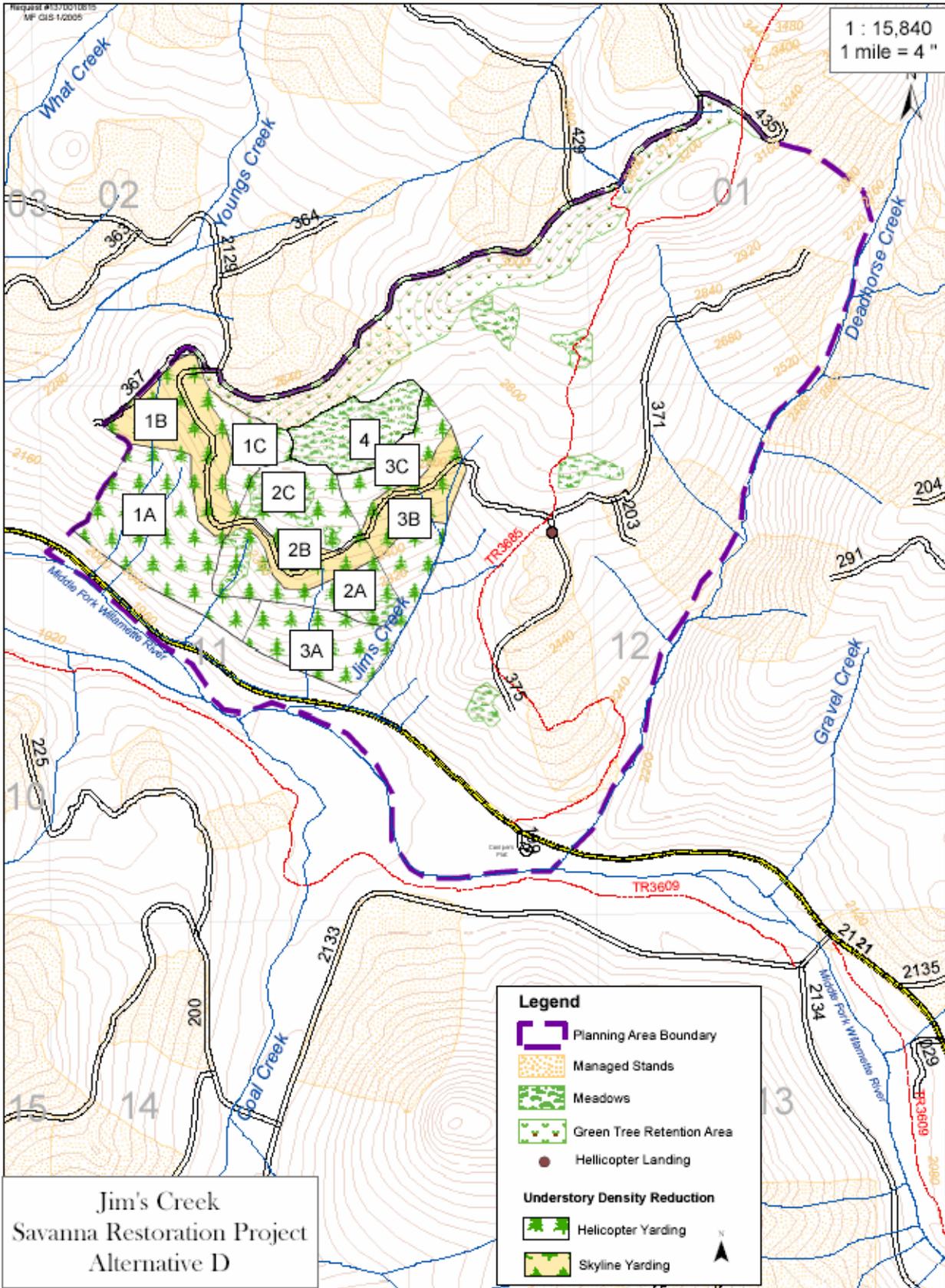


Figure 5 - Alternative D

The fuels generated by the harvest would be reduced by hand piling and burning. Snags would also be created throughout the areas proposed for harvest if natural mortality does not create sufficient number within five years.

The removal of the excess trees described above would be accomplished using a timber sale to avoid an unacceptable increase in fuel loading. Trees would be removed by cable machinery capable of suspending at least one end of the logs above the ground surface where it is feasible to do so from the existing road. In areas where that kind of cable removal is not feasible, helicopters would be used to achieve full suspension of logs. Altogether, excess tree removal would occur on a total of about 171 acres. The initial tree removal entry would generate about 3.4 million board feet of merchantable timber products. The fuels generated by the harvest would be reduced by hand piling and burning. Snags would also be created throughout the areas proposed for harvest if natural mortality does not create sufficient number within five years.

The proposed overstory canopy reduction would occur within all class II and IV riparian areas (as those areas were also part of the original savanna) with the exception of an average 50 feet either side of stream channels. A full two tree height untreated buffer would be maintained to protect all fish bearing stream channels.

No new roads would be built; the existing roads 2129.371, 375, and 367 would be maintained before and after use, then closed once all cultural activities are completed. Maintenance of Road 2129 would occur to facilitate log removal, including replacement of the Young's Creek culvert.

Green tree retention, culvert replacement, activities within the plantations, snag creation, application of prescribed fire to maintain the savanna, and all other associated restoration activities would occur as described fully under Alternative A. Based upon the net acres of harvest (not including riparian buffers and meadows) Alternative D would require retention of at least 15 acres of green tree retention clumps. The green tree retention area delineated on the preceding map encompasses 48 acres.

Implementation of this alternative would require a site-specific, non-significant Forest Plan amendment as described above for the Proposed Action in Section I. There are several Forest Wide and Management Area standards and guidelines with which this proposal may not fully comply. Specifically, Forest Wide trail management guidelines may have to be modified for this specific area, as well as timber harvest guidelines for scenic Management Areas 11c and 11d.

**Table 3 - Alternative D: multiple methods**

Unit	Acres	Harvest methods	Yarding method	Soil type	Forest Plan Management. Area	Plant Association	Canopy Cover% post treat.
1a	34	Partial Cut 20 TPA*	helicopter	316, 233	11c, 11d	PSME/HODI/GRASS CDS2 12	20%
1b	22	Partial Cut  20 TPA	skyline	316, 233	14a, 11c	PSME/HODI/GRASS CDS2 12	20%
1c	9	Partial Cut 20 TPA	helicopter	316	14a, 9d	PSME/HODI/GRASS CDS2 12	20%
2a	16	Oak release; very light Partial Cut	helicopter	310U	9d	PSME/HODI/GRASS CDS2 12	60%
2b	9	Oak release; very light Partial Cut	skyline	310U	9d	PSME/HODI/GRASS CDS2 12	60%
2c	16	Oak release; very light PC	helicopter	310U	9d	PSME/HODI/GRASS CDS2 12	60%
3a	26	Partial Cut 40 TPA	helicopter	316, 310U	11c, 11d	PSME/HODI/GRASS CDS2 12	40%
3b	12	Partial Cut 40 TPA	skyline	316,310U	9d, 14a	PSME/HODI/GRASS CDS2 12	40%
3c	11	Partial Cut 40 TPA	helicopter	310U, 316	14a	PSME/HODI/GRASS CDS2 12	40%
4	16	thinning	helicopter	2	9d	Blue wildrye – brome GM41 21	10%
Total	171						

\*TPA = trees per acre retained

## **E. Alternative E**

This alternative most directly addresses the purpose and need for action and would accomplish restoration of the project area the most quickly. It is similar in concept to Alternative A except it would remove all trees excess to the original savanna condition on the approximately 455 acres of the planning area not affected by past harvest or within meadows and fish-bearing stream riparian reserves. It also includes all the associated restoration activities mentioned in Alternative A.

The Alternative would open up the stand to provide for reestablishment of the native bunchgrass and create favorable conditions for development of natural or managed ponderosa pine and Oregon white oak regeneration. Approximately 455 acres would be treated initially with understory density reduction. This alternative also includes additional restoration activities as described below. The intent of this proposal is that the excess trees in a given area would all be removed at the same time to provide for the quickest recovery of bunchgrass and oak regeneration. This would avoid future ground disturbing activities that could damage recovering vegetation and provide additional risk of noxious weed introduction.

Approximately 90 percent of the younger age class Douglas-fir, incense cedar, and grand-fir would be removed to maintain an average of about 20 trees per acre, as described under Alternative A. The fuels generated by the harvest would be reduced by hand piling and burning. Snags would also be created throughout the areas proposed for harvest if natural mortality does not create sufficient number within five years.

The removal of the understory trees described above would be accomplished using a timber sale to reduce fuels accumulations. Trees would be removed by cable machinery capable of suspending at least one end of the logs above the ground surface where it is feasible to do so from the existing road. In areas where that kind of cable removal is not feasible, helicopters would be used to achieve full suspension of logs. The tree removal entry would generate about 11.9 million board feet of merchantable timber products.

No new roads would be built; the existing Road 2129.371 would be maintained before and after use, then closed once all cultural activities are completed. Maintenance of Road 2129 would occur to facilitate log removal. The culvert through which Young's Creek crosses Road 2129 would be replaced, as this culvert is undersized and in poor condition.

The proposed overstory canopy reduction would occur within all class II and IV riparian areas (as those areas were also part of the original savanna) with the exception of an average 50 feet either side of stream channels. A full two tree height untreated buffer would be maintained to protect all fish bearing stream channels.



Green tree retention, culvert replacement, activities within the plantations, snag creation, application of prescribed fire to maintain the savanna, and all other associated restoration activities would occur as described fully under Alternative A. Based upon the net acres of harvest (not including riparian buffers and meadows) Alternative E would require retention of at least 44 acres of green tree retention clumps. The green tree retention area delineated on the preceding map encompasses 48 acres.

Implementation of this alternative would require a site-specific, non-significant Forest Plan amendment as described above for the Proposed Action in Section I. There are several Forest Wide and Management Area standards and guidelines with which this proposal may not fully comply. Specifically, Forest Wide trail management guidelines may have to be modified for this specific area, as well as timber harvest guidelines for scenic Management Areas 11c and 11d.

**Table 4 - Alternative E: full restoration**

Unit	Acres	Harvest method.	Yarding method	Soil Type	Forest Plan Management Area	Plant Association	Canopy Cover% post treat.
1	126	Partial Cut 20 TPA*	helicopter	316, 310U	11c, 11d, 14a	PSME/HODI/GRASS CDS2 12	20%
2	99	Partial Cut 20 TPA	skyline	316, 310U, 233, 3	14a, 9d, 11c	PSME/HODI/GRASS CDS2 12	20%
3	169	Partial Cut 20 TPA	helicopter	316, 310U, 3	14a, 9d	PSME/HODI/GRASS CDS2 12	20%
4	16	thinning	helicopter	2	9d	Blue wildrye – brome GM41 21	10%
5	14	Partial Cut 20 TPA	skyline	316	11c, 14a, 11d	PSME/HODI/GRASS CDS2 12	20%
6	13	Partial Cut 20 TPA	helicopter	316	14a, 11c	27	20%
7	18	Partial Cut 20 TPA	helicopter	316	14a	27	20%
Total	455						

\*TPA = trees pre acre retained

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## **F. Forest Plan Compliance and Need for a Forest Plan Amendment**

Implementation of any action alternative would require a site-specific, non-significant Forest Plan amendment as per 36CFR 219.10. There are several Forest Wide and Management Area standards and guidelines with which these proposals may not fully comply. Specifically, Forest Wide trail management guidelines may have to be modified for this specific area, as well as timber harvest guidelines for scenic Management Areas 11c and 11d. The trail guidelines (FW-046 to 048) are essentially scenic in nature and they restrict the amount of even-aged timber harvest over time within trail corridors and trail frontage. While the proposed restoration harvest would not constitute even-aged harvest (see Bailey, 2005b), the proposed excess tree removal would substantially change the visual character of the area, even though it is designed to re-create the characteristic landscape

Similarly, the scenic management guidelines for timber harvest (MA-11c-04 to 08 and MA-11d-07 to 16) do not directly address the potential need for extensive, uneven-aged harvest for the purpose of restoring a characteristics landscape, a specific desired future condition for scenic areas (Forest Plan pages IV-205 and 207).. The scenic guidelines apply specifically to even-aged regeneration harvest units size and amount of area harvested over time, but the size of the proposed harvested areas in these alternatives would exceed harvest unit size restrictions by a factor of 30.

The Jim's Creek Savanna Restoration proposal entails a different type of silvicultural technique and a more comprehensive landscape approach than anticipated by the Forest Plan and its prescriptions. Restoration of historic, different forest habitat and conditions is not addressed in the Forest Plan standards and desired future conditions for trails and scenic resources.

A Forest Plan amendment, as mentioned in the proposed action description above, could exempt this project from strict compliance with seven specific Forest Plan standards and guidelines as discussed below, is a component of all action alternatives. Rationale as to why this project should be exempt from compliance with these standards and guidelines is also presented:

### **Trails**

Only Alternatives A and E harvest trees within the trail corridor. FW-046 specifies that scheduled even-aged harvest should not exceed 7% (for class III trails) within the trail corridor during the first ten years following plan implementation. Alternative A would harvest about 23% of the Class III trail corridor and Alternative E harvests about 70% . As explained in the Silvicultural Prescription (Bailey, 2005b) and the Recreation section of Chapter III, the proposed harvest does not constitute even-aged harvest. FW-050

specifies that Class III trail corridors shall be managed to achieve a visual quality objective of partial retention. Partial Retention is defined (Forest Plan FEISI, page III-114; USDA, 1990b) as where human activities may be evident but remain subordinate to the characteristic landscape. It is the restoration of that characteristic landscape that requires the large area of harvest prescribed.

FW-047 specifies that the amount of trail frontage affected by harvest activities should be limited to 600 lineal feet per mile per ten year period. No silvicultural systems are specified. Alternative A affects about 1,848 feet of the trail length, equating to 23% of the entire class III trail segment, and Alternative E affects about 6896 feet of the trail, about 70% of it's total length. Though the harvest included in these two alternatives would change the visual character of this trail segment, the change is overall a positive one in that it would facilitate the restoration of the characteristic landscape. Aside from the short-term effects of slash disposal that would be evident until the native grass cover becomes established, this harvest would create a diverse hiking experience with enhanced views of large tree stems, surrounding ridges and valleys, and an increased diversity of flowering plants once the native ground vegetation is reestablished.

### **Scenic Allocations**

All action alternatives potentially would not comply with the following scenic standards and guidelines, but they would promote achievement of the scenic Desired Future Conditions (Forest Plan pages IV-205 and 207) in terms of restoring the characteristic landscape.

MA-11c-04 specifies that scheduled even-aged harvest should not exceed 10% of the suitable and available lands within the management area during the first ten years following Forest Plan implementation. Some variation is permitted when site specific conditions warrant different rotations lengths or silvicultural systems. As mentioned above, the proposed harvest is not even-aged, it is uneven-aged. However, its appearance would be similar to a shelterwood harvest, an even-aged silvicultural system, prior to shelterwood removal (which is typically done if the shelterwood harvest is indeed an even-aged silvicultural prescription). Alternative harvests from about 0.7 to 1% of the 11c Management Area within the Hill's Creek Reservoir and Upper Middle Fork Fifth-field watersheds.

MA-11c-05 specifies that maximum size of even-aged regeneration harvest units should be 15 acres. Again, the proposed harvest is not even-aged, though it would initially be similar in appearance to some even-aged techniques. Alternative unit sizes range from 14 to 169 acres, but these units were designated primarily to facilitate analysis of effects based upon differing logging systems and prescriptions (in the case of Alternative D). Since the harvest units are contiguous in all alternatives, the total amount of proposed

harvest, ranging from 171 to 455 acres, would, be a better measure of how the alternatives relate to scenic standards and guidelines prescribing unit sizes. If harvest units were limited to 15 acres in this area, the characteristic landscape could not be restored, and the application of prescribed maintenance burning would be problematic at best and relatively cost inefficient to apply piece meal across harvest units that are smaller than 15 acres.

MA-11d-08 specifies that the maximum size of even-aged regeneration harvest units should be 8 acres. Roadside frontage zones in major travel corridors (such as Road 21) should have a maximum unit size of 3 acres. Contrast in form, line, color, and texture with the characteristic landscape should be minimized through maintenance of understory vegetation in road frontage zones. The proposed harvest is not even-aged, though it would initially be similar in appearance to some even-aged techniques. Alternative unit sizes range from 14 to 169 acres, but these units were designated primarily to facilitate analysis of effects based upon differing logging systems and prescriptions (in the case of Alternative D). Since the harvest units are contiguous in all alternatives, the total amount of proposed harvest, ranging from 171 to 455 acres, would, be a better measure of how the alternatives relate to scenic standards and guidelines prescribing unit sizes. If harvest units were limited to 8 acres in this area, the characteristic landscape could not be restored, and the application of prescribed burning would be problematic at best and relatively cost inefficient to apply piece meal across harvest units that are smaller than 8 acres. It is the restoration of that characteristics landscape that requires the large area of harvest prescribed.

MA-11d-10 specifies that stumps should be flush cut. This requirement responds to the perception that a stump is a negative visual element and is a solution to the short-term condition of stumps being visible immediately after harvest activities are completed. Flush-cutting stumps is an expensive and somewhat difficult task to do. Its effectiveness is questionable since the cut off stump would still be sitting on the ground looking more or less like a stump. The prescribed slash disposal is to occur in the winter months and would not likely produce fires hot enough to consume a cut-off stump. This scenic management area extends up the slope above Road 21 (the feature this scenic corridor is centered on) as far as 550 feet. It is doubtful that stumps could be seen from the road at that distance. Additionally, a portion of the road frontage consists of vertical rock faces and stumps above these cut banks cannot be readily seen from the road. Stumps on the edge of the road would be visible immediately after harvest but would soon be obscured by the planted native bunchgrass. The expense of flush-cutting stumps may not be justified in this situation.

## **G. Alternatives Considered But Not Fully Developed and Analyzed:**

The following alternatives were considered during the development of this restoration proposal but were determined not to warrant full development and analysis. They were not fully analyzed because of feasibility problems, because they do not respond well to the purpose and need for action, would involve excessive resource risk, or were likely to be unacceptable to the general public. Most of these alternatives have been identified and discussed during the field trips that have occurred over the last four years. Some of the alternatives below respond to the need for restoration without using a commercial timber sale. Some people have expressed concern regarding the sale of publicly owned trees. The Northwest Forest Plan (NWFP) does provide for the production of commercial timber products on Matrix Lands (NWFP page C-39). The NWFP Purpose and Need statement identifies the need for a sustainable supply of timber products (USDA/USDI, 1994, page 1-4). The Jim's Creek project area is entirely within lands designated as Matrix. Specific rationale for why we choose not to fully evaluate the following alternatives is provided below.

**Restoration by Underburning:** This alternative would not fell and/or remove trees and relies upon prescribed fire to thin out the 100 year age class of Douglas-fir that has encroached upon the savanna. Initially this alternative may appear to be very intuitive. The cessation of prescribed burning by the Native Americans and the commencement of fire suppression has caused the loss of most of the original savanna vegetation. From observations of the effects past occurrences of underburning had in these types of forests, it is clear that underburning alone cannot achieve the restoration of savanna conditions in this closed canopy forest of fire resistant trees. The frequent, low-intensity fires that maintained the original savanna vegetation and allowed for the persistence of the relatively thin-barked Oregon white oak were burning in a fuel bed very different than what exists today on these sites. The prescribed fires of the Native Americans could not have killed older, thick barked trees as those fires were burning in grasses and had relatively short flame lengths and residence times. They merely prevented young, fire-susceptible tree seedlings from becoming large enough to become fire-resistant. We do not expect a fire burning in an entirely different fuel regime to have the same function as one burning under vegetation with a completely different structure. In order for maintenance burns to work it is important to restore the fuel profile mechanically before returning to the past fire regime

A local, recent example illustrates why this alternative cannot accomplish the purpose and need for restoration. In August of 1996 a wildfire burned about 60 acres of the landscape that eventually became included in the Jim's Creek Savanna Restoration project (in the northeast corner of the project area, above Road 371). This fire was one of

many that were started by a large lightning storm on the Middle Fork Ranger District. This particular fire was allowed to burn for three days without fire suppression activities because resources were in short supply and because it was recognized that with the low fuel loading in the general area there was a lower risk than other areas of this fire doing wide-spread damage. The results of this fire are still apparent on the ground today. It was mostly an underburn. Less than ten percent of the trees were killed by the fire and those typically in small patches where the fire killed both young and older trees. This patch mortality was likely due to a greater than average amount of fuel accumulation in localized areas, or the presence of a patch of ladder fuels. In the bulk of the areas that underburned, no trees, or only the smallest trees were killed. The amount of canopy closure was essentially unchanged by the fire, so there was little benefit from it in terms of restoring the original ground vegetation. There is still insufficient light falling on the forest floor to provide for successful bunchgrass reestablishment or ponderosa pine and Oregon white oak regeneration. Those desired characteristics would not be created by such a fire.

For a long-term restoration perspective, repeated application of fire similar in magnitude to the 1996 event would likely continue to be unsuccessful in further restoration of this area. The use of prescribed fire under drier or windier conditions in an attempt to generate more mortality would risk the loss of the entire stand, including legacy trees. With more moderate fire behavior such as that experienced in the 1996 wildfire, the trees that did not get killed by the first fire would be larger in diameter and have thicker bark than they had during the first fire, and there would be little fuel available to carry a fire of any magnitude. Therefore, even less of such an effect from subsequent burns could be expected. The stand conditions would become progressively less likely to allow fire to restore a savanna.

It is also unlikely that prescribed fire could be applied successfully to this site in mid-summer. Prescribed fires alone would have even less efficacy for restoring a more open forest type than did the 1996 wildfire. They would be burned under less risky scenarios in terms of fuel moisture, relative humidity, and wind to meet operational and safety guidelines. Flame lengths would be shorter with less duration than in the August wildfire. Additionally, prescribed underburning may be counter to the objective of re-establishing the native bunchgrass. The sparse bunchgrass now existing in the underburned areas is stressed from shading. It could be that an underburn would further stress the remnant bunchgrass plants. Bunchgrass plants within the August wildfire received no benefit of increased sunlight. This stress with lack of positive impacts may have actually killed the bunchgrass that had persisted under the forest canopy, rather than put it on a path to restoration. This is in contrast to the positive response of bunchgrass in

the four managed plantations in the Jim's Creek area (see Bailey 2005b in the Analysis File).

Areas near the Jim's Creek project area containing similarly structured forest also burned during the same fire occurrence and these stands did experience stand replacement fire. Relying on late-season fire, whether natural or prescribed, to generate restorative benefits without a concurrent re-structuring of the vegetation being burned would entail a risk of losing the entire stand, including the legacy trees. Even though there is not enough fuel under these forests to kill trees by stem scorch, they do have a dense canopy, which can be killed by radiant heat or crown fire if fires burn during extreme conditions. Even a prescribed a fire regime that could kill the trees excess to a savanna structure would create dead tree stems and crowns that would eventually become ground fuels. The periodic burning critical to maintaining a savanna forest and the grass on the forest floor could not be done with such fuels present, or the remaining stand could be killed. So the surest way to provide for savanna restoration in this area is to re-create a fuels complex that allows for comparatively frequent, low-intensity fore events. That would require mechanical manipulation of fuels prior to reintroducing fire.

**Regeneration Harvest under Forest Plan Standards:** This alternative was initially conceived to illustrate how the proposed action contrasts with standard forest management in Matrix lands as directed by the Forest Plan as amended by the Northwest Forest Plan. This alternative would entail dispersed regeneration harvest units with green tree retention on blocks less than 60 acres in size in Matrix, and less than 8 to 15 acres in the scenic allocations. This would be followed by dense reforestation of commercial stands. This alternative approach would not meet the purpose and need for savanna restoration. Additionally, there are already examples of this type of forest management in the project area. Therefore, there is no need for creating additional examples of this management technique for comparison. This treatment would not meet the purpose and need for action.

**Restoration by Tree Removal but No Sale of Removed Trees:** This alternative would, after full implementation, essentially resemble the Proposed Action in appearance and environmental effects. It would provide for removal of the similar amounts of the 100 year age class understory, but that removal would not be accomplished using a timber sale. This alternative would respond positively to the purpose and need for restoration and was originally discussed as a way to achieve restoration while avoiding the sale of trees. Some commentators prefer not to have trees sold.

While the environmental impacts of this alternative would be essentially the same as the proposed action, the social and economic impacts would be much greater. The cost of tree removal would not be subsidized by their use for lumber products. The costs of

felling, yarding, loading, and transportation of the tree stems; and abatement of slash generated by those actions, would have to be born by appropriated wildlife and botanical habitat improvement funding. It is estimated that full restoration of the Jim's Creek area using this approach would cost in excess of one million dollars, depending upon the degree of tree removal and slash reduction. Additionally, locating an area to deposit and store the tree stems that would have to be removed is problematic. Ultimately, an area capable of holding the contents of over 2000 log trucks would have to be located. This area would have to be able to hold a pile of tree stems about 90 feet wide, 50 feet tall and about 1000 feet long. Such a pile of dead wood would create environmental problems of its own, the danger of fire being of greatest concern.

This alternative was not fully developed because it is logistically and financially infeasible. Appropriated wildlife and botanical habitat improvement funding to implement an alternative such as this is not readily available.

**Restoration by Tree Killing but no Removal of Killed Trees:** This alternative would reduce competition from excess trees in the 100 year age class by killing them, either by girdling or felling. It responds to some of the cost problems presented by the above alternative by avoiding the removal of the excess tree stems. This alternative would partially respond to the purpose and need; the stand density would be reduced such that grass, oak and pine could regenerate, but the prescribed burning that would be needed to maintain the open nature of the forest could not occur without incurring a huge risk of loosing all retained trees and re-developing vegetation, as there would be large amount of fuel on the ground resulting from implementation of this alternative. Treatment of slash would again be very expensive, and considerably problematic if the tree stems themselves remained on the ground.

This alternative, especially the felling only option, would create conditions that would be very conducive to the development of a bark beetle epidemic. Given the number of trees and the area affected, such a beetle out break could potentially threaten the retained trees as well as live trees outside the treatment areas and the planning area. Additionally, falling trees and leaving them on the ground would also present a substantial long-term risk for future hot wildfires, considering the amount of large wood that would be retained on site.

**Smaller Initial Acreage of Treatment:** This approach would be to apply treatments similar to those described in the fully developed Alternatives A, C, or D on a much smaller area, in the neighborhood of 10 to 30 acres. This alternative would respond to the concerns of some that are unsure the restoration of this savanna would succeed, therefore the initial treatments should be very tentative. This strategy was ultimately not considered for full discussion and analysis. It would be somewhat similar to the standard

approach alternative (see above), and more importantly would not be especially effective in accomplishing restoration of landscape savanna conditions. Such a tentative approach would accomplish little in providing important wildlife habitat since so little would be produced initially. Many more oak and pines would succumb to suppression and competition mortality while the tentative treatment is being evaluated. It would also not be in scale with natural landscape patterns. This is important in relation to the cost and feasibility of future underburning to maintain savanna conditions. Small blocks of restoration would not lend themselves to being placed on topographic or other features that would provide for safe and efficient application of prescribed fire. If the prescribed fire could not be applied efficiently in the future, it would likely not be used as frequently as it should to maintain savanna conditions.

The ID Team has concluded that there is not as much uncertainty regarding the potential effectiveness of the proposed actions as some people have expressed. This greater certainty is evidenced by the successful development of many of the savanna traits and species in the four plantations within the planning area. These successful small-scale examples demonstrate that bunchgrass and Oregon white oak can be reestablished even without supplemental planting. The retained trees did not blow over to any large extent or otherwise experience high amounts of mortality, which was a concern of those proposing a more tentative approach. There does not appear to be value in fully developing such a tentative restoration alternative that does not go very far in accomplishing the purpose and need.

**Release of individual oak and/or pine only across the entire area:** This alternative was not fully considered because it would not move the area towards the desired condition of a functional savanna which could be sustained over time.

Releasing just oaks would make oak or pine regeneration difficult. Insufficient clearing would occur for bunchgrass reestablishment across the landscape. The effective release of pine, which are being impinged upon more from a below-ground standpoint than from shading competition, would require removal of as many or more trees than would Alternative E . It would not provide for retention of sufficient trees to replace the savanna legacy trees which succumb to mortality over time.

One way to address pine release from competition would be to remove all other trees within the rooting zone. Ponderosa pine can have roots extending as far as five crown radii from the tree stem (Smith, 1964; Curtis, 1964). With a crown radius averaging 20 feet , one would have to clear a circle 200 feet in diameter (0.7 acres) to eliminate all direct root competition for an individual tree. With about 2 large pine per acre on average in these stands, releasing all pine this way would require the cutting of all other trees.

Another approach to release trees from competition would be to clear a radius of one tree height. This would result in an ever larger area cleared per tree. This type of release would not create the desired savanna condition. Therefore, this alternative was not fully developed and analyzed.

**Road Construction, Skyline, or Ground-based Yarding:** Most of the excess trees in any alternative, both those fully developed and those not fully considered, could be removed through more conventional and cost effective skyline yarding if the project area was more completely roaded. The action alternatives rely on helicopters to remove most of the excess trees in recognition of the impact on water quality that could be created by extensive road construction. Given the current high density of roads in this watershed and the presence of two listed fish species in the Middle Fork river, we determined additional road construction was not a reasonable means with which to remove excess trees.

Additionally, from a strict feasibility standpoint, more acreage in all the action alternatives could be accessed with the cheaper skyline removal technology. Nearly all the lands below road 2129.371 could technically be skyline yarded without the need for additional road construction. Skyline yarding requires clearing of a straight corridor within which to string the main cable. On this landscape, creating skyline corridor of any substantial length would invariably require cutting one or more savanna legacy trees. These remaining survivors are too important to lose even a few, so the amount of proposed skyline corridors was limited to areas within sight of the road to avoid the potential necessity of having to cut a legacy tree.

Portions of the project area could also be yarded by ground-based systems such as tracked vehicles. Such yarding methods would also require a more extensive road system to be constructed. Given the fine-textured nature of the soils (they are prone to erosion and compaction) and the desire to protect residual native grasses, ground-based yarding was determined to be too impactful to fully consider.

## **H. Mitigation Common to All Alternatives** \_\_\_\_\_

In response to analysis findings and public comments, mitigation measures were developed to reduce or eliminate undesirable environmental impacts the various alternatives might cause. The following mitigation measures are a part of the action alternatives. Most of the measures implement established Forest Plan standards and guidelines to comply with management direction and environmental laws. The list also briefly indicates what resources the mitigations protect. Specific details can be found in the Analysis File under individual resource prescriptions.

## **1. General Standards for all Activities:**

Activities will comply with the standards and guidelines in the Willamette Forest Plan as amended by the Northwest Forest Plan.

Activities will comply with the executive orders specifying wetland and flood plain protection (see the relevant discussions in Chapter III).

The General Water Quality Best Management Practices (BMP's) of Pacific Northwest Region (USDA, 1988c) applicable to proposed actions such as timber harvesting will be practiced in each alternative (see Murdough, et al, 2005, in the Analysis File).

## **2. Specific Measures:** (for more detail, see Alternative A and E descriptions)

- Helicopter yarding (as opposed to road construction and cable yarding)– to protect cultural resources, soil disturbance and compaction, legacy tree damage, water quality. More of the project area is feasible to skyline yard than the areas designated for skyline yarding on the Alternative maps. Skyline yarding was limited to those areas within several hundred feet of existing roads. Skyline yarding requires that a straight cable corridor be established. Creation of such a corridor over a slope length much more than several hundred feet would inevitably create the need to remove a savanna legacy tree. Helicopter yarding has been proposed in many places to avoid that outcome;
- Partial or full log suspension in areas not helicopter yarded – to limit soil disturbance and compaction, and to protect legacy trees and water quality;
- Duff, litter, and slash pullback around all legacy ponderosa pine and Oregon white oak– to provide for general biodiversity through protection of legacy trees and protect cultural resources;
- Riparian buffers – full site potential tree height buffers on permanent streams to protect water temperature, and a no treatment buffer averaging 50 feet either side of ephemeral channels to reduce the probability that soil would entrench the stream channel, provide for channel stability, wildlife dispersal habitat, and survey and manage species habitat;
- Seasonal restrictions (3/1 to 7/15) on helicopter flight while in the project area– to protect spotted owls;
- Seasonal Restrictions (1/15 to 7/31) on helicopter flight anywhere outside of a straight-line flight path between the helicopter landing and the service landing -to protect peregrine falcons; subject to waiver based upon occupancy and breeding status;
- Snag creation in all activity areas, including shelterwood stands; snag creation will only occur using 100 year old cohort trees; – to provide replacement to mitigate removal of existing snags for safety purposes; - wildlife habitat;
- Cleaning of timber harvest, road maintenance, and culvert replacement machinery prior to entering National Forest lands – to avoid noxious weed spread;

- Use weed-free fill for road and landing reconstruction - to avoid noxious weed spread;
- Treatment of noxious weeds prior to road use by manual and mechanical methods – to enhance general biodiversity and to avoid noxious weed spread;
- Covering of St. Johnswort at the helicopter landing location with either plastic, gravel, dirt or all three prior to construction – to eliminate these plants and avoid their spread;
- Revegetation of the project area (including roads) with native species after disturbances are completed – to protect soil, water quality, biodiversity, and to avoid noxious weed spread;
- Compliance with State smoke management guidelines – to protect air quality;
- Slash burning would occur only under conditions where the duff moisture content is greater than 30 percent – to protect soil, cultural resources legacy trees, and riparian areas. Fuels created by the excess tree removal would be hand-piled and burned (rather than using the cheaper and more efficient broadcast burning);
- No new road construction would occur – to reduce erosion, protect listed fish species, avoid wildlife habitat disturbance, and protect cultural resources;
- Resurface haul route roads 2129, 2129.367, 371, and 375 – to protect water quality;
- Road closure for roads 2129.367, 371, 375, and 435 – to avoid noxious weed spread, protect water quality, and limit wildlife disturbance;
- Replacement of culverts that are not properly functioning or that are close to failure– to protect water quality;
- Placement of sediment trapping structures prior to the commencement of tree removal in the Road 21 ditch line and within 175 feet either side of the Jims Creek crossing of the 2129.371 road – to protect water quality and fish habitat;
- Yard away from (not across) all stream channels, to protect wetlands meadows, soil, biodiversity, and water quality;
- Directional falling away from streams, meadow edges and cultural sites – to protect water quality, biodiversity and cultural resources;
- Documentation of culturally modified trees that need to be removed for safety reasons – to preserve the information they provide.
- Location of clumped green tree retention area (see NWFP page C-41) on the north slope on the north edge of the project area (see Alternative maps) – to provide spotted owl and other late-successional forest dependant species habitat connections; maintains a habitat connection to mitigate for the create of open forest.
- High stumping of snags felled for safety purposes, where feasible – to provide additional down wood wildlife habitat;
- Retention of five or more trees per acre than the desired future condition - to mitigate against unanticipated mortality and to provide for trees to mitigate snag removal.

**3. Best Management Practices** (USDA, 1988c), as follows (see also the Fisheries/Watershed report for more details on these practices):

T-5: Limiting the Operating Period of timber Sale Activities

Objective: To ensure the purchaser conducts operations in a timely manner, within the time period specified in the Timber Sale Contract (TSC).

T-6: Protection of Unstable Areas

Objective: To provide for identification and appropriate management prescriptions for unstable lands.

T-7: Streamside Management Unit Designation

Objective: To designate a riparian area along streams and wetlands where prescriptions are made that will minimize potential adverse effects of nearby logging and related land disturbance activities on water quality and beneficial uses.

T-8: Stream Course Protection (Implementation and Enforcement)

Objective: 1) To protect the natural flow of streams, 2) to provide unobstructed passage of storm flows, and 3) to prevent sediment and other pollutants from entering streams.

T-13: Erosion Prevention and Control Measures During Timber Sale Operations

Objective: To ensure that the Purchaser's operations shall be conducted to minimize soil erosion.

T-14: Re-vegetation of Areas Disturbed by Harvest Activities

Objective: To establish vegetative cover on disturbed sites to prevent erosion and sedimentation. Re-vegetation should be considered mitigation for the spread of weed species.

T-15: Log Landing Erosion Prevention and Control

Objective: To reduce the impacts of erosion and subsequent sedimentation, on log landings, by use of mitigating measures.

R-7: Control of Surface Road Drainage Associated with Roads

Objective: 1) To reduce minimize the erosive effects of water concentrated by road drainage features, 2) to disperse runoff from or through the road, and 3) to minimize the sediment generated from the road.

R-9: Timely Erosion Control Measures on Incomplete Roads and Stream Crossing Projects

Objective: To minimize erosion of and sedimentation from disturbed ground on incomplete projects.

**I. Comparison of Alternatives**

This section provides a summary of the effects of implementing each alternative. Information in the table below is focused on activities and effects where different levels of effects or outputs can be distinguished quantitatively or qualitatively among alternatives. This table is a very brief summary of the effects discussion contained in the following Environmental Consequences section (Chapter III)

**Table 5 - Alternative Comparison Chart**

Jim’s Creek Savanna Restoration Project

<b>Issues/evaluation criteria</b>	<b>Alternative A – Proposed Action</b>	<b>Alternative B – No Action</b>	<b>Alternative C – staged entry</b>	<b>Alternative D – multiple methods</b>	<b>Alternative E – full restoration</b>
<b>Acres of Excess Tree Removal</b>	241	0	171	171	455
<b>Road Reconstruction – mi.</b>	3.5	none	3.5	3.5	4.25
<b>Road Closure – mi.</b>	3	none	3	3	3
<b>Water Quality/Fish Habitat</b>					
change in water temp.	none	none	none	none	none
aggregate recovery % (ARP) Buck Cr. 6 <sup>th</sup> field	79.6	80	79.7	79.7	79.0
ARP; PSUB 21-1	75.7	84.4	80.1	80.1	62.9
ARP; PSUB 21-G	80.8	81.4	80.8	80.8	80.1
potential soil movement - tons	1258	115	838	838	2251
<b>Late-Successional Habitat</b>					
acres of LS habitat. modified	108	none	171	140	131
acres of LS habitat removal	132	none	none	31	323
owl habitat degraded	59	none	132	102	71
owl habitat removed	133	none	none	30	321
owl home range habitat remaining	#1088-36% #3235-62%	#1088-43% #3235-62%	#1088-38% #3235-62%	#1088-38% #3235-62%	#1088-36% #3235-58%
<b>Biodiversity</b>					

<b>Issues/evaluation criteria</b>	<b>Alternative A – Proposed Action</b>	<b>Alternative B – No Action</b>	<b>Alternative C – staged entry</b>	<b>Alternative D – multiple methods</b>	<b>Alternative E – full restoration</b>
big game habitat effectiveness index (HEI)	0.53	0.52	0.52	0.52	0.53
percent forage increase	6	none	4	4	11
acres of savanna created	217	none	none	65	423
acres of meadow improved	31	none	28	28	43
probability of restoration success	high	none	low to moderate	High -81 acs. Low to moderate – 90 acs.	high
average patch size	225 acres	none	155 acres	62 acres	439 acres
approximation of historic landscape conditions	low	none	none	none	low
Change in Fire Regime Condition Class	From a 3 to a 1 on 241 acres	none	From a 3 to a 1 on 171 acres	From a 3 to a 1 on 171 acres	From a 3 to a 1 on 455 acres
<b>Fuels and Fire</b>					
fuel loading; tons/acre	10	28	10	10	10
Total acres of fuels reduction	241	none	171	171	455
change in fuel structure (fuel model)	2	10	2	2	2
likelihood of crown fire spread	none	high	none	none	none
<b>Cultural Resources</b>					
acres of cultural plants restored	241	none	171, partially	171, partially	455
<b>Soil Productivity</b>					
% cumulative detrimental soil conditions	4.9	4.4	4.8	4.8	5.3
<b>Air Quality</b>					
amount of particulates: tons	180	none; 977 for a wildfire	128	128	341
<b>Economics</b>					

<b>Issues/evaluation criteria</b>	<b>Alternative A – Proposed Action</b>	<b>Alternative B – No Action</b>	<b>Alternative C – staged entry</b>	<b>Alternative D – multiple methods</b>	<b>Alternative E – full restoration</b>
Present Net Value	\$478,549	\$-143,510	\$-25,465	\$109,989	\$1,110,252
\$s available for restoration	\$1,032,224	none	\$371,999	\$498,078	\$2,009,970
<b>Noxious Weeds</b>					
acres of ground disturbance	241	none	171	171	455
disturbance adjacent to roads: miles	3.2	none	2.9	2.9	3.4
<b>Recreation</b>					
feet of trail affected	2,900	none	none	none	8,250
feet of temp. trail closure	5,000	none	1,000	1,000	10,000
<b>Scenic</b>					
characteristic landscape restored	241 acres	none	none	65 acres	455 acres

### **III. Environmental Consequences/Affected Environments**

This section summarizes the physical, biological, social and economic environments of the affected project area and the potential changes that could occur to those environments due to implementation of the alternatives. It also presents the scientific and analytical basis for the comparison of alternatives presented in Table 5 above. This discussion is broken into major environmental components, such as Water, Vegetation, Wildlife, etc. At the beginning of each section an overview of general environmental conditions is presented, along with effects on specific issues as discussed in Chapter I of this document. All the discussions below are based on information contained in the resource reports which can be found in this project's Analysis File (see Chapter VI. of this document for a listing of those reports).

This section details the direct, indirect and cumulative effects of the Alternatives. These effects include all activities associated with implementation of the alternatives, mitigating measures, and sale area improvement actions. The current condition narrative for each environmental component provides the context within which these effects would occur.

#### **A. Water Quality/Fish Habitat**

##### **Background**

The discussions of environmental conditions and background and the effects of proposed alternatives actions below are a summary of the more detailed discussions contained in the Fisheries and Watershed Report (Murdough, et. al., 2005) contained in this project's Analysis File. The proposed activities do not have any direct effect on fish; fisheries resources would be affected by this proposal only by potential impacts to water quality, which could make fish habitat less suitable over the short-term or long-term. Actions that could cause soil movement into the stream system would be the main cause of any degradation of water quality. Soil effects are discussed in conjunction with these resources. The fish species that could potentially be affected are discussed below under Fish Habitat.

Watershed context: The 688 acre Jim's Creek project areas is located on the upper (upstream) edge of the 110,000 acres Hills' Creek Reservoir Fifth-field watershed. The project area is primarily within the Coal Creek Sixth-field watershed and the western 120 acres is within the Buck Creek Sixth-field watershed. The conditions within the Hill's Creek Reservoir watershed have been primarily influenced by the 48,754 acres of young stands created primarily by regeneration harvest and very secondarily by wildfire, and

540 miles of road construction that have occurred over the last 50 years. Since the project area is on the upper edge of the Hill's Creek Reservoir watershed, the Middle Fork River along the southern edge of the project area is most influenced by the condition of the 113,340 acre Upper Middle Fork Fifth-field watershed. About 58,000 acres of the Upper Middle Fork watershed has been regeneration harvested over the last 50 years, and about 470 miles of road have been constructed primarily to facilitate that harvest.

The Oregon Department of Environmental Quality lists beneficial uses of the streams within the project area (Oregon Table 340A, Designated Beneficial Uses Willamette Basin (340-041-0340), November, 2003). Those include: fish and aquatic life, wildlife and hunting, fishing, boating, water contact recreation, and aesthetic quality. In addition, uses downstream of the project area include public/domestic water supply, industrial water supply, irrigation, livestock watering, and hydro power.

Pursuant to a Memorandum of Agreement with the U.S. Forest Service and the Bureau of Land Management, water quality standards are to be met through the development and implementation of water quality restoration plans, Best Management Practices (BMPs; USDA, 1988c) and the Aquatic Conservation Strategy (USDA/USDI, 1994, page B-11). Implementation of these plans, practices, and strategies have been determined to be in compliance with State water quality rules (OAR 340-041-0028(12)(g)). A Water Quality Restoration Plan, as mandated for 303d listed water bodies by the Clean Water Act, specific to the Middle Fork of the Willamette River has yet to be prepared (see discussion below).

The State of Oregon has established water quality standards set out in Chapter 340, Division 41 of the Oregon Administrative Rules (OAR). Water bodies that do not meet state water quality standards are termed "water quality limited" and are placed on a list in accordance with Section 303 (d) of the federal Clean Water Act. The Middle Fork of the Willamette River is on the 303(d) list for high summer water temperatures from river mile 52 (at the upper end of the Hill's Creek Reservoir) to river mile 64 (near the confluence with Staley Creek). The southern boundary of the project area is formed by the Middle Fork approximately from river mile 60 to 61.5. This project is in compliance with The USDA Forest Service and USDI Bureau of Land Management a Total Maximum Daily Load Implementation Strategy (USDA/USDI, 2005), which addresses water temperatures concerns in compliance with the Clean Water Act.

Temperature - On March 2, 2004, the U.S. Environmental Protection Agency (EPA) announced approval of a revised Oregon Water Quality Standards for temperature. Under the new standard, the Upper Middle Fork Willamette is considered "core cold water habitat". If a water body has a seven-day-average maximum temperature that exceeds 60.8 degrees F (OAR 340-041-0028(4)(b)) (DEQ 2004), it is considered to be

water quality limited. The Middle Fork River at the Sand Prairie gauging station has average temperatures up to 70 degrees in the summer (USDA, 1995, page b4-15).

Peak Flow – Peak stream flows are a concern because they are most likely to erode stream channels and contribute to water turbidity. Peak flows can be elevated by changes in forest canopy, whether produced by harvest or natural events such as stand replacement fire. The overall condition of forest canopies within a watershed can affect snow pack accumulation and melting. This aggregate condition is called hydrologic recovery. The Aggregate Recovery Percentage (ARP) methodology can be used to quantify the hydrologic condition of an area in reference the storage and routing of water, and ultimately how peak flows and their timing may be increased by timber harvest activities (see Appendix E of USDA, 1990b). An increase in peak flow could also cause in-channel large woody material to become mobile.

Forest stands are considered to be fully functional hydrologically when they contain trees over 30 years of age with a mostly closed canopy. In a recently cleared area in the transient snow zone (generally between 1500 and 4500 feet in elevation, depending upon slope aspect), the snowpack can accumulate faster and melt faster due to a lack of forest canopy. A dense canopy can intercept falling snow and cause it to melt faster. It also shades accumulated snow, causing it to melt slower in the spring. The young forest recovers hydrologically as it grows. The Aggregate Recovery Percentage is a measure of what percentage of a watershed has vegetation capable of moderating snow pack accumulation and melting, and conversely indicates what percentage of the area contains lands that could produce elevated peak flows, in particular when warm rains fall on snow accumulations.

The Willamette Forest Plan describes the sensitivity of planning sub-drainages (PSUB) based on the overall slope of the drainage and the percent of the area in the transient snow zone (see USDA, 1990b, Appendix E). The PSUBs have a defined mid-point ARP value as a reference for assessment purposes. The mid-point ARP values provide a relative measure of drainage sensitivity. These may be viewed as thresholds of concern below which there would be a greater risk of increased peak flows and associated adverse effects such as stream bank or channel bed erosion.

Both Jim's and Deadhorse Creeks are small tributary face drainages that flow directly into the Middle Fork of the Willamette River. Elevations for the two streams within the planning area range from approximately 1950 to 2500 feet. The two streams contribute flows to the Middle Fork of the Willamette and are a part of the Buck Creek 6<sup>th</sup> field sub-watershed. The Jim's Creek project area is within the Deadhorse(21-1) and Young (21G) planning sub-drainages. The Forest Plan midpoint ARP values for those two sub-drainages are 75 and 70 respectively.

Timber harvest effects, as well as natural events such as wildfire, that remove mature forest also include the potential for changes in base and peak stream flows through reduction in rates of evapo-transpiration. Such an effect of reducing water use by vegetation could contribute to a small increase in water yield, including an increase in summer base flows.

The proposed action and other action alternatives would return the project area, proportional to the number of acres treated, to its historic hydrologic condition. It can be assumed that the historic, more open forest functioned differently than the current, closed canopy forest, which has modified how water routes from and through the project area. A return to a more open forest could increase the magnitude and change the timing of peak flow events compared to how they occur under current conditions. This change in hydrologic function may be of concern to the extent that the existing stream channel network has accumulated sediments that would have, under historic conditions, been routed through the system by larger peak flows. If the area is returned to its previous hydrologic condition, short duration water turbidity could be increased as any sediments that have been stored in these channels is mobilized. Once these stream channels returns to their savanna-influenced hydrologic condition, such potential increases in turbidity, should they occur at all, would return to base levels.

Turbidity – Oregon's turbidity standard was first adopted by the DEQ in the 1970s and last revised in 1990. The current standard states: OAR 340-41- (Basin)(2)(C): No more than a ten percent cumulative increase in natural stream turbidities shall be allowed, as measured relative to a control point immediately upstream of the turbidity causing activity. However, limited duration activities necessary to address an emergency or to accommodate essential dredging, construction, or other legitimate activities and which cause the standard to be exceeded may be authorized provided all practicable turbidity control techniques have been applied.

## **Current Conditions**

### **1. Fish Habitat**

There are no streams internal to the Jim's Creek project area that provide fish habitat, but Deadhorse Creek on the eastern boundary contains native cutthroat trout (*Oncorhynchus clarkii*). The Middle Fork of the Willamette River on the south boundary of the project area contains rainbow trout (*Oncorhynchus mykiss*), cutthroat trout, mountain whitefish (*Prosopium williamsonii*), largescale sucker (*Catostomus macrocheilus*), speckled dace (*Rhinichthys osculus*), torrent sculpin (*Cottus rhotheus*), Paiute sculpin (*Cottus beldingi*), and shorthead sculpin (*Cottus confuses*), in addition to bull trout and spring chinook salmon, as discussed below. All the above fish species are considered Management

Indicator Species in the Final Environmental Impact Statement for the Willamette National Forest Land and Resource Management Plan (USDA, 1990b, page III-69).

The Hill's Creek Reservoir dam (about 16 miles down-stream of the planning area) was constructed in the early 1960's, (along with the earlier construction of the lower Lookout Point Reservoir dam) and blocked salmon migration into the upper tributaries of the Middle Fork River. While chinook salmon are native to the Middle Fork River adjacent to the project area, the completion of the three main stem dams in the 1960's (Dexter, Lookout Point, and Hills Creek, the latter two of which do not have fish ladders) eliminated access for this species to historic Middle Fork River habitat upstream of Lowell, OR. In 1960, prior to completion of the reservoir, all fish bearing streams upstream of the reservoir were poisoned at the recommendation of the US Fish and Wildlife Service in order to avoid an explosion of "rough" fish species in the reservoir once it was filled (USDA, 1995, USACOE, 1960). This action is what likely led to the near extirpation of bull trout from this watershed.

The reintroduction of salmon above the Hills Creek Dam is the result of efforts by Oregon Department of Fish and Wildlife (ODFW). Beginning in 1993, excess adult salmon of hatchery origin have been annually trucked above the Hills Creek Reservoir, and released into the Middle Fork River, generally in areas upstream of the Jim's Creek project area. Initially these fish were released above the dam to provide for aquatic ecosystem nutrient input and most of these fish were released above the Jim's Creek project site. It was soon noticed that these adult fish were successfully spawning, and this trucking and release of adult fish has continued to the present. From 1200 to 3000 fish are typically released, depending upon the availability of adult salmon in excess of the need for hatchery operation.

Spring chinook salmon (*Oncorhynchus tshawytscha*) utilize habitat in the Middle Fork River, and a portion of the Middle Fork River is adjacent to the southern Jim's Creek project boundary. A moderate amount of spawning habitat is available in the reach adjacent to the project area, but the Middle Fork River provides extensive rearing, refuge and forage habitat for juveniles. These salmon are part of the Upper Willamette Spring Chinook Salmon Evolutionarily Significant Unit (ESU), and have been designated as a threatened species under the Endangered Species Act (ESA) by the National Marine Fisheries Service (NMFS) (64 FR 14308, on May 24, 1999). The project area is not within NMFS spring chinook salmon Essential Fish Habitat due to its location above an impassible dam.

Bull trout (*Salvelinus confluentus*) also occupy the same habitat in the Middle Fork River. This stretch of river provides forage and refuge habitat for bull trout. Spawning and juvenile rearing occur only in the cooler upstream reaches of the Middle Fork River.

These bull trout are part of the Columbia River Distinct Population Segment (DPS), and have been designated as a Threatened species under the ESA by the U.S. Fish and Wildlife Service (63 CFR 31647) effective July 10, 1998. Bull trout fry and fingerlings were re-introduced into several large volume cold water springs tributary to the Middle Fork River up-stream of the Jim's Creek projects area in 1998. These young fish were collected from the McKenzie River system and have done well since their re-introduction, though the main stem of the Middle Fork River is too warm for them to thrive or survive (bull trout fingerlings require even colder water than do chinook salmon). Despite the above mentioned poisoning, occasional reports of adult bull trout in the Middle Fork have been made up to the present day, though spawning has yet to be confirmed.

## **2. Stream Temperatures**

A portion (10%) of the 303(d) listed Middle Fork Willamette River constitutes the south boundary of the Jims Creek Savanna Restoration Project planning area. Maximum temperatures of up to 70 degrees F have been recorded during the warmest weeks of the summer. The Watershed Analysis (USDA, 1995) establishes that historic, pre-management late summer temperatures ranged from 50 to 58 degrees F. Temperatures over 64 degrees are considered to be detrimental to native fish populations. These elevated temperatures result from past removal of riparian vegetation (USDA, 1995, page 4-17) and road building, and in part from flood effects (USDA, 1996). No other streams in or near the Jim's Creek Savanna Restoration planning area are listed as 303(d) water quality limited.

The intermittent streams within the project area do not contribute stream flow to the Middle Fork River during the critical summer period between mid-June through mid-September. All flow from Jim's Creek during the summer months enters the Middle Fork River as subsurface flow. Similarly, most of the perennial streams contribute very little flow to habitat occupied by fish within the Middle Fork River, and much of that is cooled during its subsurface condition.

The elevated temperatures in the Middle Fork River can create thermal migration barriers for fish during mid-summer. This thermal barrier is especially of concern for bull trout adults. This species possesses a pattern of mid-summer upstream migration from forage habitat to spawning habitat. This is likely to mean that bull trout using Hills Creek Reservoir in July and August would need to negotiate nearly 17 miles of excessively warm river to reach tributaries with temperatures appropriate for spawning. There could be a slight delay in migration during early August when at least part of the day, warm temperatures would impede their movement. Water temperature within the project area

reach of the Middle Fork River restricts this portion of the river from providing bull trout spawning or juvenile rearing habitat.

Migrating adult salmon are capable of enduring warmer stream temperatures than bull trout. However, water temperatures above 64 degrees F stress adult salmon. Recent Middle Fork River temperatures have on occasion exceeded this level. For both species some thermal refugia are provided in the deeper pools of the Middle Fork River and at the mouths of tributaries adding cooler water to the Middle Fork River. Stream temperature does not limit the use of the project area reach by juvenile salmon, other native trout, or non-game species.

Field reconnaissance of Deadhorse Creek and its perennial tributary found that the relatively healthy primary shade zone, the near-stream component of the riparian forest, provides adequate thermal buffer to the streams. With 80% canopy closure and the relatively small contribution (less than 2%) to flow that Deadhorse Creek provides to the Middle Fork River, it is unlikely that Deadhorse Creek flow is a significant contributing factor to the thermal load in the river. Based on samples taken in 2004, temperature maximums within the fish-bearing reach of Deadhorse Creek tend to be about three degrees cooler than the Middle Fork River. Conditions appear good for the native cutthroat population.

Jim's Creek is also well-shaded, and has intermittent flow as evidenced by occasional small, bedrock controlled pools from July through October. The segment of the stream within the valley floor of the Middle Fork River is completely dry during the summer. The temperature of Jim's Creek and the perennial tributary to Deadhorse Creek in the project area were taken in August 2004, and indicated that the daily maximum temperatures were within five degrees of the Middle Fork River. Their extremely small percentage contribution to the Middle Fork River's total flow during the critical summer months suggests that none of these streams within the project area significantly affects Middle Fork River temperatures. They are not likely contributors to the thermal stress felt by salmon and bull trout within the Middle Fork River.

### **3. Peak Stream Flow**

ARP analysis for the project area is done both on the planning sub-drainage scale and 6<sup>th</sup> field sub-watershed scale. The current ARP values in Table 6 include effects of past harvest and other disturbances. The values are compared to the assigned mid-point values in the Willamette National Forest Plan. A watershed with no harvest or recent stand replacement disturbances that have hydrologically recovered would have an ARP value of 100.

**Table 6 – Current Aggregate Recovery Percentage Values**

subwatershed	Current ARP Values	Forest Plan Midpoint ARP Value
Deadhorse 21-1	84.4	75
Youngs 21-G	81.4	70

Preliminary reconnaissance of Deadhorse stream channel indicates that the stream is currently functioning in an acceptable manner. Approximately 16% of the riparian reserve, which includes an un-named class III tributary stream, has been harvested. The riparian portions of the three plantations adjacent to Deadhorse Creek are in various stages of recovery from the past timber harvest with less than a minimum 100 foot wide at the top of the inner gorge portion of the stream side-slopes.

Deadhorse Creek has an average wood count of less than 60 pieces per mile. A stream is not considered to be fully functional hydrologically unless it has an average of 80 pieces of large woody material per mile of stream channel (USDI, 1995). Such pieces of in-stream large wood provide for channel stability in the event of elevated peak flows. There is a high potential for future wood recruitment from the existing streamside stands along this creek. No major stream bank erosion was observed during the field assessments.

**4. Turbidity**

Stream turbidity is caused by naturally occurring or management induced soil erosion. Water turbidity is a difficult characteristic to quantify since it is often quite variable in time. Turbidity is typically increased by weather events such as high intensity storms or rapid melting of a snow pack. The Middle Fork River is not listed as water quality limited due to stream turbidity, but the Watershed Analysis (USDA, 1995) does indicate there have been some increase in stream turbidities related to management activity, in particular road construction and road related landslides (WA, pages 2-4 and 4-30).

Upstream impacts in large measure account for the conditions observed within the Middle Fork River along the Jims Creek Project area. Fine sediment within the stream reaches of the river’s main stem streambed remained below 10% through all reaches surveyed (Resources Northwest, 1997). However, lower current velocities that occur within side channels can cause them to retain a greater percentage of fine sediment than the adjacent main stem channel. Increased fine sediment reduces habitat quality by decreasing pool volume and embedding coarse sediment used for juvenile cover, and necessary for spawning. The Watershed Analysis does not specifically state that the

turbidity in this river occurs as pulses caused by storm events. The Watershed Analysis does refer to turbidity as an issue, but discusses stream temperatures extensively. The Middle Fork River is generally very clear. It does experience periods of elevated turbidity during winter high water and storm events.

Turbidity impacts in this analysis are evaluated based upon the potential for erosion to occur and for eroded soil to be transported to the stream system.

Soils

Soils in the Jims Creek Savanna Restoration project area can be generally typified as being fine-textured and relatively shallow, raging in depth from only a few inches in some of the meadows to three feet. They have developed from lava flow and ash fall events which have been subject to extensive weathering and erosion. They tend to be very erosive if the bare soil surface is exposed. The soils information comes from the Willamette National Forest Soil Resource Inventory (SRI) prepared by Legard and Meyers, (1973, updated 1992). Soils were mapped as land types and land type complexes (several land types mapped as one mapping unit) which characterize the soils, vegetation, landform (topography), and geology. The basic landtype descriptions give characteristics of the soils and how they respond to various disturbances. Field reconnaissance and surveys were completed to verify current conditions such as existing soil disturbance, observations of effects to the soil, current effective ground cover, and soil erosion potential. The following table displays some characteristics of soils found in the project area.

**Table 7 - Soils of the Jims Creek Savanna Restoration Project Area**

Soil Resource Inventory Mapping Unit	Acres Project Area	% Project Area	Land Stability Class (Soil Category)	*Expected Mass Movement From Mgmt.	*Surface And Subsurface Soil Erosion Potential	*Sediment Yield Potential	*Expected Sediment Size
2	16.2	2.4	Stable (3)	Unchanged	Moderate to High	Moderate	N/A
15	38.9	5.6	Moderately Stable (5)	Unchanged	Moderate	Moderate	gravel, sand
31	1.8	0.3	Unstable (3)	Increased	Moderate to High	Low to Moderate	silt, clay

Soil Resource Inventory Mapping Unit	Acres Project Area	% Project Area	Land Stability Class (Soil Category)	*Expected Mass Movement From Mgmt.	*Surface And Subsurface Soil Erosion Potential	*Sediment Yield Potential	*Expected Sediment Size
201	6.8	1.0	Moderately Stable (3)	Increased	Severe to High	Low to moderate	silt, clay
233P	30.9	4.5	Moderately Stable (5)	Increased	Moderate to High	Moderate	silt, clay
310U	59.4	8.6	Moderately Stable (3)	Increased	Severe to High	Moderate to High	silt, sand
316	534.3	77.5	Unstable (3)	Increased	Severe to High	Moderate to High	silt, sand
356	0.3	0.1	Moderately Stable (2)	Increased	Moderate to Severe	Low	silt, clay
Total	688.6	100.00					

Soil Categories: 2=clay soil on gentle to moderate slopes, 3=steep slopes with shallow rocky soil, 5=miscellaneous flat to moderate slopes

Field reconnaissance has identified minor soil erosion (rills) associated with impaired ditch drainage on Road 2129.371. There is little evidence of any major soil erosion below the road. At perennial stream road crossings, only very small amounts of soil road erosion enter the streams during storm events. Neither of the two perennial stream road crossings have any visible evidence of any down cutting or excessive erosion below the road. Also, none of the relief culverts along Road 2129.371 show any evidence of excessive down cutting or erosion on the down slope side. Road 2129.371 is stable and has no evidence of fill slope edge cracking, any past failures, or any potential for future failures. Some work on Road 2129.371 is needed to re-establish properly functioning road drainage.

Road 2129, which would be used for log haul by all action alternatives, was field surveyed for potential road drainage problems which could route sediment laden water to the stream network. None of the relief culverts or roadside ditch drainages exhibited

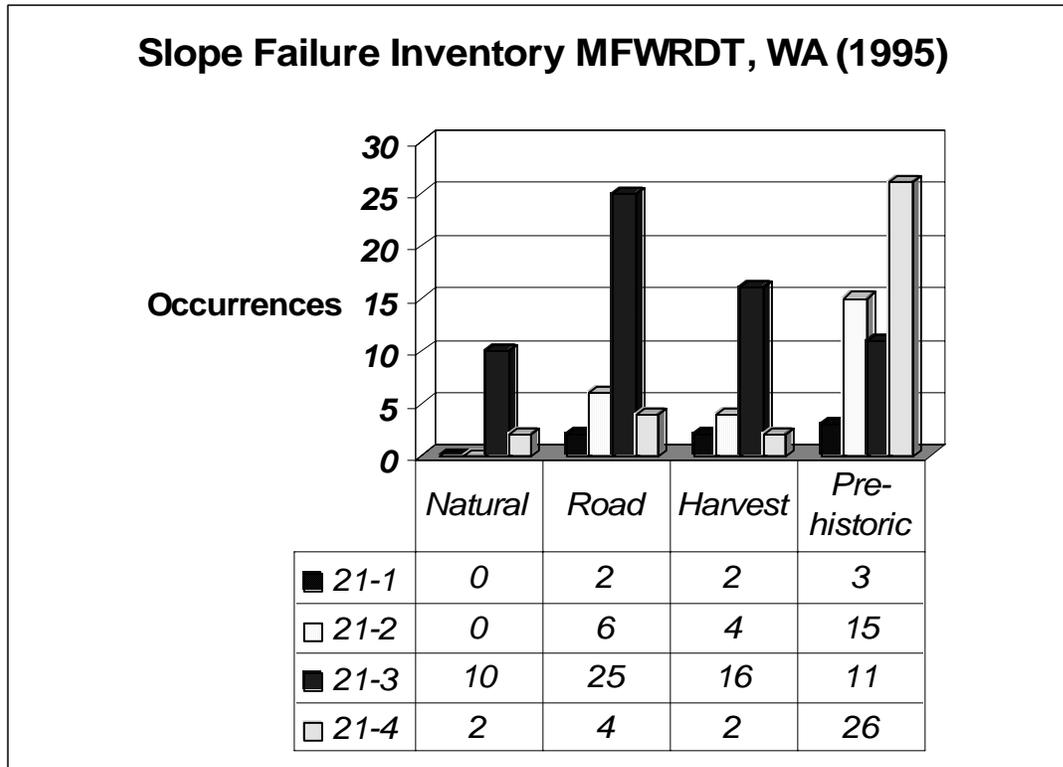
evidence of excessive down cutting or erosion. Within the last year Road 2129 has been bladed and the road ditch was cleaned out where necessary, so the road drainage is in good working condition. Adjacent to Road 2129 is a rock quarry (about one mile west of the project area) which has collected runoff water and drained into and down cut the roadside ditches along the road down-slope of the quarry. The remaining road drainage is in good condition with vegetation in most of the ditch line.

No evidence of surface erosion has been observed in the forested areas where the surface is covered with either conifer or deciduous tree litter. Most of the open, grass covered areas have adequate ground cover to protect the soils from erosion; no erosion has been observed.

One small land failure has been identified below Road 2129.371 west of Jim's Creek in unmanaged forest. The land failure does not seem connected to or related to the road location or drainage network. It appears to be associated with an increase of soil water flowing through the profile and decreasing soil strength. The land failure moved approximately 300 feet down a class IV channel, where the failure mass remains above the Jim's Creek channel in the tributary channel. No other recent land failures were identified in the Jims Creek Savanna Restoration planning area.

A broader landscape perspective of soil erosion can be obtained from the Watershed Analysis (USDA, 1995, Appendix A, Geology and Soil). A slope failure inventory gives some insight into slope failures and the relationship to natural conditions or management actions. The inventory does not specify storm frequencies associated with the particular land failures but does correlate the SRI landtype with each occurrence. The incidence ratio indicates a difference in potential for slope failure by soil type. Figure 7 summarizes the slope failures and the relationship to 6<sup>th</sup> field watershed areas.

**Figure 7 - Slope failure inventory for the 6<sup>th</sup> Field sub-watershed as presented the Middle Fork Willamette Downstream Tributaries Watershed Analysis.**



Natural=Naturally occurring debris slides. Occurs on timbered ground away from the impacts of harvest or roads.

Road=Road debris slides. Directly related to road construction, usually a fill failure.

Harvest=Harvest related debris slide. Associated with either harvest practice (suspension) or increased groundwater/decreased root strength.

Prehistoric=Pre-historic debris slide. Existing chutes which existed in earliest photo sets. Appearance stayed constant.

The Watershed Analysis identified landslide occurrences and road network sediment routing as the primary mechanisms for transport of most sediment to the stream network. Road construction practices prior to 1980 included side cast fills and inadequate aggregate surfacing, and was an era when most roads were built on steep grounds. The result is a delayed reaction of road related land failures as the buried wood decays, weakening the side cast fills (USDA, 1995; p.4-30). Current road building standards and practices provide much less risk of this occurring. As stated in the Watershed Analysis, approximately 66% of the watershed contains steep ground with shallow, erosive soils. Table 8 summarizes the slope failures and the relationship to SRI land types (soil category groupings).

Approximately 90% of the Jims Creek Savanna Restoration project area is mapped as soil category 3 which has the highest occurrence of landslides (total of 58) as inventoried for

the two 6<sup>th</sup> field watersheds. The soil stability class 3 has a stability rating of moderate to unstable. Of the 58 landslide occurrences on class 3 soils, 36 % are associated with roads, 16% with harvest units, and 48% were natural events (36% pre-historic). The likelihood of failures occurring on category 3 soils is high and the greatest management activity associated with failures is the road system. Most of the areas harvested in this watershed have been clearcut, so little residual rooting strength remains past 10 or 12 years (Bailey, 2005b).

The proposed management activities have some potential to trigger landslides within the Jims Creek Savanna Restoration project area. The amount of area managed and the type of management by alternative has the potential to increase the frequency of landslides over the current conditions. The magnitude of a land failure is difficult to predict as it relates to storm size and duration as well as location of failure initiation on the landscape. Even though the watershed analysis identifies past land failures, none of the data suggests a storm size which may have initiated the soil mass to move. The magnitude of landslides potentially caused by proposed actions would be similar to those inventoried for the WA for similar soil conditions and management activities. The partial retention harvest prescribed in all action alternatives would have a lower risk of causing slope movement than past regeneration harvest, (the slope failures inventoried in the Watershed Assessment was influenced primarily by roads and to a lesser extent regeneration harvest) since a substantial live root mass would be retained. No landslides have occurred over the last twenty years in the two shelterwood harvest units within the project area. These shelterwoods contain slopes ranging from ten to 55 percent.

**Table 8. Comparison of Soil Categories and the Slope Failures as Inventoried for the Watershed Analysis (Little Pine – 21-3 and Coal Creek - 21-4 old 6<sup>th</sup> field Sub-watersheds).**

Soil Category	1	2	3	4	5
Soil Stability Class Range for Soil by Occurrence		Moderate	Moderate to Unstable	Stable to Moderate	Moderate
Buck Creek 21-3					
Natural slides			6	4	
Road related slides		2	10	2	2
Harvest related slides		1	8	3	

Soil Category	1	2	3	4	5
Prehistoric slides			7	5	
Sub-total Occurrences		3	31	14	2
Coal Creek 21-4					
Natural slides			1		
Roads related slides			11	1	1
Harvest related slides			1	1	
Pre-historic slides			14		
Sub-total Occurrences			27	2	1
Total Occurrences		3	58	16	3

\*Notes: Stability Class - S=stable, M=moderate, U =unstable.

**Direct and Indirect Effects Common to All Alternatives**

**Issue #1 – Water Quality/Fish Habitat: Significant Issue - The Middle Fork of the Willamette River is at the bottom of the slope that is proposed for restoration to a savanna. The proposed activities have a potential to impact water quality, either through erosion, a change in the hydrologic function of the area, or an increase in temperature.**

Evaluation criteria:

- change in temperature in the Middle Fork
- increase in peak flow
- likelihood of turbidity increases

Fish habitat

None of the alternatives propose any activities that would have a direct or indirect effects upon the physical aspects of fish habitat, other than water turbidity and deposition of sediments, as discussed below. Deadhorse Creek riparian reserves conditions would remain unchanged, hence the fish habitat conditions would not change in that stream.

Stream temperature

None of the Alternatives would have an effect upon stream temperatures since all would maintain all shading vegetation adjacent to permanently flowing stream channels. There would be no measurable change to stream temperature within the Middle Fork River due to the project activities as long as the primary shade zone along all class III streams remains unaffected by harvest or fire treatments. The full riparian reserve of Deadhorse Creek would protect the stream from increased solar radiation and maintain the present moderate temperatures in this stream.

Peak Flows

Given that there is at least an average count of large wood in the Deadhorse Creek riparian area and a potential for more recruitment and the stable nature of stream channel substrate, no adverse effects to stream channel conditions are anticipated to occur due to an increase in peak stream-flow due to implementation of any of the action Alternatives. The magnitude of storm events would likely determine whether there would be an increase in stream bank erosion and movement of large wood.

**Table 9. ARP Values by Planning Sub-drainages for Jims Creek Savanna Restoration.**

PSUB	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Year	2007				
21-1	75.7	84.4	80.1	80.1	62.9
21-G	80.8	81.4	80.8	80.8	80.1
Year	2012				
21-1	83.9		87.3	87.3	74.5
21-G	84.9		84.9	84.9	84.6
Year	2017				
21-1	90.1		92.2	92.2	84.2
21-G	88.6		88.6	88.6	88.4

**Table 10. ARP Values for Hills Creek Reservoir (5th Field) by 6<sup>th</sup> Field sub-watersheds and Jims Creek Savanna Restoration Alternatives.(2007 values)**

6th Field Sub-watersheds	Current ARP 2005	Alt. A	Alt. C	Alt. D	Alt. E
Gray Creek	79	-	-	-	-
Larison Creek	78	-	-	-	-

6th Field Sub-watersheds	Current ARP 2005	Alt. A	Alt. C	Alt. D	Alt. E
Packard Creek	71	-	-	-	-
Buck Creek	80	79.6	79.7	79.7	79.0

Peak flow is not an issue at the 5<sup>th</sup> and 6<sup>th</sup> field watershed scale, (see Table 10) since none of the action alternatives would appreciable lower the ARP. Stream flow increases would be anticipated on a local scale within Deadhorse Creek. The Deadhorse sub-drainage has a current ARP of 84.4 and a mid-point ARP of 75. Based on a Douglas–fir growth model in the Deadhorse sub-drainage ARP levels would recover back to the mid-point level of 75 in the year 2012 due to continuing tree growth the (see Table 9).

Alternative A – Proposed Action: This alternative would not result in detrimental increases in peak stream flow that result in adverse downstream channel effects. The ARP calculations for this alternative indicate that the change in canopy closure would stay above the mid-point sub-drainage values (PSUB values: Deadhorse [211]: current-84.4; mid-point-70; Alternative A-75.7; and Young’s [21G]: current-81.4; mid-point-75; Alternative.A-80.8), as well as at the 6<sup>th</sup> field sub-watershed level.

Alternative B – No Action: This alternative, if implemented, would not affect existing ARP values nor result in the possibility of elevated peak flows.

Alternative C – staged entry: This alternative would not result in detrimental increases in peak stream flow that result in adverse downstream channel effects. ARP calculations indicate that the change in canopy closure would stay above the mid-point sub-drainage values (PSUB values: Deadhorse [211]: current-84.4; mid-point-70; Alternative C-80.2; and Youngs [21G]: current-81.4; mid-point-75; Alternative.C-80.8), as well as at the 6<sup>th</sup> field sub-watershed level.

Alternative D– multiple methods: This alternative would not result in detrimental increases in peak stream flow that result in adverse downstream channel effects. ARP calculations indicate that the change in canopy closure would stay above the mid-point sub-drainage values (PSUB values: Deadhorse [211]: current-84.4; mid-point-70; Alternative.D-80.1; and Youngs [21G]: current-81.4; mid-point-75; Alternative D-80.8), as well as at the 6<sup>th</sup> field sub-watershed level.

Alternative E – full restoration: This alternative would not result in detrimental increases in peak stream flow that result in adverse downstream channel effects. ARP calculations indicate that the change in canopy closure would be below the mid-point sub-drainage values for the Deadhorse planning sub-watershed [21-1] at 62.9 percent and above the midpoint for the Youngs planning sub-watershed [21-G] at 80.1percent. At the Buck Creek 6<sup>th</sup> field sub-watershed level, the current ARP value is 80 and the Alternative E

value is 79. The Deadhorse PSUB will recover to the mid-point value by the year of 2012 (see Table 8, and no stream channel erosion would be anticipated due to the adequate presence of stabilizing large wood and the stable nature of the stream channel in general.

#### Effects Common to All Action Alternatives

Given that large wood in the stream averages about that specified for proper stream function (80 pieces per mile; USDI, 1995) and that there is potential for more recruitment, no adverse effects to stream channel conditions are anticipated to occur due to an increase in peak stream-flow. The magnitude of a rain on snow storm runoff event would determine whether there will be an increase in stream bank erosion and movement of large wood under any alternative.

#### Stream turbidity:

High magnitude storm events would cause sediment generated by project activities to be transported by the tributary streams and delivered to the Middle Fork River and Deadhorse Creek, the two fish-bearing streams within the Project area. The fine component of transported sediment would increase the turbidity in both the river and Deadhorse Creek. However, the magnitude of the increase in turbidity within the Middle Fork River would likely be very low due again to the small percentage of the total watershed that the project area comprises. Over the past 50 years there has been approximately 58,000 acres of regeneration harvest and construction of about 471 miles of road constructed in the 113,000 acre Upper Middle Fork Watershed (USDA, 1996) immediately upstream of the project area. Those past management activities potentially generate turbidity within the Middle Fork River, though vegetation recovery has considerably diminished their effects over time.

None of the activities proposed for the Jim's Creek Savanna Restoration Project would generate turbidity in excess of the State of Oregon standards for stream turbidity increases. An event creating erosion in the project area that could reach the stream network would very probably cause considerable turbidity in the Middle Fork River from upstream sources of such magnitude that any inputs from the proposed actions would be indiscernible. The Best Management Practices listed at the end of Chapter II would be implemented to minimize the stream turbidity affects from all the management activities proposed, in addition to retention of no-treatment buffers along all streams.

The potential adverse effects to fish from transport of fine sediment into the Middle Fork River and Deadhorse Creek are expected to be insignificant to low. The magnitude of the effect is dependent on the magnitude of storm events during the period of vegetative recovery. Six months of vegetative recovery would likely reduce the magnitude of the sediment effect to insignificant. The most likely habitat to be affected by project

activities would be the north bank side channel of the Middle Fork River that is on the south edge of the project area. This channel would receive direct inputs from several of the tributaries within the project area. The remaining tributaries within the project area would deliver their sediment loads to the margin water along the north bank of the river upstream of the side channel. The low velocity condition along the bank could reduce the capacity of this portion of the river to mix well with the main flow of the Middle Fork River. As a result, sediment delivered along the north bank would likely migrate into the same north bank side channel. This side channel was recently observed during a 10 year flood event (late December, 2005). This was the sort of event that could cause sediment to be moved from harvested areas if it occurred before the grass layer becomes fully established. During this flood event, the side channel in question was no longer a completely separate channel of the river, the current was strong enough to prevent fine sediment from settling out, and the river was quite turbid. Therefore, if such an event did occur immediately after any of the action alternatives were implemented, there would likely be no noticeable affect above and beyond the effects of the flood itself, in conjunction with the effects of past, upstream management activities such as road building and harvesting.

#### Soil Erosion

Helicopter logging is proposed for much of the area proposed for timber harvest contained in the action alternatives to avoid road construction and the associated increased risk of slope failure, since the Watershed Analysis identified roads as the most common sediment source. Helicopter logging is considered a low soil disturbance logging system (Klock, 1975; Allen, 1997).

Timber harvest would reduce evapo-transpiration through canopy reduction, so soils remain wetter over longer periods (Swanston 1971, Klock and Helvey 1976, Helvey 1980, Swanson 1981, McNabb and Swanson 1990). Consequently, the threshold of storm magnitude needed to bring the soil to saturation and trigger landslides can be reduced after harvest (Wondzell and King 2002). Also, research has suggested that the decrease in internal soil cohesion caused by loss of mechanical cohesion, as roots of harvested trees stumps decompose, can also decrease the effective soil strength, making slopes more susceptible to debris sliding (Swanston 1971, Swanson 1981, McNabb and Swanson 1990). As observed in the H.J. Andrews forest, most hill slope failures in clearcut areas occurred in the first 12 years after cutting (Swanson and Dyrness 1975).

The proposed harvest method is not clearcutting. The reduction of a portion of these stands' root system could ultimately create conditions resulting in an acceleration of landslide frequency but such a risk would be low considering that the twenty largest trees per acre would be retained and the understory would be revegetated with grasses. The

retained trees, being the largest, would have the most extensive root systems, and dead tree roots retained their strength for several years before they begin to weaken significantly approximately 5 to 10 years following harvest (Megahan et al. 1978). By that time native ground vegetation would establish a dense root system (see the soil erosion section of the Silvicultural Prescription, Bailey 2005b, in the Analysis File for an more detailed discussion on residual rooting strength). There is less likelihood of slope failure due to the proposed tree removal than research or the watershed analysis indicates, since both those sources looked at past clearcut harvesting.

The potential for sediment delivery to a stream depends largely on the severity of high runoff storm events in the future. In the event of a high magnitude, low frequency runoff event, the potential for sediment delivery to the stream would increase from both management and natural sources. The 113,000 acre watershed immediately above the Jim's Creek project area contains 470 miles of open road and approximately half the watershed has been regeneration harvested over the last 50 years. These past activities would all contribute to turbidity of the Middle Fork River during a large storm event.

For a 10 year return interval flow the magnitude of flow entering the main stem of the Upper Middle Fork Willamette river from the tributaries in the project area is relatively small and diminishes as a percentage as more watershed area is involved, i.e., as one moves downstream (Bates, 2005). In a study of 10 small watersheds in the H.J. Andrews Experimental Forest Jones (1999) found that peak discharges increased by 26-31% during large events, defined as greater than 1 year return interval. This result was more prominent during rain-on-snow events whereas in just rain events there was not significant change following vegetative removal (Bates, 2005).

Maintaining the soil organic layer and effective ground cover has been emphasized in the alternatives by the use of helicopter and cable yarding systems, and avoidance of broadcast burning prior to establishing the grass layer (Boyer, 1980). The effective ground cover would be maintained at greater than 40% in all activity areas all action alternatives. Mitigation such as seeding native grasses and other native plants associated with the savanna type would be implemented, especially in areas where bare soil surfaces exist.

Figure 8 below illustrates the potential amount of soil movement associated with the alternatives and existing roads within the planning area. This provides a relative comparison of the potential soil erosion of current conditions and the proposed management (timber harvest, fuels treatment, and existing roads). It should be noted that this amount of soil movement is considered a worst case scenario; such movement would only occur if there is a relatively large winter storm soon after the slash disposal is

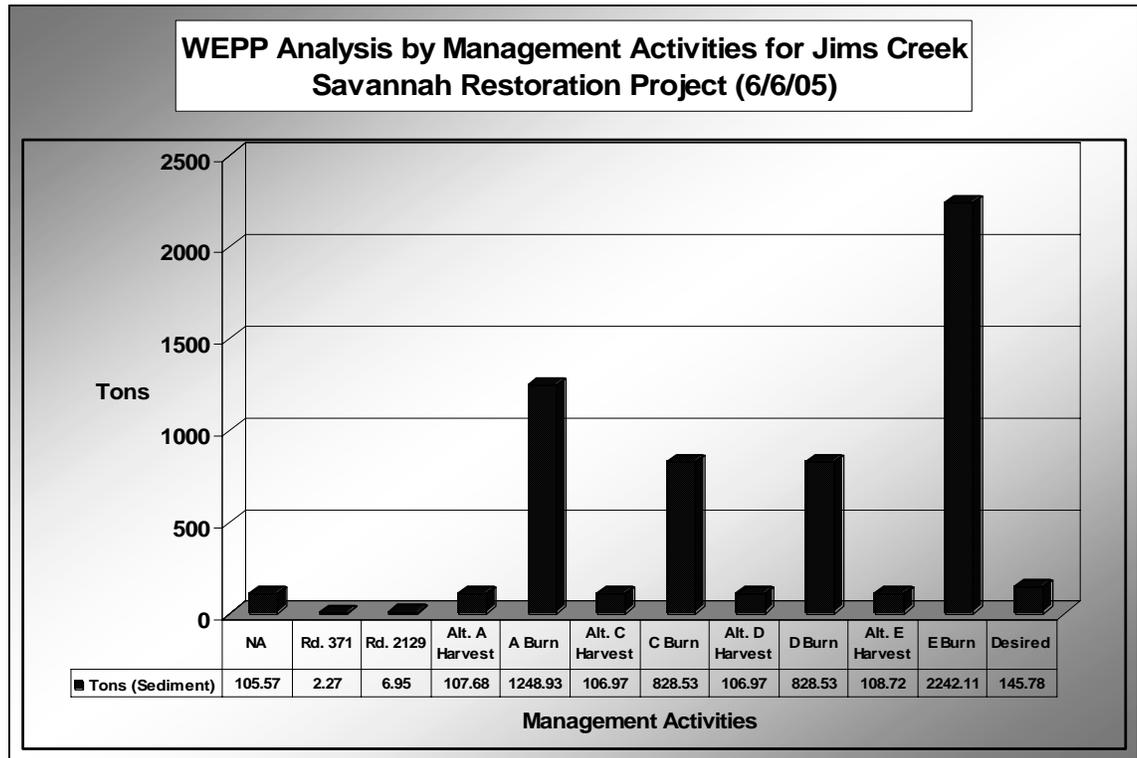
completed, and before existing and seeded native plants respond to favorable growth conditions.

The Disturbed WEPP (Watershed Erosion Prediction Project; Elliot, 2000) erosion prediction model was used to display the soil erosion potential rather than land failures (see Figure 8). The WEPP model uses the specified characteristics of climate, soil texture, local topography, plant community, and surface residue cover. This model was designed to predict runoff and sediment yield from prescribed and wild fires, harvested forests, young and old undisturbed forests, and recognizes that vegetation recovery occurs after disturbances. The erosion values this model generates are intended to be a relative index of potential erosion rather than to predict actual amounts of erosion that will reach the stream channel system. This model, like others has shortfalls when applied to large areas where surface roughness both within stream channels and upland slopes varies significantly. It works best when used for predicting erosion rates for short slope segments where surface roughness is not significantly variable. This site has variable surface roughness, so soil erosion values presented in this narrative are only intended to provide a comparison of potential risk between alternatives and should not be considered as firm predictions of erosion magnitude.

The No Action alternative effects are based upon current vegetation soil erosion potential. The values for Roads 2129 and 2129.371 are calculated from road segments where road erosion has a high potential to contribute sediment to a perennial or intermittent stream channel. The burning of hand piles would occur between November and March. The desired future condition potential soil erosion value presented in Figure 8 is the amount of potential erosion that could be expected from the periodic underburning of an oak savanna landscape

Another way to assess flood frequency is historic rainfall events. The largest percentage of the Middle Fork Willamette stream flow peaks (greater than 3500 cubic feet per second) occur in the months of December and November (USDA, 1995, p.4-12.). The frequency of flooding generally diminishes after February. As surface soil movement is most likely to occur with rain storms, a fall burning period is likely to provide a greater chance for soil erosion to occur than a late winter burn. Further precipitation analysis addresses the frequency of storm events and magnitude of the flows generated which might mobilize sediment.

**Figure 8. WEPP Analysis for Potential Soil Erosion by Alternative**



There are only 5 storms in the rainfall record for the Oakridge Fish Hatchery that are equal to or greater than 3.0 inches for a 24 hour period over the last 57 years:

- Dec. 13, 1948 3.93 inches
- Nov. 23, 1953 6.00 inches
- Nov. 22, 1961 3.70 inches
- Nov. 23, 1961 3.12 inches
- Jan. 20, 1964 3.13 inches
- Dec. 23, 1964 3.45 inches

The size of the storm event required to trigger measurable rates of sediment input is estimated to occur once every two years, with precipitation spanning a full 24 hours. During that same two-year period, there would be at least four periods of vegetative growth coinciding with precipitation: in each fall before snow cover and in each spring/summer until soil moisture is no longer available. The risk of degradation would occur if a significant storm occurs prior to revegetation.

Alternative A - Proposed Action:

Alternative A creates a potential for soil erosion due to the proposed timber harvest and slash burning treatments. The WEPP calculated soil erosion amount is 1258.25 tons.

Alternative B: No Action:

If this alternative is implemented, no ground disturbing activities would occur that could lead to accelerated rates of soil erosion or sediment movement into the stream system. No risk of increasing stream turbidity over those amounts caused by natural conditions and past management would occur. The WEPP calculated soil erosion amount is 114.82 tons.

Well-maintained roads generally deliver less sediment and have a lower probability of culvert failure than roads in need of maintenance. The road maintenance that is integral to all of the project's action alternatives would not occur if the No Action alternative is selected. The road segments in and around the project area would be more likely to endure culvert failure during significant storm flow events due to the lower level of maintenance that these roads would receive if the No Action alternative is chosen.

More than 99 percent of the management-related soil erosion due to past harvest and road construction upstream of the project area would still persist if no action is taken.

The existing road network would still cause storm runoff and peak flow changes. This added efficiency is detrimental to aquatic ecosystems and would be expected to persist as long as the road network's contribution to drainage efficiency persists.

Alternative C: staged entry:

Alternative C creates a potential for soil erosion due to the proposed timber harvest and slash burning treatments. The WEPP calculated soil erosion amount is 837.75 tons.

Alternative D: multiple prescriptions:

Alternative D creates a potential for soil erosion due to the proposed timber harvest and slash burning treatments. The WEPP calculated soil erosion amount is 837.75 tons.

Alternative E: full restoration:

Alternative E creates a potential for soil erosion due to the proposed timber harvest and slash burning treatments. The WEPP calculated soil erosion amount is 2251.33 tons.

**Effects common to all Action Alternatives**

Turbidity

Surface roughness is the key factor in determining whether the soil will actually reach and enter a stream as sedimentation. Field surveys have shown that the surface soil is very rough with effective ground cover and anticipated additional woody material as

some of the trees harvested fall and remain on the forest floor and decay. Due to the moderate slopes, the roughness of slope from woody material, and the irregular nature of the topography, much of the modeled erosion would likely be re-deposited on site rather than enter a stream as sediment. Following slash disposal, native grasses are expected to occupy much of the site and provide effective ground cover to minimize soil erosion. The grass recovery depends on the weather following the burning. Mild fall weather could bring on rapid re-growth, while immediate rain storms of significant magnitude could slow the growth, leaving the site vulnerable to potential soil erosion until spring. Movement of sediment into the stream channel system would probably only occur if a large storm event occurred before ground vegetation redevelops. A small percent of mobilized soil would enter streams and be transported into occupied aquatic habitat during storm runoff. The most likely effect to fish during such an event would be the displacement of individual fish from preferred sites to less preferred sites in order to avoid localized high concentrations of fine sediment. It is not likely that project activities would measurably reduce the quality of habitat within the main stem of the Middle Fork River. However, it is possible the side channel of the river immediately adjacent to Road 21 and the project area may receive sufficient fine sediment that some measurable habitat degradation could occur. Increased delivery of fine sediment to the habitat could cause very slight increases in embeddedness; a reduction in the quality of juvenile cover provided by coarse substrate as embeddedness increases; and minor changes in pool volume as a result of the deposition of fine sediment.

Road maintenance and culvert replacement associated with all action alternatives could cause some soil to be eroded to the connected stream network. Activities include: road bed grading (3 to 4 miles), cleaning of ditches along those roads, cleaning of culvert inlets and outlets (less than 25 culverts), removing sloughed materials (less than one mile), and placing crushed aggregate (several spots as needed, but less than two miles).

This road work would occur during dry weather periods when there are no surface water flows, thus minimizing the potential for sediment to be delivered to surface water at the time the project is implemented. For a brief period of time during the first storm related runoff event following any culvert installation, a minor amount of sediment could be delivered to streams as a result of soil disturbance from the culvert installation. This minor amount of sediment would be delivered to streams at a time when flows are elevated and the stream has the ability to dilute the incoming sediment. Additionally, during high runoff events, sediment input from all sources, including background rates, is higher. In the long-term, culvert replacement would reduce the potential for a road failure to deliver large quantities of sediment to stream channels.

There is a potential for log haul to increase sediment delivery to streams due to road use accelerating the erosion rate of fine sediment from the road surfaces. A total 3.5 to 4 miles of log haul over aggregate surfaced forest roads would occur. The hauling over paved Road 21 (19 miles) would have little potential to increase sediment to streams. Hauling over aggregate surfaced roads would have a higher potential to increase sediment delivery to streams particularly during periods of wet weather. Log haul for all alternatives could occur during winter months but would be restricted during very wet periods if the roads show signs of sediment generation. Implementation of Best Management Practices, including proper road maintenance, would result in a low risk of adverse effects from truck haul.

Mitigation of potential soil effects for all action alternatives would consist of helicopter and cable timber yarding to minimize disturbance of surface soils and organics, hand piling and burning slash accumulations to avoid a large heat pulse to the soil across the site, and planting of native grasses and other herbaceous plants.

Uncertainty about the season at which soil disturbance created by the proposed actions would reach its maximum, nor can the state of vegetative recovery at the time of the first major storm be predicted.

#### Aquatic Conservation Strategy (ACS) Objectives

The Northwest Forest Plan Aquatic Conservation Strategy Objectives (USDA/USDI, 1994, page B-11) provide direction in relation to aquatic resources. These objectives are meant to be applied at the Fifth-field watershed level. All action alternatives specifically respond to the following objectives in order to accomplish them at the Fifth-field watershed level:

- Objective 1. (“maintain and restore the distribution, diversity, and complexity of watershed and landscape-scale features ...”);
- Objective 5 (“maintain and restore the sediment regime under which aquatic systems evolved”);,
- Objective 7 (“maintain and restore the.... water table elevation in meadows... ”),
- Objective 8 (“maintain and restore the species composition and structural diversity of plant and animal communities...”) address the need to restore altered components of the ecosystem;
- Objective 9 (“maintain and restore habitat to support...populations of native plant, invertebrate, and vertebrate riparian dependant species”).

All action alternatives would have some level of short-term adverse effects to aquatic resources to the extent that they contribute to an increase in stream turbidity, but all

would also have a long-term beneficial effect in achieving ACS objectives at the 5<sup>th</sup> field watershed level. The alternatives would not retard or prevent the attainment of the ACS objectives and would serve to restore aquatic conditions specifically in relation to those objectives through restoration of the conditions which existed in the intermittent riparian areas within the project area historically.

#### Management Indicator Species

The Forest Plan FEIS (USDA, 1990b, pages III-68, 69) specifies that all anadromous fish and all resident fish comprise Management Indicator Species (MIS). Management indicator species are those which are threatened and endangered, that are hunted or fished, or whose population conditions indicate potential effects on other species dependant upon selected habitat types or water quality can be used to assess the impacts of management actions on a particular area (USDA 1990). Thirteen species of fish occur in the Hills Creek Reservoir watershed and they can be segregated into two groups based on sensitivity to declining water quality. The more sensitive group includes spring chinook salmon (*Oncorhynchus tshawytscha*), bull trout (*Salvelinus confluentus*), rainbow trout (*Oncorhynchus mykiss*), cutthroat trout (*Oncorhynchus clarkii*), mountain whitefish (*Prosopium williamsoni*), Paiute sculpin (*Cottus beldingi*), mottled sculpin (*Cottus bairdi*), torrent sculpin (*Cottus rhotheus*), and shorthead sculpin (*Cottus confusus*). Some of these species have been discussed above. The group with greater tolerance to higher temperatures and greater concentrations of fine sediment include largescale sucker (*Catostomus macrocheilus*), Oregon chub (*Oregonichthys crameri*), speckled dace (*Rhinichthys osculus*), and redbelt shiner (*Richardsonius balteatus*).

The likely effects of the Jims Creek project are an increase in fine sediment delivered to the Middle Fork river. While all gilled organisms can suffer from gill abrasion when the concentration of fine sediment reaches a high level, it is expected that fish will seek areas of lower concentration of fine sediment by avoiding a localized source. This suggests that the immobile life stages of embryo and alevin are likely to incur greater risk than the more mature and mobile life stages of juvenile and adult.

The species most susceptible to an increase in fine sediment is spring Chinook since the downstream reaches of the Middle Fork river provide the primary spawning opportunities to these fish. It is during the incubation of the fertilized eggs that this species is most susceptible to fine sediment effects because the developing eggs depend on the flow of water through the pore spaces between the gravels that form their nest. Clogging these pores with fine sediment would deprive these individuals of oxygen.

The remaining species are less susceptible to an increase in fine sediment either because their eggs are tended and kept free of sediment (e.g., the sculpin species), or their eggs

are less at risk because they are not buried in the streambed (e.g., largescale sucker), or the species has a higher tolerance for increased fine sediment (e.g., Oregon chub).

### Cumulative Effects

Since conditions within the Middle Fork river adjacent to the project area are influenced primarily by the 113,339 acre Fifth Field Upper Middle Fork watershed above it, cumulative water quality effects are analyzed for the entire upper Middle Fork watershed. Past timber management activities and natural disturbances upstream on the Middle Fork River have contributed to the Oregon DEQ 303d listing for stream temperature. Past riparian harvest in the Upper Middle Fork Willamette watershed totals 35%.

The 171 to 455 acres of the project area on which harvest and fuel treatments would occur in the action alternatives is extremely small when compared to the landscape that has shaped the current stream channel conditions of the Middle Fork River. The treatment acres in any of the alternatives are equivalent to less than 0.2 to 0.4 percent of the managed area of the Upper Middle Fork Willamette watershed. Approximately 30,000 acres have been harvested and 471 miles of road has been constructed within the Upper Middle Fork watershed over the past 50 years. If none of the alternatives were to be implemented, more than 99 percent of the management-related degradation due to past harvest and roads would persist. A storm event large enough to cause deposition in the north bank side channel of fine sediment produced as a result of alternative treatments would likely occur on a much larger, watershed scale. During such an event, many other sites of natural and anthropogenic instability would likely contribute fine sediment in quantities far greater than the amount of fine sediment produced from the project.

At the Sixth-field watershed scale, 29 percent of the 16,542 acre Coal Creek watershed (which contains most of the project area) has been harvested over the last 40 years, and 44% of the 38,530 acre Buck Creek 6<sup>th</sup> Field watershed has been harvested with even-aged methods (USDA, 1995, page 4-10) over the last 50 years (24% in the last 30 years). Other past actions that have influenced the listing of Chinook salmon is the construction of the Hill's Creek, Lookout Point and Dexter dams and reservoirs.

None of the alternatives are likely to contribute to cumulative temperature effects, as the proposed vegetation management would not affect shading vegetation along permanently flowing streams. There are no actions proposed in the foreseeable future would contribute to any stream temperature increases. ARP values are a reflection of past timber harvest (vegetation manipulation), and will continue to improve as stands grow and develop over time.

There are no reasonably foreseeable future actions that would affect the vegetation cover, subsequent land stability of the area, and the current ARP values. It is anticipated that there will be vegetative recovery over time (refer to Table 9 displaying ARP values for

2007, 2012, and 2017), reducing sensitivity to rain-on-snow events. Soil erosion has occurred due to past management activities and erosion may continue at some amount until vegetation cover is established or roads become stabilized. The potential for cumulative erosion and stream turbidity would decrease as the vegetation recovers over the area.

The Upper Middle Fork Willamette watershed has a road density of 2.7 miles per square mile. While the road density is relatively low, these roads have increased the rate at which storm events transfer runoff and fine sediment to the adjacent streams. The Middle Fork River has seen a 3 to 7 degree temperature increase due to riparian harvest and channel widening (USDA, 1996).

The cumulative effects of these past actions are greater transport and deposition of fine sediment, and warmer stream temperatures. Past management activities have decreased the habitat suitability of the Middle Fork River for the native fish assemblage adapted to cold water; and the side channels have been more impacted by past management in the Upper Middle Fork fifth field watershed in the main stem of the river

### **Fish Consultation**

A Biological Assessment of the conditions of and effects to fish habitat and threatened fish populations was prepared for this report (See Sheehan and Sims, 2005, in the Analysis File) and consultation has been initiated with the U.S. Fish and Wildlife Service (for bull trout) and the National Marine Fisheries Service (for Spring Chinook Salmon). At this writing a Biological Opinion has yet to be formulated for this project. The Biological Assessment determined that action alternatives, if implemented, would have a “likely to adversely affect” call for both Chinook salmon and bull trout.

Adverse effects to salmon and bull trout are based upon a worst case scenario where sediment could be produced and transported to the Middle Fork River by a large storm event that could occur immediately after slash burning is accomplished and before the native grass and other understory plants develop. Any amount of diminished habitat quality is considered an “adverse” affect for this consultation purposes, no matter how small. This finding should be considered in the context of the cumulative effects discussion above.

## **B. Soils**

For a general discussion of soil conditions, see the discussion above under water turbidity.

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**Issue #6 – Maintenance of Soil Productivity– Depending upon how restoration activities, in particular tree removal, slash disposal and subsequent future burning are conducted, soil productivity could be reduced.**

Evaluation criteria:

percent of the area with detrimental soil conditions

**Detrimental Soil Conditions**

Soil quality, water quality, and general site productivity are maintained when ecosystems are managed to protect site productivity. Soil and water quality can be maintained or improved by avoiding the creation of detrimental soil conditions (defined on page IV-60 of the Forest Plan, USDA, 1990a), on greater than 20 percent of the area. Standards for detrimental soil conditions have been set to meet the direction in the National Forest Management Act of 1976 and other legal mandates. Soil and water quality are maintained when soil compaction, displacement, burning, erosion, loss of organic matter and altered soil moisture regimes are maintained within defined standards. The design of all alternatives complies with these thresholds.

Soil Productivity:

Soil organisms and their interactions affect forest-site productivity through capture and uptake of nutrients, nitrogen fixation, protection against pathogens, maintenance of soil structure, and buffering against moisture stress. To minimize long-term impacts on beneficial soil organisms forest managers should: 1) minimize disturbance severity (i.e., intense burns, soil compaction and erosion), 2) emphasize retention of organic matter, and 3) emphasize rapid re-vegetation by indigenous host species and associated beneficial soil organisms (Perry, 1989).

Field surveys indicate that soil organic matter exists throughout the project area within its historic range. More downed wood exists on these sites now than did in previous centuries when fire periodically occurred. The timber harvest and the resulting slash fuels treatment would retain all of the original soil organic matter. Fuels treatments are designed be low rather than high intensity burns to avoid effects upon soil physical, biological, and chemical properties (Boyer, 1980; Harvey et. al, 1979). Soil organic matter, humified material, and decaying wood are centers of microbial activity which can diminish following an intense fire (Boerner, 1982). We can expect only a minor reduction in soil productivity due to the small amount of reduced above ground organic component from the proposed treatments.

**Current Detrimental Soil Conditions:**

1. Soil compaction and displacement

Soils of the Jims Creek Savanna planning are susceptible to compaction and displacement from management activities. Field observations indicate that most of the impact from compaction and displacement comes from existing roads and past logging operations. Those previously managed harvest units make up 11% of the Jims Creek project area. Current detrimental soil conditions for the project area is 4.4% for existing roads and 0.1% for previously harvested stands.

## 2. Severely burned

Severely burned soils are considered to be a detrimental soil condition. Field investigations have determined that there are no areas displaying any severely burned conditions in the Jims Creek Savanna Restoration planning area, though wildfire has occurred on portions of the site.

## 3. Activity Area

The activity area is defined as acreage where ground and vegetation disturbance would occur under the proposed alternatives.

The activity area becomes the entire project area when calculating the cumulative detrimental soil conditions. The “Total” row at the bottom of the following Tables 10 through 14 is an expression of the detrimental soil conditions across the entire project area, so as such it is not a true total of the numbers in the preceding rows. The existing transportation system and past harvest impacts are considered a part of the cumulative detrimental soil condition calculations.

In order to estimate the detrimental soil conditions for the proposed alternatives, the following assumptions were used for harvest methods and slash reduction:

- hand piling and burning slash would not create detrimental soil conditions due to the anticipated low intensity burn, though it is possible that a small amount of severe burning conditions would occur where large pieces of downed wood, stumps, or large concentrations of timber harvest slash occur;
- helicopter yarding would result in one percent of the area displaced; and skyline yarding would result in about 1.8 percent displaced;
- Existing road area was considered part of the activity area and was included in the cumulative effects when they were adjacent to or within a given unit.

Detrimental soil conditions created by skyline and helicopter are based upon literature findings (such as Klock, 1975), while those created by site preparation are based upon estimates from professional judgment and observation of past project results. The following tables (Tables 11 to 15) display the percent of detrimental soil conditions found in each of the activity areas, by alternative, for alternatives.

The percentages of total detrimental soil conditions for all the proposed skyline yarded harvest units are high. Because these units are centered on the existing roads (which were built some 20 years ago), they contain relatively higher percentages of detrimental soil conditions. The delineation of the harvest units was based on harvest system rather than the harvest prescriptions, which do not vary appreciably between most alternatives.

**Table 11 - Alternative A – Proposed Action: Detrimental Soil Conditions for Management (harvest) Units.**

Management Unit	1) Roads (%)	2) Timber Harvest (%)	3) Fuels (%)	4) Total (%) Detrimental Soil Conditions	5) Soil Erosion Potential
1	0	1.0	0	1.0	Low to Moderate
2	14.4	1.8	0	16.2	Low to Moderate
3	0	1.0	0	1.0	Moderately High to Severe
4	0	1.0	0	1.0	Low to Moderate
5	5.1	1.8	0	6.9	Low to Moderate
Total, all	4.4	0.5	0	4.9	-

**Table 12 - Alternative B – No Action: Detrimental Soil Conditions for entire planning area:**

Planning area	1) Roads (%)	2) Timber Harvest (%)	3) Fuels (%)	4) Total (%) Detrimental Soil Conditions	5) Soil Erosion Potential
1	4.3	0.1	0	4.5	Low to Severe-

**Table 13 - Alternative C: Detrimental Soil Conditions for Management (harvest) Units.**

Management Unit	1) Roads (%)	2) Timber Harvest (%)	3) Fuels (%)	4) Total (%) Detrimental Soil Conditions	5) Soil Erosion Potential
1	0	1.0	0	1.0	Low to Moderate

Management Unit	1) Roads (%)	2) Timber Harvest (%)	3) Fuels (%)	4) Total (%) Detrimental Soil Conditions	5) Soil Erosion Potential
2	15.6	1.8	0	17.4	Low to Moderate
3	0	1.0	0	1.0	Low to Moderate
4	0	1.0	0	1.0	Low to Moderate
Total, all	4.4	0.4	0	4.8	-

**Table 13 - Alternative D:** Detrimental Soil Conditions for Management (harvest) Units.

Management Unit	1) Roads (%)	2) Timber Harvest (%)	3) Fuels (%)	4) Total (%) Detrimental Soil Conditions	5) Soil Erosion Potential
1A	0	1.0	0	1.0	Low to Moderate
1B	9.9	1.8	0	11.7	Low to Moderate
1C	0	1.0	0	1.0	Low to Moderate
2A	0	1.0	0	1.0	Low to Moderate
2B	17.8	1.8	0	19.6	Low to Moderate
2C	0	1.0	0	1.0	Low to Moderate
3A	0	1.0	0	1.0	Low to Moderate
3B	11.5	1.8	0	13.3	Low to Moderate
3C	0	1.0	0	1.0	Low to Moderate
4	0	1.0	0	1.0	Low to Moderate
Total, all	4.4	0.3	0	4.8	

**Table 15 - Alternative E:** Detrimental Soil Conditions for Management (harvest) Units.

Management Unit	1) Roads (%)	2) Timber Harvest (%)	3) Fuels (%)	4) Total (%) Detrimental Soil Conditions	5) Soil Erosion Potential
1	0	1.0	0	1.0	Low to Moderate

Management Unit	1) Roads (%)	2) Timber Harvest (%)	3) Fuels (%)	4) Total (%) Detrimental Soil Conditions	5) Soil Erosion Potential
2	8.5	1.8	0	10.3	Low to Moderate
3	0	1.0	0	1.0	Low to Moderate
4	0	1.0	0	1.0	Low to Moderate
5	7.1	1.8	0	8.9	Low to Moderate
6	0	1.0	0	1.0	Low to Moderate
7	0	1.0	0	1.0	Low to Moderate
Total, all	4.4	0.8	0	5.3	-

Effects Common to All Action Alternatives

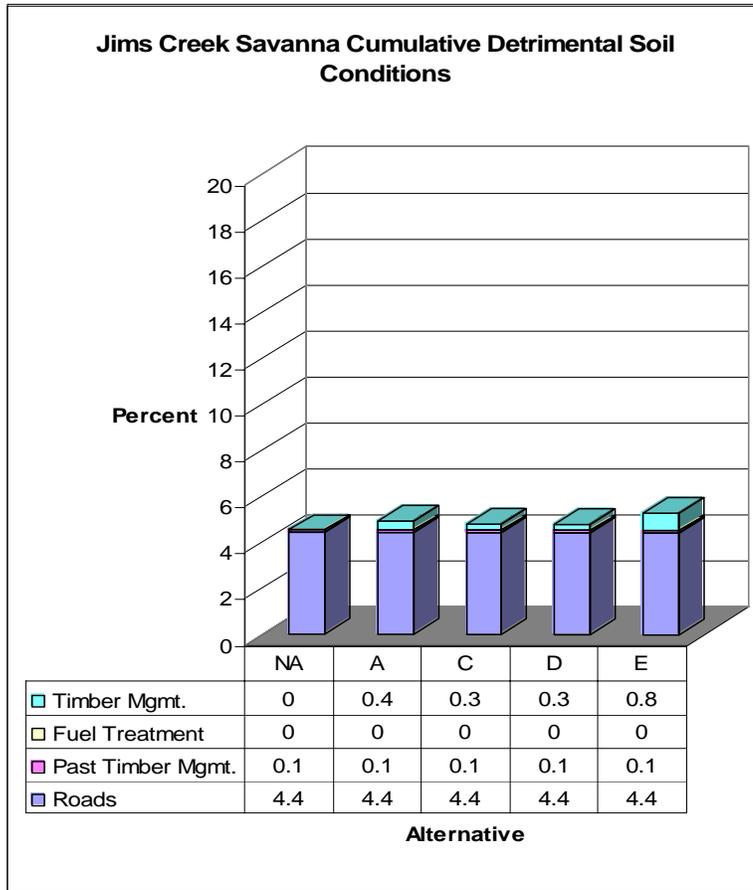
The direct effects of all alternatives are represented by Column 2 of the preceding Tables 11 through 15. All other detrimental soil percentages include the effects of past actions, in particular road construction, but also include the past harvest that has occurred in the project area.

All the alternatives modify organic matter and potential input of organic materials (wood, needles, leaves, decaying grasses, etc.) existing on or produced by the sites. No Action has a high potential for long term (indirect) input of organics for site productivity but also presents a high risk of high intensity wild fire. The action alternatives use helicopter yarding as a mitigation to minimize the disturbance of surface soils and remaining organics, and portions of harvested trees would be returned to the forest floor. The Northwest Forest Plan standards for woody material retention following timber harvest and fuels treatment would be met in the short-term. Long-term site management for all action alternatives would require the periodic application of prescribed underburning that over time may reduce down woody material below standards (USDA, USDI, 1994 – page 40), but the only the initial prescribed burning is covered by this analysis and that first iteration would not materially reduce the abundance of down wood. Over the long-term (in the range of several iterations of prescribed fire, or about two decades), the action alternatives would manage the lighter organics (grass, leaves, twigs, needles, etc.) as a future soil productivity reserve. The natural creation of snags may put enough woody material on the ground to meet the Forest Plan standards. See also the discussion of large wood material retention below in the Wildlife effects discussion.

Figure 9 displays cumulative detrimental soil conditions for the entire Jims Creek Savanna Restoration planning area. The total detrimental soil conditions range from 1.0 % to 16.2 % for the treatment units, in compliance with the Forest Plan standards for allowable levels of detrimental soil conditions (FW-081). Calculations for the previous Tables 10 - 14 are for the specific harvest units, where as in Figure 2, the cumulative detrimental calculations use the entire planning area as the activity area. Therefore, Tables 10 - 14 and Figure 9 are evaluating different scales of detrimental soil conditions and should be considered independently. When the detrimental soil conditions are considered across the entire planning area, the differences in detrimental soil conditions between alternatives are relatively small.

Positive indirect soil effects would occur as effective ground cover decays and becomes part of the soil profile over time. There would also be an increasing amount of new effective ground cover as the lower ground cover and shrub vegetation develops, cycling of organics from a healthy vegetation layer reflective of historic savanna conditions. Soil productivity would improve and the potential for surface soil erosion would decrease with the increased surface roughness from woody material input and as the vegetation fully moves toward a grass and shrub dominated condition in approximately four years.

**Figure 9 . - Jims Creek Savanna Restoration Project Cumulative Detrimental Soil Conditions and existing conditions) for the entire planning area.**



Cumulative Effects

As mentioned above, the Forest Plan includes past detrimental soil conditions accruing from past actions in calculating standards . The tables above all include detrimental soil conditions created by past management in the planning area (as displayed for the No Action alternative), specifically the road construction, 4.4 percent, and past harvest activity, 0.1 percent. Cumulative detrimental soil effects were calculated for the project area because such conditions affect primarily soil and site productivity so they do not create indirect effects on areas further from activity sites. There would be no anticipated cumulative detrimental soil conditions above the existing roads (4.4%), proposed timber harvest activities (0.4%), past timber harvest (0.1%), and fuels treatment (0%). There are no foreseeable future actions which would further contribute to detrimental soil conditions.

## C. Vegetation

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The 688 acre Jim's Creek stand is set in a larger landscape of mixed conifer forest. Unique within the Willamette National Forest, the Middle Fork watershed contains about 25,000 acres of ponderosa pine/sugar pine/Douglas-fir stands which mostly occur south of Hill's Creek reservoir in lower elevations and southerly slopes (Agar, 1998). According to historical accounts (Winkler, 1984; Winkler and Bailey, 2002; Hadley, 1999; Bailey, 2005b; Johnson, 2005), these mixed conifer stands were at one time more open than they are today. This is also evident from the structure of live and dead vegetation today. At one time these sites supported a more or less fire resistant overstory of large ponderosa pine and Douglas-fir, with some scattered sugar pine.

Portions of the Jim's Creek stand may have been more open than the rest of the mixed conifer type in the past. This is evidenced by the presence of large diameter white oak stems that still remain standing or are on the ground, even though many of these trees were shaded out by the developing Douglas-fir understory beginning 60 to 80 years ago. About 120 years ago this part of the Middle Fork landscape was an open savanna of scattered Douglas-fir, ponderosa pine and Oregon white oak with tree densities ranging from just a few to 15 trees per acre, with a more or less dense grass understory. Evidence exists that this open stand structure was maintained by frequent, low intensity fire.

Oregon white oaks are still present on these slopes, but they mostly restricted to the margins of the several small, rocky openings which occur throughout the stand. These remaining oaks are occupying the most marginal sites, and few living trees attain the size of the now dead oak. The pines still exist in these forests but they are slowly dying either of old age or through chronic root competition from the dense Douglas-fir understory. There is no pine regeneration, other than within the 63 acres of young stands created by past regeneration harvesting, as pine seedlings do not grow well in the shade of a closed canopy forest, and pine seeds need a bare soil seed bed to germinate well.

Most of the Jim's Creek stand would probably be most correctly classified as a special plant habitat, as at one time it was closer to a meadow than the closed canopy coniferous forest it is now. Without some kind of disturbance that would facilitate the regeneration of ponderosa pine and Oregon white oak, it is likely this forest will soon become a closed canopy stand of Douglas-fir. Considering that the existing Douglas-fir understory appears to be reasonably healthy, this site would likely stay a pure Douglas-fir stand without frequent disturbance. This stand presents a good opportunity for restoration as some remnant meadows, oaks, and pine remain.

### 1. Current Vegetation Conditions

#### Stand Structure

The forest in this area is somewhat variable in species composition, tree spacing, average diameter, and the spacing of the older trees, but can be generally characterized as a 156 tree-per-acre, closed canopy forest of 100 to 130 year old Douglas-fir (Table 16). The basal area occupied by tree stems averages about 250 square feet per acre and ranges from 120 to 480 sq. ft. This forest also contains a scattered, emergent overstory of Douglas-fir and ponderosa pine with diameters from 36 to 68 inches. These older remnants of the previous stand average about 4.4 trees per acre. The diameters of the 100 year old cohort of trees range from less than 8 inches to as large as 36 inches, averaging about 15 inches. The wide spread in diameters in this age class indicates the area seeded in with mostly Douglas-fir and some ponderosa pine over a period of time. Some trees became established before others and were free to grow with little competition, achieving early and more rapid diameter growth. This early open-grown condition is evidenced by the large diameter of the residual trees and by larger, persistent dead branches lower on these stems. These are the trees which likely would have survived the next underburn, had it occurred.

**Table 16 - Current Stand Composition** – on 505 acres (not counting managed plantations)

Species	Trees per acre	Basal area/acre
Douglas-fir	130	181
Ponderosa pine	8	33
Incense cedar	15	25
<u>Sugar pine/grand fir</u>	<u>4</u>	<u>4</u>
TOTAL	157*	243

Diameter class	Trees per acre
8-12”	78
14-18”	44
20-24”	21
26-30”	8
32-36”	3
38-42”	2
44-48”	3
>48”	1
TOTAL	160*

\* These totals do not match due to rounding.

Crown depths range from 25% to 35% of the total height of the 100 year old cohort and 30 to 50% for the remnant savanna trees. Crown closure ranges from 60 to 85% (excluding meadows and small forest openings that likely were meadows 50 or more years ago).

### Stand Health

The existing forest is relatively free of fungal decay and stem breakage due to its relatively young age. There is a low incidence of the stem rot *Fomes pinii* and a very occasional occurrence of *Phellinus weirii* root rot. Dwarf mistletoe does not seem to be present in the Douglas-fir in these stands but some has been noticed in the older ponderosa pine. No true mistletoe has been noted in the Oregon white oaks, though it is common in oaks occurring in the nearby City of Oakridge.

### Ground Vegetation

Shrubby understory vegetation is generally very sparse, consisting primarily of poison oak, tall Oregon grape, ocean spray, and hazelnut. In many places the shrub layer is non-existent. Herbaceous ground vegetation is also very sparse, consisting primarily of very shaded remnants of the native bunchgrasses, tarweed, woodland star, bracken fern, Oregon grape.

### Meadows

This portion of the landscape still contains a number of small grassy openings and one larger one near the ridge top. These meadows are typically rocky and thin soiled and are very dry during the summer. They contain a wide assortment of plants in the spring, including camas, various grass species, and some unusual forbs more typical of areas further to the south. While these meadows are fairly intact in terms of species composition, they do contain a number of weedy, noxious species, in particular various annual grasses, including cheat grass. This weedy vegetation is probably a result of the historic grazing that occurred in the areas in the latter part of the nineteenth and early twentieth centuries.

There are about 15 of these small meadows that are ¼ to one acre in size, and the larger one, which contains some clumps and islands of mature trees, covers about 15 acres. Most of these meadows still contain some live white oak within them or on the edges, but with a few exceptions, these oak tend to be smaller than those which once existed in the areas between the meadows. The smaller, marginal oaks do not seem to produce much in the way of a seed crop. Several large, open grown, more vigorous oak in these meadows have been observed to bear a significant number of acorns in the falls of 2001 and 2004.

### Plantations

The Jim's Creek stand contains four plantations created by past regeneration harvest, covering 63 acres. These harvest units consist of two shelterwood stands and two clearcuts which were completed about 20 years ago and now contain trees from six to 25 feet tall. All these stands are fully stocked with conifers, though they do not comprise a closed canopy forest yet. It is expected these young stands will close canopy within the next 15 to 25 years, at which time the understory vegetation will come to resemble that which occurs now under the 100 year old Douglas-fir stand discussed above.

The two areas which were clearcut now support a stand composed primarily of ponderosa pine with a little more than two clumps of Oregon white oak per acre on average. The shelterwood overstories contain primarily Douglas-fir, with some ponderosa pine, incense cedar, and sugar pine, and the young stands below the overstory reflect the species in the shelterwood. These young stands also contain small numbers of Oregon white Oak. The young Oregon white oak in these plantations regenerated after harvest, some from stump or root sprouts, some from seed. These young managed stands have developed a grassy understory vegetation, though the grass is denser in the clearcut stands. The grass consists mostly of California fescue, a native grass that appears to have been common on this landscape before the open savanna was grown over. The shelterwood stands have a more diverse shrub layer than do the clearcut plantations, consisting primarily of ocean spray, hazelnut, Pacific madrone, and deer brush

None of these past harvest treatments included burning of logging slash, so these stands have residual medium-sized fuels on the ground.

#### Plant Associations

The forested plant associations (see USDA/USDI, 2002) occurring in this area are not especially varied, consisting primarily of Douglas-fir/poison oak (CDC124) and Douglas-fir/oceanspray/grass (CDS212) with some Douglas-fir/oceanspray –dwarf Oregon grape (ecotype (CDS211) in the few relatively more moist areas. These plant associations are the driest in the Douglas-fir climax series and typically occur on fine-textured to rocky clay soils. The vegetation in upland areas, excluding meadows, is more or less uniform and is probably best represented as a transition between the first two associations listed above.

A more mesic plant association also occurs on the lower east facing slopes above Deadhorse Creek, the Grand fir/dwarf Oregon grape type (ecotype CWS5 22). This association typically occurs on steep slopes with deep clay soils and indicates a relatively dry environment, though it is more lush than the above Douglas-fir associations. The many small and large meadow openings in this area are more varied than the forest types, and are typified by the Common Vetch–Peregrine Fleabane–Blue Wildrye non-forested plant association (ecotype FM30 11) or the flat, xeric Rock Garden (Ecotype NRR9 11)

(see Hemstrom, et. al, 1987). These very floristically diverse vegetation types typically occur on flat to very steep, shallow-soiled south-facing slopes.

#### Threatened, Endangered, and Sensitive Plants

A pre-field review revealed nine locations in Interagency Species Management System (ISMS) and two in the sensitive plant locations in the TES Plant database. None of the former survey and manage species located in ISMS are now sensitive (*Allotropia virgata* and *Ulota megalospora*). No sensitive fungi were documented within the watershed. One of the two sites in the TES database, *Asarum wagneri*, has been dropped from the Regional Forester's Sensitive list. This leaves *Romanzoffia thompsonii* as the only documented sensitive plant within the watershed. Merrifield (2000) did a survey of bryophytes on oak in the Willamette Valley which resulted in no sensitive bryophyte flora. Stone (1989) studied lichen succession in Oregon oak in the Willamette Valley and found one rare lichen, *Usnea longissima*. Pike (1973) studied these species in an oak forest and that study found also did not find any sensitive lichens or bryophytes occurring in that type of habitat.

Other species with the potential to occur in meadow habitats in the Jim's Creek project area include *Eucephalis vialis*, *Lupinus sulphureus* var. *kincaidii* and *Lathyrus holochlorus*. These species have been located in similar habitats on the valley fringe, but have never been located along the Middle Fork of the Willamette river, upstream of Hills Creek Dam.

Surveys were conducted on June 21, 25 and July 14, 2004 and May 24, 2005. High probability habitat was surveyed using the intuitive controlled method. No threatened, endangered, or sensitive plants, lichens or bryophytes were located during the survey. A new species to the Willamette, *Asclepias cordifolia*, was located in two meadows in the project area. This species has been added to the Forest Concern List, which is meant to track species on the edges of their range (in this case the northern extent) that are of interest for maintenance of biodiversity.

#### Snags and Down Wood

These stands have relatively few snags, and most are of small diameter (2 to 16 inches) from suppression mortality in the 100 year old cohort. There are about 13 snags per acre with diameters ranging from 8 to 16 inches. There are fewer than 0.5 snags per acre over 30 inches in diameter. Most of the large snags are ponderosa pine which have died relatively recently. Over half of the five large ponderosa pine per acre that existed 100 years ago have succumbed to mortality in the last 100 years. Most of these trees have already fallen to the forest floor since pine rots quickly once it dies.

Ground fuels are even more sparse than the vegetation. In places there is little or no vascular vegetation except a thin layer of duff and litter. Some of the denser stands of the 100 year old cohort have several small Douglas-fir stems per acre on the ground from suppression mortality. There are occasional large trees on the ground from recent past mortality of the large overstory pine.

## 2. Past Vegetation Conditions

### Stand Structure

Prior to development of the 100 year old cohort of Douglas-fir, these slopes contained an open, savanna forest with an average of about 14 large trees per acre scattered variably across the landscape (Table 17). There were areas (possibly up to several acres) not associated today with a meadow that appear to have been free of trees 100 years ago (Johnson, 2005). A total of 27% of the retrospective stand exam plots contained no large trees 100 years ago (see the Silvics Background Paper and Silviculture Prescription [Bailey, 2005b] for a discussion on data collection methods, and Johnson, 2005). Nearly 65% of those “empty” plots were adjacent to another empty plot, implying there may have been larger areas with no large savanna trees. The data indicates the variable and/or clumpy distribution of savanna-grown trees. The tree species distribution in this savanna was as shown in the table below:

**Table 17 - Stand Composition 100 years ago – on 505 acres**

Species	Trees per acre
Douglas-fir	5.1
Ponderosa pine	4.9
Oregon white oak	2.5
Incense cedar	1.0
<u>Sugar pine</u>	<u>0.2</u>
TOTAL	13.8

Judging from the extent of large dead branches on the lower stems of the legacy conifers, crown depth (the height of the live branches) before the 100 year-old cohort developed was probably in excess of 60% of total tree heights. For oak trees, crown depth was probably approaching 90%. Crown closure in the original savanna was likely quite variable, ranging from nearly zero where there were few trees to as high as 50 or 60 percent.

In areas where live, dead or down oak trees greater than 10 inches in diameter were found, the species distribution was a bit different, as shown in Table 18. There was an average of nearly four large oak per acre and ponderosa pine was the dominant species. The highest density oak occurred in areas that are now closed canopy Douglas-fir forests between the larger extant meadows.

**Table 18 - Stand Composition 100 years ago in high oak occurrence area – about 240 acres**

Species	Trees per acre
Douglas-fir	3.5
Ponderosa pine	4.6
Oregon white oak	3.8
Incense cedar	0.3
<u>Sugar pine</u>	<u>0.3</u>
TOTAL	12.5

Since evidence of any smaller trees no longer exists on the site, it is not known to what degree smaller seedlings, saplings, or pole-sized trees might have existed in this stand 150 years ago. There certainly were some which eventually were able to survive the periodic fires to replace the larger, more fire resistant trees as they succumbed to old age, wind throw, diseases or insects, and the occasional, locally extreme, fire.

#### Ground Vegetation

This savanna-like forest contained a variably dense understory of bunchgrasses. A recent study (Kirchholtes, 2006) has documented the presence of grass phytoliths (small, decay resistance cell structures) throughout the soils of the project area, which indicate the past presence of a grassy understory. Sparse remnants of a native bunchgrass, *Festuca californica*, still exist under the younger canopy. This grass is known to thrive in open forest conditions, and has also responded strongly to the increased sunlight provided by the 63 acres of plantations within the Jim’s Creek area. A broader presence of this grass was probable given the frequent occurrence of fire that was instrumental in creating and maintaining this open forest (see the Fire History discussion below). The grass fuel type provides a fuel bed that can burn frequently but with low intensity, which would have maintained the savanna.

There was little shrubby vegetation in this savanna. Frequent fires would have periodically killed above ground portions of shrubby species and would favor the growth

of grasses and other herbaceous vegetation. Shrub species certainly occurred on these sites but at very low levels compared to open areas in current times. Camas (*Camas quamash*) was probably more common in the open forested grassland than it is on the site now. Camas occurs in some of the existing meadows and in a few places within the existing plantations. This plant is typically most common in moist or mesic meadow environments and it responds vigorously to burning (Agee, 1996). The areas that are now closed canopy forest tend to have deeper soils than the still extant meadows, and had few deeply rooted trees on the site, so overall soil moisture was probably higher in the summer than it typically is now.

### Meadows

The meadows that exist now probably were not very apparent 100 years ago since the surrounding forest was so much less dense. Meadows probably had about the same vegetation as they have now but were larger, since young tree encroachment had not begun. The meadow vegetation was more dense and lush since there were many fewer conifer trees around the meadows removing soil moisture from the site.

### Plant Associations

Plant Associations are determined by the characteristics of the site in question. As discussed below under Fire History, the disturbance regime under which the original savanna vegetation type developed has not existed for the last 100 or more years. The Willamette National Forest Plant Association and Management Guide (Hemstrom, et al, 1987) does not contain a classification that describes the characteristics of the savanna vegetation type, because those classifications were developed for plant groups in the absence of any disturbance, and the savanna type vegetation was no longer in existence in any meaningful way when the Guide was prepared. The overstory species mix was likely similar to its current classification of primarily Douglas-fir/oceanspray/grass (ecotype CDS2 12) within some Douglas-fir/oceanspray –dwarf Oregon grape (ecotype (CDS211), but at a much lower density. The ground vegetation was likely very different, however, as the understory was probably dominated by California fescue bunchgrass, a very competitive understory plant that would have influenced the amount of cover of many of the herbaceous species mentioned under the above forested plant associations.

The many meadow openings in this area were probably still fairly representative of the current Common vetch/peregrine fleabane/blue wildrye non-forest plant association (ecotype FM30 11) or the flat, xeric Rock Garden (Ecotype NRR9 11). They may have been even more floristically diverse and contained more biomass due to a greater amount of soil moisture.

### Snags and Down Wood

Given the apparent frequency of past fire, it is unlikely this stand had much in the way of these structural elements (see the Wildlife Report; Davis, 2006a; in the Analysis File). Though the savanna trees were likely quite large when they died, such a frequent fire regime would have quickly consumed the dead and down trees as they began to deteriorate. Additionally, dead trees on an open, southerly slope deteriorate quickly as exposure to full sunlight and extreme temperature fluctuations tend to make wood crack and break apart more quickly than in moist areas. The lack of moisture means dead stems would be more likely to be consumed when fires come through. Ponderosa pine can deteriorate quickly, as its wood (at least in comparison to Douglas-fir) is quite susceptible to fungal invasion. The fuel model would have included a more or less contiguous cover of dense bunchgrass.

### **3. Fire history**

Fire history has had the greatest influence in both the past and current vegetation conditions. In the past, periodic, low ground fires in the Jim's Creek project area, as well as the larger mixed conifer forest type, kept the understory open and grassy and limited the number of trees that could become established. This past stand condition is evident from historical accounts, the structure of these stands, and the presence of multiple fire scars on the older ponderosa pine. The intervals between scars are from 2 to 18 years and average 6.4 years. Interestingly, even though these trees occurred on essentially the same slope, there was no consistent pattern in the number of years between scars from one tree to the next. All the scars tallied occur within 150 years or less of the last fire event on this landscape. This implies that the fires were even more frequent than the above numbers suggest, since not every tree was scarred by a given event. A similar fire return interval (a mean of 4.4 years over the period from 1815 to 1837) was seen by Hadley(1999) at Rigdon Meadows, which is about four miles east and upstream of the Jims 'Creek project area and is also within the Mixed Conifer forest type. The advent of fire suppression and lack of managed underburning has resulted in the development of the dense 100 to 120 year old secondary canopy of Douglas-fir, and incense cedar mentioned above.

This area may have been created or at least maintained by intentional burning by Native Americans. While there are no specific references to native use of fire on this site, such use is well documented throughout the Willamette Valley (Agee, 1990 and 1996; Boyd, 1999). There are abundant prehistoric cultural remains within and adjacent to the project area, indicating people have been using it heavily for perhaps thousands of years (Winkler, 1984; Winkler and Bailey, 2002; Hadley, 1997). The presence of culturally modified ponderosa pine show this use continued into relatively recent times.

A study of the fire history in the Warner Mountain area about two miles north of the Jim's Creek area (Kertis, 2000) generated a fire return interval of from 26 to 42 years. A fire regime this infrequent would not likely provide for the persistence of a savanna structured vegetation type. It is assumed the difference between the fire return intervals in the Warner Mountain area versus the Jim's Creek area is explained as the difference between the natural periodicity of lightning fires versus the additional frequency caused by intentional burning by aboriginal peoples. The frequency of burning needed to maintain this savanna is likely greater than historic natural fire starts, implying the important role Native Americans have played in the fire regime of this area.

A fire regime and condition class delineation was recently completed for the entire western Cascade mountains, including the Willamette National Forest, to identify locations where fire regimes are outside their natural range as a result of historic fire suppression activities (USDA, et. al., 2005). A condition class 3 indicates that many historic fire cycles have been missed, while a conditions class 1 indicates the fire regime is still within its natural range of occurrence. This delineation was based upon plant association groups and assumptions made about fire regimes in each groups. Such assumptions are necessarily broad; the Jim's Creek area has been mapped as having a fire regime II (a 0-35 year fire frequency with high severity fire, resulting in more than 75 percent stand replacement).

Conditions on the ground indicate the area's fire regime would be more accurately typified as Fire Regime I, a high frequency, low intensity regime (see the discussion above regarding fire scar counts above). The Jim's Creek area and the surrounding mixed conifer forest type occurring on southerly slopes were classified as condition class III, with the exceptions of the 20 year old plantations within the project area (see the condition class map contained in the project's Fuels Report, Hays, 2005) which were typed as condition class 1. Given that these plantations were never burned and that they contain young stands of trees denser than forests of any age on these sites used to be, these areas would also be more correctly typed as condition class 3.

#### Direct and Indirect Effects of Alternatives

**Issue #4 – Maintenance of Biodiversity – significant issue - Forest Wide Standard and Guidelines direct that biological diversity be maintained or enhanced by providing an ecologically sound distribution and abundance of plants and animals. Much of the diversity that existed on these slopes has been lost, especially in terms of wildlife species that use open pine and oak habitat. Continuation of the current forest development pattern will result in continued reduction in biodiversity compared to what used to exist on these lands.**

Evaluation criteria:

- acres of meadow habitat improvement
- acres of savanna/open forest created

The rationale for these evaluation criteria is that biodiversity maintenance in a 25,000 acre landscape that has essentially lost all its open forest and oak/pine habitat is improved by each acre restored to that historic condition.

Alternative A – Proposed Action: This alternative would create about 217 acres of savanna or open forest and would improve about 31 acres of meadow habitat.

Alternative B – No Action: This alternative would not accomplish any restoration and so would not provide for any biodiversity maintenance benefits.

Alternative C – staged entry: This alternative would not accomplish full restoration on the 149 acres of treatment because of 40 per acre tree retention. With this relatively high level of retention, it is doubtful that enough growing space would be available to provide for vigorous regeneration and growth of Oregon white oak, ponderosa pine, or bunchgrass, therefore, the restoration would not be complete. Subsequent removal of the second group of excess trees would further delay restoration by potentially damaging or destroying the bunchgrass and young oak saplings that may developed after the initial treatment. In addition, a sparse grass understory layer may not carry fire very well, so this alternative may not provide for effective prescribed fire maintenance of more open conditions. It would improve about 28 acres of meadow habitat.

Alternative D– multiple methods: This alternative would accomplish full restoration on the 65 acres of 5 to 15 percent retention (20 trees per acre), and partial restoration on the 49 acres of 20 to 25 percent retention (40 trees per acre). On the later piece of ground, it is doubtful that enough growing space would be available to provide for vigorous regeneration and growth of Oregon white oak, ponderosa pine, or bunchgrass. In the 36 acres of oak release, restoration options would be partially retained in that the few remaining oaks would persist on the site for a longer period of time, but that area would still not provide a fully functioning savanna environment, and ponderosa pine would continue to drop out of the stands. Subsequent removal of the second group of excess trees would further delay restoration by potentially damaging or destroying the bunchgrass and young oak saplings that do develop after the initial treatment. In addition, a sparse grass understory layer that would initially developed under the 40 tree per acre retention iteration may not carry fire very well, so this alternative may not provide for effective prescribed fire maintenance of more open conditions. It would improve about 28 acres of meadow habitat

Alternative E – full restoration: This alternative would create about 423 acres of savanna or open forest and would improve about 43 acres of meadow habitat.

Cumulative Effects:

The 25,000 acres mixed conifer type was used to analyze the cumulative effects of actions alternatives on vegetation biodiversity since the project area occurs within this forest type. The Mixed Conifer forest type is an important component of biodiversity in the watershed and has seen considerable change in species abundance and stand structure in the last 100 years due in part to fire suppression. As much as 75 percent of this forest type was historically open canopy, mid- or late-seral forest, with five percent early-seral stands and five percent closed canopy late-successional stands (UDSA, et. al., 2005; see also the following Table 18 under 6. Landscape Conditions). Due to fire suppression, lack of prescribed fire, and even-aged regeneration harvest, the composition of this forest type is now as follows:

- Early seral (tree diameters less than 5 inches) - 31%
- Mid-seral (tree diameters 5 to 15 inches), open canopy 3%
- Mid-seral, closed canopy 14%
- Late-seral (tree diameters greater than 20 inches), open canopy 1%
- Late-seral (tree diameters greater than 20 inches), closed canopy 50%

The early seral, and mid seral types have all been created by past regeneration harvest and aggressive reforestation efforts over the last 50 years, a total of 48 percent of the forest type. . The action alternatives would increase the percentage of late-seral open canopy forest by as little as one percent for Alternatives C and D, and as much as two percent for Alternative E. The mid-seral-open canopy stands are those which have not been reforested well enough to have a closed canopy, or those which have been affected by recent wildfire. The late-seral open canopy forests that occur in this type are either shelterwood harvested stands that have not had the overstory removed (as is typically done in true shelterwood harvest methods), or are the last harvest which has occurred on public land within this type, consisting of small group selections (Bailey, 2005b) designed to retain pine and provide for pine regeneration.

There have been no other past actions (within the last 20 years) and there are no current actions (other than this one) which have attempted to restore savanna or open mixed conifer forest vegetation within this watershed by creating more open canopy forest stands. There have been some attempts, both in the Jim's Creek project area and within the mixed conifer forest type, to maintain meadows and other open forest types (Big Pine Openings and Mutton Meadow), through the use of fire and some manual removal of encroaching trees. These efforts were moderately successful when they were initially

done prior to 1985, but since no follow-up work was done, trees have again invaded the meadows. In terms of the amount of restoration done in order to address the maintenance of biodiversity issue, there are little to no cumulative effects from past actions in regard to this proposal.

At this time there are no reasonably foreseeable future actions that would add to the cumulative effects regarding maintenance of biodiversity in the Middle Fork mixed conifer forest type. While the Jim's Creek restoration proposal would provide information to determine if additional restoration of more open forest conditions within the Mixed Conifer forest type would be desirable, it is unknown how many acres may be treated in the future to accomplish those goals, nor where those acres may be, until the results of this set of proposed actions are evident. There are no cumulative effects from future restoration actions, since their extent and location is not reasonably foreseeable.

#### **4. Concern for Success/Restoration Efficacy**

The following discussion on alternative efficacy addresses uncertainty for the effectiveness or success of savanna restoration and accomplishment of biodiversity objectives. This discussion is a summary of the discussion on restoration efficacy contained in the Silvicultural Prescription in the Project's Analysis File (Bailey, 2005b).

Several people have expressed concerns about moving too fast in this restoration effort. (See the Public Involvement section in the Analysis File for more detail relating to this concern) These concerns ultimately relate to whether or not the proposed actions would be successful in restoring the original savanna conditions. There is a fear that retained vegetation might respond negatively to release and/or that new, desired vegetation will not develop to an appropriate extent. Many comments have been received supporting the proposed action and advocating the need to expand the area proposed for treatment. At the same time, some have suggested caution and deliberateness, though they may acknowledge a need for quick action. The commentors did not provide specific explanation, information, or research literature citations to support the concern that removal of all the excess trees at one time might cause excessive mortality of the retained trees. Such mortality has not occurred in the shelterwood harvested stands.

Concern was also expressed for the potential spread of noxious weeds. The plants to be encouraged (specifically, bunchgrass, ponderosa pine, and Oregon white oak) require some environmental changes to regenerate and grow vigorously. Noxious weeds respond to the same conditions needed for vigorous growth of the desired vegetation. The project design mitigates the potential for bringing the noxious weeds into the area. If any noxious weed spread does occur early and preemptive eradication would be implemented.

While there are phenomenon such as thinning shock and sun scald can cause decline or mortality in trees released by removal of their neighbors, the species to be released here are not known to respond to an increase in sunlight in that way. There are examples in this planning area where the trees we are trying to release can and do respond well to such conditions.

Harrington and Kern (2002) have initiated a study of release effects on Oregon white oak. Though this is a long-term study, preliminary results suggest that even the most complete and abrupt release results in a positive response for the released trees and no immediate mortality was detected. Devine and Harrington (2004) have documented an increase in epicormic branching in fully released oaks, a greater response than for partially released trees. Epicormic branching is an important means through which a formerly suppressed oak can rebuild its crown volume and once again become a vigorous and reproductive tree. Ponderosa pine response to release has been even more studied. It is a well established from decades of selection harvest management that ponderosa pine responds positively to release (Barrett, 1963, 1969, and 1979).

Additionally, a study by Fule, et. al. (2001), though conducted in an ecosystem somewhat different than that occurring in the Jim's Creek area, found full restoration treatment in a ponderosa pine stand (as in immediate return to pre-settlement densities) protected the stand from crown fire better without any significant change in native understory vegetation, than did minimal thinning or burning alone. Research done on distant sites need not be relied upon to establish that pine do well with release from adjacent conifer competition considering the response of the shelterwood harvesting mentioned above.

There are two threats which could potentially affect many or most of the retained trees; windthrow and stress from subsequent slash burning. There are local examples indicating that wide-spread incidence of windthrow on this particular part of the landscape is not likely. These examples include the two shelterwood harvested stands which retained from 15 to 25 trees per acre. While these stands have seen minor windthrow related mortality and some of the older retained pine have continued to succumb to old age and /or bark beetles attack, less than 1.5 per acre of the retained trees have died in the 20 years since they were exposed by the harvest. This lack of shelterwood mortality was also noticed by Williams (1973). That level of mortality would still provide conditions favorable to development of the savanna.

As discussed in the Silvicultural Prescription (Bailey, 2005, contained in the Analysis File), damage to retained trees by inappropriately applied prescribed fire could also affect restoration efficacy by causing overstory tree mortality. Such mortality would be caused through two mechanisms; crown mortality from radiant heat, or general stress to the trees through impacts to the root system. These types of effects have been experienced a

number of times in past management endeavors and we know well how to mitigate such problems. Hand piling and burning of harvest generated slash would occur only during times when fine feeder roots that can be close to the soil surface are dormant (generally from September through the end of February), and when fuels are wet enough that they will not burn with excessive flame lengths. This would prevent tree mortality from occurring due to fuels reduction or general savanna maintenance burning. These effects can be mitigated through slash pull back from trees with slash accumulation too close to the bole, and the season of burn.

There are also several examples within and immediately adjacent to the planning area where various savanna characteristics have successfully been reestablished even though there was no conscious intent to do that at the time the activities were implemented. These include the development of a bunchgrass ground vegetation layer and oak regeneration in the four plantations.

The primary concerns for the efficacy of this proposed savanna restoration are how to get a relatively dense bunchgrass understory to develop most quickly, and when to reintroduce periodic, landscape-scale prescribed fire to the sites without killing newly regenerated oaks. Though these are important questions, small test projects have been implemented (as in the burning which has already occurred in nearby Mutton Meadow and the larger pine plantation in the Jim's Creek project area; see USDA, 2004a and Bailey, 2005a) to help us learn how to best encourage bunchgrass establishment and provide for oak survival of prescribed fire.

#### Staged Removal of Excess Trees

A staged removal of trees on a limited portion of this landscape was considered in the analysis (in Alternatives C and D) to address the general concern for retained tree mortality and the potential effect of abrupt release. Multiple entries for excess tree removal raises some specific concerns regarding restoration efficacy. A staged removal of excess trees would provide for multiple chances for introduction of non-native plant species into the area. A second entry would potentially damage regenerating oak, pine, and bunchgrass due to mechanical damage and fire damage. Multiple entries would also be less economically viable and efficient, in part because they would generate less money from the sale of trees due to incurring two or more sets of equipment mobilizations costs. The Financial Analysis (Bailey, 2005c) prepared for this project (see the Economics section below) shows that the second entries, because they would be removing fewer trees, would be below cost operations (meaning they cost of administration and labor would exceed the value of the trees being removed). This is of particular concern in that one of the primary objectives of this proposal is restoration of historic conditions and the

money generated by the sale of excess trees is to be used to fund future restoration activities in and around the Jim's Creek project area.

#### Amount of Savanna Restored

One aspect of alternative efficacy is the amount of ground treated (see above). Some commentors want absolute certainty that these efforts would be successful, and some suggest a smaller, experimentally-sized treatment should be tested first. The current proposal actually is a very small first step. Though several hundred acres may seem to be a large area, it is less than two percent of the original, more open mixed conifer forest type in this area. Many options remain for the rest of that area. We fully expect success in restoring the savanna because similar treatments have restored many of the targeted characteristics. If the desired conditions were not achieved, the risk to the overall environmental would be small because of the small percentage of the vegetation type being treated.

#### Efficacy of Maintenance Underburning

Another aspect of alternative efficacy in savanna restoration success is the likelihood that future periodic underburning will occur and be successful. Some have expressed concern that there will not be funding available in the future to accomplish this most important task. While this analysis does not commit to perpetual maintenance, it assumes that a decision made to restore this area would reflect people's interest in such restoration and that interest and support is likely to increase with time. It also predisposes the area to burn in a way that perpetuates savanna conditions should a natural ignition occur.

One aspect of successful application of future prescribed fire is how efficient that application may be. Strategies that place treatment units on the ground to make use of natural topographic breaks on which to stop fire would be efficient in terms of reducing costs of future maintenance burning. Alternatives with a number of smaller treatment units, each one different enough to need a different timing or extent of fire application, would be more expensive to burn.

### **5. Potential for Successful Restoration**

**Issue #3 – Maintenance of Biodiversity – significant issue Much of the original diversity that existed on these slopes has been lost, especially in terms of wildlife species that use open pine and oak habitat, and various plant species requiring more open conditions.**

#### Evaluation criteria:

- probability of long-term restoration success

Alternative A – Proposed Action: This alternative has a high probability for restoration success. There is a low likelihood that a significant number of retained trees would die. Removal of the excess trees in one entry, combined with future snag creation or natural mortality, would provide for adequate growing space for important components of the savanna such as open-grown oaks, a dense and vigorous bunchgrass ground vegetation layer, and ponderosa pine regeneration. With this one treatment entry, there would be no chance for damage to recovering and restored vegetation from future removal of excess trees and the associated fuels reduction. This alternative is less effective in terms of restoration success than Alternative E since only half the area analyzed would be treated, but it would be more successful than other alternatives.

Alternative B – No Action: This alternative presents no probability for restoration success since nothing would be done to prevent continued mortality of legacy vegetation, nor would it provide any growing space for development of replacement savanna vegetation. Implementation of this alternative would eventually result in a nearly pure stand of middle-age Douglas-fir. It would present the possibility that the entire forest, including all remaining legacy trees, be entirely lost in a late-season wildfire (see the Fuels discussion below). Without some action, the remaining savanna characteristics would progressively be lost to forest succession.

Alternative C – staged entry: This alternative provides a low to moderate probability for restoration success since it would retain almost twice the number of trees on treated sites as would Alternatives A and E, though full restoration would occur in the 16 acres of pine thinning in the large meadow (unit 4). This amount of density reduction would not provide adequate growing space for important components of the savanna such as open-grown oaks, a dense and vigorous bunchgrass ground vegetation layer, and ponderosa pine regeneration. Under this alternative, there would be a substantial chance for damage to recovering and restored vegetation from future removal of excess trees and the subsequent need for slash reduction. Even if the initial removal is deemed a success and the remaining trees are removed in a second entry, a period of time would elapse between treatments when legacy trees would continue to succumb to suppression and old-age mortality on the acreage treated. The alternative would also not treat 250 acres of the planning that could be restored.

Alternative D– multiple methods: This alternative has a high probability for restoration success on the 65 acres of complete excess tree removal (20 trees per acre retained), and the 16 acres of pine thinning in the large meadow (unit 4). On these acres there is a low likelihood that a significant number of retained trees would die, and full removal of excess trees at one time (and future snag creation in the extra retained trees) would provide for adequate growing space for important components of the savanna such as open-grown oaks, a dense and vigorous bunchgrass ground vegetation layer, and

ponderosa pine regeneration. In the above treatment block, there would be no chance for damage to recovering and restored vegetation from future removal of excess trees and the subsequent need for slash removal.

On the 49 acres prescribed for 20 to 25 percent retention (40 trees per acre), this alternative would provide a low to moderate probability for restoration success since it would generally not provide adequate growing space in that area for important components of the savanna such as open-grown oaks, a dense and vigorous bunchgrass ground vegetation layer, and ponderosa pine regeneration. Under this alternative, there would be a significant chance for damage to recovering and restored vegetation from future removal of excess trees and the subsequent need for slash removal. Even if the initial removal is deemed a success and the remaining trees are removed in a second entry, a period of time would have elapsed between treatments, during which additional legacy trees would succumb to competition and old-age. The alternative would also not treat 250 acres of the planning could be restored.

On the 41 acres prescribed for oak release restoration potential for legacy oaks persisting on the site would remain but no provision would be made for the restoration or improved vigor of other important vegetative components, such as oak and pine regeneration and bunchgrass reestablishment.

This alternative would be less efficient in terms of restoration success because less than half the area analyzed would be treated. No improvement would occur on the 250 acres of the planning area that would remain untreated. This alternative also creates the small treatment areas and the inherent difficulty in treating small areas that are difficult to efficiently underburn.

Alternative E – full restoration: This alternative has a high probability for restoration success, since full removal of excess trees at one time (and future snag creation in the extra retained trees) would provide for adequate growing space for important components of the savanna such as open-grown oaks, a dense and vigorous bunchgrass ground vegetation layer, and ponderosa pine regeneration. With one treatment entry, the chance for damage to recovering and restored vegetation from future removal of excess trees and the subsequent need for slash removal would be eliminated. This alternative would restore all the available acres in the planning area (while maintaining various other resource values, such as within Class II riparian reserves), so it best meets restoration objectives of all the alternatives.

Time Frame:

Full restoration of pre-settlement conditions would take a long time. It would take at least 200 years to re-grow the large, open-grown oak that have been shaded out. Based upon the natural recovery of the native bunchgrass observed in the four plantations, and

considering that we are prescribing to broadcast grass seed to assure success, it would probably take no more than about five years to reestablish a dense cover of native ground vegetation. The pre-settlement frequency fire regime could be reestablished in 10 to 12 years after oak seedlings become established. Because we suppress wildfires on the surrounding landscape to protect social and resource values, and because the burning that historically maintained this savanna type was likely more frequent than the “natural” fire regime, it would be necessary to continue use of prescribed fire to maintain this type over time. These proposed actions restore many of the savanna characteristics while initiating vegetation development patterns and disturbance regimes that would foster complete restoration over the long-term.

#### Cumulative Effects:

There have been no past actions (within the last 20 years) and there are no current actions (other than this one) which have been specifically designed to restore savanna or open mixed conifer forest vegetation in this watershed. There has been some attempts, both in the Jim’s Creek project area and within the mixed conifer forest type, to maintain meadows and other open forest types (Big Pine Openings and Mutton Meadow), through the use of fire and some manual removal of encroaching trees. These efforts were moderately successful when they were initially done prior to 1985, but since no follow-up work was done, trees have again invaded the meadows. In terms of the amount of restoration done in order to address the maintenance of biodiversity issue, there are little to no cumulative effects from past actions in regard to this proposal.

At this time there are no reasonably foreseeable future actions that would add to the cumulative effects regarding maintenance of biodiversity in the Middle Fork mixed conifer forest type. While the Jim’s Creek restoration proposal would provide information to determine if additional restoration of more open forest conditions within the Mixed Conifer forest type would be desirable, it is unknown how many acres may be treated in the future to accomplish those goals, nor where those acres may be, until the results of this set of proposed actions are evident. Therefore, it is not possible to assess the cumulative effects of possible future restoration actions, since their extent and location is not reasonably foreseeable.

### **6. Landscape Conditions**

**Issue #3 – Maintenance of Biodiversity – Much of the original diversity that existed on these slopes has been lost, especially in terms of wildlife species that use open pine and oak habitat, and various plant species requiring more open conditions. The structural characteristics of this forest have changed with the increasing canopy closure. significant issue**

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Evaluation criteria:

- average patch size, as an approximation of historic landscape conditions.
- change in fire regime condition class

The key changes that have occurred from pre-settlement (historical) to current times include: 1) an overall increase in tree density; 2) a decrease in tree species diversity; 3) an increase in dominance of Douglas-fir; 4) the loss of Oregon white oak, ponderosa pine, and the grassy understory; 5) the shift in dominance of the site's growing space from large trees to small size classes (< 30 inches in diameter); and 6) the modification of the active role of fire on the landscape.

The alternatives vary in their treatment type and area. They also vary in how closely the vegetative composition, structure, and functions they create approximate historical conditions.

The amount of savanna created on this specific project area does not fully address the biodiversity issue at the landscape level. The amount of open forest this landscape had before the fire regime has been severely reduced by cessation of prescribed burning and commencement of fire suppression. The amount of open late-successional forest in the mixed conifer landscape was once very much larger than it is now. In comparison to past conditions such forests are virtually non-existent (see the Terrestrial Wildlife BE/BE, and the Wildlife Report (Davis, 2006a and 2006b) in the Analysis File).

The Jim's Creek stand structure and composition reflect effects of past fire suppression and lack of prescribed burning. Over time fire has been the most influential component of a natural disturbance regime (Chappell et al. 2001; Bailey, 2005b). Historically frequent, low-severity fires (about every 5 to 10 years) occurred within the Jim's Creek Savanna Restoration Project area. Historic conditions combined with the past decades of fire suppression have resulted in a current Fire Regime I with a Condition Class 3 (USDA et. al. 2005; Hays, 2005; Bailey, 2005b; Kertis 2005). Condition Class 3 reflects that this piece of the landscape has missed many fire cycles in terms of its historic fire frequency. This departure from the historic disturbance regime has modified ground and canopy vegetation structure, leading to an unnaturally high fuel level (both living and dead) that increases the susceptibility of this and surrounding areas to stand-replacement fires.

Table 19 shows how the current Middle Fork Mixed Conifer habitat condition class composition on 25,000 acres compares with the average pre-settlement condition. Significant increases in the amount of late-seral closed (>20" dia., canopy closure >30%) and post replacement (<5" dia.) have occurred. Even greater decreases in amount of mid-seral open (5"-20" dia, canopy closure >30%) and late-seral open (>20" dia, canopy closure >30%) habitat have occurred. Post replacement (young, regenerating stands) are

over-represented and this forest type will relatively quickly grow into mid-seral closed status

**Table 19. - Historic and current Middle Fork mixed conifer habitat type condition class composition (on 25,000 acres).**

Middle Fork Mixed Conifer Habitat Type – Condition Class Composition		
Habitat Condition Class	Average Pre-settlement Condition % of Habitat Type	Current Condition % of Habitat Type
Post Replacement <sup>1</sup>	5	31
Mid-seral Open <sup>2</sup>	35	3
Mid-seral Closed <sup>3</sup>	15	14
Late-seral Open <sup>4</sup>	40	1
Late-seral Closed <sup>5</sup>	5	50

<sup>1</sup> 5"-20" diameter, canopy cover < 30%

<sup>2</sup> 5"-20" diameter, canopy cover < 30%

<sup>3</sup> 5"-20" diameter, canopy cover > 30%

<sup>4</sup> > 20" diameter, canopy cover < 30%

<sup>5</sup> > 20" diameter, canopy cover > 30%

Table 20 shows the current habitat condition class composition within the Jim’s Creek project area boundary. These data show a large departure from average pre-settlement percentages (reference Table 1). The shifts in composition result from the combination of previous harvest activity and fire suppression. The shift within the project area however, where only 12% of the acreage has been subject to harvest activity, is almost exclusively a result of fire suppression.

**Table 20. Current Project area habitat condition class and condition**

Habitat Condition Class	Current Composition of Habitat % of Project Area
Meadow	5
Post Replacement <sup>1</sup>	5
Mid-seral Open <sup>2</sup>	<1
Mid-seral Closed <sup>3</sup>	1
Late-seral Open <sup>4</sup>	6
Late-seral Closed <sup>5</sup>	82

<sup>1</sup> 5"-20" diameter, canopy cover < 30%

<sup>2</sup> 5"-20" diameter, canopy cover < 30%

<sup>3</sup> 5"-20" diameter, canopy cover > 30%

<sup>4</sup> > 20" diameter, canopy cover < 30%

<sup>5</sup> > 20" diameter, canopy cover > 30%

**Direct and Indirect Effects of Alternatives**

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Alternative A – Proposed Action: would treat approximately 241 acres to create an approximation of the original, historic savanna structural conditions by removing excess 100 year old trees, resulting in a maximum patch size of about 225 acres. This alternative would restore slightly over one third of the project area to its pre-European settlement/pre-fire suppression condition, changing the fire regime condition class from a 3 to a 1 on the acres treated. Of the 241 acres restored, 214 acres (89%) would change from late seral closed canopy forest to late seral open canopy and 27 acres (11%) would be early seral/meadow enhancement. Treated acres would have on average 20% of the pre-treatment canopy cover except for meadow acres that would average 10%, and riparian reserve acres that would average approximately 40%.

Alternative B – No Action: would not create any size patch of savanna structured forest and would have no effect upon the distribution of late-successional open forest within the planning area or across the mixed conifer landscape. It would not change the fire regime condition class; the area would remain many fire cycles behind the nature fire regime.

Alternative C – staged entry: would initially reduce density to an average of 40 trees per acre, creating a 155 acre patch size. This may create low density conditions in microsites and small patches, but would not create savanna conditions with the first entry. Planting of Oregon white oak and sowing of California fescue would likely be more limited than Alternatives A and E as both species need semi-open to very open conditions to grow successfully. Burning may be delayed as well, if tree densities remain high and Oregon white oak and fescue planting take more time to regenerate. This alternative would begin the restoration of the project area to its pre-European settlement/pre-fire suppression condition, changing the fire regime condition class from a 3 to a 1 on the acres treated. Of the 171 acres under this alternative, 146 acres (86%) would modify late seral closed canopy forest and 25 acres (14%) would enhance early-seral/meadows. None of these vegetation structures could initially be considered late-succession-open forests (the desired condition). Treated acres would average 40% post-treatment canopy cover except for meadow acres that would average 10%.

Alternative D – multiple methods: would create savanna conditions with an overstory density of 20 trees per acre on a small percentage of the Jim's Creek site, about 65 acres. The 49 acres of 40 tree per acre retention, and the 41 acres of oak release would constitute a beginning to restoration of savanna conditions but these areas would still contain a forest too dense to provide for many savanna habitat values and stimulate understory vegetation recovery. The average patch size created would be 62 acres, with a maximum of 79 acres. This alternative would restore less than one tenth of the project area to its pre-European settlement vegetation conditions and would begin the restoration of the project area to its pre-fire suppression condition, changing the fire regime condition class from a 3 to a 1 on the acres treated. Planting of Oregon white oak and

sowing of California fescue would occur on less than 65 acres of 20 tree per acre retention as both species need semi-open to very open conditions to be successful. Burning may be delayed if tree densities remain high and Oregon white oak and fescue planting take more time to regenerate. Of the 171 acres treated in this alternative, 31 would be initially converted to late-seral open canopy, 65 acres to 20% post-treatment canopy cover, 50 acres would average 40% canopy cover, 41 acres would average 60% canopy cover, and 15 acres would average 10% canopy cover. Canopy cover throughout treated riparian reserves would average approximately 40%.

Alternative E – full restoration: would treat a total of 455 acres and restore a 439 acre patch of savanna vegetation. This alternative would modify the landscape so roughly 77% of the area would be in tree densities of 25/acre or less. This alternative would restore over two thirds of the project area to its pre-European settlement/pre-fire suppression condition, changing the fire regime condition class from a 3 to a 1 on the acres treated. Oregon white oak and California fescue would be planted on the site, and a frequent low severity burning program initiated. Alternative E would most closely recreate historical savanna conditions, in terms of size, structure, composition, and disturbance processes. This alternative most completely addresses the purpose stated for this restoration project. It would accomplish the restoration goal within the project area most quickly. It is similar to Alternative A except at a greater scale. Of the 455 acres under this alternative, 423 acres (93%) involves modification of late-seral closed canopy forest to late-seral open canopy and 32 acres (7%) of upland early-seral/meadow would be enhanced. Treated acres would average 20% post-treatment canopy cover except for meadow acres that would average 10%, and riparian reserve acres that would average approximately 40%.

#### Effects Common to all Action Alternatives

All action alternatives have some degree of locally positive effects on seral stage composition in terms of achieving the desired future conditions. None of the proposed alternatives would appreciably affect the percentage of late-seral/open forest habitat at a landscape scale. The stand sizes in and adjacent to the project area, an indication of the original savanna vegetation patch sizes, are around one thousand or more acres, so none of the action alternatives go very far in terms of recreating large-scale historic vegetation patterns ( see the Silvicultural Prescription – Bailey, 2005, in the project’s Analysis File).

#### Cumulative Effects

As discussed above under cumulative effects for Issue #4, Maintenance of Biodiversity, the past replacement, mid-seral, and late-seral-open figures in Tables 18 and 19 reflect the effects of past harvest. Most of this harvest has resulted in a departure from historical distribution of these forest aged and structure characteristics; e.g., there are now 20

percent more post replacement and mid-seral closed stands and 45 percent less late-seral open stands now than there were in historic times. Most past actions have functioned to return this landscape to its historical condition in term of seral stage and canopy structure distributions. Those few past actions that have created late-seral, open canopy structures, the un-removed shelterwood stands and the small groups selections harvest units, did not create patch sizes near the historic extent of these types of stands. There are no reasonably foreseeable future actions that would change the distribution of these successional and structural conditions and distributions.

## 7. Noxious Weeds

There are a number of non-native species of plants occurring within the Jim's Creek project area. Most such species occur along road edges, within the meadows, or in the plantations. Noxious weeds are a threat to biodiversity. They can alter nitrogen fixation cycles, change the hydrology, cause increased sedimentation, and most critical in the Jim's Creek area, compete with native species for water, nutrients or growing space (Harrod and Reichard, 2001).

Compared to many areas on the Willamette National Forest, and other oak and pine types in the Willamette Valley, the Jim's Creek project area has a relatively low density of noxious weed species. In particular there are virtually no Himalayan blackberry or Scot's broom plants, although Scots broom (*Cytisus scoparius*) has been located and manually controlled along Road 21 and is currently located at the junction of Roads 21 and 2129. These plants can be very invasive and persistent on disturbed oak sites. Surveys for noxious weeds occurred along with surveys for sensitive plants in May-June, 2004 and May 2005.

The most problematic weed found in the Jim's Creek project is St. Johnswort, (*Hypericum perforatum*). It is found in low densities in both forested and meadow habitats, sometimes far from roads or trails, vectors along which one might expect introduction. Other weedy species are found associated with roads. This species has been found in all types of oak habitat in the Willamette Valley. In a study conducted by Thilenius (1968), St. Johnswort was found in small densities in from 2-11% of plots sampled. It was found in 4% of the oak woodlands and 15% of the annual grasslands surveyed in one California study (Jimerson and Carothers, 2002).

Bull thistle (*Cirsium vulgare*) and St. Johnswort are noxious weeds found along road 2129. Invasive species such as wild carrot (*Daucus corota*), cheatgrass (*Bromus tectorum*), and several other non-native weedy plants are also found along this haul route. Birdsfoot trefoil (*Lotus corniculatus*) was probably used in the grass seed mixes for road shoulder stabilization and this species is also very invasive. Bull thistle Canada thistle (*C. arvensis*) St. Johnswort, wild carrot, cheatgrass, self-heal (*Prunella vulgaris*) false

dandelion (*Hypochaeris radicata*) and chrysanthemum (*Leucanthemum vulgare*) are located along Road 2129-371 and its spurs.

The proposed helicopter landing contains an infestation of chrysanthemum, St. Johnswort, and wild dandelion. Densities are high near the road but do not occur in the interior of the plantation.

Several other less pervasive non-natives also occur in this project area. Holly (*Ilex aquifolium*) and sweetbriar rose (*Rosa eglanteria*) are non-native shrubs located away from the roads in the project area and lemon balm (*Melissa officinalis*) is an invasive herb. These all grow in the shaded understory.

**Issue #9 –Noxious weeds: Disturbance of vegetation and soils by some of the proposed actions could potentially cause non-native and noxious plants to colonize new, larger areas.**

Evaluation criteria:

- acres of ground disturbance
- amount of road adjacent to disturbed areas:

In all action alternatives, habitat for noxious weed species will be created. Those alternatives include small localized disturbances associated with culvert removal, creation of a helicopter landing, maintenance of road 2129 and parts of 2129.371, and road closure activities. Alternatives differ in disturbance associated with acres harvested, acres skyline yarded, and length of road needed for haul. Action alternatives also include various mitigating measures to minimize the spread of noxious weeds, such as planting native vegetation, use of weed-free fill on the helicopter landing, and cleaning of construction and logging equipment.

The alternative with the greatest number of disturbed acres and miles of road for hauling logs would create the most habitat for noxious weed introduction. Creation of habitat by harvest includes both opening of the canopy by felling trees and by skyline yarding with partial suspension (trees drag along ground in skyline corridors). Roads would be maintained and, in some cases, upgraded for harvest. All these activities increase the risk of noxious weed introduction by off-road equipment as well as simply opening up a seed bed for weedy species to take advantage of.

The effects of burning on St Johnswort are unclear. Shuller (1997) found a neutral effect on abundance following a fall burning Mima Mounds, Washington. Conversely, Tueten and Fonda (1999) report an increase in St. Johnswort following both spring and fall burns, especially if additional habitat is opened up. Buckley (2003) suggests that the most effective strategy to managing the species is reducing the size of vegetative plants.

Observations of the plantations within the project area show that if the site is competitively planted, small populations of St. Johnswort may still be present, but at very low densities; it does not appear that timber harvest caused it to spread unchecked. It is, however, very prominent along road shoulders.

### **Direct and Indirect Effects of Alternatives**

Alternative A – Proposed Action: would create 241 acres of ground disturbance through complete excess tree removal, including about 66 acres of skyline yarding. About 3.2 miles of road would be disturbed by project activities.

Alternative B - No Action: would allow existing noxious weed populations to persist in the project area. It is unknown whether St. Johnswort populations are increasing, decreasing or stable. Because no logging or road maintenance machinery would be dispatched to the site, there would be no risk of additional introduction from contaminated off-road equipment. No ground would be disturbed to provide a seed bed for invasive species.

Alternative C – staged entries: would retain a higher canopy cover (40 trees per acre rather than 20) than Alternatives A and E. This greater canopy density could be enough to shade out shade-intolerant weed species. Buckley et. al (2003) note that St. Johnswort recruitment from seed is less in shaded populations than in open. This alternative would moderately disturb 171 acres through partial excess tree removal, including 43 acres of skyline yarding. Alternative C would provide for a lower risk of noxious weed spread than would Alternatives A or E. About 2.9 miles of road would be disturbed by project activities.

Alternative D – multiple methods: calls for maintenance of higher canopy covers on 49 acres (40 trees per acre rather than 20) than Alternatives A and E. These higher canopy covers could be enough to shade out shade-intolerant weed species. Buckley et. al (2003) note that St. Johnswort recruitment from seed is less in shaded populations than in open. This alternative would moderately disturb 106 acres through partial excess tree removal and, more heavily disturb 65 acres through complete excess tree removal, including 43 acres of skyline yarding. Alternative D would provide for about the same risk of noxious weed spread as would Alternative C. About 2.9 miles of road would be disturbed by project activities.

Alternative E – full restoration: would disturb about 455 acres through complete excess tree removal, including about 113 acres of skyline yarding. About 3.4 miles of road would be disturbed by project activities.

### Threatened, Endangered, and Sensitive Plants

No direct, indirect or cumulative effects would occur to sensitive plants, bryophytes or lichens. Under all action alternatives, habitat in which *Asclepias cordifolia* is found will be enhanced through prescribed burning, seeding with native species and small conifer removal. Reintroducing the natural disturbance regime and reducing the overall density and abundance of non-native annual grasses that can compete with native species will benefit *Asclepias* populations.

Under Alternative B, no action, there should be no direct or cumulative effect on sensitive fungi. An indirect effect of no action may be natural succession which may change the underground species composition. As stands get older, the underground species composition also gets more diverse (Visser, 1995; Bradbury et al, 1998; Smith et al, 2002).

Alternatives differ by the number of acres that will be disturbed (Table 1). It is assumed that the greater number of acres of harvest, the greater effect there will be on fungi. These effects may be ameliorated by leaving greater numbers trees. Korb et al (2001) found that restoration thinning in a northern Arizona ponderosa pine forest, mycorrhizal fungi rapidly increased following thinning. The key to recolonization was immigration of new propagules from nearby areas and spread of residual propagules. Prescriptions under Alternative C and part of Alternative D will provide 50% more trees from which residual propagules can spread. The oak release areas will also provide more residual trees for recolonization of harvested areas. All alternatives maintain refuge trees, important for recolonization of the site (Wiensczyk et al, 2002).

Under all action alternatives, there will be direct effects to fungi, but severity and amount of habitat loss differs. Removal of host trees for mycorrhizal species will occur in all alternatives, regardless of whether entry is single or double, or oak release. This will result in the disruption of mycelial networks (Kranabetter and Wylie, 1998; Amaranthus and Perry, 1994).

Indirect effects of timber harvest to fungal habitat include the short-term loss of moisture retention capabilities due to the drying effect of over-story shade removal, and the reduction of water storage with the disturbance or removal of forest floor organic material and large wood. Loss of large woody material and host trees also represents a reduction of available nutrients and possible inoculum source for future fungal regeneration and expansion.

Cable yarding of trees causes soil compaction and localized disturbance along yarding corridors. This causes a loss of ectomycorrhizal root tips (Amaranthus et al, 1996) and can disturb litter-dwelling and saprophytic fungi within the corridors. The area affected by this is much larger in Alternative E than in other action alternatives (Table 1).

Culvert replacement may cause some disturbance to soil-dwelling fungi through direct disturbance and potential removal of habitat, but in a much localized area. Development of a helicopter landing area will have a similar localized direct effect to fungi in the soil.

In the short-term, adverse effects due to fire should be localized to burn pile areas. The number of piles will differ between alternatives, with the greatest number of piles being in Alternative E. Pile burning has the potential to disrupt mycelial networks (Amaranthus and Perry, 1994) by creating localized intense disturbance and loss of organic matter that can decrease the ability of plants to form linkages with ectomycorrhizal fungi.

Ectomycorrhizal diversity and abundance decrease with high intensity fire, especially where they are found in the litter and organic layers (Stendell et. al, 1999; Wiensczyk et. al, 2002).

In the longer term, prescribed burning at Jim's Creek would cause loss of litter, so it could reduce substrates for litter-dwelling fungi. Bruns (2002) studying short-term effects of ground fire in the Sierra Nevada found a short-term reduction in the biomass of ectomycorrhizal fungi correlated with incineration of the litter layer but that lower layers, where the greatest specie richness occurs, were preserved. Stendell et al. (1999) found a similar pattern in a Sierra Nevada ponderosa pine forest after prescribed fire where litter/organic species biomass decreased eightfold but no difference was detected in mineral layers.

Cumulative effects on fungi will be analyzed on a watershed level-the Buck Creek watershed. It is assumed that the distribution of these species is relatively localized. Spores, the method by which they propagate from fruiting bodies, may travel some distance, so an area larger than the project area is appropriate for analysis. I am assuming that there has been some recovery of mycorrhizal diversity in stands over 20 years of age and that clearcut activity has the most severe effects on mycorrhizal diversity within the watershed by harvesting the host species they depend upon. Approximately 4000 acres, 27% of the watershed, were clearcut by the Forest Service from 1986 to 2002. An additional 104 acres, 0.7%, have been or are slated to be clearcut by private landholders within the watershed (Bearbones Block). Alternative D would add 65 acres of open late seral habitat (0.44%). This alternative will reduce available fungus habitat by less than one half of a percent within the watershed. Alternative A would add 225 acres of open late seral habitat. This alternative would remove one and a half percent of fungus habitat from the watershed. Alternative E would add 439 acres of open late seral habitat, reducing fungus habitat by 3%.

In summary, because no surveys were completed to determine effects on fungi, all action alternatives were given a May Impact Individuals or Habitat, But Will Not Likely

Contribute to a Trend Towards Federal Listing or Loss of Viability for the Population or Species rating (Lippert, 2005).

### Cumulative Effects

Cumulative effects upon noxious weed spread were analyzed on the Jim's Creek and Deadhorse Creek sub-watersheds scale because weeds most often travel along road systems. It is probable that clearcut harvesting and road maintenance contribute the most early seral (potential weed) habitat in the watershed. Thus, the extent of these activities is the measure of cumulative impacts. Past actions that create habitat for weeds within the sub-watershed include clearcut harvesting (400 acres on public lands and 104 acres on private lands). No additional, reasonably foreseeable harvest is slated for areas in the Jim's Creek project area. About 1.5 percent of the watershed would become potential habitat for weeds under 1.5% under Alternative A, approximately 1% for Alternative C, less than one percent for Alternative D, and 3% for Alternative E. It is unknown whether any new roads are planned on private lands, but such activity is unlikely given the current high road density on those parcels. No new roads are proposed in the foreseeable future. However, road maintenance activities occur in this watershed on an annual basis. Additional upgrading for hauling will occur on between 2.9 (Alternatives A, C and D) and 3.4 (Alternative E) miles. These activities will also create habitat for noxious weeds.

## **8. Survey and Manage Species**

The Northwest Forest Plan (USDA/USDI, 1994, page C-4) contains requirements to survey for and protect a variety of organism thought to be rare and dependant upon late-successional forest conditions. There are three plant species on the current list (USDA/USDI, 2001) of survey and management species (Lippert, 2005) that could occur in habitats within the project area. The project area was surveyed for these species in the summer of 2004 and late spring of 2005. None were found.

## **D. Wildlife**

### Current Conditions

A complex set of geographic and native anthropogenic influences resulted in the historic Jim's Creek habitat condition characterized by an ecological overlap between three habitat types. Across the landscape surrounding the Jim's Creek project area, but most specifically within the immediate project vicinity, that overlap results in a condition dominated by the ecological influence of Westside Oak and Dry Douglas-fir Forest and Woodlands habitat and secondarily influenced by both Southwest Oregon Mixed Conifer-Hardwood, and Ponderosa Pine Forest and Woodlands habitat types (as defined in Johnson and O'Neil, 2001).

Effects of recent decades of fire suppression have contributed to profound ecological changes occurring throughout the Middle Fork Mixed Conifer Habitat Type. These changes are consistent with changes described in similar habitat throughout the region (Ryan and Carey 1995). Current wildlife habitat conditions throughout the Jim's Creek project area are on a growth and development trajectory that will ultimately more resemble Westside Lowlands Conifer-Hardwood Forest habitat which is the dominant habitat downstream from the project area throughout the Hills Creek Reservoir watershed.

The following discussion attempts to summarize what is known or inferred about terrestrial wildlife species and their associations with habitat types within and surrounding the Jim's Creek project area. A focus is placed on those species identified as being closely associated with a habitat type, and that may act as indicators for a larger suit of species that may be influenced by this project.

Unless otherwise indicated in this report, effects to wildlife species from proposed activities are considered in relation to the planning area – which may also be referred to as the project area.

#### Westside Oak and Dry Douglas-fir Forest and Woodlands Habitat

Where it occurs in Washington and Oregon, 222 wildlife species have been identified as associated with the Westside Oak and Dry Douglas-fir Forest and Woodlands Habitat type (O'Neil et al. 2001). This includes 118 bird, 70 mammal, 16 amphibian, and 18 reptile species. Only a small percentage of those species however are listed as closely associated with this type of habitat. That list includes 18 bird, 15 mammal, and 1 reptile species. If one considers the plant association characterizing current vegetation within the project area influenced by this habitat type, the list of closely associated species that are known or likely to occur in the project area is further reduced (Csuti et al. 1997, Johnson and O'Neil 2001, Marshall et al. 2003, O'Neil et al. 2001, Verts and Carraway 1998) to 15 bird and 11 mammal species.

#### Southwest Oregon Mixed Conifer-Hardwood Forest Habitat

Where it occurs in Washington and Oregon, 231 wildlife species have been identified as associated with the Southwest Oregon Mixed Conifer-Hardwood Forest Habitat type (O'Neil et al. 2001). This includes 130 bird, 64 mammal, 18 amphibian, and 19 reptile species. Only a small percentage of those species however are listed as closely associated with this type of habitat. That list includes 16 bird, 17 mammal, and 2 amphibian species. If one considers the plant association characterizing current vegetation within the project area influenced by this habitat type, the list of closely associated species that are known or likely to occur in the project area is further reduced

(Csuti et al. 1997, Johnson and O’Neil 2001, Marshall et al. 2003, O’Neil et al. 2001, Verts and Carraway 1998) to 13 bird and 15 mammal species.

#### Ponderosa Pine Forest and Woodlands Habitat

Where it occurs in Washington and Oregon, 232 wildlife species have been identified as associated with the Ponderosa Pine Forest and Woodlands Habitat type (O’Neil et al. 2001). This includes 131 bird, 67 mammal, 13 amphibian, and 21 reptile species. Only a small percentage of those species however are listed as closely associated with this type of habitat. That list includes 13 bird and 13 mammal species. If one considers the plant association characterizing current vegetation within the project area influenced by this habitat type, the list of closely associated species that are known or likely to occur in the project area is further reduced (Csuti et al. 1997, Johnson and O’Neil 2001, Marshall et al. 2003, O’Neil et al. 2001, Verts and Carraway 1998) to 12 bird and 9 mammal species.

#### Westside Lowlands Conifer-Hardwood Forest Habitat

Where it occurs in Washington and Oregon, 232 wildlife species have been identified as associated with the Westside Lowlands Conifer-Hardwood Forest Habitat type (O’Neil et al. 2001). This includes 120 bird, 72 mammal, 26 amphibian, and 14 reptile species. Only a small percentage of those species however are listed as closely associated with this type of habitat. That list includes 22 bird, 23 mammal, and 2 amphibian species. If one considers the plant association characterizing current vegetation within the project area influenced by this habitat type, the list of closely associated species that are known or likely to occur in the project area is further reduced (Csuti et al. 1997, Johnson and O’Neil 2001, Marshall et al. 2003, O’Neil et al. 2001, Verts and Carraway 1998) to 18 bird, 20 mammal, and 2 amphibian species.

**Issue #3 – Maintenance of Biodiversity – significant issue - Forest Wide Standard and Guidelines direct that biological diversity be maintained or enhanced by providing an ecologically sound distribution and abundance of plant and animal. Much of the original diversity that existed on these slopes has been lost, especially in terms of wildlife species that use open pine and oak habitat. Continuation of the status quo will result in continued reduction in biodiversity compared to what used to exist on these lands.**

Evaluation criteria:

- Species that would be favored or not favored by restoration

Species that comprise the refined “closely associated” lists for each habitat type are displayed in Table 21. Table 21 also includes information regarding potential habitat or viability concerns for an individual species. Lastly, an indicator is displayed for each

species showing whether the influence from proposed habitat restoration activities is considered potentially beneficial, neutral, or non-beneficial.

Survey results or casual sighting observations have documented the presence of many species listed in Table 21 within the Jim' Creek project area or adjacent 6th field watersheds. For example, District records contain more than 30 reports of northern goshawk dating back to 1987, and in 2004 an acorn woodpecker was observed perched on a large ponderosa pine that appeared to have once been used as a "granary tree". Despite negative results associated with a recent great gray owl survey of the area (2003-2004), records dating to 1983 indicate the presence of this species in the vicinity of the project. Influences suggested in Table 4 are intended to reflect long-term effects (>10 years) of habitat restoration as opposed to short term. Habitat restoration proposed under any Action Alternative for this project should have little to no effect on species identified as being non-beneficially influenced in terms of their ability to persist in the vicinity of the project area or throughout their ranges.

As indicated in Table 21, about 57% of closely associated species may be beneficially influenced by restoration activities, 25% may be neutrally influenced, and 18% may be non-beneficially influenced. A non-beneficial influence to 18% of these species is considered a trade-off to neutral or beneficial influences for 82% of species that are known to associate closely with this limited habitat type. Project effects to all closely associated species are not quantifiable on an individual basis relative to the amount of habitat modified or disturbed against the amount available throughout the 25,000 acre Middle Fork Mixed Conifer Habitat type. Approximately 1% of mixed conifer habitat would be restored to a pine-oak savanna condition under Alternative A, with 0.7% restored under Alternatives C or D, and 1.8% restored under Alternative E. Some proposed restoration activities would likely occur outside the breeding season for these species and/or at a time when many may have migrated from the area or become seasonally inactive (Csuti et al. 1997, Johnsgard 1988, O'Neil et al. 2001, NatureServe 2005, Verts and Carraway 1998) which serves to further mitigate any potential short-term negative effects from habitat modification or disturbance. Project effects would result in a positive yet marginal overall contribution, with respect to restoring historic habitat and biodiversity, to cumulative effects that have occurred from past actions affecting the project area.

**Table 21. Species closely associated with habitat types influencing historic and current vegetation conditions for terrestrial wildlife in the Jim’s Creek Project area, and anticipated influence of project activities.**

Closely Associated Wildlife Species		Habitat Type				Species Status Concern	Project influence
		Westside Oak/Dry Douglas-fir Forest & Woodland	Southwest OR Mixed Conifer-Hardwood Forest	Ponderosa Pine Forest & Woodland	Westside Lowlands Conifer-Hardwood Forest		
Common Name	Scientific Name						
<b>BIRDS</b>							
Northern Goshawk	<i>Accipiter gentiles</i>			X			B
Ruffed Grouse	<i>Bonasa umbellus</i>				X		N
Blue Grouse	<i>Dendragapus obscurus</i>			X	X	AWL	N
Band-tailed Pigeon	<i>Columba fasciata</i>	X	X		X	AWL	B
Flammulated Owl	<i>Otus flammeolus</i>		X	X		BCC AWL	B
Northern Pygmy-owl	<i>Glaucidium gnoma</i>		X		X		B
Spotted Owl	<i>Strix occidentalis</i>		X		X	AWL/a	NB
Barred Owl	<i>Strix varia</i>				X		N
Great Gray Owl	<i>Strix nebulosa</i>			X			B
Northern Saw-whet Owl	<i>Aegolius acadicus</i>	X	X	X	X		B
Anna's Hummingbird	<i>Calypte anna</i>				X		N
Lewis's Woodpecker	<i>Melanerpes lewis</i>	X				BCC AWL	B
Acorn Woodpecker	<i>Melanerpes formicivorus</i>	X	X	X			B
White-headed Woodpecker	<i>Picoides albolarvatus</i>			X		BCC AWL	N
Olive-sided Flycatcher	<i>Contopus cooperi</i>				X	BCC AWL	B
Pacific-slope Flycatcher	<i>Empidonax difficilis</i>				X		N
Ash-throated Flycatcher	<i>Myiarchus cinerascens</i>	X					B
Cassin's Vireo	<i>Vireo cassinii</i>	X	X	X			B
Hutton's Vireo	<i>Vireo huttoni</i>	X	X				B
Warbling Vireo	<i>Vireo gilvus</i>				X		B
Western Scrub-jay	<i>Aphelocoma</i>	X	X				B

Closely Associated Wildlife Species		Habitat Type				Species Status Concern	Project influence
		Westside Oak/Dry Douglas-fir Forest & Woodland	Southwest OR Mixed Conifer-Hardwood Forest	Ponderosa Pine Forest & Woodland	Westside Lowlands Conifer-Hardwood Forest		
Common Name	Scientific Name						
	<i>californica</i>						
White-breasted Nuthatch	<i>Sitta carolinensis</i>			X			B
Winter Wren	<i>Troglodytes troglodytes</i>				X		NB
Golden-crowned Kinglet	<i>Regulus satrapa</i>				X		NB
Western Bluebird	<i>Sialia mexicana</i>	X	X	X	X		B
Varied Thrush	<i>Ixoreus naevius</i>				X		NB
Black-throated Gray Warbler	<i>Dendroica caerulescens</i>	X	X		X		N
Hermit Warbler	<i>Dendroica occidentalis</i>		X		X		N
Western Tanager	<i>Piranga ludoviciana</i>	X	X	X	X		B
Spotted Towhee	<i>Pipilo maculatus</i>	X					N
Fox Sparrow	<i>Passerella iliaca</i>			X			N
Bullock's Oriole	<i>Icterus bullockii</i>	X					B
Purple Finch	<i>Carpodacus purpureus</i>	X					B
Lesser Goldfinch	<i>Carduelis psaltria</i>	X					B
<b>MAMMALS</b>							
Pacific Shrew	<i>Sorex pacificus</i>		X		X	a	NB
Trowbridge's Shrew	<i>Sorex trowbridgii</i>				X		N
Shrew-mole	<i>Neurotrichus gibbsii</i>				X		NB
Coast Mole	<i>Scapanus orarius</i>				X		N
California Myotis	<i>Myotis californicus</i>	X	X		X		B
Long-legged Myotis	<i>Myotis volans</i>		X	X	X		B
Silver-haired Bat	<i>Lasiorycteris noctivagans</i>			X	X		B
Big Brown Bat	<i>Eptesicus fuscus</i>	X	X	X	X		B
Townsend's Chipmunk	<i>Tamias townsendii</i>		X		X		B

<b>Closely Associated Wildlife Species</b>		<b>Habitat Type</b>				<b>Species Status Concern</b>	<b>Project influence</b>
		Westside Oak/Dry Douglas-fir Forest & Woodland	Southwest OR Mixed Conifer-Hardwood Forest	Ponderosa Pine Forest & Woodland	Westside Lowlands Conifer-Hardwood Forest		
Common Name	Scientific Name						
Siskiyou Chipmunk	<i>Tamias siskiyou</i>		X				B
Golden-mantled Ground Squirrel	<i>Spermophilus lateralis</i>		X	X			B
Western Gray Squirrel	<i>Sciurus griseus</i>	X	X	X			B
Douglas' Squirrel	<i>Tamiasciurus douglasii</i>	X	X		X		B
Northern Flying Squirrel	<i>Glaucomys sabrinus</i>	X	X		X		B
Western Pocket Gopher	<i>Thomomys mazama</i>	X	X	X	X		B
Deer Mouse	<i>Peromyscus maniculatus</i>	X		X	X		B
Dusky-footed Woodrat	<i>Neotoma fuscipes</i>	X	X	X			B
Bushy-tailed Woodrat	<i>Neotoma cinerea</i>	X			X		N
Western Red-backed Vole	<i>Clethrionomys californicus</i>		X		X		NB
White-footed Vole	<i>Phenacomys albipes</i>				X		NB
Red Tree Vole	<i>Phenacomys longicaudus</i>	X	X		X		N
Common Porcupine	<i>Erethizon dorsatum</i>	X	X	X	X		B
Gray Fox	<i>Urocyon cinereoargenteus</i>				X		NB
Fisher	<i>Martes pennanti</i>				X	a	N
<b>AMPHIBIANS</b>							
Ensatina	<i>Ensatina eschscholtzii</i>				X		NB
Red-legged Frog	<i>Rana aurora</i>				X		NB

AWL = Audubon Watch List 2002 BCC = Birds of Conservation Concern List 2002 (USFWS)

a = effects to this TES species addressed in project's wildlife BA/BE

B = Beneficial influence N = Neutral influence NB = Non-Beneficial influence

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**Direct and Indirect Effects of Alternatives**

Alternative A – Proposed Action: would restore approximately 1% of mixed conifer habitat to a pine-oak savanna condition.

Alternative B – No Action: would not provide for any habitat restoration

Alternatives C and D – staged entry and multiple methods: would restore about 0.7% of the mixed conifer habitat.

Alternative E – full restoration: would restore about 1.8% of the habitat.

Restoration activities would occur throughout the year; some would occur outside the breeding season for these species and/or at a time when many may have migrated from the area or become seasonally inactive (Csuti et al. 1997, Johnsgard 1988, O'Neil et al. 2001, NatureServe 2005, Verts and Carraway 1998). This would serve to mitigate some of the potential short-term negative effects from habitat modification or disturbance. Project effects would result in a positive yet marginal overall contribution, with respect to restoring historic habitat and biodiversity, to cumulative effects that have occurred from past actions affecting the project area.

**1. Management Indicator Species: pileated woodpecker, marten, and cavity excavators -**

The Willamette Forest Plan (USDA, 1990a) has identified a number of terrestrial wildlife species with habitat needs that are representative of other wildlife species with similar requirements. These management indicator species (MIS) include the northern spotted owl, bald eagle, peregrine falcon, cavity excavators, pileated woodpecker, deer, elk, and marten (see Forest Plan FEIS page III-69). These species have potential to occur in or near the project area. Spotted owls, bald eagles, and peregrine falcons are addressed in the terrestrial Biological Analysis/Evaluation contained in the project Analysis File (Davis, 2006a). Bald Eagles would not be affected, peregrine falcons would not be affected as long as the prescribed restrictions on helicopter travel are implemented (see the mitigations measures listed in Section II of this document), and spotted owls habitat would be degraded or removed in proportion to the number of acres treated in each action alternative. Activities associated with the proposed action are consistent with, or exceed the requirements of the Forest Plan pertaining to MIS management.

Some suitable habitat for terrestrial MIS would be modified by activities associated with the proposed Jim's Creek Savanna Restoration Project, and activities could result in disturbance to MIS that may be present in or adjacent to proposed treatment sites. However, any modification or disturbance that may occur associated with this project is not of a scale that would threaten the viability of any MIS to persist within the project area or throughout the range of these species.

### Pileated Woodpecker:

Snag and down wood habitat within and adjacent to the project area is considered abundant, and well in excess of natural conditions for this area (USDA, 1995; and Davis, 2006a). Snag distribution across the project area is also patchy and variable. These habitat components are important in influencing the presence of this MIS in the project area. Current as well as historic composition and structure of plant associations for this area favor nesting and foraging use by pileated woodpeckers (Csuti et al. 1997, Marshall et al. 2003, NatureServe 2005, O'Neil et al. 2001). This species has been detected on numerous occasions during field visits throughout the planning process, and District records document pileated woodpecker presence in the vicinity dating back to 1987.

Restoration activities proposed under any action alternative does involve modification of foraging and nesting habitat for this species. Removal of standing green trees, loss of standing snags that pose a risk to worker safety, and loss of some large down wood from effects of prescribed burning would occur. However, negative effects associated with this habitat modification are considered short-term, and suitable foraging and nesting habitat would continue to be provided throughout the project area both during and long after initial restoration activities are completed. Retention of the largest overstory trees at levels that exceed historic density would provide for replacement of snag and down wood habitat under each action alternative. In addition, a green tree retention area established for the project area (see the Alternative maps) will continue to provide habitat for this species that would not be modified or disturbed by proposed restoration activities.

Project effects to this species are considered relative to the large home range size (>1000 ac) and the amount of habitat modified or disturbed against the amount available throughout the area. For the purpose of this review the area considered includes the 6th field watersheds surrounding the planning area. Of the estimated current average of 14 snags (size range 8"-60" diameter) per acre throughout the planning area, only about one per acre is  $\geq 208''$  diameter. The majority of large standing snags are ponderosa pines - remnants of the former savanna habitat condition. Most small snags in the area are Douglas-fir, and result from suppression mortality of the developing understory. Snag distribution across the project area is also patchy and variable. Table 3 could be used to estimate number of both large and small snags lost under each alternative, however it can be stated the loss will be greatest under Alternative E, which is approximately 89% greater than under Alternative A, and 166% greater than under either Alternative C or D. The silvicultural prescription includes provisions for replacement of large snags at levels exceeding the current average throughout the project area under any alternative. Habitat restoration as described for this project should have little to no effect on this species such that its ability to persist within the project area or throughout its range would be

compromised. Project effects would result in a minor contribution to cumulative effects that have already occurred from past management actions surrounding the project area.

The Oregon Natural Heritage Program (ONHP), The Nature Conservancy (TNC), and the Oregon Department of Fish and Wildlife (ODFW) currently indicate the status of the pileated woodpecker is secure in Oregon. This suggests the changing trend in timber management that has occurred within the past decade, and projected for the future, may positively influence occupancy of suitable habitat by this species as previously harvested stands redevelop, and more emphasis is placed on retention of key structural components in unharvested stands (USDA 1985, USDA/USDI, 1994). Long term effects of the Jim's Creek Savanna Restoration Project should be positive for pileated woodpeckers as habitat throughout the project area recovers to a condition that once likely supported this species along with a diverse assemblage of other woodpeckers.

#### Marten:

Marten occupy a narrow range of habitat types found in or near coniferous forests. More specifically, they associate closely with late-successional stands of mesic conifers – especially those with complex physical structures near the ground such as large low snags and down wood (Chapin et al. 1997, NatureServe 2005, Ruggiero et al. 1994, Verts and Carraway 1998, Zielinski et al. 2001). Current habitat in portions of the planning area can be described as having such characteristics, and may support use by this species. Despite lack of documented presence in the immediate vicinity, it should be assumed that marten are likely a member of the local faunal community. Historically however, the Jim's Creek savanna habitat would have lacked the canopy cover and ground level structural complexity favored by this species for selection as optimum breeding/denning habitat.

Because the home range size for marten is 3-4 times larger than predicted for a similar size terrestrial carnivore (Buskirk and Ruggiero 1994) effects from proposed activities on this wide-ranging species are considered in relation to the 6th field watersheds surrounding the planning area.

Restoration activity proposed under any Action Alternative does involve modification of habitat components known to be used by this species. Removal of standing green trees, loss of standing snags that pose a risk to worker safety, and loss of some large down wood from effects of prescribed burning would occur. Habitat restoration as described for this project should have little to no effect on compromising this species' ability to persist in habitat surrounding restoration areas or throughout its range.

Project effects to this species are considered minor relative to the quality and amount of habitat modified or disturbed against the amount available throughout the surrounding watershed. The highest potential for loss of habitat components that may be used by

marten in areas treated for restoration is under Alternative E, followed by Alternative A, then Alternatives C and D. Long-term effects associated with habitat restored by the Jim's Creek Savanna Restoration Project may not be positive for marten as habitat throughout the project area recovers to a condition that once supported a diverse assemblage of species that may not have favored marten. However project effects would result in a negligible contribution to cumulative effects that have already occurred from past management actions surrounding the project area.

Currently the ONHP, TNC, and the ODFW show the status of this species to be secure or not immediately imperiled, which suggests species viability may be assured as long as adequate protection measures such as Standards and Guidelines governing activities proposed by this type of project continue to be implemented. The changing trend in timber management that has occurred within the past decade, and projected for the future, may positively influence occupancy of suitable habitat surrounding the project area by marten as previously harvested stands redevelop, and more emphasis is placed on recruitment of key structural components missing from harvested stands and retention of key structural components present in unharvested stands.

#### Cavity Excavators:

The significance of snags as one component characterizing both old-growth and younger timber stands, and the dependence of primary cavity excavators on this component as MIS that provide nesting and denning habitat for numerous additional species of birds and mammals (secondary cavity nesters) is thoroughly addressed in the Willamette National Forest Land and Resource Management Plan (1990). The significance of this relationship is further emphasized by management standards and guidelines under the Northwest Forest Plan ROD (1994, 2001, 2004) and elsewhere throughout published literature (Hagar et al. 1996, Hallett et al. 2001, Lewis 1998, Muir et al. 2002, Olson et al. 2001, Rose et al. 2001). All species of primary cavity excavators used as ecological indicators in the Willamette Forest Plan (USDA 1990) have current and/or future potential to exist within the Jim's Creek project area based on recognized associations with habitat types as previously described (O'Neil et al. 2001). A complete list and discussion of these species can be found on page 74 in Chapter III of the Forest Plan FEIS.

Although implementing the silvicultural prescription associated with any of this project's action alternatives would result in maintaining a full or partial no-harvest buffer in all riparian reserves, plus protection and retention of habitat features such as hardwoods and the largest conifers (many of which possess decadent features making them suitable for use by cavity excavators) this project would result in reduction of some habitat features under all Action Alternatives. These features, important in considering habitat suitability

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for cavity excavators, include large standing snags and some green trees having structural potential to be used by these species as foraging and nesting habitat.

The reduction of existing snag habitat would occur quite suddenly under each Action Alternative, and is unavoidable due to safety issues. Many, if not most existing snags in proximity to restoration areas will present a serious safety risk to workers involved with implementing the silvicultural prescription. All felled snags would be left as large down wood, however depending on decay class and burning conditions many will also likely be fully or partially consumed during subsequent fuels reduction and prescribed underburning.

Of the estimated current average of 14 snags (size range 8"-60" diameter) per acre throughout the planning area, only about one per acre is  $\geq 20$ " diameter. The majority of large standing snags are ponderosa pines - remnants of the former savanna habitat condition. Most small snags in these stands area are Douglas-fir, and have formed through suppression of the developing understory. Snag distribution across the project area is also patchy and variable. Table 3 could be used to estimate number of both large and small snags lost under each alternative, however it can be stated the loss will be greatest under Alternative E, which is approximately 89% greater than under Alternative A, and 166% greater than under either Alternative C or D. The silvicultural prescription includes provisions for replacement of large snags at levels exceeding the current average throughout the project area under any Action Alternative. A more thorough discussion of effects this project may have on snag and down wood habitat is presented elsewhere in this report.

The number of both large and small snags lost under each alternative is a function of the number of acres treated and the loss would be greatest under Alternative E, which is approximately 89% greater than under Alternative A and 166% greater than under either Alternative C or D. The silvicultural prescription includes provisions for replacement of large snags at levels exceeding the current average throughout the project area under any Action Alternative. The Wildlife Report (in the project's Analysis File – Davis, 2006a) contains additional discussion on effects of this project to snag and down wood habitat.

Modification of snag habitat associated with restoration activities under any action alternative should have little to no effect on cavity nesting species such that their ability to persist in the project area or throughout their ranges would be compromised. Habitat for cavity excavator species that may occur in the area would remain abundant within and surrounding the area after implementation of this proposal. One anticipated result of this project would be a post restoration habitat offering greater amount of edge habitat, with greater complexity in open habitats, and with abundant forage and nesting opportunities in both living defective and dead trees that can be considered to provide better overall

habitat for a greater diversity of cavity excavator species (Csuti et al. 1997, O’Neil et al. 2001, Marshall et al. 2003, NatureServe 2005).

For this review, effects to this group of species from proposed activities are considered within the project planning area and include stands immediately surrounding the area. Project effects to these species are considered minor relative to the amount of snag habitat modified or disturbed against the amount available throughout the adjacent landscape. Project effects would result in an inconsequential contribution to cumulative effects that have already occurred from past management actions surrounding the project area. The changing trend in timber management that has occurred within the past decade, and projected for the future, may positively influence presence of cavity excavators as previously harvested stands redevelop, and more emphasis is placed on retention of key structural components in unharvested stands (USDA 1985, USDA 1994). Long-term (>10 years) effects of the Jim’s Creek Savanna Restoration Project should be positive for cavity excavators as habitat throughout the project area recovers to a former condition that supported these species along with a diverse assemblage of others.

MIS summary: Although proposed activities would modify some suitable habitat, and likely disturb some individual MIS that may be present, they should not threaten the capability of any local population of these species to become established in the project area or adjacent watersheds. Any project effect considered negative in this regard would be short-term and minimal compared to the amount of habitat available in the surrounding landscape. Cumulative effects to MIS from proposed activities would be small in scale yet generally beneficial, as they contribute to long-term improvements in the overall diversity of habitat in the Jim’s Creek area.

## **2. Elk/Deer (Big Game) – management indicator species:**

The Jim’s Creek Savanna Restoration Project area is within the Dry Pine Big Game Emphasis Area (BGEA). This review therefore considers effects from proposed activities within the Dry Pine BGEA, but also recognizes the effect restoration activities would have on big game habitat in adjacent BGEAs based on the landscape setting of the project area. The Dry Pine BGEA is rated as a high emphasis area under the Willamette NF Land and Resource Management Plan. Recent analysis of the Habitat Effectiveness Index (HEI) (Wisdom et al. 1986) for this BGEA indicate that individual values for forage quality (HEf) and open road density (HEr) are below Forest Plan S&Gs. Individual effectiveness values for habitat patch size and spacing (HEs) and cover quality (HEc) are currently above Forest Plan standards and guidelines. Because of the low HEf and HEr values the overall HEI value also fell below current standards.

**Issue #3 – Maintenance of Biodiversity - significant issue - Forest Wide Standard and Guidelines direct that biological diversity be maintained or enhanced by providing an ecologically sound distribution and abundance of plant and animal Much of the original diversity that existed on these slopes has been lost, especially in terms of wildlife species that use open pine and oak habitat. Continuation of the status quo will result in continued reduction in biodiversity compared to what used to exist on these lands**

Evaluation criteria:

- Percent change in the amount of big game forage habitat
- change in Habitat Effectiveness Index for big game

The Middle Fork Downstream Tributaries Watershed Analysis (USDA, 1995) included a discussion that identified a projected downward trend in HEI for throughout the watershed due the loss of forage habitat as it is converted to cover habitat based on effects from shifts in management practices under the Northwest Forest Plan (USDA, USDI 1994). This projection is validated for the Dry Pine BGEA by comparing current individual HEI values against those generated during the 1998 Young’n Timber Sale EIS analysis. Current HEc values reflect a 20% increase, and HEf values reflect a 20% decrease compared to baseline values generated from habitat modeling for the Young’n project. As stated previously in this report, harvest activity under the Young’n project has essentially not occurred, nor does it appear likely to such that it would affect current or future big game habitat.

Alternative Effects

The alternatives would have the following direct effects on the amount of forage available in the Big Pine BGEA:

**Table 22 – Comparison of Alternative Effects on Big Game Forage Habitat – Dry Pine BGEA**

Alternatives	Changes in Forage Habitat		
	Acres converted to forage	Percent increase in forage acres	Percent decrease in BGEA cover acres
<b>A</b> – Proposed Action	216	6	2
<b>B</b> – No Action	0	0	0
<b>C</b> – staged entry	149	4	1.5

Alternatives	Changes in Forage Habitat		
	Acres converted to forage	Percent increase in forage acres	Percent decrease in BGEA cover acres
<b>D</b> – multiple methods	149	4	1.5
<b>E</b> – full restoration	421	11	4

As evidenced by the positive growth response of native forage species to reduction in forest overstory cover associated with each of the two regeneration units and shelterwood units within the project area, and the favorable response of ground vegetation to fire, an increase in forage quantity is expected to occur in areas where restoration activities are proposed. Declines in forage quality (digestibility) are known to occur in conjunction with increases in forage quantity responding to growth stimulated by overstory removal (Cook 2002). However this relation appears to be variable between study sites and across regions. Dynamic shade patterns resulting from buffered riparian reserves and retained remnant overstory trees should mitigate potential negative and positive responses in forage quantity. The diversity of tree, shrub, grass, and forb species throughout the project area should respond favorably to restoration activities thereby adding to overall quality of habitat for big game.

Table 22 data can be used to rank alternatives relative to each other in their potential to provide increased levels of forage habitat within the project area and BGEA.

Table 23 displays projected effects of Jim’s Creek Savanna Restoration Project Action Alternatives against the current habitat effectiveness baseline (No Action Alternative) for big game Habitat Effectiveness Index as prescribed by Forest Plan guidelines FW-147 to 151 for high emphasis BGEAs. These values result from model output (Wisdom et al. 1986). The data reveal a slight increase (<3%) in HEf under Alternatives C or D, with a somewhat more significant increase under Alternative A (5%), and the highest increase in forage quality under Alternative E (10%). These increases in HEf have little to no effect on modeling overall index for habitat effectiveness under any Action Alternative. Because the entire Jim’s Creek Savanna Restoration Project area only comprises 4% of the Dry Pine BGEA, current modeling methods are not sensitive enough to accurately reflect benefits to big game habitat in the area resulting from proposed activities. The local effect is positive but not of large enough scale to change modeled values.

**Table 23 – HEI Comparison for Alternative Effects on Big Game Habitat – Dry Pine BGEA**

Alternatives	Individual Indices				Overall Index
	HEs	HEr	HEc	HEf	HEI
A – Proposed Action	0.93	0.31	0.71	0.38	0.53
B – No Action	0.94	0.29	0.71	0.36	0.52
C. Staged Entry	0.93	0.31	0.71	0.37	0.52
D – Multiple Methods	0.93	0.31	0.71	0.37	0.52
E – Full Restoration	0.92	0.31	0.72	0.40	0.53

Holthausen et al. (1994) concluded that expert opinion may exceed the accuracy of model output when cover/forage ratios exceed 80:20. The current cover/forage ratio for the Dry Pine BGEA is 85:15, and would only improve to 82:18 under Alternative E (full restoration alternative). Table 23 displays the overall effect to cover and forage habitat under each of the Action Alternatives. The model output is insensitive to the differences between alternatives in how they affect the overall amount of forage habitat in the Dry Pine BGEA. The model is also considered insensitive to the potential quality of native forage habitat restored under the Action Alternatives, as well as the long term nature of restored forage that would be maintained by prescribed burning. The demand for forage and the impact of deer and elk on available forage within the project area/BGEA are beginning to be quantified as a result of activities associated with the preliminary Jim’s Creek Plant and Animal Habitat Improvement Project (USDA, 2004a). Also associated with data being gathered is the response of native forage from effects of prescribed burning. Data analysis at this time is premature; however field observations and photo points confirm a high level of browsing/grazing pressure and a positive response in vegetation growth and foraging preference from the February 2005 prescribed burn (Bailey, 2005a) in one of the project area’s pine plantations.

The effectiveness of increasing big game forage habitat under any Action Alternative would be further enhanced by implementing proposed road closures. Approximately 37 miles of currently open roads would need to be closed to achieve compliance with road

density standards for the Dry Pine BGEA. Open road density would be reduced under any action alternative by implementing the three miles of proposed road closures (roads 2129.203, 367, 371, 375, and 435). Although these closures represent only 8% of the amount required to meet the minimum S&G, open road density would essentially reach zero within the project area. This is not meant to suggest that closed roads would be obliterated, but that motorized access would be restricted to administrative access and limited to an average of less than one entry per month (FW-142) to facilitate future restoration and monitoring activities.

Project effects to these MIS beyond those displayed in Table 23 are considered unquantifiable relative to the amount of habitat modified or disturbed against the amount available to big game on a daily basis in the surrounding landscape. In the context of the Dry Pine BGEA and adjacent BGEAs in surrounding the 6th field watersheds, project effects would result in a slight (albeit progressively undetectable) positive contribution to cumulative effects that have already occurred from past management actions surrounding the project area. Model output does not reflect the positive qualitative contribution of this restoration project to big game habitat with representative quantitative support. That is to say qualitative cumulative effects to big game habitat associated with any Action Alternative exceed quantitative values (Table 23).

Current ODFW biological data are not sufficient to provide an accurate estimate of the black-tailed deer population in western Oregon (ODFW 2002). Despite a perceived decline, ODFW has identified areas such as those in the vicinity of the project area as being more productive and achieving higher population densities than elsewhere in northwestern Oregon.

Recent ODFW elk population estimates indicate that state management units in the vicinity of the project area (McKenzie, Upper Deschutes, Indigo and Fort Rock) have elk herds with population numbers near their current management objectives (Castillo 2005; ODFW 2003; ODFW 2005).

Given what is currently known about local deer and elk populations, the future viability of these species should be assured as long as habitat restoration opportunities continue to be explored, and adequate protection measures such as standards and guidelines governing activities proposed by this type of project continue to be implemented.

#### Cumulative Effects

The big game habitat index values presented above, as well as the values for the individual size and spacing, road density, cover, and forage indices, account for past actions. All these numbers include the cumulative effects of the proposed actions with past timber harvesting and road building; those activities that for the most part have influenced these values. Forage produced by timber harvest is fairly ephemeral, usually

lasting no longer than 20 years or less as young, regenerated stands close canopy and shade out forage vegetation. There are no reasonably foreseeable future actions within the Big Pine BGEA that would produce additional forage (while removing cover), or reduce the amount of open roads. A Road Management Plan (USDA, 2003, 2004b) has been prepared for the Middle Fork watershed, and this plan recommends that about 446 miles of roads be closed (out of 1600 miles total) for various resource reasons and to address a reduction in road maintenance funding. These recommended road closures will occur as funds become available, and that list of roads include Roads 2129.371, 435, and 375 which are proposed for closure under all action alternatives.

### **3. General Wildlife Effects:**

Another influence of proposed activities on terrestrial wildlife is considered in the context of whether or not a species may be present at sites when physical disturbance may occur, and if they are sensitive to and thereby influenced by the presence of noise-generating equipment during implementation of this project.

The entire Jim's Creek's Creek Savanna Restoration Project represents 1.5% of the Buck Creek 6<sup>th</sup> field watershed, and less than 0.5% of the Hills Creek Reservoir 5<sup>th</sup> field watershed. Disturbance potential to individuals within local populations of any given species with a larger home range (> 1000 acres) is therefore considered low. Disturbance potential to individuals within a local metapopulation (a collection of distinct populations; see Johnson and O'Neil, 2001, page 718) of any given species with a smaller (< 60 acres) or medium (60-100 acres) home range is considered to be somewhat higher. In either case the potential is considered unquantifiable due to the lack of species inventory data plus the spatial and temporal variability associated with the variety of activities under any of the proposed action alternatives. The relative potential for disturbance to terrestrial wildlife from project activities would be greatest under Alternative E, intermediate under Alternative A, and lowest under either Alternative C or D, based on acres proposed for restoration. This effect represents the trade-off between restoring the highest or lowest amount of pine-oak savanna habitat throughout the planning area.

#### Watershed Analysis/Additional Document Support

The Middle Fork Willamette and Downstream Tributaries Watershed Analysis (USDA, 1995) provides an account of processes associated with timber harvest and effects of fire at various spatial, temporal, and intensity scales on terrestrial wildlife habitat in and near the project area. One effect associated with the Jim's Creek Savanna Restoration Project would be to reduce the amount and distribution of snags and down logs within the project area. Historic and current dead wood levels and distribution were extensively discussed in the Watershed Analysis. Throughout the terrestrial wildlife habitat analysis section in

this document (USDA, 1995, Appendix J) it was consistently recognized that in portions of the watershed such as the mixed conifer habitat (with specific reference to Jim's Creek area) current forest habitats were once characterized as having an open understory along with low levels of logs and snags. This situation was the result of frequent low intensity fires burning through habitat dominated by pines, oaks, and grass. As a result of fire exclusion the ecological character of such habitat has been altered, resulting in a beneficial influence to some wildlife species (late-successional habitat associates) and neutral or non-beneficial influences on other species.

In addition to ecological influences on wildlife and habitat associated with stand development under the absence of fire, the MFWDT WA recognized an ecological link between fire suppression and an increased risk to habitat from effects of high intensity fires. This risk is pertinent to the Jim's Creek Project area in the context of late-successional habitat connectivity across the landscape. Both the Watershed Analysis and Mid-Willamette Late Successional Reserve Assessment (MW LSRA) (USDA et al. 1998a) identified the Jim's Creek Project vicinity as serving an important role in providing habitat connectivity across the landscape between two large LSRs (RO221 and RO222). Relative to any concern pertaining to loss of habitat connectivity from wildfire, the Jim's Creek Savanna Restoration Project could actually serve to protect current and future late-successional habitat connectivity along Young's Creek and Deadhorse Creek drainages (which flank the project area) by acting as a fuel break. It has been determined that within treated portions of the project area under a restored condition as prescribed, available fuels would not likely carry a crown fire (reference to project fuels specialist report).

A third aspect associated with effects of fire exclusion discussed in the Watershed Analysis is forest encroachment on meadow habitat. This situation is described in the Jim's Creek Project EA, and activities proposed under all Action Alternatives address this loss of habitat throughout the project area.

The reader is encouraged to review the Watershed Analysis and MW LSRA for a more thorough review on these subjects. Restoration activities proposed under any of the Action Alternatives associated with the Jim's Creek Project respond to numerous recommendations made in the MFWDT WA pertaining to terrestrial wildlife habitat. For example, this project would respond to:

- 5 of 6 recommendations pertaining to vegetation management (VM1)
- 1 of 4 recommendations pertaining to connectivity (VM3)
- 2 of 2 recommendations pertaining to fire suppression - habitat diversity (NF2)
- 1 of 2 recommendations pertaining to fire suppression – TES species (NF3)

- 3 of 6 recommendations pertaining to road effects – wildlife (TR7).

Overall, implementation of Alternative E would result in the largest amount of pine/oak/savanna habitat restored to better meet the Watershed Analysis recommendations pertaining to terrestrial wildlife habitats. The effect of Alternative A would be approximately 45% less than Alternative E. The effects and support from Alternatives C and D are similar, and would be approximately 60% less than Alternative E.

#### Snags and Course Woody Material

The significance of the ecological role of snags and down wood in influencing ecosystem diversity and productivity is well addressed in the Willamette National Forest Land and Resource Management Plan (1990a). The significance of this relationship in coniferous forests of the Pacific Northwest is further emphasized by management standards and guidelines under the Northwest Forest Plan ROD (USDA/USDI, 1994; USDA/USDI, 2001; USDA/USDI, 2004a) and elsewhere throughout published literature (Hagar et al. 1996, Hallett et al. 2001, Laudenslayer et al. 2002, Lewis 1998, Muir et al. 2002, Rose et al. 2001).

Under the Willamette Forest Plan as amended by the ROD, snag habitat shall be managed at levels capable of providing for at least 40% or greater potential populations of cavity-nesting species (page C-42). Current science has questioned the validity of the potential population approach to species management, yet it remains the basis for standards and guidelines involving snag management. Strong support for identifying more appropriate amounts of snag and down wood habitat is being given to new approaches in addressing these habitat components. One such approach devoted to identifying appropriate levels of snag and down wood in selected habitat types is DecAID - the decayed wood advisor for managing snags, partially dead trees, and down wood for biodiversity in forests of Washington and Oregon (Mellen et al. 2006). DecAID has been created to help managers decide how much dead wood to provide for this part of a species habitat needs, and is designed to apply to salvage as well as green tree projects. The benefit of DecAID applied to projects involving removal (harvest) of green trees is in evaluating affected habitat types during the planning process to determine if current dead wood levels are consistent with reference conditions, and to aid in identifying dead wood management goals for projects that affect dead wood habitat throughout dominant habitat types.

Snag and dead wood habitat levels are best monitored and managed at a landscape level such as a watershed or portion thereof (Mellen et al. 2006). DecAID may be used to evaluate snag habitat on a landscape against a variety of ranges to accommodate species needs in certain habitat types. Interpretation and/or application of DecAID recommendations pertaining to dead wood becomes problematic in the context of this

restoration project because of the habitat types and fire history influencing habitat composition and structure within the Jim's Creek project area, as well as the remainder of the Middle Fork mixed conifer habitat type which only occupy relatively small portions of 6th field watersheds within which they are located. Overall however, this 25,000 acre mixed conifer habitat may be considered an appropriate sized area of similar habitat to consider when evaluating current and future levels of dead wood.

Since the Watershed Analysis (USDA, 1995) identified excessive levels of snags and down wood, a number of events throughout the 6th and 5th field watersheds surrounding (and including) the Jim's Creek project area have occurred to further increase dead wood levels across the landscape (page 4-25). These events are largely a result of lightning caused wildfires. In 1996 approximately 3,000 acres were affected by the South Zone Complex fires, resulting in additional inputs of snags and down wood across eight locations averaging 377 acres each. Between 1998 and 2003, 58 small wildfires averaging .45 acre each contributed to additional levels of dead wood in a patchy distribution throughout much of the mixed conifer habitat in four townships in the 5th field watersheds immediately surrounding the project area. Portions of the Jim's Creek planning area ranging in size from less than ¼ acre to greater than 60 acres were involved in these wildfire incidents where fire intensity ranged from mild underburning to small patches of 100% mortality. No salvage has occurred associated with these recent wildfire events. In addition to dead wood levels increasing related to effects from wildfire, effects from insects and disease have further increased this habitat component across the landscape surrounding the Jim's Creek project area. Annual aerial insect and disease detection surveys from 1996 through 2005 have documented dozens of sites across the watershed where snag habitat is increasing in a patchy distribution from effects of these mortality agents (USDA 2005).

In support of the Watershed Analysis discussion on the subject (USDA 1995), reference information extrapolated from DecAID suggests current size, abundance, and distribution of snags and down wood likely exceeds normal historic levels across portions of the project area considering habitat type(s) and historic fire regime.

Implementing the silvicultural prescription associated with any of this project's Action Alternatives would result in maintaining a full or partial no-harvest buffer in all riparian reserves, plus protection and retention of habitat features such as hardwoods and the largest conifers - many of which possess decadent features providing an arboreal dead wood habitat component. Nevertheless this project would result in reduction of dead wood habitat under all Action Alternatives.

Snags:

The reduction of existing snag habitat would occur quite suddenly under each Action Alternative, and is unavoidable due to safety issues. Many, if not most existing snags in proximity to restoration activities would present a safety risk to workers involved with implementing the silvicultural prescription. All felled snags would be left as large down wood. Depending on decay class and burning conditions, many of the felled snags may be fully or partially consumed during subsequent fuels reduction and prescribed underburning activities. Current snag abundance is estimated based on 105 stand exam plots. Exam data reveal an average of 14 snags per acre (ranging from 8 to 60 inches in diameter) throughout the planning area. About one snag per acre is greater than 20" in diameter. The majority of large standing snags are ponderosa pine remnants of the former savanna habitat condition. The majority of smaller snags throughout the area are Douglas-fir, and are a component of the developing understory. Snag distribution across the project area is patchy and variable. The relative number of both large and small snags lost under each alternative is related to the amount of area where excess trees will be removed; the loss will be greatest under Alternative E, which is approximately 89% greater than under Alternative A, and 166% greater than under either Alternative C or D.

Under the silvicultural prescription for this project, green trees less than 24" in diameter (with the exception of pines – all of which will be retained) would be removed from specified areas. Following this prescription would result in an average retention of 20 dominant trees per acre, many of which have some level of decadence and would continue to provide this type of dead wood habitat component distributed throughout the project area. The silvicultural prescription also includes replacement of large snags at levels exceeding the current average throughout the project area under all action alternatives. As many as 5 snags per acre would be created from retained trees (depending upon the degree of natural mortality) to mitigate snag loss, resulting in a 5-fold increase in large snag density over current conditions. Future replacement snags would not be created from existing dominant overstory trees of any species, pine of any age, nor trees with evidence of previous cultural use.

Within stand variability throughout the planning area influences current snag distribution. This variability would also influence the location of replacement snags, which would be provided for in a patchy rather than even distribution across the area. This prescription is common to all Action Alternatives and will assure compliance with Northwest Forest Plan guidance to maintain 40% of potential populations of cavity nesting species (USDA, USDI 1994 page C-42). It would also provide snag habitat in sufficient sizes and amounts to meet 100% of potential population levels for additional cavity nesting species having specific mitigation standards identified in the 2001 amendment to the Northwest Forest Plan (USDA, USDI 2001 Standards and Guidelines pages 33-35).

Post treatment snag sizes and quantities would also exceed levels recently provided from plot data in unharvested Douglas-fir stands such as those influencing habitat throughout the analysis area (McCain 2006). These data are presented in terms of tolerance levels and tolerance intervals described in DecAID. They reveal that 50% of individuals in all populations of species using snags in a Douglas-fir Westside Cascades-moderate habitat type can be expected to occur where an average of 4 snags greater than 20" in diameter exist. It should be noted that the objective of the Jim's Creek Savanna Restoration Project is more directed at managing historic dead wood habitat conditions rather than focusing on individual wildlife species.

Snag levels for this project were compared against those listed in DecAID for Southwest Oregon Mixed Conifer (SWOMC\_L) and Ponderosa Pine/Douglas-fir (PPDF\_L) habitat types having larger tree vegetation conditions. A review of DecAID data discloses that with one exception, current snag levels throughout the planning area are above, to well above, average snag abundance in unharvested areas within these habitat types and condition. How snag levels in the Jim's Creek planning area (JCPA) compare to DecAID data is displayed as follows:

- JCPA snags  $\approx \geq 10''$  dbh represents the 78th percentile for similar SWOMC\_L
- JCPA snags  $\geq 20''$  dbh represents the 37th percentile for similar SWOMC\_L
- JCPA snags  $\approx \geq 10''$  dbh represents the 95th percentile for similar PPDF\_L
- JCPA snags  $\geq 20''$  dbh represents the 70th percentile for similar PPDF\_L

Percentile figures refer to the percentage of plots in a given forest type that have few snags than the Jim's Creek project area. Implementing the post-restoration snag prescription of 5 snags/ac (11/ha) would raise the ranking of treated acres as follows:

- JCPA snags  $\geq 20''$  dbh representing the 74th percentile for similar SWOMC\_L
- JCPA snags  $\geq 20''$  dbh representing the 88th percentile for similar PPDF\_L

Unpublished plot data from Westside Oak and Dry Douglas-fir Forest and Woodlands habitat type has been assigned to two more specific habitat types (Mellen, 2005). These are White Oak Douglas-fir (WODF) and Westside Dry Douglas-fir (WDF). Comparing snag levels in the JCPA with data for WODF and WDF reveals further evidence that snag levels throughout the planning area are, or will be, above average for similar habitat types at a landscape level (see below).

- JCPA snags  $\approx \geq 10''$  dbh represents the 82nd percentile for similar WODF\_L
- JCPA snags  $\geq 20''$  dbh represents the 38th percentile for similar WODF\_L
- JCPA snags  $\approx \geq 10''$  dbh represents the 81st percentile for similar WDF\_L

- JCPA snags  $\geq 20''$  dbh represents the 56th percentile for similar WDF\_L

Implementing the post-restoration snag prescription of 5 snags/ac (11/ha) would raise the ranking of treated acres as follows:

- JCPA snags  $\geq 20''$  dbh representing the 92nd percentile for similar WODF\_L
- JCPA snags  $\geq 20''$  dbh representing the 79th percentile for similar WDF\_L

Down wood:

Down wood estimates for current size and distribution were made based on reasoned estimates from a combination of plot data and field reconnaissance. Tree mortality largely associated with understory self-thinning, understory competition with remnant overstory, and recent wildfire activity has resulted in an average per acre estimate of down wood as follows:

- 15 logs 5'' - 10'' in diameter averaging 30' in length = 450<sup>3</sup>/ac
- 10 logs 10'' - 20'' in diameter averaging 60' in length = 600<sup>3</sup>/ac
- 2 logs  $\geq 20''$  in diameter averaging 120' in length = 240<sup>3</sup>/ac

Smaller logs are generally in decay class I and II, while larger logs are in decay class II and III. Douglas-fir yield tables were used to calculate a range of cubic feet of material associated with these three size classes. The per acre estimate for the existing volume of down wood is:

- 5'' - 10'' logs = 75 - 90 cubic feet of dead wood / ac
- 10'' - 20'' logs = 250 - 300 cubic feet of dead wood / ac
- $\geq 20''$  logs = 600 - 700 cubic feet of dead wood / ac

These amounts reveal an average of between 925 - 1090 cubic feet per acre of down wood currently exists throughout the planning area. These amounts exist in a patchy rather than even distribution across the area.

In addition to dead wood levels associated with down logs, it is estimated that decaying wood habitat associated with stumps would cover 0.4% of areas treated under either the proposed action (Alternative A) or full restoration (Alternative E). The amount would be somewhat less under Alternatives C or D based on a lighter prescription. This estimate translates to an average of 247 cubic feet of down wood per acre in areas treated. Use of stumps throughout a range of decay classes has been documented for a wide variety of organisms (O'Neil et al. 2001, NatureServe 2005, Rose et al. 2001, Zabel and Anthony 2003). This type of dead wood provides a valuable, long-lasting habitat component that supplements the potential to maintain native biodiversity throughout the project area during the overall restoration effort.

Vesely and Tucker (2004) state a down wood average of approximately 700 ft<sup>3</sup>/ac is typical for an Oregon white oak/Douglas-fir habitat type. Volume estimates displayed above indicate an initial post-restoration range of dead wood that exceeds this average by 67% - 91%. This estimate does not factor in logging slash. Stated differently, a 40% - 48% reduction in post-restoration levels of larger down wood would still provide typical amounts as stated for similar habitat. Prescribed slash reduction prescriptions for this project should not cause consumption that would approach this level of reduction, and down wood throughout the project area would likely remain above the average estimated by Vesley and Tucker (2004).

Another way to compare down wood levels in specific habitats against natural ranges is to consider volume as percent cover. DecAID selects percent cover because it best describes down wood abundance as it relates to wildlife use (Mellen et al. 2006). Estimated down wood values for the Jim's Creek planning area converted to percent cover are as follows (quantities based on conversion values from DecAID):

- Down wood in the 5" – 10" diameter range  $\approx$  0.9% cover/ac
- Down wood in the 10" – 20" diameter range  $\approx$  1.9% cover/ac
- Down wood in the  $\geq$  20" diameter range  $\approx$  1.3% cover/ac
- Down wood  $\geq$  5" diameter  $\approx$  4.1% cover/ac
- Dead wood associated with stumps  $\approx$  an additional 0.4% cover/ac

Down wood levels for this project were compared against those listed in DecAID for Southwest Oregon Mixed Conifer (SWOMC\_L) and Ponderosa Pine/Douglas-fir (PPDF\_L) habitat types having larger tree vegetation conditions. A review of DecAID data discloses current down wood levels throughout the planning area are above, to well above, average values representative for dead wood in unharvested areas within these habitat types and condition. How down wood levels in the Jim's Creek planning area (JCPA) compare to DecAID data is displayed as follows:

- JCPA down wood  $\geq$  5" diameter represents the 74th percentile for similar SWOMC\_L
- JCPA down wood  $\geq$  20" diameter represents the 69th percentile for similar SWOMC\_L
- JCPA down wood  $\geq$  5" diameter represents the 99th percentile for similar PPDF\_L
- JCPA down wood  $\geq$  20" diameter represents the 99th percentile for similar PPDF\_L

Unpublished plot data from Westside Oak and Dry Douglas-fir Forest and Woodlands habitat type has been assigned to two more specific habitat types (Mellen, 2005). These are White Oak Douglas-fir (WODF) and Westside Dry Douglas-fir (WDF). Comparing down wood levels in the JCPA with data for WODF and WDF reveals further evidence that down wood levels throughout the planning area are, or will be, above average for similar habitat types at a landscape level (see below).

- JCPA down wood  $\geq 5''$  diameter represents the 97th percentile for similar WODF\_L
- JCPA down wood  $\geq 20''$  diameter represents the 92nd percentile for similar WODF\_L
- JCPA down wood  $\geq 5''$  diameter represents the 85th percentile for similar WDF\_L
- JCPA down wood  $\geq 20''$  diameter represents the 82nd percentile for similar WDF\_L

Dead wood summary:

Use of inventory data from unharvested plots in habitat types such as those referenced in DecAID to mimic the upper end of a natural range may be misleading due to decades of fire suppression (Mellen et al. 2006). However considering the information presented above, it is expected that dead wood levels throughout the planning area would remain above average in the natural range considered for similar habitat following initial prescribed fuels reduction and maintenance burning.

The fact that the natural disturbance regime for the Jim's Creek project area has been altered by human influence has been well documented (Winkler, 1984; USDA, 1995; Hadley, 1999; Winkler and Bailey, 2002; Bailey and Kertis, 2002; Johnson, 2005, Kirchohotes, 2006). The Northwest Forest Plan provides flexibility in forest management based on physiographic location and the role natural disturbance played in influencing the structure and composition of habitat that supported native species biodiversity (ROD pages B-1 through B-8). This project complies with Standards and Guidelines pertaining to green tree retention, snag, and down wood management on matrix land. The prescribed average of 5 larger snags per acre in this area exceeds the number considered to provide 100% population potential for cavity nesting species addressed in the ROD. Based on geographic location, habitat type(s), and fire history there is sufficient site-specific justification to support application of the Northwest Forest Plan Standard and Guideline (ROD page C-40) to leave a minimum of 120 linear feet of logs per acre greater than or equal to 16 inches in diameter across areas treated by the Jim's Creek Savanna Restoration Project under any Action Alternative. The Northwest Forest Plan

also directs that models for groups of plant associations and stand types be developed, and further directs that woody debris already on the ground should be retained and protected to the greatest extent possible. The Northwest Forest Plan (USDA/USDI, 1994, page C-40) also says that the above guidelines are meant to provide for initial guidance but further refinement will be required for specific geographic areas through planning based upon watershed analysis and the adaptive management process. This analysis, in part, constitutes this specific geographic refinement.

Effects on dead wood habitat:

Although this project does propose removal of some snag habitat due to worker safety concerns and eventual reduction in levels of down wood resulting from prescribed burning, the overall effect to this habitat component creates a negligible change relative to the amount available across the landscape. The objectives of the Jim's Creek Savanna Restoration Project is to managing for a historic habitat condition rather than being focused on individual wildlife species. The reduction of dead wood habitat subsequent to restoration activities results in a condition that is within the natural range for the affected habitat. Under a full restoration alternative (Alternative E), snag and down wood habitat components across an area representing approximately 1.5% of the mixed conifer habitat in the surrounding landscape would be subject to modification associated with project activities.

Within the Middle Fork Mixed Conifer Habitat type, past harvest activity has reduced dead wood habitat to some extent but overall levels likely remain above reference levels. Project effects would result in a minor contribution to cumulative effects that have already occurred from past management actions in mixed conifer habitat surrounding the project area. Current science and the changing trend in timber management that has occurred within the past decade, and projected for the future, should positively influence management of decaying wood as previously harvested stands redevelop, and more emphasis is placed on retention of key structural components in unharvested stands.

Dead wood habitat should exist in a sufficient amount and distribution to support the local wildlife community, including MIS such as pileated woodpecker, marten, and cavity nesters such that their ability to persist or become established would not be limited by this habitat component important to most members of the wildlife community in this area.

#### Adjacent Activities/Cumulative Effects

Past timber harvest has occurred on approximately 4400 acres of private land within the four 6th field watersheds immediately surrounding the Jim's Creek Project area. According to permit records from the Oregon Department of Forestry (ODF), harvest

activity has occurred within the past two years on approximately 6% of the private land (245 acres of regeneration harvest on 5 Units averaging 49 acres each). The ODF indicates they have no permits pending for harvest in this area. Private land in the area is virtually devoid of late-successional habitat. Current habitat on private land is a mix of post harvest early-seral and mid-seral closed canopy stands – with the majority of acreage in the latter condition class.

On federal land, timber harvest has occurred on approximately 60,500 acres (55%) of within the 5th field watershed which contains the Jim's Creek Project. From the 1940's to the 1970's approximately 23,000 acres were harvested. From the 1970's into the early 1990's approximately 37,500 acres were harvested. During the past decade the rate of timber harvest was drastically reduced. Timber sales from 1995 to 2005 have resulted in approximately 350 acres of regeneration harvest (42 Units averaging 8.3 acres each), and 257 acres of commercial thinning. Regeneration harvest activity within the past decade as a % of total previous harvest activity in this watershed is as follows: 1940's-1970's = 1.5%, 1970's-1990's = 1%, 1940's-1990's = 0.5%. Sales contributing to these totals are Boulderdash, Chinkapin, Slinky, Windfall, and Springer.

It should be noted that the Springer Timber Sale was sold under the Young'n Timber Sale EIS having a signed ROD (September 1998) that includes 477 acres of regeneration harvest plus 120 acres of shelterwood harvest. However due to a variety of contributing factors it does not appear to be reasonably foreseeable that this activity will occur. Therefore there are no other present or reasonably foreseeable projects in the vicinity of the Jim's Creek Project area that would modify habitat or otherwise contribute to cumulative effects that would affect the outcome of this analysis.

Overall, past management activities that have contributed to affect habitat throughout the watershed on a measurable scale (timber harvest, fire suppression) have had a mixed effect on terrestrial wildlife species. Generally speaking the maintenance and development of closed canopy habitat with late-successional characteristics on approximately half of the area has favored one group of species, while the conversion of the other half of the area to post replacement and mid-seral closed canopy habitat set in a patchy mosaic across the landscape has favored another group of species.

#### **4. Late-Successional Wildlife Habitat**

Late-successional forests are those exhibiting mature or old-growth forest conditions (USDA/USDI, 1994, page G-9.). The Jim's Creek project area, with the exception of the meadows and 66 acres of plantations, is composed of mature forests (see FEMAT, 1993 page IX-31), which have recently attained that status. Without any intervention, these forests would not attain old-growth habitat conditions for another 100 or more years (FEMAT, 1993 page IX-24), as they do not now contain many of the structural

conditions and species that one would typically find in an old-growth Douglas-fir forest as described in Franklin, et al., (1981).

**Issue #2 – Late-Successional Wildlife Habitat - Significant Issue - Restoration of savanna conditions would change the wildlife habitat from a closed canopy forest slowly approaching late-successional conditions to a much more open forest that would not exhibit late-successional conditions as long as prescribed or natural fire is applied to maintain savanna conditions.**

Evaluation criteria:

- amount of habitat removed or modified, by habitat type

All action alternatives, to one extent or another, would convert this closed canopy, late-successional forest to stands of trees that would still be of the same age class but which would be much more open and not provide the kind of structural habitat nor environmental conditions typically provided by a closed canopy late-successional forest.

Alternative A – Proposed Action: This alternative would restore over one third of the project area to its pre-European settlement/pre-fire suppression condition. In the process, 132 acres of late-successional habitat, closed canopy habitat would be replaced with open forest habitat, and 108 acres would be modified to a more open, but still late-successional condition. Of the 241 acres under this alternative, 55% involves modification of upland late-seral closed canopy forest, resulting in a change to late-seral open canopy structural conditions. Remaining habitat under this alternative would be modified as follows: 34% riparian late-seral closed canopy, 10% upland early-seral/meadow, 1% riparian early-seral/meadow. Treated acres would average 20% post-treatment canopy cover except for meadow acres that would average 10%, and riparian reserve acres that would average approximately 40 percent

Alternative B - No Action: Effects of the No Action alternative are somewhat dependant upon natural events and therefore are a challenge to quantify. The expected effect of no action would be to allow the former pine-oak savanna habitat to continue developing on a trajectory towards a closed canopy Douglas-fir forest habitat. Most remnant overstory pines would be lost during this transformation due to understory competition. Most larger remnant oaks would also be lost as a result of competition and old age. Ponderosa pine would become a minor component of the overall stand. Future oaks would persist in scrubby form and be restricted to the harshest growing sites.

Because the project area currently consists of an uncharacteristically high percentage of late-seral closed canopy habitat, the No Action alternative would have no effect on species dependant on such habitat. Forest encroachment on meadow habitat would

continue, but likely reach equilibrium where some meadow habitat would remain on the harshest sites. Habitat for species associated with meadow environments would continue to exist, but would not flourish after a reduction in amount of habitat. The risk of loss from catastrophic fire would continue to grow along with the accumulation of unnatural composition and levels of living and dead material compared to conditions associated with historical habitat.

Despite these scenarios there is no rationale to suggest that the No Action alternative would affect or impact non-TES wildlife species based on current habitat conditions throughout the project area and ecological requirements of any such species. Current habitat proposed for restoration would continue to provide suitable habitat for wildlife species that may be present as it evolves without human management. The development of these stands and associated dynamic nature of habitat suitability that may be subject to an unknown frequency and variety of stochastic events is considered beyond the scope of this analysis.

Alternative C – staged entry: This alternative would begin restoration on a smaller area than proposed under Alternative A, and would involve a restoration strategy that involves full implementation in two stages. It would not result in removal of closed canopy, late-successional habitat, but that habitat would be modified to a more open conditions on 171 acres. Of the 171 acres under this alternative, 56% involves modification of upland late-seral closed canopy forest. Remaining habitat under Alternative A would be modified as follows: 30% riparian late-seral closed canopy, 13% upland early-seral/meadow, 1% riparian early-seral/meadow. Treated acres would average 40% post-treatment canopy cover except for meadow acres that would average 10%.

Alternative D – multiple methods: This alternative proposes restoration on the same area as Alt C, but involves varying prescriptions. On 31 acres, late successional, closed canopy habitat would be changed to an open forest habitat, and 140 acres of late-successional habitat would be modified to a more open, but still late-successional condition. Of the 171 acres under this alternative, 56% involves modification of upland late-seral closed canopy forest – 18% of which would result in a change to late-seral open canopy. Remaining habitat under Alternative D would be modified as follows: 30% riparian late-seral closed canopy, 13% upland early-seral/meadow, 1% riparian early seral/meadow. Under this alternative 38% of treated acres would average 20% post-treatment canopy cover, 29% would average 40% canopy cover, 24% would average 60% canopy cover, and 9% would average 10% canopy cover. Canopy cover throughout treated riparian reserves would average approximately 40%.

Alternative E – Full Restoration: This alternative is similar in concept to Alternative A except at a greater scale. About 323 acres of closed canopy, late-successional, habitat

would be replaced with open forest habitat and 131 acres would be modified to a more open, but still late-successional condition. Of the 455 acres treated with excess tree removal, 71% involves modification of upland late-seral closed canopy forest – resulting in a change to late-seral open canopy. Remaining habitat under Alt A would be modified as follows: 22% riparian late-seral closed canopy, 7% upland early-seral/meadow, <1% riparian early-seral/meadow. Treated acres would average 20% post-treatment canopy cover except for meadow acres that would average 10%, and riparian reserve acres that would average approximately 40%.

### 5. Threatened, Endangered, and Sensitive Terrestrial Species

The following discussion is a summary of the material contained in the Terrestrial Fauna Biological Analysis/Evaluation report (Davis, 2006b) contained in the Analysis File for this project.

This discussion estimates potential effects to proposed, threatened, endangered or sensitive (TE&S) fauna listed in the Region 6 Regional Forester’s Federally Listed or Proposed, and Sensitive Species Lists (dated July 21, 2004) with documented or suspected occurrences on the Willamette National Forest. Biological evaluations of the potential effects to threatened, endangered and sensitive fish and flora are in separate documents prepared by this project’s Fish Biologist and Botanist. Table 24 lists the T, E, or S species that occur on the Middle Fork District, shows their likelihood of occurring in the planning area, and indicates whether the action alternative may have some negative effects upon such species.

**Table 24 Threatend, Endangered, or Sensitive Species Occuring on the Middle Fork District, the liklihood of them occurring in the planning area:**

SPECIES	Habitat Present (B,R,F,D)*	Occupancy Status	Conflicts?
			Action Alts
Northern Spotted Owl <i>Strix occidentalis caurina</i>	B,R,F,D	Occupied	Potential Conflict
Northern Bald Eagle <i>Haliaeetus leucocephalus</i>	No		
Least Bittern <i>Ixobrychus exilis</i>	No		
Bufflehead <i>Bucephala albeola</i>	No		
Harlequin Duck <i>Histrionicus histrionicus</i>	No		
American Peregrine Falcon	F,D	Occupied	No Conflict

<b>SPECIES</b>	<b>Habitat Present (B,R,F,D)*</b>	<b>Occupancy Status</b>	<b>Conflicts? Action Alts</b>
<i>peregrinus anatum</i>			
Yellow Rail <i>Coturnicops noveboracensis</i>	No		
Black Swift <i>Cypseloides niger</i>	No		
Baird's Shrew <i>Sorex bairdii permiliensis</i>	B,R,F,D	Unknown	Potential Conflict
Pacific Shrew <i>Sorex pacificus cascadenis</i>	B,R,F,D	Unknown	Potential Conflict
Wolverine <i>Gulo gulo</i>	F,D	Unknown	No Conflict
Fisher <i>Martes pennanti</i>	B,R,F,D	Unknown	Potential Conflict
Pacific Fringe-tailed Bat <i>Miotis thysanodes vespertinu</i>	R,F	Unknown	Potential Conflict
OR Slender Salamander <i>Batrachoseps wrighti</i>	B,R,F,D	Unknown	Potential Conflict
Cascade Torrent Salamander <i>Rhyacotriton cascadae</i>	No		
Foothill Yellow-legged Frog <i>Rana boylei</i>	No		
Oregon Spotted Frog <i>Rana pretiosa</i>	No		
Northwestern Pond Turtle <i>C. marmorata marmorata</i>	No		
Mardon Skipper <i>Polites mardon</i>	B,F,D	Unknown	No Conflict
Crater Lake Tightcoil <i>Pristiloma arcticum crateris</i>	B,R,F,D	Unknown	Potential Conflict

\* B = breeding/nesting/denning habitat R = roosting/cover habitat F = foraging habitat D = dispersal habitat  
A discussion of the effects of the proposed project on TES species follows.

### Northern Spotted Owl

Northern spotted owl effects are highlighted here because those effects were identified as an issue in this analysis, and the spotted owl is a management indicator species (see discussion above) and as such serves as a surrogate for effects to a host of late-successional animal species.

**Habitat and Ecology:** The northern spotted owl is a species strongly associated with old-growth forests containing a component of large diameter Douglas-fir. These forest stands commonly provide a variety of structural features such as large diameter trees having central cavities, dense canopies with a high level of vertical and horizontal diversity, and an abundance of snags and down logs (Thomas et al. 1990). Stands with all these characteristics provide the best suitable (nesting, roosting, foraging) habitat for spotted

owls. However, all of the above characteristics may not need to be present for spotted owls to make use of an area as nesting, roosting or foraging habitat. The owl's affinity to old-growth forest types may result from adaptation and niche partitioning of this species to foraging on prey commonly present in such stands under lack of predation pressure and interspecies competition typical of more open areas (USDI 1992). Nevertheless, spotted owls have been known to forage short distances into harvested openings from a forested edge if a prey is available (Carey 2004).

Dispersal-only habitat for the northern spotted owl generally consists of mid seral stage stands between 40 and 80 years of age with canopy closures of 40 percent or greater and trees with a mean diameter of 11 inches or greater. Older stands lacking structural development that supports nesting may be considered dispersal habitat, however on some occasions may provide roosting or foraging opportunities for the species. Spotted owls generally use dispersal habitat to move between blocks of suitable habitat or, for juveniles, to disperse from natal territories (Forsman et al. 2002, USDI 2004a).

Current knowledge of habitat use by spotted owls on the Middle Fork District, and elsewhere throughout their range, confirms that much of the project area where restoration activities are proposed has developed into suitable spotted owl habitat (capable of providing nesting, roosting, and foraging opportunities). Based on what is currently known about habitat use, and supported by on-site evidence of pre-fire suppression habitat conditions, the former Jim's Creek savanna was too open to function as suitable habitat for this species. However, historic habitat may have supported some foraging use, especially considering the absence of barred owls from this area during that time. Under the silvicultural prescription for any action alternative, a greater number of trees would remain throughout all treated areas than what existed in the historic savanna condition.

The project area was surveyed according to current protocol for spotted owl presence during the summers of 2004 and 2005. No spotted owl occupancy was recorded (i.e. there are no owls nesting in the planning area). However, two historical activity centers, one about one half mile southwest and the other about one mile north of the planning area, were documented to be occupied and the planning area is at least partially within a 1.2 mile home range radius of both these activity centers. It is likely that these owls currently use the Jim's Creek area for foraging.

This project is consistent with current standards established for projects that would specifically affect the northern spotted owl and its habitat. The standards were established for the Willamette Province by the Level 1 Consultation Team and are listed in both the Programmatic Biological Assessment (BA) (USDA et al. 2004) and the subsequent Biological Opinion (BO) (USDI 2005) that address spotted owl habitat

modification projects proposed for implementation during FY/CY 2005 and 2006. The Jim's Creek Savanna Restoration Project is among the projects identified in the BO, which also considered new information from the 5-year species status review and other recent documents (USDI 2004a, Anthony et al. 2004, Courtney et al. 2004). The literature updates our knowledge related to northern spotted owl biology, ecology, and connected issues such as climate change on regional vegetation patterns, sudden oak death syndrome, West Nile virus, wildfire, barred owls, timber harvest, and range wide population decline as presenting individual and cumulative threats to the species.

Of those concerns and threats listed above, it may be that in the vicinity of the Jim's Creek Project area timber harvest, wildfire, and barred owls affect spotted owls and their habitat to a greater degree than the others. This analysis reviews, incorporates, and addresses new information to the extent appropriate for the scope and scale of this project. Effects not specifically discussed in this document pertain to issues that cannot be addressed at the project scale, but are further discussed and analyzed in the 2005 – 2006 Habitat Modification BA and BO which provide a thorough analysis of new information pertaining to potential threats to this species in the Willamette Province (USDA et al. 2004, USDI 2005).

#### Spotted Owl Habitat Analysis Area

Effects to this specie have been reviewed by focusing on habitat conditions at two scales. A landscape level analysis was conducted to assess habitat suitability and connectivity between LSRs RO221 and RO222 along pathways that include the Jim's Creek planning area. Within the landscape level analysis area, an analysis of habitat suitability in the home ranges for known owl pairs was also conducted. This area included a 1.2 mile radius traditional home range around spotted owl activity centers, and identified which activity centers could be affected by proposed restoration activities. The home range analysis also provided data to compare the condition of occupied habitat surround the Jim's Creek Planning Area against the condition of occupied habitat within the Willamette Province.

On April 13, 1994 the USDA Forest Service and the USDI Bureau of Land Management signed a Record of Decision (ROD, USDA/USDI, 1994). The cornerstone of this conservation strategy is to provide an array of late-successional reserves (LSR) and a network of riparian reserves providing long term late-successional forest habitat available to the spotted owl as well as other old-growth dependent wildlife and plant species to ensure their viability is maintained through time. Along with this, the ROD Standards and Guidelines defined matrix land as land where most scheduled timber harvest could occur. Prior to the establishment of the array of LSRs under the ROD, the Secretary of Interior had designated critical habitat within the range of the northern spotted owl in the

form of Critical Habitat Units (CHUs) which are recognized in addition to those areas delineated as LSRs. In most areas there is considerable overlap between LSR and CHU acres, however many acres within CHUs are also designated as matrix.

The Mid-Willamette and South Cascades LSR Assessments (USDA/USDI. 1998a,b) present thorough discussions of LSRs and CHUs with respect to their current and projected functionality and overall contribution to meeting the needs of the northern spotted owl and other late-successional dependent species in the landscape surrounding the Jim's Creek Savanna Restoration Project area. The project is consistent with Northwest Forest Plan Standards and Guidelines. Standards and Guidelines associated with habitat components such as snags and down wood are addressed in the project EA and wildlife report. The 680 acre Jim's Creek Project area is designated as matrix land, and consists of upland (66%) and riparian reserve (33%) habitat. None of the project area is within the LSR network designated by the ROD or within designated critical habitat.

On May 26, 2004 a meeting was held with the Willamette Province Level One Team to discuss consultation aspects of the Jim's Creek Project. Topics addressed included habitat suitability, history of spotted owl use, proposed restoration treatment(s), and an approach to effects analysis. Based on USFWS input during that meeting (Thraillkill, 2004) a decision was made to evaluate effects on suitable spotted owl habitat from modification associated with restoration activities by focusing on riparian reserves and upland habitat condition within 6<sup>th</sup> field watersheds encompassing the landscape between the project area and nearby large LSRs. Five 6<sup>th</sup> field watersheds were selected to be included in the Jim's Creek spotted owl habitat analysis area. These watersheds were selected based on their current or potential ability to provide late-successional habitat connectivity between LSRs RO221 and RO222 along pathways that could include the Jim's Creek Project area.

Effects of proposed restoration activities have been evaluated based on the following objective and subsequent questions:

Objective: Conduct riparian reserve and other protected allocation analysis focusing on current and projected spotted owl habitat (OHAB) connectivity condition between Jim's Creek Project area and adjacent LSRs within five 6<sup>th</sup> field watersheds.

- 05-01 Coal Creek
- 05-02 Middle Fork Willamette River/Buck Creek
- 02-01 Upper Hills Creek
- 01-06 Upper Middle Fork Willamette River/Echo Creek
- 01-05 Staley Creek

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The following questions pertaining to OHAB were addressed in this analysis:

- What is the current amount of suitable, dispersal, and non OHAB within riparian reserves, and where is it?
- What is the current amount of suitable, dispersal, and non OHAB outside riparian reserves, and where is it?
- What is the current amount of suitable, dispersal, and non OHAB in LSRs (both 100ac and large), and where is it?
- What is the current amount of suitable, dispersal, and non OHAB in CHU, and where is it?
- What is the current amount of suitable, dispersal, and non OHAB in riparian reserve, “protected” allocation, and on “unsuited” soils, and where is it?
- How would these values change under each Jim's Creek Project Action Alternative?

Result of this analysis and habitat maps of the analysis area can be found in Table 2.2 and Figures 1 and 2 of the Terrestrial Fauna Biological Analysis/Evaluation (Davis, 2006b).

Nesting, roosting, and foraging (NFR) owl habitat modified by this project is located within a mixed conifer habitat type with some current characteristics more representative of NRF habitat that may be found elsewhere within the range of the northern spotted owl such as the portions of the Klamath Province and Southwest Oregon (USDI 1994, Chappell et al. 2001). Abundant evidence exists throughout the Middle Fork mixed conifer habitat type, and particularly within the Jim's Creek Project area, indicating historic habitat characteristics for this area that could be considered similar to some of those found in dry eastern Cascades environments (Johnson and O'Neil 2001).

NRF habitat characteristics within each of these three aforementioned environments is recognized to vary somewhat from those associated with the Westside Lowlands Conifer-Hardwood Forest habitat type (O'Neil et al. 2001) more common to the remainder of the Middle Fork District. Average overstory tree size, along with amounts of canopy closure, understory, and large down wood is considered to vary greatly when attempting to define NRF based on geographic variation within the range of the northern spotted owl and subsequent influence of habitat types and plant associations (Atzet et al. 1996, McCain and Diaz 2002, O'Neil et al. 2001, Courtney et al. 2004).

Although the Jim's Creek Savanna Restoration Project action alternatives would modify current NRF habitat to one extent or another by removing a large percentage of existing trees, some potential for use by northern spotted owl would be provided under a restored habitat setting. Foraging (and to a lesser extent roosting) habitat characteristics

associated with known use in more open and drier environments (Courtney et al. 2004) would occur throughout the project area. The retention of legacy trees and other components of the restoration prescription under any Action Alternative would restore spatial heterogeneity to habitat within the Jim’s Creek portion of a larger mixed-conifer landscape. Habitat heterogeneity in this context has been suggested to be “the key to restoration of forest health and low intensity fire regimes while retaining patches of complex forests that benefit owls and their prey” (Carey 2004). The known presence of barred owls within the project area may, however, affect this foraging/roosting potential, or result in encounters between barred owls and spotted owls from nearby territories. These two species have been recognized as food competitors (Hamer et al. 2001). The extent or outcome of competition for resources between these species cannot be predicted based on current science. The degree to which barred owls compete with spotted owls has been identified as a critical question in need of addressing (Courtney and Franklin 2004). Some investigations are underway or being considered that should lead to a better scientific understanding of this subject.

The two spotted owl activity centers are located within 1.2 miles of the proposed activities. Spotted owl activity center #1088 lies southwest of the project area. Approximately 40% of the Jim’s Creek Project area is within 1.2 miles of this activity center. Spotted owl activity center #3235 lies northeast of the project area. Approximately 30% of the Jim’s Creek Project area is within 1.2 miles of this activity center. About 30% of the project area falls outside the 1.2 mile home range radii for these two activity centers. The entire project area is beyond a 0.7 mile home range radius for each activity center. A 0.7 mile radius is considered to be the core home range for northern spotted owls in this portion of their range, and an area where the amount and quality of suitable habitat is particularly important for supporting resident owls. Alternative effects on the amount of habitat within home ranges for these two sites are listed in the following Table 25.

**Table 25** – Effects of Alternatives on suitable northern spotted owl habitat for affected home ranges – 1.2 mile radius from activity center

<b>Northern Spotted owl habitat by Alternative</b>				
<b>Alternative</b>	<b>Activity Center</b>			
	1088		3235	
	Suitable acres	Percent of home range	Suitable acres	Percent of home range
A –proposed action	1049	36	1793	62

<b>Northern Spotted owl habitat by Alternative</b>				
<b>Alternative</b>	<b>Activity Center</b>			
	1088		3235	
	Suitable acres	Percent of home range	Suitable acres	Percent of home range
B – No Action	1257	43	1793	62
C	1108	38	1793	62
D	1108	38	1793	62
E	1044	36	1673	58

Recent NSO survey efforts indicate that ground based restoration activities proposed under any Action Alternative are beyond the disruption distance, a design criteria, listed in the BO for spotted owls (USDI 2005). Helicopter activity associated with yarding under any Action Alternative would occur within 0.5 mile of suitable owl habitat not covered by the 2004-2005 owl survey. This habitat is west/northwest of the project area along a flight path between the yarding landing located within the project area, and the service landing located at a quarry along Road 2129 approximately 1 mile west of the project area.

All Action Alternatives would ultimately remove suitable upland spotted owl habitat and degrade riparian reserve habitat within the project area. This removal and degradation would essentially be permanent considering the proposed periodic underburning to maintain the open nature of the future savanna forest.

**Issue #2 – Late-Successional Wildlife Habitat - Significant Issue - Restoration of savanna conditions would change the wildlife habitat from a closed canopy forest slowly approaching late-successional conditions to a much more open forest that would never again exhibit late-successional conditions as long as prescribed fire is applied to maintain savanna conditions.**

Evaluation Criteria:

- acres of northern spotted owl habitat removal
- percentage of suitable habitat within activity site home ranges (home range viability)

Alternative A – Proposed Action: This alternative would remove 133 acres of currently suitable (NRF) spotted owl habitat and downgrade up to 59 acres of currently suitable

spotted owl habitat from the partial harvest of riparian areas. This alternative would reduce the percentage of suitable habitat in home ranges to 36 percent for site 1088 and would not affect the home range of site 3235.

Alternative B - No Action:- No removal or degradation of currently suitable (NRF) spotted owl habitat would occur. This alternative would not reduce the percentage of suitable habitat in home ranges for sites 1088 and 3235; they would remain at 43 percent and 62 percent respectively.

Alternative C – staged entry: This alternative would not remove any currently suitable (NRF) spotted owl habitat initially, but could result in the removal of 132 acres of suitable habitat if partial removal of excess trees is determined to be inadequate to provide for successful savanna restoration. This alternative would downgrade up to 132 acres of currently suitable spotted owl habitat from the partial harvest of riparian areas. This alternative would reduce the percentage of suitable habitat in home ranges to 38 percent for site 1088 and not reduce the percentage of suitable habitat in the home range of site 3235.

Alternative D – multiple methods: This alternative would remove 30 acres of suitable spotted owl habitat, but could result in the removal of an additional 102 acres if the partial removal of excess trees is determined to be inadequate to provide for successful savanna restoration. The alternative would downgrade about 102 acres of suitable spotted owl habitat from the partial removal of excess trees and the partial harvest of riparian areas. This alternative would reduce the percentage of suitable habitat in home ranges to 38 percent for site 1088 and not reduce the percentage of suitable habitat in the home range of site 3235.

Alternative E – full restoration: This alternative would remove 321 acres of suitable spotted owl habitat and downgrade 71 acres of suitable spotted owl habitat from the partial harvest of riparian areas. This alternative would reduce the percentage of suitable habitat in home ranges to 36 percent for site 1088 and 58 percent for site 3235.

Effects from all action alternatives would reduce the 1.2 mile home range condition to below 40% suitable habitat for one activity center (1088). The reduction is the same for Alternatives A and E, as well as for Alternatives C and D. Only Alternative E would reduce suitable habitat near the second activity center (3235) and the 1.2 mile home range condition would retain about 58 % of suitable habitat, well above the 40% threshold of concern. Spotted owl home ranges in the Willamette Province have typically been considered to incorporate a 1.2 mile radius around an owl activity center, and that at least 40% of the area within that home range should provide suitable habitat in order to support successful nesting. The 40% suitable owl habitat within 1.2 miles of an activity

center was once considered a viability threshold but is now recognized as a measure of fitness for owls (Courtney et al. 2004).

Analysis of Significance: This analysis revealed the amount of current suitable spotted owl habitat as a percent of the Jim's Creek owl analysis area is consistent with a similar range-wide estimate. The analysis also revealed the capability of Federal land to provide suitable habitat within the Jim's Creek owl analysis area is considerably greater than elsewhere throughout Willamette Province or the NWFP range of the spotted owl. Current conditions throughout the Jim's Creek spotted owl habitat analysis area are sufficient to support occupancy and dispersal of owls across the landscape, and should become more so as capable habitat continues to develop. The overall effect of this project on spotted owl habitat within the analysis area under any of the Action Alternatives is of such a small scale it becomes barely discernible.

Nevertheless, as described in this analysis, this project does involve removal and downgrading of suitable spotted owl habitat from within the project area under each of the Action Alternatives. This habitat modification would also affect suitable habitat within one or more spotted owl home ranges under each Action Alternative.

Current Forest Plan standards and guidelines governing management of this and surrounding areas provide direction that should provide for the long term maintenance of amount and distribution of potentially suitable habitat for the northern spotted owl. Because of the location of harvest and non-harvest allocations, it is unlikely that cumulative effects would influence the ability of local populations to persist, or become established, by eliminating demographic linkages beyond the species dispersal capabilities. There is little difference between the action alternatives in the long-term cumulative effects any one may have on this species. Cumulative effects associated with the Jim's Creek Project have been incorporated into the cumulative effects considered in both the Willamette Province BA (USDA /USDI. 2004) and BO (USDI 2005) covering 2005-2006 projects that would modify spotted owl habitat.

Consultation Results:

Based on best available information at the time, 400 acres of habitat removal (from terrestrial excess tree removal) and 40 acres of habitat downgrade (from partial harvest of riparian reserves) were submitted for this project in the Willamette Province Habitat Modification BA (USDA/USDI. 2004b) which constitutes consultation with the US Fish and Wildlife Service. Those amounts represent 92% and 1.5% of the total amount submitted for consultation under those activities respectively. Because the Jim's Creek Restoration Project involves removal and/or downgrading of currently suitable habitat, it is determined, for the purposes of USFWS consultation that implementing any of the

Action Alternatives may affect, and is likely to adversely affect northern spotted owls. This project would have no effect on designated critical habitat.

The USFWS issued a Biological Opinion for calendar years 2005 and 2006 habitat modification activities within the Willamette Province on March 29, 2005 (USDI, 2005). This Biological Opinion included the Jim's Creek Restoration project. The Biological Analysis for this project (see the Analysis File) indicated that implementation of all action alternatives would result in a "may affect, likely to adversely affect" call for the northern spotted owl.

The adversely affect determination for spotted owls was made because the proposed action results in the removal of suitable habitat. As explained in the Purpose and Need section of this EA, and the Silviculture Prescription (Bailey, 2005b) and Terrestrial Wildlife Biological Evaluation (Davis, 2006a) in the project's Analysis File, this degree of habitat modification is needed to improve the long-term structure and biodiversity of these stands. This habitat removal would be permanent considering the prescription to periodically underburn the restored forest to make sure it remains open. The proposed actions should not result in direct harm to individual spotted owls.

#### Cumulative Effects:

Timber harvest activity has occurred on approximately 4400 acres of private land within the four 6th field watersheds immediately surrounding the Jim's Creek Project area. According to Oregon Department of Forestry permit records, harvest activity has occurred within the past two years on approximately 6% of this private land (245 acres of regeneration harvest on 5 Units averaging 49 acres each). There are no current permits issued, nor requests received, for future harvest in this area. There is essentially no late-seral habitat remaining on private land in this area. The composition of habitat on private land is a mix of post replacement (early-seral) and mid-seral closed – with the majority of acreage falling under the latter condition class.

Timber harvest activity has occurred on approximately 60,500 acres (55%) of federal land within the 5th field watershed containing the Jim's Creek Project area. For the period between 1940's-1970's approximately 23,000 acres were harvested. For the period between 1970's-1990's approximately 37,500 acres were harvested. During the past decade the rate of timber harvest has been drastically reduced. Recent (1995-2005) timber sales in this area have resulted in approximately 350 acres of regeneration harvest (42 Units averaging 8.3 acres each), and an additional 257 acres of commercial thinning. Sales contributing to these totals are Boulderdash, Chinkapin, Slinky, Windfall, and Springer. The contribution of recent regeneration harvest activity as a % of total previous harvest activity in this watershed is as follows: 1940's-1970's = 1.5%, 1970's-1990's = 1%, 1940's-1990's = 0.5%.

It should be noted that the Springer Timber Sale was sold under the Young'n Timber Sale EIS having a signed ROD (September 1998) that includes 477 acres of regeneration harvest plus 120 acres of shelterwood harvest. However due to a variety of contributing factors it does not appear to be reasonably foreseeable that this activity will occur. Therefore there are no other present or reasonably foreseeable projects in the vicinity of the Jim's Creek Project area that would modify habitat or otherwise contribute to cumulative effects that would affect the outcome of this analysis.

The changing trend in timber management that has occurred throughout the analysis area within the past decade, and projected for the future, should positively influence occupancy of suitable habitat for the northern spotted owl as previously harvested stands redevelop; and more emphasis is placed on recruitment of key structural components missing from harvested stands, retention of key structural components present in unharvested stands, and restoration/maintenance of special habitats as key components of biodiversity at a landscape level. However, long-term effects of the Jim's Creek Savanna Restoration Project may not be locally positive for the spotted owl as habitat throughout the project area recovers to a condition that supports a diverse assemblage but may not favor northern spotted owls.

## **6. Land Birds/ Neotropical Migrants**

Land bird species exhibit a dramatic response to the height, seral stage, canopy structure, and spatial distribution associated with forest habitat where greater numbers of birds are associated with more complex heterogeneous forested landscapes (Altman 1999). The current amount of forested and open ecotonal habitat characteristic throughout the project area should be attractive for use by a variety of avian species (Gilbert and Allwine 1991). However effects of past management practices – specifically fire suppression – have resulted in simplification of habitat throughout this area as a uniform canopy dominated by Douglas-fir closes in and induces mortality throughout the remnant overstory trees dominated by ponderosa pine, and encroaches on open spaces once supporting a healthy distribution of larger oaks.

The importance of habitat associated with hardwood trees and shrubs has been widely documented in published literature as one of the leading factors influencing bird community composition in conifer-dominated landscapes such as found around the Jim's Creek project area (Csuti et al. 1997, O'Neil et al. 2001, Marshall et al. 2003). A direct positive correlation has been shown to exist between abundance and distribution of hardwoods, and abundance and diversity of birds.

Management actions such as those proposed under any of this project's Action Alternatives are recognized as a key component of a conservation strategy for land birds in coniferous forests of western Oregon (Altman 1999). These actions can be considered

particularly important when they involve restoration of habitat associated with the Middle Fork Mixed Conifer type. Of which certain components such as Oregon White Oak Woodlands have been recognized as high priority habitats when considering maintenance and restoration of biodiversity (Campbell 2004, Larsen and Morgan 1998, Vesely and Tucker 2004). It has been stated that within the Pacific Biome, mature coniferous forest and oak habitats stand out as supporting the most avian species of continental importance (Rich et al. 2004). Species listed in Table 4 such as band-tailed pigeon, olive-sided flycatcher, and western bluebird are considered focal in the effort to maintain functional ecosystems that support a diverse assemblage of land birds throughout this area.

#### Direct and Indirect Effects

For this review, effects to this group of species from proposed activities are considered limited to within the project planning area. Consideration of project effects to native bird species from proposed activities is directed to the potential for habitat modification and disturbance to occur associated with restoration sites. These activities may result in loss or displacement of individuals that could be occupying habitat during implementation of proposed activities such as falling, yarding, and prescribed burning. The number of individuals and/or species potentially affected by proposed activities is unknown and considered unquantifiable without reliable survey data. Based on the extent of restoration proposed under each Action Alternative, short term risks to individuals that may be present and negatively affected by project activities can be considered greatest under Alternative E, intermediate under Alternative A, and lowest under either Alternative C or D.

Given these considerations, both short and long-term suitability of open forest, meadow, and edge habitat in and near proposed treatment areas should improve for the majority of bird species that are likely to forage and nest in this area – albeit on a small scale compared to the surrounding landscape. The effect would be greatest under Alternative E, intermediate under Alternative A, and lowest under either Alternative C or D.

#### Cumulative Effects

Current Forest Plan standards governing management of this area provide direction that should ensure the long-term maintenance of amount and distribution of suitable habitat for native resident and migratory land bird species. Due to the location of treated and untreated areas within the planning area, it is unlikely that cumulative effects would influence the ability of local populations of any such species to persist (or become established) by eliminating demographic linkages beyond these species' dispersal capabilities.

## 7. Survey and Manage, and other 2001 ROD species/habitat (USDA, USDI 2001).

Species discussed below were compiled from the 2003 Annual Species Review (IM-OR-2004-034) and incorporates those vertebrate and invertebrate species whose known or suspected range includes the Willamette National Forest according to the following documents: Survey Protocol for the Great Gray Owl within the range of the Northwest Forest Plan v3.0, January 12, 2004; Survey Protocol for the Red Tree Vole v2.1, October 2002; Survey Protocol for S&M Terrestrial Mollusk Species From the Northwest Forest Plan v3.0, 2003. The listing below includes category A and C species; there are no known category B, D, E, or F species to consider in this area.

### Survey and Manage Species

Because of territory sizes for this group of species (with the exception of Crater Lake tightcoil), and the position of Jim's Creek planning area on the landscape, effects from proposed activities are considered in relation to the 6th field watersheds surrounding the planning area.

Great gray owl (*Strix nebulosa*): Under the 2001 amendment to the Northwest Forest Plan (USDA, USDI 1994) the status of the great gray owl changed from a protection buffer species to a Category C Survey and Manage species (USDA, USDI 2001). The species was changed to a Category A species following the 2002 Annual Species Review where it remains considered rare, and for which pre-disturbance surveys are practical if habitat is present.

A survey of suitable nesting habitat associated with the Jim's Creek Planning Area was initiated in 2003 based on survey protocol trigger criteria and methodology. The survey was completed in July 2004, and meets requirements contained in the current protocol (Version 3.0 January 2004). Although great gray owls are known to occur elsewhere within the Buck Creek 6th Field Watershed at nest sites documented within the past decade, survey results failed to confirm additional sites or occupancy. The nearest known site is approximately two miles from the project area, and will not be affected by any proposed activities.

Suitable habitat within the project area is determined to be currently unoccupied based on survey results. Proposed restoration activities are expected to result in loss of some snags that could function as nesting habitat for this species within and immediately adjacent to treatment areas. This negative effect will be countered by restoration activities that result in improved foraging habitat for this species. This benefit would be greatest under Alternative E, followed by Alternatives A, C and D.

Crater Lake tightcoil (*Pristiloma arcticum crateris*): The Crater Lake tightcoil has been listed as a Survey and Manage species since the 1994 Northwest Forest Plan ROD

(USDA, USDI 1994). Under the 2001 ROD (USDA, USDI 2001) it was classified as a Category B species. The species was changed to a Category A species following the 2002 Annual Species Review where it remains considered rare, and for which pre-disturbance surveys are practical if habitat is present. This species is also included on the Regional Forester's Sensitive Species List, and a more thorough discussion of how proposed activities may impact this species is conducted in the biological evaluation for this project.

Suitable habitat for this species exists in a very small portion of the project area (approximately 0.5%) and is associated with perennially wet areas within riparian reserves. Mitigation measures that protect habitat for this species are incorporated into the Silvicultural Prescription for all Action Alternatives. Because this proposed restoration project would implement measures that should maintain microclimate conditions in habitat for this species, each of the three criteria necessary to trigger a survey are not met therefore surveys for Crater Lake tightcoil are not required.

Regardless of the limited amount of suitable habitat and mitigation measures identified that should protect this species and its habitat, there remains some risk to undetected individuals from effects associated with prescribed burning activities. The risk potential is equal under all Action Alternatives, considered negligible, and should not influence the current or potential persistence of this species in habitat within the project area.

Red tree vole (*Arborimus longicaudus*): The red tree vole was initially listed as a Survey and Manage species in the 1994 Northwest Forest Plan ROD (USDA, USDI 1994). In the 2001 ROD the red tree vole was classified as a Category C species. Under that classification it was considered uncommon, where pre-disturbance surveys were considered practical, and where survey requirements applied across the known or suspected range of the species. Based on survey results that revised the understanding of occurrence, distribution, and habitat use, the 2003 Survey and Manage Annual Species Review removed the red tree vole from the Survey and Manage list within the Mesic Zone portion of its range. The Jim's Creek Savanna Restoration Project is within the Mesic Zone therefore Survey and Manage requirements for this species do not apply to this project.

Suitable habitat for this species will be exposed to disturbance associated with proposed restoration activities. Negative effects to this species or its habitat from proposed activities should have little impact on the local population in this area where the persistence of red tree voles is shown to be of no concern based on Northwest Forest Plan land allocations and Standards and Guidelines.

**Other ROD Species/Habitat:**

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Cavity-nesting birds - white-headed woodpecker, black-backed woodpecker, pygmy nuthatch, and flammulated owl:

The white-headed woodpecker, black-backed woodpecker, pygmy nuthatch, and flammulated owl will not be sufficiently aided by applying mitigation measures for riparian habitat protection or other elements of the Northwest Forest Plan (USDA, USDI 2001 and 2004). These four species occur on the periphery of the range of the northern spotted owl on the east slope of the Cascade Range in Washington and Oregon. Additionally, the white-headed woodpecker and flammulated owl occur in the Klamath Provinces in northwestern California and southwestern Oregon.

Although these species are generally not considered with Westside Oregon Cascades habitat, key characteristics of habitat (particularly species composition) utilized by each of these species can be considered to exist in portions of the Middle Fork Mixed Conifer Habitat Type including the Jim's Creek Project area. Based on closely or generally recognized habitat associations for these special status species (USDA, USDI 2001 and 2004, O'Neil et al. 2001, NatureServe 2005) potential habitat for white-headed and black-backed woodpeckers along with flammulated owl is considered present in the project area. There is a low likelihood however that the pygmy nuthatch would occur this far west of its documented range.

Surveys are not required for these species, and no confirmation of their occurrence within the project area exists in recent or historic sighting reports.

To ensure the distribution and numbers of all four species do not decline on BLM Districts and National Forests within the range of the northern spotted owl, adequate numbers of large snags and green-tree replacements for future snags in appropriate forest types within the range of these four species will be maintained in sufficient numbers to maintain 100 percent of potential population levels of these four species (USDA, USDI 2001 and 2004).

This project responds to Standards and Guidelines pertaining to habitat management for these species. The silvicultural prescription includes protection measures for current snag and defective tree habitat, and provides for recruitment of future snag habitat.

Considering the appropriate forest types and fire history associated with the Jim's Creek Project area, sufficient snag habitat for these species should continue to exist across the landscape despite the loss of some snags during implementation of this project's restoration activities as a result of logging feasibility and worker safety concerns.

The influence of this project on these species is considered either neutral or beneficial. Beneficial influences are generally associated with improved foraging habitat. The wildlife specialist report for this project contains a discussion of snag management and

how this project's silvicultural prescription contributes to managing this habitat component at a landscape level.

Bat roosts – caves, mines, and abandoned wooden bridges and buildings: There are no caves, mines, abandoned wooden bridges or buildings within the project area that would need to be protected from activities associated with this project.

Project Effects and Cumulative Effects to Survey and Manage Species:

Restoration activities proposed by this project include measures that maintain and protect habitat components important to support potential use by Survey and Manage, and other ROD Species. Implementing project activities under any Action Alternative should have little to no effect on these species such that their ability to persist within the project area or throughout their ranges would be compromised.

Overall, past management activities that have contributed to affect habitat throughout the watershed on a measurable scale (timber harvest, fire suppression) have had a mixed effect on Survey and Manage wildlife species. Generally speaking the maintenance and development of closed canopy habitat with late-successional characteristics on approximately half of the area is considered to have positively influenced these species, while the conversion of the other half of the area to post replacement and mid-seral closed canopy habitat set in a patchy mosaic across the landscape has likely had a negative influence on these species.

Current Forest Plan standards governing management of this area provide direction that should ensure the long-term maintenance of amount and distribution of suitable habitat for Survey and Manage species. Due to the location of harvest and non-harvest allocations throughout the watershed, it is unlikely that cumulative effects associated with this project would influence the ability of local populations of any such species to persist (or become established) by eliminating demographic linkages beyond these specie's dispersal capabilities.

## **E. Fuels and Fire Risk**

Thirteen fuel models have been designated in the National Wildfire Coordinating Group's Fire Behavior Prediction System (Anderson). These models are as follows:

**Table 26 – Fuel Model Descriptions**

Fuel Model	Description
1	Short Grass
2	Timber (grass & understory)
3	Tall Grass
4	Chaparral
5	Understory Brush
6	Tall Brush
7	Southern Rough
8	Timber Litter
9	Hardwood Litter
10	Timber (with dead & down)
11	Light Logging Slash
12	Medium Logging Slash
13	Heavy Logging Slash

GIS mapping indicates the majority of the Jim’s Creek project area consists of fuel models 5, 8 and 10. Ground- verification of this data shows that fuel model 8 exists in the project area in proportions equal to those of fuel model 10. Current fuel loading averages about 28 tons per acre.

Seven wildfire ignitions have occurred within the project boundary since 1970. Five of these fires were contained at .10 acres, one fire grew to 7 acres, and the largest was contained at approximately 65 acres. Five of the seven total wildfires were lightning caused, and two were human caused. Several other small and large fires occurred near the project area during the same time period. The current stand structure can provide for the spread of crown fire, or at least fire that would result in high tree mortality from crown scorch, as evidenced by the result of the 1996 wild fire which occurred north of the project area.

**Direct and Indirect Effects**

**Issue #4 – Fuel Accumulation and Fire Risk– Significant Issue - This area has changed dramatically from what it was about 100 years ago due to fire suppression and the cessation of prescribed burning. These slopes have missed from four to 12**

**fire cycles over that period of time, resulting in the development of a closed canopy forest that could carry a crown fire over an area that previously did not have enough coniferous vegetation to support severe fires.**

Evaluation criteria:

- change in fuel structure;
- increase or change in fuel loading.

In the two pine plantations within the project area there are less than ten tons per acre of dead/down fuels. Post treatment fuel loadings would not change significantly in plantations, and therefore will not be analyzed further. Thinning done in plantations will help promote the overall objectives by reducing crown density. This will promote a stand structure that is less susceptible to mortality from wildfires.

The primary driver of change in fuel loading, structure, and continuity under this proposal is stand density reduction and subsequent fuels reduction through prescribed fire. Timber harvest would create similar amounts of slash under all action alternatives. After treatment (hand piling and burning), approximately 10 tons per acre of dead/down fuels would remain. As a result of timber harvest, crown density would decrease by approximately 87%, and existing dead fuels will decrease by approximately 64%.

Alternative A – Proposed Action: This alternative would remove excess trees on approximately 241 acres with 20 trees per acre being retained in most areas. It would create about 14 tons of slash per acre, for a total of about 42 tons per acre. Tree spacing under this alternative would be increased to an average of 47 feet. Approximately 241 acres would be converted from fuel model 10 to fuel model 2. There would be a substantial modification of the existing fuel structure on 241 acres. Fire intensities on these acres would be greatly reduced in the event of a wildfire.

Alternative B - No Action: Under this alternative, dead/down fuel loadings would remain at the existing level of approximately 27.6 tons per acre. The site currently contains approximately 160 trees per acre, or slightly less than 16 foot spacing between trees. This arrangement of fuels is best represented by fuel model 8 or 10 (see Table 24). Fires in this fuel model burn with higher intensity than other timber types. Under this alternative a wildfire burning in extreme weather conditions could result in a crown fire traversing the entire project area. Control problems due to crown fires are more frequent than in more open forest stands (Anderson, 1982).

Alternative C – staged entry: This alternative would remove excess trees on approximately 171 acres, with 40 trees per acre being retained in most areas. This would create about 12 tons of slash per acre, for a total fuel loading of about 40 tons per acre. Tree spacing would be increased to about 33 feet. Approximately 171 acres would be

converted from fuel model 10 to fuel model 2. There would be a substantial modification of the existing fuel structure on 171 acres. Fire intensities on these acres would be greatly reduced in the event of a wildfire.

Alternative D – multiple methods: This alternative would remove excess trees on approximately 171 acres. Treatments would include retention of 20 trees per acre on 65 acres, retention of 40 trees per acre on 49 acres, and oak release on 41 acres. These activities would create an average of 13 tons of slash per acre, for a total fuel loading of about 41 tons per acre. The oak release treatment would not have a significant impact in changing overall fuel loading/structure in the unit. Tree spacing under this alternative would be increased from 33 feet to 47 feet. The average tree spacing would be little changed from the existing average of 16 feet in the oak release areas. Approximately 106 acres would be converted from fuel model 10 to fuel model 2. A change of this magnitude means that no possibility of a crown fire traversing the slope would exist in the stand after harvest and slash treatment is completed. There would be a substantial modification of the existing fuel structure on 106 acres. On those acres fire intensities would be greatly reduced in the event of a wildfire.

Alternative E – full restoration: would harvest approximately 455 acres with 20 trees per acre being retained in most areas, creating about 12 tons of slash per acre, for a total fuel loading of about 42 tons per acre. Tree spacing under this alternative would be increased to an average of 47 feet. Approximately 455 acres would be converted from fuel model 10 to fuel model 2. There would be a substantial modification of the existing fuel structure on 455 acres. On those acres fire intensities would be greatly reduced in the event of a wildfire.

Effects Common to All Action Alternatives

Timber harvest would create similar amounts of slash under all treatment alternatives. After treatment (hand piling and burning), approximately 10 tons per acre of dead/down fuels would remain. Existing dead fuels would decrease by about 64% on the acres treated. The following Table 27 indicates there would be a slight difference in fuel loadings between alternatives immediately after tree removal, but after slash treatment fuel loadings per acre would be similar for all alternatives. The crown density of the treated stand would be reduced by 75 to 88 percent.

**Table 27 - Jim’s Creek Fuel Loadings (tons per acre)**

Treatment type	Current	Harvest Created Slash	Post Harvest Total	Post Treatment
20 TPA retention (Alts. A and E and	27.6	14.3	41.9	10**

Treatment type	Current	Harvest Created Slash	Post Harvest Total	Post Treatment
parts of D)				
40 TPA retention* (Alts. C and parts of D)	27.6	12.4	40.0	10**
Alt. B (no action)	27.6	N/A	N/A	N/A

\*Alternatives C and D have 40 trees per acre (TPA) retention prescription for some units.

\*\*Estimate based on experience and not a model. Fuel remaining depends on fuel consumed during treatment, which depends on fuel moistures/weather.

Evaluation criteria:

- likelihood of the forest to carry a crown fire

#### Direct and Indirect Effects

Differences in fuel types exist in a mosaic across the landscape. Fire behavior on the landscape changes in response to these differences and many other factors. Fire behavior predictions were done with BEHAVE fire modeling software to determine how a wildfire might burn in stands at Jim's Creek before harvest (fuel model 8/10), post-thinning (fuel model 12) and after fuels treatment is accomplished (fuel model 2). These calculations were done using historical weather observations obtained for 80<sup>th</sup> percentile conditions (typical warm, dry summer day). Note that fire the behavior predictions below show the maximum rate of spread possible under 90<sup>th</sup> percentile conditions. Fire behavior predictions are for modeling purposes only; actual observed conditions may differ significantly.

**Table 28: Fire Behavior Predictions (90<sup>th</sup> percentile weather conditions, 30% slope, late summer)**

Fuel Model	Rate of Spread (chains/hr)	Flame Length (feet)	Crown Scorch Height (ft above ground)	% Conifer Mortality	1 Hour Fire Size (acres)
5 (current)	104.8	12.8	115.9	96.0	269.9
8 (current)	5.8	1.9	1.5	10.2	.8
10 (current)	32.9	10.2	76.0	18.5	26.5

<b>Fuel Model</b>	<b>Rate of Spread</b> (chains/hr)	<b>Flame Length</b> (feet)	<b>Crown Scorch Height</b> (ft above ground)	<b>% Conifer Mortality</b>	<b>1 Hour Fire Size</b> (acres)
12 (post thinning)	31.0	12.4	109.5	96.0	23.1
2 (post treatment)*	111.6	12.4	109.1	2.8	309.6

There is little difference between action alternatives regarding fire behavior and fuel loading, other than that proportional to the number of acres treated upon which wildfire behavior would be modified. All action alternatives would result in no probability of a crown fire passing through the acres treated with excess tree removal. A study by Raymond and Peterson (2005) indicates that thinning and underburning stands similar in age and species composition to the Jim's Creek project area moderates the behavior of wildfire and essentially prevent wide-spread mortality of the overstory. The No Action alternative would provide for the possibility of crown fires occurring in this forest with extreme weather conditions.

#### Cumulative Effects

About 60,500 acres (55 percent) of the Fifth Field watershed containing the project area has been harvested. Most of these harvested acres were clearcut and most had fuels reduction occurring in conjunction with the harvest. The fuels reduction proposed in the actions alternatives does not materially affect the amount of fuels existing at the landscape/watershed level.

In term of fuel accumulation, the largest cumulative effect from past actions on fuels in the project area and Middle Fork Ranger District as a whole is from fire exclusion through suppression of wildfires and the lack of prescribed burning to maintain the originally open forest. Fire exclusion due to effective suppression has caused an increase in natural fuels within existing fuel models by preventing natural fires from running their course. In some cases fire exclusion may cause a gradual shift from one fuel model to another. This has been the case in the Jim's Creek project area.

Native American burning and wildfires once helped maintain the area as an oak-pine savanna. The savanna is characterized by low-intensity, quick burning surface fires that burn mostly in grass. These fires cause little mortality in mature trees but often kill seedlings and saplings, resulting in a naturally thinned stand. Such stands are typically designated as Condition Class 1 (see the fire history discussion in the Vegetation section above), indicating they are within the natural range of natural/historical variability of vegetation characteristics, fuel composition, fire frequency, fire severity, and associated disturbances.

Past fire exclusion in the Jim's Creek area has changed the forest to a closed canopy structure. Most stands in the Jim's Creek project area can now be described as Condition Class 3 (as per USDA, et. al., 2005), or high departure from the natural/historical variability of vegetation characteristics, fuel composition, fire frequency, fire severity, and associated disturbances. Fires in closed conifer stands of this type often burn with high intensity and have more potential to become stand-replacing crown fires. The number of acres treated to restore savanna conditions in action alternatives would essentially result in those areas being restored to Condition Class 1. This change in fuel loading and structure, combined with maintenance burning on a regular basis (every 5 to 10 years), would promote stands that are safer from stand replacing crown fires.

While there has been a considerable amount of past harvest within the Mixed Conifer forest type (about 12,240 acres, or 48 percent of the type) there are no past, ongoing, or foreseeable future projects that have had or would have a modification of fuel structure within the larger mixed conifer forest landscape. There have been no past, ongoing, or foreseeable future projects which have returned fire to its historic function in the larger landscape.

## **F. Cultural Resources**

### Current Conditions

The Jim's Creek project area has one of the highest densities of cultural resources on the Willamette National Forest, may be considered a traditional cultural landscape. This was apparently an important and well used landscape for Native Americans over the last several thousand years, and it is likely that this use played an important role in maintaining, if not creating the original savanna vegetation that this project is proposing to restore (Winkler and Bailey, 2002). Due to changes in stand composition over the past 150 years, the area is has begun to lose the characteristics that represent its historic past. The Jim's Creek Savanna Restoration project provides a unique opportunity to enhance a significant cultural landscape. The cataloging of the numerous culturally modified trees has revealed patterns of use that tend to coincide with the understanding of landscape use that were previously described by Baxter (1983, 1986), as has the documentation of the additional sites in this and the surrounding terrain.

The project area supports a many species of culturally significant plants, such as camas, yampa, biscuit roots, oak and hazel. Of particular note is the historic use of the inner bark of ponderosa pine trees, evidenced by the large rectangular scars indicative of the removal of the bark about 150 years ago (Hadley 1999). Ethnographic accounts suggest various uses for the sap and cambium harvested in this way. About one hundred such trees were identified throughout the area.

It appears that the river flat area on the southern edge of the planning area was a summer camping site and served as a base for use of the slopes above. It is surmised that the native peoples used the area for hunting and gathering of food plants. Though there is no physical evidence (in the form of grinding rocks), there may have been some collection of acorns, as well as use of more traditional (for the Mollala People) plants such as camas, yampa, hazelnuts, and ponderosa pine which all still occur in the area. Cultural resources, in the form of lithic scatters and culturally modified trees, are found throughout the project area. Of particular note are the culturally modified ponderosa pine. There are many trees (about half of which have died in the last 100 years) with unique scars indicating the bark was removed from 150 to 300 years ago for purposes that are not yet well understood. It could be that these two to three foot wide and four to seven foot high patches of bark were removed to facilitate the collection of pitch and pine sap for various uses, and/or the collection of the cambium for food or medicinal purposes.

The Jim's Creek project area is one of the most studied areas on the Forest in terms of archaeological research. Three earlier data recovery excavations have provided a rich data source on site typology and function. Several timber sale surveys were conducted in the mid 1980s, numerous cultural sites were recorded and several of these sites were subject to various levels of data recovery excavations prior to logging under the Colt Timber Sale. A review of District files shows that 23 historic properties (cultural sites) have been recorded in or near the Jim's Creek project area, including archaeological lithic scatter sites, rock cairns, culturally modified trees (CMTs), and rock shelters.

The culturally modified trees are ponderosa pine which at one time had about 25 percent of their cambial surface exposed by removal of the trees' bark 2 to 6 feet above the ground. Though many of the resulting scars have been charred by the last fire to burn in this area, they typically do not occur on the uphill side of the trees' stems, as do most fire scars. Additionally, these scars do not extend down to the soil and are not triangular in shape like most fire scars tend to be. A few of these scars also have some tools marks in the exposed wood.

These sites are most likely associated with resource procurement, hunting, and travel by Native American groups such as Kalapuya, Molala, and probably Klamath Indians. The Young's Rock trail, which bisects the planning area, appears as early as 1920 on forest maps indicating a likely aboriginal association as well.

Additionally, historic records indicate the area as part of an early (Warner Mountain) grazing allotment from at 1920 to 1945, perhaps as early as 1900. Cabin remains and other historic features are also recorded in the area. The Oregon Central Military Wagon road, constructed c. 1864, skirts the lower perimeter of the project area. Crews from the Siletz reservation reportedly worked on the construction of this route (Beckham 1981).

In light of the abundance of aboriginal cultural sites already known, and the indications in the historic record of early “post-contact” Euro American activities in the area, the entire planning area was considered as high probability for the occurrence of cultural resources. As per the Forest Inventory Plan (Davis 1988) and State Historic Preservation Office (SHPO) standards, an intensive field survey was conducted on 100% of the project area. Seven newly discovered historic properties were recorded in the project area; previously known sites were monitored and many re-recorded through this effort (Winkler and Lindberg 2006).

In all 23 sites have been recorded within the planning area, including open lithic scatter sites, culturally modified tree (CMT) sites and rock cairns; some sites exhibit a combination of these features. The condition or integrity of some of these sites have been compromised to some degree by timber harvest and related road construction that has occurred in the area over the past 25- years. Nonetheless, they will be protected from additional disturbances by applying the mitigation measures identified in Chapter II. Results of the cultural resource survey described above and proposed mitigation plan were provided to the SHPO in support of a determination of “no adverse effect” to significant historic properties, as per the National Historic Preservation Act. A copy of the Project Review form, documenting this consultation is found in the project analysis file at the Middle Fork Ranger District office. (Other site specific information is exempt from public disclosure under the Archaeological Resources Protection Act {ARPA}).

#### Direct and Indirect Effects

Effects to living culturally modified trees (all of which would be retained in terms of excess tree removal prescriptions), would be mitigated by avoidance through helicopter yarding, and protection from slash burning and maintenance prescribed fire by manual removal of fuel accumulations adjacent to the trees. Other cultural sites would be protected by avoiding soil disturbance through helicopter yarding.

Open lithic scatter sites: Eleven lithic dominated sites are recorded within the project area. Several of these were recorded during the Colt Timber sale in the mid-1980s. Three of these sites were excavated as mitigation for the effects of that timber harvest, and subsequently logged. Others have had different levels of data collection in association with other past projects. Some had been damaged by earlier road construction which in many cases led to their discovery. Potential effects of the current project are mitigated by prescription of the helicopter yarding system with full suspension. This has been acknowledged as having minimal impacts on soils and therefore no adverse effect to archaeological sites. No mechanized activities will occur on or near known sites. No equipment staging will be permitted within 100 feet of these sites. Likewise, they will be avoided during fire-line construction as well.

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Rock Cairn sites: Sites with rock features are by nature fairly vulnerable to impacts from logging and related activities. These sites would be protected from all project activities by exclusion from the harvest units.

Culturally Modified Trees: Twelve recorded sites include CMTs – and many more individual CMTs are scattered throughout the project area. About 100 trees located through this and previous surveys have been fully documented with GPS locations, physical description, measurements and photos. Recorded CMTs have been marked with numbered aluminum tags along the base on the uphill side. About 50% of these trees are still alive. Some of the dead trees are down while others are still standing. The mortality over the past 50 years is due in large part to the encroachment of dense younger stand that has developed as wildfire has been suppressed (Bailey ,2005b)

The goal is to preserve-in-place as many CMTs as possible. Live CMTs are protected by nature of the project prescription that calls for retention of all pine and oak legacy trees.

It may be necessary to fell dead standing CMTs if they are deemed to present a safety hazard to individuals implementing the project. Others may be preserved if their location is such that they can be left buffered by other legacy trees are if they are within riparian buffers. In any case, these trees have been well documented. Additional tree-ring data will be collected from any CMTs that must be cut in the implementation of this project.

The CMTs will be afforded additional protection during the slash reduction phase of the project by manually removing slash accumulations from the perimeters of CMTs prior to burning.

CMTs would not be considered for the creation of replacement snags after the harvest is completed.

**Issue #5 – Cultural Resources: There is an opportunity to enhance the abundance or persistence of traditional cultural plants, including the culturally peeled trees scattered throughout the stands.**

Evaluation criteria:

- acres of cultural traditional plants created or enhanced

All action alternatives would provide for the protection and persistence of the culturally modified trees. They would also provide for reestablishment of native herbaceous ground vegetation, as well as Oregon white oak. In addition to the native bunchgrass, camas and yampa would also be planted on sites where they would be expected to grow. Alternative A would plant about 241 acres to traditional plants. Alternative B, No Action, would not provide for any restoration of traditional plant populations. Alternative C would plant about 171 acres to traditional plants. Alternative D would plant about 171 acres to traditional plants. Alternative E would plant about 455 acres to

traditional plants. In addition, all actions alternatives would provide for restoration of the remaining meadows through manual removal of encroaching conifers, burning to maintain the meadow edges, and planting of native species after burning to reduce the spread and vigor of existing non-native plants.

## **G. Air quality**

### Current Conditions

Air quality in the planning area vicinity is generally excellent except for brief periods (usually lasting less than a full day) during fuel reduction activities, or during wildfire events, which can create extreme air quality degradation for days to weeks.

There are two Class I airsheds (as designated by the Clean Air Act of 1977) in the general vicinity of the Jim's Creek planning area. One is the City of Oakridge, about 17 air miles north-northwest of the project area, which is so designated due to particulate levels having occasionally exceeded Clean Air Act guidelines during winter months. The elevated particulate load has been attributed primarily to wood stove smoke and secondarily (about 20 percent) to road dust. The other Class I airshed is the Diamond Peak Wilderness, located about nine miles to the east of the project area, which was so designated to maintain visibility and scenic conditions within the wilderness.

The proposed prescribed burning to reduce fuels created by the excess tree removal and subsequent underburning prescribed in all action alternatives to maintain the savanna would both generate particulates. This burning could affect air quality in the above Class I airsheds, depending upon wind direction at the time of the burns. Assuming underburning is done to treat slash, measurable particulate matter (PM 2.5 & PM 10) and carbon monoxide (CO) would be generated as shown in the following Table. Particulate matter is made up of soot, tars, condensed organic substances, and water droplets. Particulate matter less than 10 microns (PM 10) in diameter is respirable into human lungs and is considered a health hazard. Actual human health effects depend on exposure time and concentration of smoke (USDA 2002).

### Direct and Indirect Effects

**Issue #7 – Air Quality - Burning to reduce ground fuels after certain restoration activities, as well as periodic underburning used to maintain the savanna condition, have the potential to reduce air quality by generation of particulates. Smoke could also cause temporary scenic degradation.**

Evaluation criteria:

- amount of particulates produced by prescribed fire
- emissions from burning:

**Table 29 – Emissions Produced by Slash Burning methods**

Type of Burning	PM 10 (tons/acre)	PM 2.5 (tons/acre)	Carbon Monoxide (CO) (tons/acre)
Prescribed Underburning (Slash)	.75	.64	8.2
Prescribed Underburning (Post-Treatment)	.18	.15	2.0
Pile Burning (machine)	.49	.44	3.5
Pile Burning (hand pile)	.43	.32	*
Wildfire (Alt. B—no action)	.77	.65	8.7

Sources: Oregon Dept. Forestry/Emission Factors/First Order Fire Effects Model (FOFEM)

\*CO estimate not available for hand pile burning.

Prescribed burning is done only in concurrence with very strict prescription parameters in terms of weather conditions, timing, and tonnage of fuel consumptions allowed per day. For this reason, smoke impacts to designated areas or other smoke sensitive areas (wilderness) are uncommon. Forest Plan standards and guidelines will be adhered to (FW-215 to 219; USDA, 1990a). Smoke is made up of suspended particulate matter and gases. Air quality standards for fine particulates, protection for designated areas and compliance with the State of Oregon smoke management plan must be met for all prescribed burning done by the Forest Service. All burning would be done when smoke advection and dispersion conditions are favorable and would not impact Class I airsheds.

All action alternatives would produce about the same amount of particulates and CO per acre; the gross amounts of the products produced would be proportional to the number of acres treated.

It should be noted that while all the action alternatives would produce particulate matter during the burning of logging generate slash, they would create future conditions which would, to some extent, modify the effects of future wildfires in this area, thereby reducing the amount of smoke and the degree of air quality degradation that future wildfires may produce. This is illustrated in the table above by comparing the amount of particulates produced by wildfire (Alternative B – No Action) with that produced by the

post-treatment prescribe burning. Prescribed burning entails a 77 percent reduction in total per acre particulate production compared to particulates that would be produced by a wildfire. The total tonnage of particulates produced by the Alternatives is:

- Alternative A – 180 tons;
- Alternative B – zero, or 977 tons, if a wildfire were to burn in the entire 688 acre project area;
- Alternatives C and D – 128 tons;
- Alternative E – 341 tons.

The Clean Air Act and its promulgating regulations do not regulate or take into account air quality impacts from wildfire. Production of smoke from the proposed regulated management activities would, to the extent that a wildfire may occur within the treated area at some time in the future, result in less particulate production from prescribed burning as compared to a wildfire situation.

#### Cumulative Effects

The effects of forest burning, whether a wild or prescribed fire, are very ephemeral, though wildfire effects generally last much longer than prescribed fire effects. Fires on the Regional scale (such as the 2002 Biscuit Fire in southwestern Oregon) can affect air quality over wide areas for weeks or months. But once done, the fire's effects on air quality are quickly dissipated. Therefore, there are no accumulating effects from past actions or current actions that have emitted particulate matter, and emissions released through implementation of any of the proposed actions would be gone long before any potential future actions may produce smoke. Therefore, there are no cumulative effects from the proposed forest burning in any of the action alternatives. There are no other activities that are known to affect air quality occurring in or around the project area

## **H. Economics**

#### Current Conditions

The Forest Service Handbook (FSH 2409.18, 32 and 32.11) requires the preparation of a Financial Analysis for all timber sale projects, and specifies in general how such an analysis is to be conducted. The primary objective expressed in the need to do a financial analysis is to provide for efficient governmental operations. A Financial Analysis, as per the above direction, has been prepared and is contained in this Project's Analysis File (Bailey, 2005c). The results of this analysis are summarized below.

The Jim's Creek Savanna Restoration Project has been granted stewardship contracting authority by the Regional Forester. One of the many advantages of such contracting authority is that the receipts generated from the removal of commercially valuable products can be retained by the local administrative unit for use in other, approved restoration projects within an approved stewardship area. A tentative list of such projects has been identified for the Jim's Creek stewardship contracting area, which encompasses about 168,000 acres. One of the purposes of the Jim's Creek project is to provide for restoration opportunities other than savanna restoration, and one measure of alternative effects is how much funding each would generate for use in such restoration projects.

To address this funding opportunity, the amount of money available for additional restoration projects under the Stewardship authority is presented along with the required calculation of Present Net Values (PNV). This figure is larger than the PNV. The money available for restoration work is larger than the PNV for several reasons. As required by Forest Service Handbook 2409.18, Chapter 30; Timber Sale Preparation Handbook (FSH 2409.18, 32 and 32.11), administrative costs (planning, implementation and contract administration) must be included in PNV calculations, but funding generated by Stewardship Contracts cannot be used for staff salaries, project planning, nor administration (FSH 2409.10 Chapter 60, sec. 67.2). The Middle Fork District receives appropriated money for such activities and such expenditures are not directly funded by project receipts.

The decision as to which restoration projects would be implemented with the funding generated by this stewardship project is to be made with the assistance of a public collaboration group. This group would identify the final list of restoration activities and help determine the priority of those projects. The expectation is that all the funding generated by the sale of excess trees from the Jim's Creek project area would be expended to accomplish restoration goals over the larger stewardship contracting area. In that sense, if the costs of these restoration projects were included in the calculation of present net values for each alternative, each alternative would have a PNV of zero, and this financial analysis would be fairly worthless in terms of helping to differentiate between alternatives. Additionally, the exact nature and specific costs of these future restoration efforts is not known at this time, since the public collaboration group has yet to be convened, and such expenditures are discretionary (e.g., not absolutely required by the implementation of the proposed actions), as further explained in the last paragraph of this narrative. Therefore, these costs have not been included in the calculation of Present Net Value.

The main economic concern regarding the Jim's Creek proposal is how much money would be generated to facilitate further restoration. The only costs that will be accounted for in this analysis will be those directly incurred by the Jim's Creek project (as in the

need to plant Oregon white oak, native grasses, road maintenance of the haul routes, etc. – those specifically mentioned in the description of the proposed action) that achieve restoration objectives specific to the planning area, or those activities needed to mitigate effects of other actions.

Direct and Indirect Effects

**Issue #8 –Economics– Several of the potential alternative actions and proposed restoration activities would be expensive, and needed restoration activities exceed available funding. It is important to develop cost-effective actions and to minimize the cost of future actions.**

Evaluation criteria:

- income generated to the government (Present Net Value)
- total amount of funding available for future restoration projects

**Table 30 – Alternative Economic Effects**

<b>Alternatives</b>	<b>Total Revenue</b>	<b>Total Cost</b>	<b>Present Net Value</b>	<b>Benefit/Cost Ratio</b>	<b>Amount available for Restoration activities</b>
<b>A – Proposed Action</b>	\$1,311,760	\$ 822,211	\$ 478,549	1.59	\$1,032,224
<b>B – No Action</b>	\$ 0	\$ 143,510	\$-143,510	N/A	\$ 0
<b>C – Staged Entry</b>	\$ 681,551	\$ 707,016	\$ -25,365	0.96	\$ 371,999
<b>D – Multiple Methods</b>	\$ 735,689	\$ 625,700	\$ 109,989	1.17	\$ 498,078
<b>E – Full Restoration</b>	\$2,497,504	\$1,387,251	\$1,110,252	1.8	\$2,009,970

The Financial Analysis mentioned above also analyzed the PNV for each of the multiple entries proposed in Alternatives C and D separately. The second excess tree removal entries for both those alternatives were below cost (negative PNV), meaning that the cost

of removing the second batch of excess trees would exceed the revenue generated by their sale.

### Cumulative effects

The generation of commercial timber products and employment related to their harvest and processing has been occurring upon the Middle Fork Ranger District for nearly 80 years. These activities have in some part contributed to the formation and growth of the Oakridge/Westfir community. It is unclear how the economic effects of past actions have translated to the current day, as both mills that processed harvested trees within this community have been closed and demolished for over 20 years. None-the-less, this project, in combination with past timber harvest projects and future timber sales proposed within the Middle Fork Range District, would contribute to the local economy by providing a source of employment, to the extent that relatively constant, permanent employment is generated. The proposed actions accumulate with the effects of past management actions to the extent that they have served to create and maintain the infrastructure and work force contained by the surrounding community. The Proposed Actions would continue to provide a demand for that workforce.

While economic efficiency is an important consideration for any project being developed or implemented on the National Forest, once past projects are completed, there may little effect into the future since government revenues and expenditures are ephemeral; they do not accumulate in the classic sense of a savings account. Therefore, past projects do not accumulate with the economic effects of current projects. There are no past or known reasonably future proposed actions that may produce funding that can be used specifically for restoration projects in the Jim's Creek Stewardship Contracting area. Therefore, these alternative effects have no cumulative effects with other actions.

## **I. Recreation**

The following discussion comes from the Scenic and Recreation Resources Report for this project, which can be found in the Analysis File (Bailey, 2005d). The planning area contains three features central to established recreational uses of the surrounding landscape; Road 21 (which provides primary access to a number of recreational opportunities and a driving for pleasure experience in itself), the Camper's Flat Campground, and the Young's Rock trail (#3685). From a more dispersed recreation perspective, the project area is also a popular place to hunt big game in the fall. As mentioned in the scenic discussion below, driving for pleasure is a popular recreational activity also, and the project area contains about 2.9 miles of low standard gravel roads, about 1.1 miles of two lane paved road (Road 21), and there is about 1.2 miles of high standard gravel road (road 2129) along the northern project area boundary.

**Issue #10 –Recreation - Implementation of some of the proposed actions could change the setting for recreational activities in this area.**

The narratives below describe the recreational resources within the project area and discusses how the use of these resources may be affected by the alternatives.

**1. Driving for Pleasure**

Driving for pleasure is one of the most popular recreation activities engaged in by people in Oregon (OPRD, 2003). The Middle Fork watershed contains about 1,600 miles of roads, most of which are open (USDA, 2004c). Road 21 is a main recreational access road; there are six developed campgrounds up-river of the Jim’s Creek project area (and another two down stream) which are accessed by this road, as well as many dispersed camping sites and miles of trails. The 2129 road accessing the Jim’s Creek project area is a popular recreational road since it accesses the upper end of the Young’s Rock trail and the Warner Mountain Lookout. This lookout is a rental cabin during the fall and winter and a functioning fire lookout in the summers during extreme fire seasons. The 2129.371 road within the project area is a moderately well-used road considering it dead-ends about two miles from its junction with 2129. This road is used by people camping at the nearby Young’s Flat dispersed camping area who are in search of firewood, or by hunters in the fall.

Alternative Effects

The only effect of the alternatives on the use of Roads 2129 or 21, would be from log truck traffic down-river of the project area for up to four continuous months (primarily on weekdays when recreation traffic would be relatively low). The length of time noise generating activities would occur is discussed below for an estimation of how long this increased traffic would last. Traffic would increase on Road 21 downstream of the project area by about 1,240 truck trips for Alternative A, 490 trips for Alternative C, 560 trips by Alternative D, and 2374 trips by Alternative E.

All action alternatives would eventually close road 2129.371, 375, 367, and 435 (totaling about three miles), so people used to driving these roads would have their experience slightly curtailed. All the above roads would be closed in a fashion such that the roads could still be used for administrative access to facilitate future cultural activities, specifically the prescribed maintenance underburning.

Cumulative effects

Many past actions, primarily timber management activities over the last 50 years, have resulted in the creation of the existing road system that people use, for hunting, hiking access, or driving for pleasure. A Road Management Plan (USDA, 2003, 2004b) has been prepared for the Middle Fork watershed, and this plan recommends that about 446

miles of roads be closed (out of 1600 miles total) for various resource reasons and to address a reduction in road maintenance funding. These recommended road closures will occur as funds become available, and that list of roads include Roads 2129.371, 435, and 375. Since the road closures recommended by the Road Management Plan have not been formally proposed, they do not constitute a reasonably foreseeable future action. Road oriented recreation opportunities will be reduced by about 41 percent in this watershed whether or not the proposed three miles of road closures proposed by the action alternatives are implemented.

There is also a future proposal to pave the 10 miles of gravel roads connecting the paved Road 21 to the paved Road 2106 on the Umpqua National Forest. If this proposal is implemented (and at this time there is no funding to do the work), this route, including Road 21, would be designated as the West Cascades Scenic Byway. Creation of a paved through route between Oakridge and Crater Lake would likely increase the amount of recreational traffic on Road 21. Based upon local experience with creation of a Scenic Byway (Aufderhiede Drive; Road 19 along the North Fork of the Middle Fork of the Willamette River), such a designation probably would result in about a 5 percent increase in traffic per year. This increase would be more or less permanent compared to the temporary increase in amount of commercial traffic on this road due to this proposal.

## **2. Camper's Flat Campground**

This campground is situated in the southern corner of the project area between Road 21 and the Middle Fork of the Willamette River. It has five campsites and a hand-pump water source. It is open year-around and fees are collected from Memorial Day through mid-September. The campground is open for free use during the remainder of the year, but no services are provided (i.e. garbage pickup and water).

### Alternative Effects

None of the Alternatives propose vegetation altering activities immediately adjacent to the campground. The slope uphill and above Road 21 is within the Deadhorse Creek riparian reserve and no activities are proposed there. Therefore, none of the alternative would affect the appearance of the area immediately visible from the campground.

The proposed removal of excess trees would produce some amount of noise over and above the ambient levels associated with the adjacent river and Road 21, in particular due to the use of helicopter yarding. The proposed helicopter landing location is the same for all action alternatives; it would be about 2000 feet uphill of the campground. Most removed trees would be deposited upon this landing, so the helicopter noise would be more or less continuous over the period of the working day. Alternative A would result in about 36 days worth of helicopter noise, Alternative C would result in about 15 days

worth of noise, Alternative D would result in about 16 days worth of noise, and Alternative E would result in about 72 days worth of helicopter noise. This noise would, for the most part, occur during normal working hours on weekdays, and may not occur on every work day, depending upon machinery down time and weather. It is not thought that this amount and duration of noise would materially affect the level of use in this campground given that it is most often used on weekends.

The proposed skyline yarding would also produce some noise, but at a lower level than would the helicopter use. Most commonly what might be noticed from the campground is a periodic whistle or horn in the distance (the radio signal sent between the yarder operator and the choker setters). Such effects would last from 30 to 60 days and could occur concurrently with the helicopter disturbance.

The Campers Flat Campground is immediately adjacent to Road 21, and during weekends in particular there is a fair amount of highway noise impinging upon this campground. The log haul routes for all action alternatives do not pass by the campground, so there would be no direct effects on ambient noise levels in terms of the use of Road 21 associated with this proposal.

#### Cumulative effects

There have been no past actions nor any reasonably foreseeable future actions that might affect the appearance or noise levels experienced in this campground.

### **3. Young's Rock Trail**

This trail begins just above Camper's Flat Campground and progresses uphill for about five miles, accessing Young's Rock and Warner Mountain, and eventually tying in to Road 2129. This is not a heavily used trail, but it is popular with local mountain bikers. Some trail rutting has been noticed on the steeper portions of this trail, apparently due to bike tires sliding while breaking for a turn or at the bottom of a grade. The lower portions of the trail (those within the project area) are accessible nearly year-around due to its relatively low elevation and its southerly aspect. The Young's Rock trail is designated a Class III trail within the project area by the Forest Plan (USDA, 1990a, page IV-53), and the class III portion of this trail (some of which is north of the project area) is about 9,900 feet in length. The Forest Plan standards provide for a scheduled even-aged harvest per decade of seven percent of the trail corridor, and requires that a Visual Quality Objective of at least Partial Retention be maintained (see page IV-54 of the Forest Plan).

#### Alternative Effects

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Alternatives A and E would affect the setting along portions of this trail. Implementation of the proposed tree density reduction in these alternatives would affect 1,848 and 6,864 feet of this trail respectively.

The proposed tree removal would create a much different hiking environment than exists now; instead of the existing closed canopy forest that over 90 percent of this trail traverses now, the trail lengths mentioned above would be in an open, grassy forest with a diverse set of understory plants. It would provide views of the adjacent ridges and full views of the large remnant trees. This change should ultimately provide for a very high quality trail experience, in terms of scenic and botanic viewing opportunities. Immediately after tree removal and slash disposal and before native grasses become fully established, the trail setting may not be especially pleasing to the eye.

Alternatives B (No Action), C and D would not affect the Young's Rock trail experience in any way, other than a brief closure period during yarding activities as discussed below. All action alternatives would also provide for trail improvement consisting of small reroutes to eliminate several short, steep sections where erosion is occurring.

Once the native bunchgrass is reestablished, residual oaks respond in vigor to the release from competition, and new oak trees are planted, the sections of this trail affected by Alternatives A and E should provide a unique experience in the context of the rest of the trail, which for the most part traverses through closed canopy forest with little to no understory vegetation. The opening up of the forest along this trail would provide for less shade and a hotter summer hiking experience, but would also provide for sunny and more pleasant early season hiking.

Noise audible from portions of the trail would occur under all action alternatives during helicopter yarding. Closure of the section of trail near the proposed helicopter landing (near the junction of roads 371 and 375) would also occur under all action alternatives within the project area during yarding activities. Alternative A and E would both result in closure of portions of this trail during falling, yarding, and slash disposal operations. Alternative A would result in closure of about 5000 feet of the lower end of the trail for up to 60 working days and Alternative E would close about 10,000 feet of the lower portion of the trail for up to 120 working days. Alternatives C and D would require the closure of about 1000 feet of the trail closest to the proposed helicopter landing for safety purposes during the 15 total days that the landing would be used. The same portions of the trail would also be closed for a day or two under each alternative during slash burning and maintenance burning activities. Under Alternatives A and E, the upper three miles of the Young's Rock trail would be available for hiking.

As mentioned above in the Section I description of the proposed action, Alternatives A and E may not fully comply with Forest Plan standards and guidelines for trail

Management. Even-aged timber harvest is limited by FW-046 to no more than seven percent of a Class III trail corridor in the first ten years of plan implementation (the WNFP was approved in 1990). While the harvest proposed in Alternatives A and E is uneven-aged harvest (see Bailey, 2005b), that harvest would modify the appearance of the trail surroundings. Additionally, FW-047 directs that no more than 600 lineal feet of trail frontage per mile be affected by any type of timber harvest, though it goes on to say that some variation on harvest rate is permitted in consideration of uneven-aged silvicultural systems. Since Alternatives A and E would harvest about 23 percent and 71 percent of the trail corridor respectively, and would affect 2,310 and 6,696 feet of trail frontage respectively, these two alternatives are not in full compliance with Forest Plan standards and guidelines for trail corridor management. The Forest Plan standards for trail management were not designed to account for the need to restore degraded landscapes. Visual quality objectives are given for trails in FW-050. The objective for Class III trails is partial retention, where human activities are evident but remain subordinate to the characteristic landscape. As fully explained below under the Scenic effects discussion, the proposed harvest is required in order to recreate the characteristic landscape.

#### Cumulative Effects:

The Young's Rock Class III trail corridor has seen little harvest over the years; about 2500 feet of the Class III trail's entire length (19%) has experienced adjacent harvest over the last 25 years, and most of that is the shelterwood harvested areas just above the trail head and just to the north of the project area boundary. Forest Plan standards (FW-046) provide for a seven percent per decade amount of even-aged harvest in class III trail corridors. Alternatives A and E would harvest about 14 percent and 53 percent of the trial corridor respectively, but neither include even-aged harvest practices. The trail was also rerouted about 20 years ago, due to construction of roads 2129.371 and 375. It is not known if the changes in the trail experience caused by these past management activities had an affect upon the amount of use the trail has received or the quality of experience for users. There are no reasonably foreseeable future actions that would affect the qualities of this trail. The proposed maintenance prescribed burning in all actions alternatives would affect the use of this trail during brief periods, as the lower portions would be closed during the day or two it would take to accomplish these burns. Such closure would not likely happen more frequently than every five years.

#### **4. Big Game Hunting**

The Jim's Creek project area occurs in the Big Pine Big Game Emphasis Area (BGEA), a block of a high quality habitat. This 14,000 acre BGEA currently has about 3915 acres of foraging habitat and 2100 acres of hiding cover (most of which has been created from

past regeneration harvest), and forage habitat is currently limiting in terms of optimal habitat conditions. The Jim's Creek planning area, as well as the surrounding areas within the Big Pine BGEA, is a popular area for hunters. The roads within the Jim's Creek planning area probably get used more during the various hunting seasons than during any other time of the year.

### Alternative Effects

Implementation of any of the action alternatives would improve hunting opportunities in the area, commensurate with the amount of forage produced by each (see the big game Habitat Effectiveness Index effects discussion above under Wildlife). The proposed savanna restoration would provide a high quality big game forage area, particularly for elk, as evidenced by the forage use that has occurred in the large pine plantation that was burned in the winter of 2005 (USDA, 2004a). The proposed actions would create a high quality forage habitat that would be permanent considering the prescription for periodic maintenance burning that would maintain the area as a grassy open forest. Most forage areas created by harvest are fairly ephemeral; even-aged regeneration harvest areas harvested areas typically grow into dense hiding cover within ten years on good sites. Maintaining or increasing big game populations would have a direct effect on hunting opportunities.

In addition, all action alternatives would close Road 2129.371 and all its tributary spurs, and Road 2129.435 to protect big game utilizing the restored forage habitat from excessive disturbance and harassment by vehicle travel. Though lack of vehicle access may negatively affect some hunters' experience, it would also create a high quality experience for those willing to walk in on the closed road without interruption by vehicle travel through the area. Limiting hunting in this area to a walk-in experience would also likely limit the number of animals taken in this area, and so should increase the success of hunters who are willing to walk to their hunting experience. There are many road accessible hunting opportunities in the surrounding area.

### Cumulative Effects

The existing acreage of forage and hiding cover habitat mentioned above were largely created by past, even-aged harvest activities. These activities have affected more acres in the Dry Pine BGEA, but some areas have grown beyond the point where they provide forage habitat. There have been some past activities which have functioned to create or perpetuate more open forest conditions that would benefit big game and subsequently maintain big game hunting opportunities. These include the prescribed fire that was applied to habitats like Big Pine Opening and Mutton Meadow (both up-river of the Jim's Creek project area) in the early 1980's. However, follow-up management activities have not been implemented and both these areas are again transitioning into hiding cover.

There are no known specific proposed future actions that would increase the amount of forage habitat in the Dry Pine BGEA. There are no activities proposed in the Upper Middle Fork or Hill's Creek Reservoir watersheds that would serve to change big game hunting opportunities or conditions, other than the road closures discussed above.

## **J. Scenic Conditions**

### Current Conditions

The following narrative is from the Scenic and Recreation Resources Report for this project, which can be found in the Analysis File (Bailey, 2005d). The lower slopes of the Jim's Creek project area are designated as two different scenic management allocations Management Area 11d just above Road #21 (encompassing about 95 acres ), and Management Area 11c (encompassing about 105 acres) by the Forest Plan (see Figure 2; Forest Plan land allocations map). The Desired Future Conditions given for these two land allocations say "Resource treatments will be conducted in such a way that they are visually subordinate to the characteristic landscape" (Forest Plan pages IV-207 and 210; USDA, 1990a). The characteristic landscape is the original, historic open condition of these forests (Dole, 2002; USDA, 1988b). The Forest Plan directs that these scenic allocations be managed as a unit according to visually sensitive areas viewed from major travel routes and rivers. For this visual corridor, these are Road 21 and the Middle Fork of the Willamette River

The MA 11c/11d scenic corridor extends along the Middle Fork river and Road 21 for some 26 miles, from the upper end of the Hill's Creek reservoir up to Timpanogas Lake in the upper reaches of the watershed. It contains 8,323 acres of Management Area 11c and 8,936 acres of Management Area 11d, for a 17,259 acre total. It generally provides a densely forested landscape for viewing, but it also provides views of the Middle Fork river and the less dense hardwood stands that tend to occur in the river flood plain. The viewshed also contains occasional rock outcrops and small meadows that can be seen, but not as many of these features are evident as they may have been when the mixed conifer forest type was less dense than it is now. Occasional vistas of the surrounding mountains and ridgetops are also visible where foreground vegetation is absent or especially short, as where one is looking down the road, or the river is nearby. About 35 percent of the corridor (6,083 acres) has been affected by past harvest or stand replacement fires and all but 58 acres of these harvested stands now are comprised of dense young and vigorous stands of conifers that are fully recovered from a scenic perspective (MA-11c-07; MA-11d-15). The unrecovered acres represent 0.5% of the 11c portion of the corridor and 0.15% of the 11d portion.

### Direct and Indirect Effects

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**Issue #11 Scenic Conditions - This area is visible from Forest Road 21 and The Young's Rock trail. A portion of the area has been allocated as either Scenic – partial retention foreground or middleground by the Willamette Forest Plan. Restoration activities could change the current scenic qualities of the area and there would be some short-term degradation of scenic value**

Since the characteristic landscape is the original condition of these open forests (Dole, 2002) and various documents have highlighted the opportunities to restore this characteristics landscape of a more open forest (USDA, 1995, USDA, 1988b, and USDA/USDI, 2000), the alternative effects upon scenic resources would be a positive one, measured by the number of acres that are restored to a more open condition and how closely those acres approximately the original, characteristic landscape.

The characteristic landscape is that which we are proposing to restore; an open forest within ground vegetation dominated by native grasses. Short-term disturbance may adversely affect visual quality. Once accomplished, the restoration activities would have positive effects on scenic resources as they would re-create the characteristic cultural landscape that has all but disappeared in this area. A recovered savanna, whether viewed from Road #21 or the Young's Rock trail, would provide for a very pleasant and very rare scenic experience.

The Middle Fork Willamette Viewshed Corridor Study (USDA, 1988b) also establishes that the ponderosa pine found in the general vicinity of Jim's Creek stand out as a positive feature in the characteristic landscape, as do the many small meadows, and recommends thinning in areas of old growth and second growth that have the potential to generate views of large pine and Douglas-fir boles.

See the restoration efficacy discussion in the Silvicultural Prescription (Bailey 2005b), and the Biodiversity Issue: Similarity to Historical Condition Report (Kertis, 2005) in the Analysis File for this project for further discussions on the likelihood of these alternatives to restore the characteristic landscape.

The evaluation criterion for this issue is the degree to which the characteristic landscape is approached:

Alternative A – Proposed Action: This alternative would recreate about 241 acres of the characteristic landscape. About 85 acres of the harvested areas occur within Management Area 11c, and about 47 acres occur within Management Area 11d.

Alternative B – No Action: This alternative would not re-create any of the historic, characteristic landscape.

Alternative C - staged entry: This alternative treats about 171 acres but removes about half the trees deemed to be excess if the desired future condition is to be approached.

The alternative, therefore, does little in the short-term to re-create any aspect of the characteristic landscape. It would buy some time for some of the legacy trees, which would be partially released and therefore live somewhat longer than they would with no release treatment at all. Additionally, this alternative approach would be detrimental to re-establishment of the characteristic landscape. It is meant to be a test of partial removal and if the initial 50 percent tree removal is deemed to not have any near-term negative effects, removal of the remainder of the excess trees would then occur. When this second entry is accomplished, the removal of another 15 to 20 trees per acre would very likely damage or destroy the bunchgrass and oaks that became established after the first iteration of excess tree removal. In this alternative about 58 acres of the harvested areas occur within Management Area 11c, and about 24 acres occur within Management Area 11d.

Alternative D– multiple methods: This alternative would fully recreate the characteristic landscape on about 65 acres, would partially recreate the original stand density on about 49 acres (as under Alternative C described above), and the additional 41 acres of oak release would essentially not recreate the characteristic landscape, though it would provide for future retention of Oregon white oak, an important component in the characteristic landscape. On 49 acres of 40 tree per acre retention this alternative would have similar detrimental effects to Alternative C discussed above. In this alternative about 58 acres of the harvested areas occur within Management Area 11c, and about 24 acres occur within Management Area 11d.

Alternative E – full restoration: This alternative would fully re-create about 455 acres of the characteristic landscape. In this alternative about 88 acres of the harvested areas occur within Management Area 11c, and about 50 acres occur within Management Area 11d.

#### Effects Common to All Alternatives

All the action alternatives above would generate some scenic effects that will be ephemeral in nature. Initially, there will be considerable amounts of slash on the ground, and even after that slash is burned (as specified in the Fuels Report [Hays, 2005] and Silvicultural Prescription [Bailey, 2005b] contained in the Project's Analysis File), some will still remain, along with some bare ground. Stumps would be visible immediately after slash burning. These conditions would persist until a vigorous and relatively contiguous layer of native ground vegetation, primarily the native bunchgrass California fescue, is established. Judging by the biomass of this grass in the existing 20 year old pine plantations, it estimated that the development of a grass understory vegetation layer sufficient to mitigate the negative visual effects of tree removal and slash disposal would

take about five years (See also the discussion of restoration efficacy in the Silvicultural Prescription – Bailey, 2005 - contained in the Project's Analysis File).

The scenic allocations mentioned above were delineated from the perspective of the Middle Fork River and Road 21 (see USDA, 1988b); “Foreground” and “Middleground” scenic conditions are in reference to those features. In all action alternatives, a portion of the foreground area (Management Area 11d) along Road 21 (in the western portion of planning area above the road) would not be treated to recreate the characteristic landscape due to the need to retain a dense stand of trees within the Middle Fork riparian reserve (which is about 500 feet either side of the river channel's edge). In this sense, restoration of the characteristics landscape on the uplands, above and removed from Road 21, would not materially affect nor improve the scenic driving experience because most of the restored area would not be visible through the buffer left to protect riparian resources. Should an unlikely event, such as windthrow or wildfire, remove this buffer, the scenic resources of Road 21 would be affected. They would be improved to the extent that people could enjoy driving through an open and more historically appropriate pine, Douglas-fir, and Oregon white oak forest with a grassy understory.

The action alternatives are not in full and obvious compliance with Management Area 11c and 11d standards and guidelines relating to timber harvest (MA-11c-04 to 08, and MA-11d-07 to 16). These standards regulate even-aged harvest in terms of harvest unit size and the percentage harvest per decade within a Management Area. While the proposed restoration harvest would not constitute even-aged harvest (see the Vegetation section above and Bailey, 2005b), the proposed excess tree removal would substantially change the visual character of the area, even though it is designed to re-create the characteristic landscape. The Desired Future Condition statements for these two scenic Management Areas (Forest Plan pages IV-205 and IV-207) stipulate that management activities will be conducted in such a way that they are visually subordinate to the characteristic landscape. There is a tacit assumption in these desired conditions that the characteristic landscape is the existing landscape. The scenic management guidelines for timber harvest (MA-11c-04 to 08 and MA-11d-07 to 16) do not directly address the possible need for extensive, uneven-aged harvest for the purpose of restoring the characteristics landscape. Again, these scenic guideline apply specifically to even-aged regeneration harvest, but the size of the proposed areas of uneven-aged harvest in these Alternative would exceed harvest unit restrictions by up factors from 20 (Alternative C) to 55 (Alternative E).

### Visual Quality Objectives

Visual Quality Objectives (or VQOs) differ by Forest Plan land allocation (see Figure 2). For General Forest lands (MA-14; generally the upland areas of the project area) the

VQO is Maximum Modification (Forest Plan page IV-228). For Scenic, Partial Retention Middleground (MA 11c, mid-slope areas along Road 21) the VQO is Partial Retention. For Scenic, Partial Retention Foreground (MA 11d, areas immediately adjacent to Road 21) the VQO is Partial Retention. For Special Habitat Areas (MA-9d, which encompasses most of the larger meadows) the VQO is Retention. All action alternatives would meet these various visual quality objectives since all would bring the project area closer to the conditions of the characteristic landscape. Alternative B - No Action would not facilitate accomplishment of visual quality objectives.

#### Cumulative Effects:

Cumulative effects to scenic conditions are modeled for the scenic corridor (comprised of Forest Plan Management Areas 11c and 11d, as per MA-11c-04 and 08, and MA-11d-07 and 16) along Road 21. This scenic corridor contains 8,323 acres of Management Area 11c and 8,936 acres of Management Area 11d. Over the past 40 years, 6,083 acres of even-aged harvest or stand replacement fires have occurred in this scenic corridor, and 58 acres have occurred in the last 10 years and are still considered unrecovered from a scenic perspective (MA-11c-07 and MA-11d-15). These unrecovered acres represent 0.5% of the 11c portion of the corridor and 0.15% of the 11d portions. If the proposed restoration harvest were considered to be unrecovered from a scenic perspective, the total percentage of land in a disturbed scenic condition would range from 1.2% to 1.6% in 11c and from 0.4% to 0.7% in 11d.

No vegetation changes have occurred in the scenic Management Areas within the project area in the past 20 years.

There have been few past harvest projects that have had the return of these mixed conifer forests to their original open condition as an objective or effect. One harvest project implemented within the last ten years in the scenic corridor, the Boulderdash timber sale, did have as one of its objectives perpetuation of ponderosa pine in this landscape. The Boulderdash project created a number of small openings in the mixed conifer forest (ranging in size from two to five acres) north of the Jim's Creek planning area, within which all trees other than ponderosa pine were removed in order to maintain pine on the site and provide for natural pine regeneration. This past project created about 12 small openings to total about 35 acres. There was a scenic element to the objectives for this harvest, and several of the small openings were located within view of Road 21 in order to provide views of older, large-boled pine trees.

While the Boulderdash treatments had objectives common with the Jim's Creek proposal, there was no provision by that project for maintaining the open nature of the forest, and most of the created openings are well on their way to becoming a closed canopy stand of young conifers. Nor did the Boulderdash project provide for restoration of the

characteristic landscape, which did not consist of small openings in an otherwise densely forested landscape.

The past meadow burning and meadow tree encroachment removal mentioned there was also partially done to maintain the scenic aspects of the naturally more open characteristic landscape. See also the cumulative effects discussion under the Biodiversity Maintenance issue.

At this time there are no reasonably foreseeable future actions that would add to the cumulative effects regarding restoration of the characteristic landscape. While the Jim's Creek restoration proposal is in large part being made as an adaptive management treatment for additional restoration of more open forest conditions within the Mixed Conifer forest type, we will not know if such activities will even occur until we see the results of this set of proposed actions. Any subsequent restoration actions would require additional planning under the National Environmental Policy Act. Therefore, there are little or no cumulative effects on scenery in regard to this proposal, beyond the effects of this project in itself.

## **K. Cumulative Effects**

The Forest Service Handbook (FSH 1909.15 Chapter 10 15.1) requires consideration of cumulative impacts in an environmental analysis. Cumulative effects are defined as the impacts on the environment resulting from incremental effects of the action when added to other past, present, or reasonably foreseeable future actions. Reasonably foreseeable future actions are those for which effects can be accurately estimated, typically actions that have been formally proposed, and have a specific locations and acreage associated with them. These actions may take place after the effects considered in this analysis occur. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

In some cases there are no accumulating effects on a particular resource from past or future actions because the effect on a given resource are so ephemeral (for example smoke produced by prescribed burning) that it is gone before the next action produces a similar effect. In other cases, there have not been any past nor reasonably foreseeable future actions that had or may have a similar effect to the actions under consideration. Council of Environmental Quality guidelines (Cannaughton, 2005) for cumulative effects analyses do not require a cataloging or exhaustive listing of individual past actions.

The above alternative effects narratives include cumulative effects from past actions specific to each issue and/or environmental component. Each cumulative effects analysis for each resource or environmental component has been done for a different area to best

characterize the effects on a given resource. For example, the effects on big game were done for the Big Game Emphasis Area defined by the Forest Plan, while fisheries or watershed issues were analyzed at the Watershed level. Regardless of the resource, past actions that have been accounted for in these cumulative effects analyses primarily comprise past even-aged harvest and associated road construction as it is these activities that typically have had direct and relatively long-lasting effects on fisheries and wildlife habitat, and water quality. In addition, and specific to the fisheries resources, the construction of the Hill's Creek, Lookout Point and Dexter dams and reservoirs were also taken into account in assessing the cumulative effects on fish populations. All the cumulative effects analysis areas that have been used in this analysis are within the two Fifth-field watersheds that comprise the bulk of the Middle Fork river drainage. These are the Hill's Creek Reservoir Watershed and the upper Middle Fork Watershed. The following information is provided to give an idea of what past activities have occurred with these watersheds, and which were used in calculating cumulative effects of past actions for the various cumulative effects analyses.

The Two Fifth-field watersheds mentioned above contain a total of about 223,340 acres, or 349 square miles. Within this area, about 79,200 acres (or 35%) have been harvested with even-aged, regeneration harvest techniques since forest management activities began about 60 years ago. Of that acreage, about 60,700 acres were harvested since around 1960. A total of about 1,011 miles of road has been constructed in this area, primarily to facilitate the harvest activity. This equates to an average road density of 2.9 miles per square mile. At this time, there are no future harvest or road construction activities proposed within these two watersheds with enough specificity to be considered reasonably foreseeable in terms of location and/or timing of actions. Any future action proposed in this planning area would be in compliance with Forest Plan standards and guidelines designed to keep cumulative effects from preventing the achievement of desired future conditions.

There are about 7000 acres of private forest lands within the Mixed Conifer forest type. Most occur in a contiguous block located about one mile east of the project area. When these lands occurred in analysis areas for various cumulative effects analyses, the conditions of these private lands, in terms of past management actions, were taken into account by the cumulative effects analyses.

The most recent timber sales which have been implemented in this planning area were completed over 20 years ago and there has been no timber harvest or any other ground disturbing vegetative management adjacent to the planning area in the last eight to ten years.

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## L. Incomplete and Unavailable Information

As seen in the above environmental effects discussions, there are not quantified estimates of exactly how various species would be affected by the action alternatives in terms of population numbers or impacts to individuals. There is incomplete information regarding absolute population levels of some fish and terrestrial wildlife species, and such information is essentially unavailable because most censusing techniques are both very expensive and unlikely to generate sufficiently accurate results. In the case of fish populations, the only methods for accurately estimating the number of individuals present in a large and fast moving river are destructive (as in the use of poisons) or may cause injury or death to individuals (as in electro-shocking). Censusing for various small animals often can only be done by trapping which still does not give absolute number of individuals and traps can also cause mortality. In fact, populations can vary from year to year, and a thorough censusing effort may take more than one year to complete. In the face of this unavailable information, various indices have been used to estimate effects upon species. Often worst case scenarios analysis is used (in the case of soil erosion and the resultant probability of stream sedimentation) to estimate harm to a species under the most unfavorable conditions.

As alluded to above, a worst case scenario has been used to estimate the amount of soil erosion that may occur. Such erosion is only likely to occur if a large storm occurs before ground vegetation is established. There is a lack of absolute predictive ability for adverse weather conditions that could cause soil erosion. Even if the weather that will be experienced while there is bare ground could be predicted, the exact amount of soil movement which could get into the stream system and create water turbidity and subsequent stream channel sedimentation cannot be predicted due to the high variability of slope roughness and residual organic material remaining on the slopes.

Restoration success is likely but that probability cannot be absolutely quantified. In face of this uncertainty, personal and professional judgment based upon vegetation responses to past management practices and natural disturbance event has been relied upon. Our perception is that the risk of failure is very low and the site's potential to support the desired vegetation would not be decreased.

Interactions between spotted owls and barred owls could affect spotted owl populations but the possibility that the barred owl population may be expanded is unknown and speculative.

Resident animals within the planning area could be affected by the implementation of various activities, in particular the cutting of trees and burning of slash. Which and how many animals may be affected is not determinable because many animals move from one year to the next and this analysis and accomplishment of the proposed actions would take

several years. The locations of vulnerable animals at the time of the disturbance will not be known.

## **M. Legal and Policy Requirements, and other NEPA Decisions**

The action alternatives all comply with the following legal and policy requirements as follows:

### **1. Federal Laws and Policies:**

*The National Historic Preservation Act of 1966*---All areas proposed for ground-disturbing activities have been surveyed for the presence of cultural resources. All surveyed and inventoried cultural resource sites in the Jim's Creek planning area will be protected by avoidance, helicopter yarding, slash pull back (in the case of live culturally modified trees), covering with soil (in the case of the site that coincides with the helicopter landing), or mitigated through data collection (as in the case with culturally modified trees. See the Project Review Form Heritage Resources document in the Analysis File for more information.

*The National Environmental Policy Act (NEPA), 1969*---NEPA establishes the format and content requirements of environmental analysis and documentation such as the Jim's Creek Savanna Restoration Project analysis. The entire process of preparing an environmental assessment was undertaken to comply with NEPA requirements, as codified by 40 CFR 1501 and the Forest Service Handbook 1909.15, Chapter 40.

*The Endangered Species Act, December 1973, as amended* ---There are three species of animals listed as threatened under this Act that occur or utilize habitat within or adjacent to the project area. These are Chinook salmon, bull trout, and the northern spotted owl. There are no plants listed as threatened or endangered that have been found to occur in the area (see the project's Botany Biological Evaluation, [Lippert, 2005b], in the Analysis File) . Field surveys for all listed endangered, threatened, or sensitive species has been conducted to determine possible effects of any proposed activities in the Jim's Creek planning area. Discussions of the effects on these species can be found in the Environmental Consequences section of this document under Water Quality/Fish Habitat, and Wildlife. More in depth discussions of habitat conditions, survey techniques and project effects are contained in the Fisheries Biological Evaluation (Sheehan and Simms, 2005) the Fisheries and Watershed Report (Murdough, et. al.,2005), and the Terrestrial Faunal Biological Evaluation (Davis, 2006b) contained in the Analysis File for this project.

*The National Forest Management Act (NFMA), 1976*----All alternatives were developed to be in full compliance with NFMA via compliance with the Willamette National Forest Land and Resource Management Plan, as amended, with the exceptions as discussed below and in Section III. F. of this document which will require a non-significant Forest Plan amendment to exempt this project from several trail and scenic management standards and guidelines. This EA contains

numerous references as to how this project complies with Forest Plan and Northwest Forest Plan standards and guidelines, usually parenthetically, and the Silvicultural Prescription in the Analysis File (Bailey 2005b) contains a discussion of compliance with NFMA's requirement to identify lands unsuited for management and the requirement to achieve reforestation within five years. See also the discussion below regarding compliance with FSH 1909.

*The Clean Water Act, as amended in 1977 and 1982*---The alternatives all meet and conform to the Clean Water Act, Amended 1982. This Act establishes a non-degradation policy for all federally proposed projects. None of the action alternatives would degrade water quality below standards set by the State of Oregon. This is accomplished through project design and planning, application and monitoring of Best Management Practices (BMPs; see the mitigating measures discussed above), and adherence to the Northwest Forest Plan's Aquatic Conservation Strategy Objectives (See the Fisheries and Watershed Report (Murdough et. al., 2005) and the water quality discussion in this EA under Issue #1). This project is in compliance with the Total Maximum Daily Load Implementation Plan (USDA/USDI, 2005), as described in the Silviculture Prescription and Silvics Background Paper (Bailey ,2005b) in this project's Analysis File, in that all action alternatives would retain riparian buffers to avoid increases in water temperature

*Clean Air Act as Amended in 1990*---The action alternatives are designed to meet the National Ambient Air Quality Standards, as per direction from the Oregon Smoke Management Act, through avoidance of practices which degrade air quality below health and visibility standards, as fully discussed in the Fuels Management Prescription (Hays, 2005) contained in the Analysis File.

*Forest Service Handbook (FSH)* --- FSH 1909.12 5.31a indicates that all projects implementing Forest Plan direction that involve vegetative manipulation of tree cover must comply with the following National Forest Management Act (1976) requirements:

**1. Consistency with the Forest Plan:** These proposals are in compliance with the Forest-wide and Management Area standards and guidelines presented in Chapter IV of the Forest Plan, as cited throughout this EA and the documents within the Analysis File (see also the detailed discussion below under Other NEPA Decision documents), aside from exceptions as discussed in Section III. F. of this document.

**2. Factors of Significance for Forest Plan Amendment:** Implementation of any action alternative would necessitate a non-significant Forest Plan Amendment to exempt the project from strict compliance with those trail and scenic management standards and guidelines. Such a Forest Plan amendment has been determined to be non-significant based upon the following factors specified in FSH 1909.12.

Timing – The Willamette National Forest Plan was approved in 1990 so it is now over 15 years old. It is currently scheduled for a revision to be completed in 2011. Given the upcoming revision, the import of these changes would be small. While it is not possible to predict what

issues will or will not be considered in the upcoming Forest Plan revision, it is likely that all allocations will be reviewed from possible changes

Location and size – This exemption from certain standards and guidelines would be applied only to the 688 acre Jim’s Creel project area. This piece of land equates to approximately 0.03 percent of the Willamette National Forest.

Goals, objectives, and outputs – This amendment would not have any effect upon the production of goods and services projected by the Forest Plan. In the short-term these exemptions would provide for additional harvest in the Jim’s Creek project area compared to what could be done under the harvest amounts and unit size restrictions contained in these trail and scenic management guidelines, but given the small percentage of the Willamette National Forest that this project represents, there would be virtually no effect at the Forest level.

Management prescription – The thoughts and rationale behind this different approach to forest management and the need to promote and restore biodiversity may well influence future decisions and standards and guidelines applicable to specific areas of the Forest in the next revision of the Willamette National Forest Plan. However, this Forest Plan amendment applies only to this project and project area at this time. Such an amendment would not set a precedent for future management decisions on the Forest because the Jim’s Creek area occurs in a unique habitat type that does not occur in other areas of the Forest. This environmental assessment constitutes a listing of how these proposals, and their purposes, respond to the direction contained in the Forest Plan

**3. Suitability for timber production:** is addressed in the Silvicultural Prescription contained in the Analysis File (Bailey, 2005b). Some lands proposed for excess tree removal would not be not suitable for timber production (as per 36 CFR 219.14) in terms of their ability to be reforested within five years due to shallow soils, but 36 CFR 219.27(c)(1) indicates that harvest may occur on such classified lands if needed for reasons other than timber production. In this case the proposed harvest is facilitating the restoration of biodiversity, not timber production as a primary objective.

**4. Vegetative manipulation:** The following narrative responds to direction for NEPA compliance contained in 16 USC 1604 (g)(3): *management prescriptions that involve manipulation of tree cover shall:*

1) *be best suited to the multiple use goals established for the area;* The Forest Plan Management Areas within this planning area, and their standards and guidelines, determine the multiple use goals for the area. The proposed actions are in compliance with these guidelines as mentioned in many places throughout this document, in particular the Purpose and Need statement.

2) *assure that lands can be adequately restocked with trees*; no total removal of forest cover is proposed. The purpose and need for action recognizes that there are too many trees on the sites in questions to meet Forest Plan biodiversity objectives and guidelines.

3) *not be chosen primarily because they will generate the largest monetary return or yield the greatest output of timber, although these factors should be considered*; The proposed systems for removing excess trees include skyline and helicopter machines, both of which are not the least cost method of moving logs. Additionally, no regeneration harvest is proposed, and such harvest would be proposed if the objective of the proposed action was to generate the largest monetary return. The proposed hand piling and burning of slash is also not the cheapest method of fuels reduction, but has been proposed to provide for more assured protection of cultural, soil, and legacy vegetation resources.

4) *consider effects on residual trees and adjacent stands*; These effects were considered in the range of alternatives developed and in the Silvicultural Prescription's discussion of leave tree retention. The proposed slash abatement method of hand piling and burning is not the cheapest to implement and has been proposed despite its cost in part to better protect residual trees.

5) *avoid permanent impairment of site productivity*; The Silvicultural Prescription contains a comprehensive discussion of harvest effects on long-term site productivity. Implementation of any of the action alternatives would not impair site productivity.

6) *provide the desired effects on water quality and quantity, wildlife habitat, regeneration of tree species, forage production, recreational uses, and aesthetic values*; The desired effects on these resources are detailed in the many Standards and Guidelines contained in Chapter IV of the Forest Plan. The effects upon these resources are presented in this chapter of the EA. As stated above, all proposed actions are in compliance with the Forest Plan, therefore they would have the desired effects upon these many resources.

7) *be practical in terms of transportation and harvesting requirements, and total costs of administration and logging*; The Logging Feasibility Report and the Financial Analysis contained in the Analysis File show these proposals are practical from logistical and cost perspectives.

### **Executive Orders**

#11988 – Floodplain Management, and #11990 – Protection of Wetlands: These orders direct Federal Agencies to avoid, to the extent possible, both short-terms and long-term adverse impacts associated with the modification of floodplains and wetlands. None of the alternatives presented above have specific actions that adversely affect floodplains. Proposed activities comply with

these orders and USDA Departmental Regulation 9500-3. See the discussions above regarding fisheries, soils, and watershed effects for more information.

**#12898, Environmental Justice:** The Jims Creek Savanna Restoration Project is located about 21 miles south of the Cities of Oakridge, and Westfir, and about 43 miles southeast of the City of Lowell, in Lane County, Oregon. These communities have minority populations of 7%, less than 1%, and 8%, respectively. Lane County, in its entirety, has a minority population of 9%, (U.S. Census Bureau, 2000).

Approximately 11.5% of the population of the City of Lowell is at or below poverty level; approximately 14.5% of the population of the City of Oakridge is at or below the poverty level, while 12.2% of the City of Westfir's population is at or below poverty level, (U. S. Census Bureau, 2000). According to information from the Oregon Economic and Community Development Department (OECD), Lane County, (excluding areas within the city limits of Eugene, Springfield, Coburg and Dunes City), is rated 1.30, (threshold 1.20), on the distressed area index.(OECD, 2002). These Cities, as well as much of Lane County, have experienced a significant decline in timber-based jobs over the past decade, contributing to factors used to determine distressed community status.

Implementation of any alternative that provides the opportunity for employment may positively affect low-income families who are either unemployed or underemployed. Implementation of any alternative is not expected to impose a disproportionately high or adverse effect to those populations.

Subsistence and cultural use levels are difficult to quantify and differential patterns of subsistence consumption are unknown at this time. However, the Forest provides access to firewood, Christmas trees, mushrooms and other consumables through a personal-use permit system. Middle Fork Ranger District records indicate the following for 2002: permits were sold for 829 cords of firewood; 2,057 Christmas tree permits were sold; and 490 personal-use mushroom permits were sold. All action alternatives would provide for continued or restoration of historic cultural use by Native Americans.

The proposed treatments have the potential to contribute to the supply of special forest products (SFP) available within the area, such as basic greenery plant species and some mushrooms. Interest in commercial harvest of SFPs is low in this area at this time, and supply far exceeds demand in the Middle Fork watershed. (See "Special Forest Products," discussed below)

Road closures may impact subsistence in the immediate project area, but these impacts would be mitigated by the availability of other access routes throughout the area.

The Willamette National Forest has Memorandums of Understanding (MOU) with the Confederated Tribes of the Grand Ronde, the Confederated Tribes of Warm Springs, and the Confederated Tribes of Siletz. These MOUs provide a mechanism for regularly scheduled

consultations on proposed activities. Beyond this, the Forest notifies and consults with tribal governments in a manner consistent with the government-to-government relationship on any matters that ripen outside of the meeting schedule. The Willamette National Forest does not currently have an MOU with the Klamath Tribe, but the tribe has been consulted regarding this proposal. Several tribal organizations with the State of Oregon which have historic interests in this area have been contacted in reference to this planning effort. Several (in particular the Grand Ronde Tribe) have visited the project area and have expressed interest in and support of this project.

**#12962 – Aquatic Systems and Recreational Fisheries:** This Order was made to conserve, restore, and enhance aquatic systems to provide for increased recreational fishing opportunities. It requires Federal agencies to evaluate and document the effects of federally funded actions on these resources and opportunities. There is potential for sediment input into streams from the proposed actions, as discussed above in details in the water quality sections. These effects would be short-term and would not threaten fish species or population levels. Mitigating measures have been applied in all actions alternatives to minimize the potential of detrimental effects to fish species. These measures include provision of untreated riparian buffers along all stream classes, helicopter removal of excess trees, planting of native ground vegetation after slash disposal, provision of various erosion control structures during the project life, and restriction of culvert replacement and road maintenance work to dry periods. These mitigating measures are consistent with current management guidelines including the Willamette National Forest Plan Standards and Guidelines (USDA, 1990a, pages IV-59 to 65), the Aquatic Conservation Strategy Objectives contained in the Northwest Forest Plan (USDA/USDI, 1994, page B-11) at the watershed level, and the Federal Clean Water Act. Implementation of required and standard Best Management Practices (USDA, 1988) would ensure protection of aquatic resources and fishing opportunities under all alternatives

**#13007 – Indian Sacred Sites and **#13084 – Consultation and Coordination with Indian Tribal Governments:** The Confederated Tribes of the Grand Ronde, the Confederated Tribes of Warm Springs, the Klamath Tribe, The Cow Creek Band of the Umpqua Tribe of Indians, and the Confederated Tribes of Siletz were notified of the project during scoping of issues and development of alternatives as part of the Public Participation process. Representatives of the Grand Ronde Tribe have visited the project area on two occasions and participated in presentations of the proposal and alternatives actions. The Grand Ronde Tribe has expressed interest in and support of this project, though no specific comments were received. No specific sacred sites have been identified that would be affected by the proposed actions. No impacts, as outlined in the Indian Religious Freedom Act, are anticipated in terms of American Indian social, economic, or subsistence rights. The proposed actions would serve to restore a vegetation assemblage that is important to local tribal groups and may provide future subsistence gathering opportunities.**

**#13112 – Invasive Species:** This Order requires Federal Agencies whose actions may affect the status of invasive species to prevent the introduction of invasive species, detect and respond rapidly to and control populations of such species, and provide for restoration of native species and habitat conditions in ecosystems that have been invaded, as well as other various requirements. The proposed actions all carry mitigating measures to assure invasive species do not move into the area as discussed above under the Vegetation effects section, and the purpose and need for action addresses restoration of native species and habitat.

**#13186 – Migratory Birds:** This Executive Order, entitled “responsibilities of Federal Agencies to Protect Migratory Birds, requires that environmental analysis of Federal actions evaluate the effects of actions on migratory birds, with emphasis on species of concern.

The primary effect of the proposed actions would be conversion of a closed canopy mature forest to an open, grassy forest, with a concomitant reduction of snag habitat. Such effects are addressed in the Wildlife effects discussion above (Landbirds, Neotropical Migrants), as well as in the Terrestrial Wildlife report and Biological evaluation contained in the project’s Analysis File (Davis, 2006b). When taken in the context of the watershed, the effects of any proposed actions are negligible, aside from the fact that these actions could result in the return of several species of migratory birds, such as the acorn and Lewis’s woodpeckers, which likely used to inhabit the area but no longer do.

## **2. State Laws:**

*Oregon State Best Management Practices (BMPs).* State BMPs are employed to maintain water quality (see the Cumulative Effects Report, page 26 and 27 and the Mitigation measures listed in section II of this EA and USDA, 1988c).

*The Oregon Smoke Management Plan---*The Oregon State Implementation Plan and the Oregon State Smoke Management Plan will be followed to maintain air quality. See Fire and Fuel Prescription contained in the Analysis File (Hays, 2005).

Consultation with the *Oregon State Historic Preservation Officer (SHPO).* SHPO has been consulted concerning proposed activities in the Jim’s Creek Savanna Restoration Project Area. The Advisory Council on Historic Preservation (ACHP) has been consulted about measures to protect significant archeological sites from adverse affects (see the Project Review for Heritage Resources Form in the Analysis File).

*The Oregon State Water Quality Regulations (DEQ, 2004).* These regulations dictate how water resources are to be managed and protected; see the Fisheries/Watershed Report (Murdough and Sheehan, 2005) in the project Analysis File.

### **3. Other NEPA Decision Documents:**

The Willamette National Forest Land and Resource Management Plan (USDA, 1990a; as amended by USDA/USDI, 1994) played a major role in determining the Purpose and Need and in the development of all the alternatives. As mentioned above, the action alternatives comply with all aspects, standards, and guidelines of the Forest Plan aside from exceptions as discussed in section III. F. of this document which will require a non-significant Forest Plan amendment to exempt this project from several trail and scenic management standards and guidelines. Rationale for compliance with these requirements can be found in the Fisheries and Wildlife Effects sections above, and the Silvicultural Prescription (Bailey, 2005b) and the Terrestrial Wildlife Report (Davis, 2006b) contained in the project's Analysis File, and in the above discussion on compliance with Federal Laws and Policies in this section. This analysis is tiered to the Final Environmental Impact statement for the Forest Plan (USDA, 1990b).

### **4. Programmatic Analyses:**

The Watershed Analysis for the Middle Fork of the Willamette Downstream Tributaries (USDA, 1995); identified the needed activities and mitigation measures to comply with the Aquatic Conservation Strategy Objectives, determines the width for riparian reserves, and establishes the need for and benefit of thinning stands within the riparian reserves (see Recommendations section, page 5 and Appendix K, USDA, 1995).

The Willamette National Forest Road Analysis Report (USDA, 2003) and the Middle Fork District Supplemental Road Analysis (USDA 2004b) recommended which system roads should remain open to facilitate management and public use and which should be closed to reduce maintenance costs and resources risk. The Forest Road Analysis provides decision makers with information needed to identify and manage a minimum road system that is safe and responsive to public needs and desires, is affordable and efficient, has minimal adverse effect upon ecological processes and ecological health and productivity of the land, and is in balance with available funding for needed management actions. It provided recommendations for key roads that should remain open and well maintained as well as recommendations of roads that should be considered for closure.

The District road analysis evaluated each road segment on the District relating to terrestrial, aquatic, administrative, and public use factors. Based upon that rating system, road closure recommendations for the Districts road system were made. The roads in the project area proposed to be closed under all action alternatives developed for this project have all been recommended for closure in the two above Road Analysis documents.

## **N. Consumers, Civil Rights, Minority Groups, and Women**

Implementation of any alternative may not by itself have any effects upon consumers but, in combination with other timber harvest projects, may have an effect on the local economy, especially upon the communities of Lowell, Oakridge, Westfir, Springfield, and Eugene. The Willamette National Forest Plan FEIS (USDA, 1990a) addresses social and economic effects on pages IV-119 to 128.

Implementation of this project proposal has not been planned to either favor or discriminate against any social or ethnic group. Contracting procedures used to implement whatever decision may come from this analysis would ensure that contracts used to implement proposed actions would be advertised and awarded in a manner that gives proper consideration to minority and women-owned business groups and meet Equal Employment Opportunity requirements. Due to these considerations, there would be no direct, indirect or cumulative effects to consumers or minority groups should, any of the action alternatives be implemented.

## **O. Irreversible and Irrecoverable Commitments of Resources**

Some irreversible and irretrievable commitments of resources would result from the proposed actions contained in all action alternatives. Some erosion or soil movement could result from culvert replacement if a large rainstorm occurred during construction, but the likelihood of storm-based erosion would be minimized through the mitigating measures presented above in the Alternatives section. Some soil movement and stream sedimentation could result if a large storm event occurred before or immediately after grass planting is accomplished. Soil loss in this worst case scenario would be irreversible, but if rainfall caused only soil displacement (e. g., soil is mobilized but moves only to fill in depressions on the slope) there would be no irreversible effects.

Production of crushed rock from quarries used in maintenance of the existing road system would be both irreversible and irretrievable from a practical standpoint. Energy used to grow, manage, and harvest trees, and in other management activities, is generally irretrievable. The tree growth that would be forgone by the maintenance of this area as an open savanna-type forest would be irretrievable but the open canopy nature of the restored forest could be reversed in the future simply by ceasing the application of prescribed underburning. The same could be said for wildlife habitat and individual animal and plant species that would use closed canopy mature forest over open, grassy forests. Irreversible and irretrievable commitments as stated above are also discussed in a general sense in the Willamette Forest Plan FEIS (USDA 1990b) on page IV-178.

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## **P. Special Forest Products**

There is increasing recognition of the economic value of special forest products (SFPs) and their potential role in supporting the diversification of forest product dependent communities. The SFP program on the Forest provides a potentially wide range of products (see USDA, 1993).

The Jim's Creek Savanna Restoration Stewardship project has been proposed, in part, to assure the provision of certain forest products that have a cultural importance such as Oregon white oak acorns, camas, yampa, bunchgrass, and various shrubs. These SFPs are defined as "non-timber, renewable, vegetative natural resources" that can be utilized either for personal, cultural, or commercial use.

The collections of SFPs are directed by Forest Plan Amendment No. 23 and the SFPs Management Plan (USDA, 1993). The latter document suggests that collection of certain SFPs be focused upon areas that are scheduled for harvest, so the proposed actions would provide for a greater amount of potential SFP harvest. This direction ensures resource protection that is consistent with current Forest Plan goals and resource protection and ensures a sustainable long-term supply of desired products. FW-323 to 338 provides direction, such as acceptable harvest levels of various plants/products, acceptable methods of harvest, measures needed to protect other resource values, and where harvesting will be allowed.

At this time, though SFPs provide a potential for economic development, there is a low amount of interest in their collection, and the supply of various renewable forest products existing in this planning area and throughout the Middle Fork watershed far exceeds the demand for these products.

## **Q. Short-term and Long-term Effects**

The No Action alternative would not provide for any restoration of historically more open forest conditions and would have the long-term effect of causing the eventual extirpation of ponderosa pine and Oregon white oak on this portion of the landscape.

The short-term effects of the proposed actions are to impact resources in the planning area within thresholds established in the Willamette National Forest Plan as amended by the Northwest Forest Plan, as described in detail above. These would include a short-term degradation of the scenic conditions of the area (specifically in reference to the Young's Rock Trail) and a potential short-term increase in turbidity within the Middle Fork river should a large storm event occur before ground vegetation recovers. The action alternatives also have the long-term effect (as long as the prescribed maintenance underburning is applied) of providing some amount of open, grassy forest that would serve to maintain the original diversity in this watershed, which includes the provision of

a permanent big game forage source. No long-term adverse resource impacts are anticipated.

## **R. Farmland, Rangeland, and Forestland Effects**

No farmland or rangeland is found in the project area, though the entire project area and a much larger area adjacent to it were grazed around the turn of the 20<sup>th</sup> century. Effects on forest land are displayed in this document for all alternatives, and are generally consistent with the management direction contained in the Willamette National Forest Land Management Plan (USDA, 1990) as amended by the Northwest Forest Plan (USAD/USDI, 1994), though if any of the proposed actions are implemented, the activities areas would not be growing a much merchantable tree volume of these stands currently have.

## **S. Unavoidable and Adverse Effects**

Unavoidable adverse effects from any of the action alternatives (in proportion to the amount of area being restored) would include soil movement, the potential for sediment entering the stream system should there be a large storm before recovery of ground vegetation, the production of smoke during fuels reduction and maintenance burning, some sediment production as the result of road maintenance and use, soil erosion as the result of slash burning and periodic maintenance underburning, the loss of snag habitat in areas proposed for excess tree removal (due to safety concerns for forest workers), and removal of late-successional, closed canopy forest habitat, such as that preferred by the northern spotted owl.

Also unavoidable are the effects to fish and fish habitats as detailed above under the water quality/fish habitat issue. There is risk of sediment production in this restoration proposal that cannot be avoided given the change that has occurred to this landscape over the last 100 years and the need to reduce fuels in the process of restoring this landscape.

## **T. Climate Change**

Potential changes in the physical and chemical nature of the earth's climate are likely to have impacts on the Nation's agriculture, forests, and related ecosystems. The complete extent and magnitude of these changes are uncertain at this time. There is a lack of sufficient information to predict and detect changes in health, diversity, and productivity of these specific ecological systems due to global climate change. The United States, through the Office of Science and Technology Policy and the FCCSET, has developed a national plan for global climate and atmospheric change research. The USDA activities

are identified in that plan, and are outlined in "Our Changing Planet: The FY 1991 U.S. Global Change Research Program." The Department of Agriculture is developing a Strategic Plan for Global Change which includes assessment and development of policy options, and research on the effects of management of forest and agricultural ecosystems on carbon dioxide and greenhouse gas cycling. The USDA is committed to a long-term research effort. Until research removes significant scientific uncertainties, the National Environmental Policy Act (NEPA) disclosure documents at the regional or project levels are not the appropriate means for addressing global change issues. The USDA endorses the concept that atmospheric and climate effects from major Federal actions be considered in national planning. Such analysis is incorporated as part of the two National analyses coordinated by USDA, the Resources Planning Act (RPA) Assessment and Program of 1990 and the Resources Conservation Act Appraisal of 1995. Evaluation of global change effects in NEPA documents at the regional or project levels would be speculative and rarely provide meaningful information for the decision maker. Evaluation of global change effects for long-term regional programs may be appropriate in the future when research removes significant scientific uncertainties. The USDA will continue an active leadership role in agriculture and forestry regarding the reduction of emissions of greenhouse gases.

Additionally, the manipulation of vegetation is not likely an effective method of reducing concentrations of carbon dioxide in the atmosphere as long as large amounts of fossil fuels continue to be burned. As Herzog, et al. (2000) point out, one would have to plant an unforested area the size of the Indian subcontinent each year to balance current carbon dioxide emissions that are almost entirely generated from the combustion of fossil fuels. Even if there was enough bare land to use for effective carbon sequestration through afforestation, these forests are not really storing carbon for any reliably long period of time; they are still part of the active carbon cycle and are subject to various disturbances that can abruptly end the storage function. This is especially true of coniferous forests in the western United States, such as those in the Jim's Creek planning area, which are quite flammable and subject to periodic wildfire during summer droughts (USDA, 1995, Characterization section, page 6). One severe wildfire on this landscape would release much carbon dioxide immediately, and much more would be generated chronically as the killed tree stems decompose.

The restorations that would occur in the Jim's Creek area at what ever level, if any of the action alternatives are implemented, would preserve a plant community adapted to dry conditions and frequent fires. According to Mote, et al (1999; page 74) successful forest management approaches in the face of potential increases in temperature and decreases in precipitation and snowpack accumulation include maintaining the full range of biodiversity, managing forest densities for reduced susceptibility to drought stress , plant

species with a known broad physiological climate response curve, and use prescribed fire to reduce susceptibility to high-intensity, large disturbances. All these management approaches are included in the action alternatives that have been developed for the Jim's Creek Savanna Restoration project.

## **IV. Monitoring Plan**

Based upon the issues identified during the scoping process and used in the design of the alternatives, the following conditions are recommended to be used as a guide for monitoring key components of the project, should an action alternative be selected for implementation. Not every project on the Middle Fork Ranger District can be fully and formally monitored. The following items should be strongly considered for evaluation and review should this project or any portion thereof be selected for formal monitoring in the Willamette National Forest monitoring program.

### **A. Success of Restoration: –**

- Monitor the health and response of legacy oak and pine to verify that they respond as expected to the restoration of historic conditions;
- General leave tree survival and vigor to determine if they respond as expected to release and to verify the need for artificial snag replacement;
- Degree of grass re-establishment; also all native forbs, including cultural plants, to document the rapidity of vegetation reestablishment to determine replanting need and for more accurate future soil erosion modeling;
- Amount of natural pine regeneration, to determine if supplemental planting is needed;
- Success of oak planting and growth of seedlings to determine if additional planting is needed and to help determine when prescribed maintenance underburning can begin;
- Effectiveness of slash disposal to determine if Forest Plan levels were achieved;
- Soil temperature during slash disposal to determine if that activity creates any detrimental soil conditions;
- Noxious weed population changes – in meadows, plantations and restored savanna to verify the need to do additional eradication;
- Vigor of understory vegetation after maintenance burning to determine the effects of frequent underburning;

- Effectiveness of maintenance burning in terms of conifer exclusion to determine if there is a need to do hand control of young conifers;
- Effects of maintenance burning on native and non-native vegetation to determine the effects of frequent underburning and whether prescribed underburning is a successful technique to reduce non-native vegetation.

## **B. General:**

- Spotted owl, barred owl and peregrine falcon status and occupancy to determine if assumptions used in this analysis were correct;
- Continue wildlife exclosure browse pressure monitoring (USDA, 2004) to determine the long-term effects of elk grazing on grass reestablishment;
- Resurvey streams to see if any changes in stream class occur to see if a low tree density translates to increases soil moisture and/or elevated water tables;
- Implement annual breeding bird surveys to document the effects of savanna restoration on bird species abundance;
- Follow up small mammal, butterfly, and herptile surveys to document the effects of savanna restoration on species abundance;
- Class IV streambed/bank failure, down cutting to determine if the restoration causes any change in channel stability;
- Soil movement after fire, in particular whether or how much sediment enters stream channels to verify the validity of soil erosion assumptions made in the analysis.

## **V. Consultation and Coordination**

The Forest Service consulted the following individuals, Federal, State, and local agencies, tribes and non-Forest Service persons during the development of this environmental assessment:

### **A. Interdisciplinary Team Members:**

The following disciplines comprised the core Interdisciplinary (ID) Team for the Jim's Creek Savanna Restoration Project analysis:

Dick Davis - wildlife biologist

Mike Sheehan - fisheries biologist

David Murdough - soil scientist

Bev McCully - timber sale specialist

Tim Bailey – silviculturist, NEPA specialist, team leader

Jennifer Lippert - botanist

Carol Winkler/ Cathy Lindberg - archaeologist

Chris Hays - fuels management specialist

Jane Kertis - fire ecologist

May Lee Sayer - engineer

This ID Team did most of the field work and analysis but also consulted with various other resource specialists, as mentioned below, as needed and as determined by ground conditions.

The following Middle Fork District or Willamette Forest personnel were directly consulted during this analysis, and/or submitted reports as part of the analysis of the proposed actions:

- Recreation Forester
- Hydrologist
- Geotechnical Specialist
- Certified Silviculturist
- Contracting Specialist
- Logging Systems Specialist

## **B. Federal, State, and Local Agencies:**

The following Federal and State government agencies were contacted at various points during project development. This contact consisted primarily of field trip and/or meeting attendance.

USDI Fish and Wildlife Service

USDI National Marine Fisheries Service

Oregon Department of Fish and Wildlife

Oregon State Historic Preservation Office.

In addition, the Cities of Oakridge and Westfir received scoping documents regarding this project.

### **C. Tribal Governments:**

The Cow Creek Band of the Umpqua Tribe of Indians, the Confederated Tribes of the Grand Ronde, The Confederated Tribes of the Warm Springs Reservation, the Confederated Tribes of Siletz, and the Klamath Tribes were all sent various document relating to this project, including the scoping letter and this environmental assessment. All the above tribes were invited to a number of field trips and meeting related to the project. Representatives of the Grand Ronde confederation visited the project area on two separate occasions. Both those visits included a comprehensive review and discussion of the purpose and needs for action and the proposed actions. The Grand Ronde, Silz, and Kalmath Tribes have expressed general interest in and support of this proposal.

### **D. General Public Consultation**

As mention in Chapter I, the public has been consulted throughout the development and analysis of this project. A total of ten public field trips and six public meeting and presentations were consulted prior to development of the proposed action. An electronic mailing list of approximately 80 names of meeting participants and other interested parties was created during the development of this project. Interdisciplinary meeting notes and various documents prepared during project development were mailed to this list.

## **VI. Contents of the Project Analysis File**

The following documents and reports were prepared as part of the analysis for the Jim's Creek Savanna Restoration Project. These documents are on File at the Middle Fork Ranger Station Westfir, Oregon phone (541)782-2283.

- Fisheries/Watershed Report (Murdough, et. al., 2005)
- Silvics Background Paper and Silviculture Prescription (Bailey, 2005b)
- Terrestrial Wildlife Report (Davis, 2006a)
- Biological Evaluations/Assessments: terrestrial fauna (Davis, 2006b), fisheries (Sheehan and Sims, 2005), and botanical (Lippert, 2005b); including letters of consultation from the US Fish and Wildlife Service and National Marine Fisheries Service;
- Project Review for Heritage Resources form
- Financial Analysis (Bailey, 2005c)

- Fire and Fuels Report and Prescription (Hays, 2005)
- Recreation and Scenics Report (Bailey, 2005d)
- Botany Report (Lippert, 2005a)
- Fire Ecology Report (Kertis, 2005)
- Public Comments/Correspondence
- Implementation Plan

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## VII. LITERATURE CITED

The references cited in the Environment Assessment are listed below.

- Agar, John, 1998; Analysis File, Young'n Final Environmental Impact Statement. Middle Fork Ranger District, Willamette National Forest, USDA Forest Service. September, 1998.
- Agee, J.K., 1990. The historic role of fire in Pacific Northwest Forests. In Natural and Prescribed Fire in the Pacific Northwest. Walstad, J.D., Radosovich, S.R., and Sanberg, D.V. (eds.) Oregon State University Press, Corvallis, Oregon.
- Agee, J. K., 1996. Fire in Restoration of Oregon White Oak Woodlands. In: The Use of Fire in Forest Restoration, General Technical Report INT-GTR-341, Hardy C. C., and Arno, S. F., eds., US Department of Agriculture, Forest Service, Intermountain Research Station, 1996.
- Allen, M. M., 1997. Soil Compaction and Disturbance Following a Thinning of Second-Growth Douglas-fir With a Cut-to-Length and Skyline System in the Oregon Cascades. Masters Thesis, Department of Forest Engineering, Oregon State University, Corvallis, Oregon. September 15, 1997.
- Altman, B. 1999. Conservation strategy for landbirds in coniferous forests of western Oregon and Washington. Version 1.0. Prepared for: Oregon-Washington Partners in Flight. March 1999.
- Anderson, Hal E., 1982. Aids to Determining Fuel Models for Estimating Fire Behavior. National Wildfire Coordination Group; USDA Forest Service Intermountain Forest and Range Experimental Station, Boise, Idaho. General Technical Report GTR INT-122, 1982.
- Anthony, R.G., E.D. Forsman, A.B. Franklin, D.R. Anderson, K.P. Burnham, G.C. White, C.J. Schwarz, J. Nichols, J.E. Hines, G.S. Olson, S.H. Ackers, S. Andrews, B.L. Biswell, P.C. Carlson, L.V. Diller, K.M. Dugger, K.E. Fehring, T.L. Fleming, R.P. Gerhardt, S.A. Gremel, R.J. Gutierrez, P.J. Happe, D.R. Herter, J.M. Higley, R.B. Horn, L.L. Irwin, P.J. Loschl, J.A. Reid, S.G. Sovern. 2004. Status and Trends in Demography of Northern Spotted Owls, 1985 – 2003. September 2004
- Atzet, T., D.E. White, L.A. McCrimmon, P.A. Martinez, P.R. Fong, and V.D. Randall. 1996. Field guide to the forested plant associations of southwestern Oregon. USDA Forest Service, Pacific Northwest Region, Technical Paper R6-NR-ECOL-TP-17-96. September 1996

- Bailey, Timothy W. 2005a. The Jim's Creek Savanna Restoration Project Plantation Underburning Monitoring Review. Internal paper, Middle Fork Ranger District, Willamette National Forest, Westfir, Oregon, October, 2005.
- Bailey, Timothy W. 2005b. Stand Diagnosis of Treatment Needs, Silvicultural Prescription, and Silvics Background Paper; The Jim's Creek Savanna Restoration Project. Jim's Creek Savanna Restoration Project Environmental Assessment, Analysis File. Middle Fork Ranger District, Willamette National Forest, Westfir, Oregon, October, 2005.
- Bailey, Timothy W. 2005c. The Jim's Creek Savanna Restoration Project Financial Analysis. Jim's Creek Savanna Restoration Project Environmental Assessment, Analysis File. Middle Fork Ranger District, Willamette National Forest, Westfir, Oregon, October, 2005.
- Bailey, Timothy W. 2005d. Scenic and Recreational Resources Effects Paper, Jim's Creek Savanna Restoration Project. Jim's Creek Savanna Restoration Project Environmental Assessment, Analysis File. Middle Fork Ranger District, Willamette National Forest, Westfir, Oregon, May, 2005.
- Bailey, T. W., and J. Kertis, 2002. Jim's Creek Savanna: The Potential for Restoration of an Oregon White Oak and Ponderosa Pine Savanna – Current, Past, and Desired Future Condition. White Paper, Willamette National Forest, Middle Fork Ranger District, Westfir, Oregon, August, 2002.
- Barrett, J. C., 1963. Dominant Ponderosa Pine Do Respond To Thinning. Research Note PNW-9. USDA Forest Service Pacific Northwest Forest and Range Experiment Station, Portland Oregon, 1963.
- Barrett, J. C., 1969. Crop Tree Thinning of Ponderosa Pine in the Pacific Northwest. Research Note PNW-100. USDA Forest Service Pacific Northwest Forest and Range Experiment Station, Portland Oregon, 1969.
- Barret, J. C., 1979. Silviculture of Ponderosa Pine in the Pacific Northwest. General Technical Report PNW-232. USDA Forest Service Pacific Northwest Forest and Range Experiment Station, Portland Oregon, 1979.
- Bates, D. 2005. Report calculating the peak stream discharges based on selected frequencies and the watershed area. Willamette National Forest, Supervisor's Office, Eugene, Oregon.
- Baxter, Paul W., 1983. The Colt Timber Sale Project: an archaeological investigation of six sites in the Upper Middle Fork of the Willamette River Valley. Department of Anthropology, University of Oregon, Eugene, Oregon. 1983

- 
- Baxter, Paul W. 1986 *The Colt and Saddle Sites: Excavations on Deadhorse Creek*. Department of Anthropology, University of Oregon, Eugene, Oregon.
- Beckham, Stephen Dow 1981 *The Oregon Central Military Wagon Road: A History and Reconnaissance*. Heritage Research Associates Report No. 6. Eugene, Oregon.
- Boerner, R.E. 1982. Fire and nutrient cycling in temperate ecosystems. *BioScience* vol. 32 no. 3, March, 1982.
- Boyd, Robert, 1999. *Indians, Fire and The Land*; Robert Boyd, editor. Oregon State University Press, Corvallis, Oregon. 1999.
- Boyer, D. E., and Dell, J.D. 1980. Fire Effects on Pacific Northwest Forest Soils. USDA, Forest Service, Pacific Northwest Region (R-6), Portland, Oregon.
- Buckley, Y. M, D.T. Briese and M. Rees. 2003. Demography and management of the invasive plant *Hypericum perforatum* II. Construction and use of an individual-based model to predict population dynamics and the effects of management strategies. *Journal of Applied Ecology* 40:494-507
- Cary, A.B. 2004. Appendix 5: relationship of prey and forest management. in Courtney, S.P., J.A. Blakesley, R.E. Bigley, M.L. Cody, J.P. Dumbacher, R.C. Fleischer, A.B. Franklin, J.F. Franklin, R.J. Gutierrez, J.M. Marzluff, L. Sztukowski. 2004. Scientific evaluation of the status of the northern spotted owl (SEI Report). Sustainable Ecosystems Institute, Portland OR. September 2004.
- Castillo, W.J. 2005. Personal Communication. District Wildlife Biologist, South Willamette Watershed District, Oregon Department of Fish and Wildlife. March 9, 2005.
- Castillo, W.J. 2005. Personal Communication. District Wildlife Biologist, South Willamette Watershed District, Oregon Department of Fish and Wildlife. March 9, 2005.
- Chappell, C.B., R.C. Crawford, C. Barrett, J. Kagan, D.H. Johnson, M. O'Mealy, G.A. Green, H.L. Ferguson, W.D. Edge, E.L. Greda, and T.A. O'Neil. 2001. Wildlife habitats: descriptions, status, trends, and system dynamics. in D. H. Johnson and T.A. O'Neil (Manag. Dirs.) *Wildlife-Habitat Relationships in Oregon and Washington*. Oregon State University Press, Corvallis, OR, USA. 2001. 736 pp.
- Chapin, T.G., D.J. Harrison, and D.M. Phillips. 1997. Seasonal habitat selection by marten in an untrapped forest preserve. *Journal of Wildlife Management* 61(3): 707-717.
- Chappel, C. B. and J. Kagen, 2001. Westside Oak and Dry Douglas-fir Forests and Woodlands in: *Wildlife Habitat Relationships in Oregon and Washington*;

- Managing Directors D. H. Johnson and R. A. O'Neil. Oregon State University Press, 2001.
- Cook, J.G. 2002. Nutrition and Food. Chapter 5, pp. 259-350. in: Toweill, D.E. and J.W. Thomas, editors. North American Elk: Ecology and Management. Smithsonian Institution Press. 2002.
- Cannaughton, James L., 2005. Memorandum re: Guidance on the Consideration of Past Actions in Cumulative Effects Analysis. James L. Connaughton, Chairman, Council of Environmental Quality, June 24, 2005.
- Courtney, S.P., J.A. Blakesley, R.E. Bigley, M.L. Cody, J.P. Dumbacher, R.C. Fleischer, A.B. Franklin, J.F. Franklin, R.J. Gutierrez, J.M. Marzluff, L. Sztukowski. 2004. Scientific evaluation of the status of the northern spotted owl (SEI Report). Sustainable Ecosystems Institute, Portland Oregon. September, 2004
- Courtney, S.P. and A. Franklin. 2004. Scientific evaluation of the status of the northern spotted owl: chapter twelve – information needs. in Courtney, S.P., J.A. Blakesley, R.E. Bigley, M.L. Cody, J.P. Dumbacher, R.C. Fleischer, A.B. Franklin, J.F. Franklin, R.J. Gutierrez, J.M. Marzluff, L. Sztukowski. 2004. Scientific evaluation of the status of the northern spotted owl (SEI Report). Sustainable Ecosystems Institute, Portland Oregon. September, 2004.
- Csuti, B., A.J. Kimerling, T.A. O'Neil, M.M. Shaughnessy, E.P. Gaines, and M.M.P. Huso, 1997. Atlas of Oregon Wildlife (Distribution, Habitat, and Natural History), Oregon State University Press, Corvallis, Oregon.
- Curtis, J. D., 1964. Roots of a Ponderosa Pine. USDA Foirest Service Research Paper INT-9, 1964.
- Davis, Carl M.1988. Willamette National Forest Cultural Resource Inventory Plan. U.S. Forest Service, Pacific Northwest Region. 1988
- Davis, Richard F., 2006a. Terrestrial Wildlife Report for: Jim's Creek Savanna Restoration Project. Jim's Creek Savanna Restoration Project Environmental Assessment, Analysis File. Middle Fork Ranger District, Willamette National Forest, Westfir, Oregon, February, 2005.
- Davis, Richard F., 2006b. Terrestrial Fauna Biological Analysis/Evaluation for: Jim's Creek Savanna Restoration Project. Jim's Creek Savanna Restoration Project Environmental Assessment, Analysis File. Middle Fork Ranger District, Willamette National Forest, Westfir, Oregon, February, 2005.
- Devine, Warren, and C. Harrington, 2004. Garry Oak Woodland Restoration in the Puget Sound Region: Releasing Oaks From Overtopping Conifers and Establishing Oak

- Seedlings. In: Proceedings in the 16<sup>th</sup> Annual Society for Ecological Restoration Conference, Aug. 24-26, 2004. Victoria, B. C. Canada: Society for Ecological Restoration. 1-8.
- Dole, Jessica, 2002. Personal communication from Jessica Dole, Landscape Architect for the Siuslaw National Forest, titled "Jim's Creek Oak Restoration Evaluation for Possible Project Initial Scenery Assessment. May, 2002.
- Elliot, 2000. Watershed Erosion Prediction Project (WEPP). Forest Service WEPP interfaces for disturbed forest and range runoff, erosion, and sediment delivery. Agricultural Research Service, National Soil Erosion Research Laboratory. <http://forest.moscowfsl.wsu.edu/fswepp/>. Moscow, Idaho.
- Franklin, Jerry F., et al. 1981. Ecological Characteristics of Old-Growth Douglas-fir Forests. Pacific Northwest Forest and Range Experiment Station, General Technical Report PNW-118.
- FEMAT, 1993. Forest Ecosystem Management: An Ecological, Economic, and Social Assessment. Report of the Forest ecosystem Management Assessment Team. USDA Forest Service; USDI Fish and Wildlife Service; USDC National Oceanic and Atmospheric Administration, National Marine Fisheries Service; USDI, Bureau of Land Management; USDI National Park Service; US Environmental Protection Agency, July, 1993.
- Forsman, Eric D., R.G. Anthony, J.A. Reid, P.J. Loschl, S.G. Sovern, M. Taylor, B.L. Biswell, A. Ellingson, E.C. Meslow, G.S. Miller, K.A. Swindle, J.A. Thraikill, F.F. Wagner, D.E. Seaman. 2002. Natal and breeding dispersal of northern spotted owls. The Wildlife Society, Wildlife Monographs No. 149, October 2002.
- Fule, P. Z., W. W. Covington, H. B. Smith, J. D. Springer, T. A. Heinlein, K. D. Huisinga, and M. M. Moore, 2001. Comparing Ecological Restoration Alternatives, Grand Canyon, Arizona. *Forest Ecology and Management* 170 (2002) 19-41
- Gilbert, F.F. and R. Allwine. 1991. Spring bird communities in the Oregon Cascade Range. pp. 319-325 in: Ruggiero, Leonard F.; Aubry, Keith B.; Carey, Andrew B.; Huff, Mark H., tech. coords. *Wildlife and vegetation of unmanaged Douglas-fir forests*. USDA Forest Service, Pacific Northwest Research Station, Portland, Oregon, General Technical Report PNW-GTR-285, May 1991.
- Gunderson, Grant. 2004. Personal Communication. Regional Wildlife Program Leader (retired), USDA Forest Service Region 6. October 6, 2004.

- Hadley, Keith S., 1999. Forest History and Meadow Invasion at the Rigdon Meadows Archeological Site, Western Cascades, Oregon. *Physical Geography*, 20, 2:116-133.
- Hagar, J.C., W.C. McComb, and W.H. Emmingham. 1996. Bird communities in commercially thinned and unthinned Douglas-fir stands of western Oregon. *Wildlife Society Bulletin* 24 (2): 353-366.
- Hallet, J. G., T. Lopez, M. A. O'Connell, M. A. Borysewicz, 2001. Decay dynamics and avian use of artificially created snags. *Northwest Science* 75:378-386.
- Hamer, T.E., D.L. Hays, C.M. Senger, E.D. Forsman. 2001. Diets of northern barred owls and northern spotted owls in an area of sympatry. *J. Raptor Res.* 35(3):221-227.
- Harrington, C. A., and C. C. Kern, 2002. Will Garry Oak Respond to Release from Overtopping Conifers. In: Burton, Philip J. ed., *Proceedings: Garry Oak Ecosystem Restoration: Progress and Prognosis*, British Columbia Chapter of the Society for Ecological Restoration, 2002 third annual meeting. [Canada]: [University of Victoria]: 39-46.
- Harrod, R. J. and S. Reichard. 2001. Fire and invasive species within the temperate and boreal Coniferous forest of western North America. 2001. In K.E.M. Gallery and T.P. Wilson (eds). *Proceedings of the Invasive Species Workshop: The role of fire in the control and spread of invasive species. Fire Conference 2000: the First National Congress of Fire Ecology, Prevention, and Management. Miscellaneous Publication No. 11*, Tall Timbers Research Station, Tallahassee, FL, pp. 95-101.
- Harvey, A.E., M.F. Jurgensen, and M.J. Larsen, 1979. Role of forest fuels in the biology and management of soil. USDA, Forest Service, Gen. Tech. Rep. INT-65, September, 1979.
- Hawes, S., and J. A. Christy, 2002. Preliminary Assessment – Historic Vegetation of the Jim's Creek Area, Middle Fork of the Willamette River, Willamette National Forest. September, 2002.
- Helvey, J.D. 1980. Effects of a north-central Washington wildfire on runoff and sediment production. *Water Resources. Bull.* 16, pp. 627-634.
- Hemstrom, M. A., S. E. Logan, W. Pavlat, 1987. *Plant Association and Management Guide – Willamette National Forest. USDA Forest Service Pacific Northwest Region R6-Ecol 257-B-86. May, 1987.*
- Herzog, H, B. Eliason, and O. Kaarstad, 2000. Capturing Greenhouse Gases. *Scientific American*, February, 2000.

- Holthausen, R.S., M.J. Wisdom, J. Pierce, D.K. Edwards, and M.M. Rowland. 1994. Using expert opinion to evaluate a habitat effectiveness model for elk in western Oregon and Washington. USDA Forest Service, Pacific Northwest Research Station, Research Paper PNW-RP-479, September 1994.
- Jimerson, T.M. and S. K. Carothers. 2002. Northwest California oak woodlands: environment, species composition, and ecological status. USDA Forest Service General Technical Report. PSW-GTR-184.
- Johnsgard, P.A. 1988. North American Owls – biology and natural history. Smithsonian Institution Press. 295 pp.
- Johnson, David H. and T.A. O'Neil (Manag. Dirs.). 2001. Wildlife-habitat relationships in Oregon and Washington. Oregon State University Press, Corvallis, Oregon.
- Johnson, Bart R. 2005. Final report-Jim's Creek Study. Unpublished report on file at the Willamette National Forest
- Jones, J.A. 2000. Hydrologic processes and peak discharge response to forest removal, regrowth, and roads in 10 small experimental basins, western Cascades, Oregon. Water Resources Research, Vol. 36. No. 9, pp. 2621-2642.
- Kertis, Jane 2000. Warner Mountain Pilot Fire History Study. Unpublished data, draft report. May, 2000.
- Kertis, Jane , 2001. Personal communication, Notes from May 24 visit to the Jim's Creek stand. May 24, 2001.
- Kertis, Jane, 2005. Jim's Creek Savanna Restoration Project Maintenance of Biodiversity Issue; Evaluation Criteria: Similarity to Historical Condition. Jim's Creek Savanna Restoration Project Environmental Assessment, Analysis File. Middle Fork Ranger District, Willamette National Forest, Westfir, Oregon, July 12, 2005.
- Kirchholtes, Renske 2006. Re-construction of Pre-settlement Vegetation Patterns Based Upon Phytolith Analysis. Master's Thesis, Educational Institute of Life and Earth Sciences, University of Amsterdam, the Netherlands. March, 2006.
- Klock, G.O., 1975. Impacts of five post-fire salvage logging systems on soils and vegetation. Journal of Soil and Water Conservation, pp. 78-81.
- Klock, G.O and Helvey, J.D. 1976. Soil-water trends following wildfire on the Entiat Experimental Forest. In: Annual Proceedings of Tall Timbers Fire Ecology Conference No. 15. USDA Forest Service Tall Timbers Res. Stn. Tallahassee Florida, pp. 193-200.

- Laudenslayer, W.F.Jr., P.J. Shea, B.E. Valentine, C.P. Weatherspoon, T.E. Lisle, technical coordinators. 2002. Proceedings of the symposium on the ecology and management of dead wood in western forests. 1999 November 2-4; Reno, NV. Gen. Tech. Rep. PSW-GTR-181. Albany, CA: Pacific Southwest Research Station, USDA Forest Service; 949pp.
- Legard, Harold A. and L. C. Meyer, 1973, 1992. Willamette National Forest Soil Resource Inventory. Willamette National Forest, USDA Forest Service. October, 1981.
- Lewis, J.C. 1998. Creating snags and wildlife trees in commercial forest landscapes. *Western Journal of Applied Forestry*, Vol. 13, no. 3 pp. 97-101.
- Lippert, Jennifer, 2005a. Botanical Report, The Jim's Creek Savanna Restoration Project. Jim's Creek Savanna Restoration Project Environmental Assessment, Analysis File. Middle Fork Ranger District, Willamette National Forest, Westfir, Oregon. December 21, 2005.
- Lippert, Jennifer, 2005b. Botanical Biological Evaluation for the Jim's Creek Savanna Restoration Stewardship Project. Jim's Creek Savanna Restoration Project Environmental Assessment, Analysis File. Middle Fork Ranger District, Willamette National Forest, Westfir, Oregon. December 21, 2005.
- Marshall, D.B., M.G. Hunter, and A.L. Contreras, Eds. 2003. *Birds of Oregon: A General Reference*. Oregon State University Press, Corvallis, OR. 768pp.
- McCain, C. and N. Diaz. 2002. Field guide to the forested plant associations of the Westside Central Cascades of Northwest Oregon: Willamette N.F., USFS; Mt. Hood N.F., USFS; Salem District, BLM; Eugene District, BLM. USDA Forest Service Pacific Northwest Region. Technical Paper R6-NR-ECOL-TP-02-02. June, 2002.
- McNabb, D.H. and Swanson, F.J. 1990. Effects of fire on soil erosion. In: J.D. Walsad, S.R. Radosevich, and D.V. Sandberg (eds.) *Natural and prescribed fires in the Pacific Northwest Forests*. Oregon State University Press, Corvallis, Oregon.
- Megahan, W.F., N. F. Day and T. M. Bliss, 1978. Landslide occurrence in the western and central northern Rocky Mountain Physiographic Province of Idaho. In: C.T. Youngberg (ed), *Forest Soils and Land Use*. Proceedings of the 5<sup>th</sup> North American Forest Soils Conference. Colorado State University, Ft. Collins, pp. 116-139.
- Mellen, 2005. Personal communication, Kim Mellen, Regional Wildlife Ecologist, USDA Forest Service, Portland, Oregon, February 15, 2005.

- 
- Mellen, K., B. G. Marcot, J. L. Ohmann, K. Waddell, S. A. Livingston, E. A. Willhite, B. B. Hostetler, C. Ogden, and T. Dreisbach. 2003. DecAID, the decayed wood advisor for managing snags, partially dead trees, and down wood for biodiversity in forests of Washington and Oregon. Version 1.10. USDA Forest Service, Pacific Northwest Region and Pacific Northwest Research Station; USDI Fish and Wildlife Service, Oregon State Office; Portland, Oregon.
- Mote, P., D. Canning, D. Fluharty, R. Francis, J. Franklin, A. Hamlet, M. Hershman, M. Holmberg, K. Gray-Ideker, W. S. Keeton, D. Lettenmaier, R. Leung, N. Mantua, E. Miles, B. Noble, H. Parandvash, D. W. Peterson, A. Snover, and S. Willard, 1999. Impacts of Climate Variability and Change, Pacific Northwest. National Atmospheric and Oceanic Administration, Office of Global Programs, and JISAO/SMA Climate Impacts Group, Seattle, WA. JISAO Contribution No. 715, 1999.
- Muir, Patricia S., R.L. Mattingly, J.C. Tappeiner II, J.D. Bailey, W.E. Elliott, J.C. Hagar, J.C. Miller, E.B. Peterson, E.E. Starkey. 2002. Managing for biodiversity in young Douglas-fir forests of western Oregon. Biological Science Report, USGS/BRD/BSR-2002-0006, October 2002.
- Murdough, David, M. Sheehan, D. Bates, and A. Johnson, 2005. Jim's Creek Savanna Restoration Project Fisheries and Watershed Report. Jim's Creek Savanna Restoration Project Environmental Assessment, Analysis File. Middle Fork Ranger District, Willamette National Forest, Westfir, Oregon. December 5, 2005.
- NatureServe. 2005. NatureServe Explorer: An online encyclopedia of life [web application]. Version 4.5. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. Copyright © 2005 NatureServe, 1101 Wilson Boulevard, 15th Floor, Arlington Virginia 22209, U.S.A. All Rights Reserved.
- ODEQ, 2004. Oregon Department of Environmental Quality Communications and Outreach News release: EPA Approves Water Quality Standards. March 2, 2004.
- ODFW, 2002. Draft black-tailed deer work group report 2002 (7/12/02). Oregon Department of Fish and Wildlife, P.O. Box 59, 2501 S.W. First Avenue, Portland, Oregon 97201.
- ODFW, 2003. Oregon's elk management plan: February 2003. Oregon Department of Fish and Wildlife, P.O. Box 59, 2501 S.W. First Avenue, Portland, Oregon 97201.
- ODFW, 2005. DRAFT Review of Oregon's mule deer and elk management objectives February 2005. Proposals developed by district working groups for public review. Oregon Department of Fish and Wildlife, 3406 Cherry Avenue NE, Salem, Oregon 97303.

- OPRD, 2003. Oregon Statewide Comprehensive Outdoor Recreation Plan – 2005 – 2007. Oregon Parks and Recreation Department, Salem, Oregon. January, 2003.
- OECD, 2002. 2005 Distressed Areas and Associated Index Values Oregon Economic Community Development Department web site: [www.econ.state.or.us/distlist.htm](http://www.econ.state.or.us/distlist.htm).
- Olson, D.H., J.C. Hagar, A.B. Carey, J.H. Cissel, and F.J. Swanson. 2001. Wildlife of Westside and High Montane Forests. pp. 187-212. in D. H. Johnson and T.A. O’Neil (Manag. Dirs.) Wildlife-Habitat Relationships in Oregon and Washington. Oregon State University Press, Corvallis, OR, USA. 2001. 736 pp.
- O’Neil, Thomas A., David H. Johnson, Charley Barrett, Maria Trevithick, Kelly A. Bettinger, Chris Kiilsgaard, Madeleine Vander Heyden, Eva L. Greda, Derek Stinson, Bruce G. Marcot, Patrick J. Doran, Susan Tank, and Laurie Wunder. Matrixes for Wildlife-Habitat Relationship in Oregon and Washington. Northwest Habitat Institute. 2001. in D. H. Johnson and T.A. O’Neil (Mng. Dirs.) Wildlife-Habitat Relationships in Oregon and Washington. Oregon State University Press, Corvallis, OR, USA. 2001. 736 pp.
- Oregon Biodiversity Project, 1998. Oregon’s Living Landscape: Strategies and Opportunities to Conserve Biodiversity. Defenders; of Wildlife publication, 1998.
- Perry, D. A., M.P. Amaranthus, J.G. Borchers, S.L. Borchers, and R.E. Brainerd, 1989. Bootstrapping in ecosystems - internal interactions largely determine productivity and stability in biological systems with strong positive feedback. *BioScience* Vol. 39 No. 4. April, 1989.
- Raymond, Crystal L. and D. L. Peterson, 2005. Fuel Treatments Alter the Effects of Wildfire In a Mixed-evergreen Forest, Oregon, USA. *Canadian Journal of Forestry*, 35: 2891-2995, December, 2005.
- Resources Northwest, 1997. Middle Fork Willamette River Level II Hankin and Reeves Stream Survey. Kirkland, WA.
- Rose, C.L., B.G. Marcot, T.K. Mellen, J.L. Ohmann, K.L. Waddell, D.L. Lindley, B. Schreiber. 2001. Decaying wood in Pacific Northwest forests: concepts and tools for habitat management. pp. 580-623. in D. H. Johnson and T.A. O’Neil (Manag. Dirs.) Wildlife-Habitat Relationships in Oregon and Washington. Oregon State University Press, Corvallis, OR, USA. 2001. 736 pp.
- Ruggiero, L.F., K.B. Aubry, S.W. Buskirk, L.J. Lyon, and W.J. Zielinski (technical editors). 1994. The scientific basis for conserving forest carnivores: American marten, fisher, lynx, and wolverine in the western United States. USDA Forest Service General Technical Report RM-254. September 1994.

- Schuller, R. 1997. Vegetation response to fall prescribed burning within *Festuca idahoensis*-dominated prairie, Mima Mounds, Natural Area Preserve, Washington 1985-1992. IN Dunn, P and K. Ewing, eds., Ecology and Conservation of the South Puget Sound Prairie Landscape. The Nature Conservancy, Seattle, Washington.
- Smith, J. H. G., 1964. Root spread can be Estimated From Crown Widths of Douglas-fir, Lodgepole Pine and Other British Columbia Tree Species. *Forestry Chronicles*, 40: 456-473
- Sheehan, Michael, and W. Sims, 2005. Biological Assessment, Jim's Creek Savanna Restoration Project Environmental Assessment, Analysis File. Middle Fork Ranger District, Willamette National Forest, Westfir, Oregon, October 21 2005.
- Swanson, F.J. 1981. Fire and Geomorphic Processes. Gen. Tech. Rep. USDA Forest Service. WO-26. Washington DC. pp. 401-420.
- Swanson, F.J. and Dyrness, C.T. 1975. Impact of clearcutting and road construction on soil erosion by landslides in Western Cascade Range, Oregon. *Geology* 3, pp. 393-396.
- Swanston, 1971. Principal soil movement processes influenced by road building, logging, and fire. Proceedings of a symposium: Forest Land Uses and Stream Environment. Oregon State University, Corvallis. pp. 29-40.
- Thilenius, J. F. 1968. The *Quercus garryana* forests of the Willamette Valley, Oregon. *Ecology* 49:6, pp. 1125-1133.
- Thomas, J.W., E.D. Forsman, J.B. Lint, [and others]. 1990. A conservation strategy for the northern spotted owl: a report of the Interagency Scientific Committee to address the conservation of the northern spotted owl. Portland, OR: USDA Forest Service; USDI Bureau of Land Management, Fish and Wildlife Service, and National Park Service. 427pp.
- Thraillkill, 2004. Personal conversation with James Thraillkill, U.S. Fish and Wildlife Service wildlife biologist, Portland, Oregon, May26, 2004
- Tveten, R.K and R.W. Fonda. 1999. Fire effects on prairies and oak woodlands on Fort Lewis, Washington. *Northwest Science* 73:3 pp. 145-157..
- US Census, 2002. United States Bureau of Census Report for the 2000 Census.
- USACOE, 1960. Progress Report, Hill's Creek Project; U. S. Army Engineer Contract No. DA-35-026-CIVENG-61-10. October 13, 1960.
- USDA 1985. Management of Wildlife and Fish Habitats in Forests of Western Oregon and Washington Forest Service Publication No. R6-F&WL-192-1985. .

- USDA, 1988a. Final Environmental Impact Statement- Managing Competing and Unwanted Vegetation. Pacific Northwest Region. Portland, OR.
- USDA, 1988b. Middle Fork Willamette Viewshed Corridor Study – Rigdon Ranger District. USDA Forest Service, Willamette National Forest. Prepared by Jody Stix. April, 1998.
- USDA, 1988c. General Water Quality Best Management Practices. Forest Service. Pacific Northwest Region.
- USDA, 1990a. Land and Resource Management Plan for the Willamette National Forest. Willamette National Forest. Eugene, Oregon, 1990.
- USDA, 1990b. Final Environmental Impact Statement for the Willamette National Forest Land and Resource Management Plan. Willamette National Forest, Eugene, Oregon, 1990.
- USDA, 1993a. A First Approximation of Ecosystem Health – National Forest Lands. USDA Forest Service, Pacific Northwest Region, Portland, Oregon. June, 1993.
- USDA, 1993b. Special Forest Products Environmental Assessment. USDA Forest Service, Willamette National Forest, Eugene, Oregon, December, 1993
- USDA, 1995. Watershed Analysis Report - Middle Fork Willamette River Downstream tributaries. Willamette National Forest, Rigdon Ranger District. August, 1995.
- USDA, 1996. Watershed Analysis Report – Upper Middle Fork Willamette River. Willamette National Forest, Rigdon Ranger District. August, 1996.
- USDA, 2002. *Wildland Fire in Ecosystems: Effects of Fire on Flora/Effects of Fire on Fauna/Effects of Fire on Air*. Rocky Mountain Research Station General Technical Report, USDA Forest Service, 2002.
- USDA, 2003. Willamette National Forest Road Analysis Report. USDA Forest Service, Willamette National Forest, Eugene, Oregon, 2003.
- USDA, 2004a. Jim’s Creek Demo Plant and Animal Habitat Improvement Project Decision Memo. Middle Fork Ranger District, Willamette National Forest. April, 2004.
- USDA, 2004b. Middle Fork Ranger District Supplemental Road Analysis Report, USDA Forest Service, Willamette National Forest, Middle Fork Ranger District, Westfir, Oregon. 2004.
- USDA/USDI, 1994. Final Supplemental Environmental Impact Statement and April 13, 1994 Record of Decision on Management of Habitat for Late-Successional and Old Growth Forest Related Species within the Range of the Northern Spotted Owl.

- 
- USDA Forest Service. Pacific Northwest Region, Bureau of Land Management Portland, OR. April, 1994.
- USDA/USDI, 1998a. Mid-Willamette Late-Successional Reserve Assessment. USDA Forest Service, Willamette National Forest; Salem District Bureau of Land Management; USDI Fish and Wildlife Service, August 24, 1998.
- USDA/USDI, 1998b. South Cascades Late Successional Reserve Assessment. USDA Forest Service, USDI Fish & Wildlife Service and Bureau of Land Management April 1998.
- USDA/USDI, 2000. Integrated Natural Fuels Management Strategy. Willamette National Forest, Eugene, Oregon; and the Eugene and Salem, Oregon offices of the Bureau of Land Management. November, 2000.
- USDA/USDI, 2001. Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines. USDA Forest Service, USDI Bureau of Land Management January, 2001.
- USDA/USDI, 2002. Field Guide to the Forested Plant associations of the Westside Central Cascades of Northwestern Oregon. Willamette and Mount Hood National Forests and the Eugene and Salem of the Bureau of Land Management. November, 2002.
- USDA /USDI Bureau of Land Management. 2004a. Record of Decision to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines in Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl. USDA Forest Service, USDI Bureau of Land Management, March 2004.
- USDA/USDI, 2004b. Programmatic biological assessment for projects with the potential to modify the habitats of northern spotted owls and/or bald eagles or modify critical habitat of the northern spotted owl: Willamette Province – FY2005-2006. USDA Forest Service and , Columbia River Gorge National Scenic Area, USDI Fish and Wildlife Service and Bureau of Land Management, August 13, 2004
- USDA/USDI, 2005. Northwest Forest Plan Temperature TMDL Implementation Strategies – Evaluation of the Northwest Forest Plan Aquatic Conservation Strategy and associated tools to achieve and maintain stream temperatures and water quality standards. USDA Forest Service and the USDI Bureau of Land Management. September 9, 2005.

- USDA, USDI-BLM, USDI-FWS, USDI-NPS, USGS, TNC. 2005. Interagency fire regime condition class guidebook, Version 1.2, May 2005  
[http://www.frcc.gov/docs/1.2.2.2/Complete\\_Guidebook\\_V1.2.pdf](http://www.frcc.gov/docs/1.2.2.2/Complete_Guidebook_V1.2.pdf)
- USDI, 1994. Draft Northern Spotted Owl Recovery Plan. USDI US Fish and Wildlife Service, 2004.
- USDI, 1995. Biological Opinion on Implementation of Interim Strategies for Managing Anadromous Fish-producing Watershed in Eastern Oregon and Washington, Idaho, and Portions of California (PACFISH). US Department of the Interior, Nations Marine Fisheries Service, Northwest Region, January 23, 1995.
- USDI, 2005. Biological Opinion and Letter of Concurrence for Effects to Bald Eagles, Northern Spotted Owls and Northern Spotted Owl Critical Habitat from the U.S. Department of the Interior; Bureau of Land Management, Eugene District and Salem District; U.S. Department of Agriculture, Mt. Hood and Willamette National Forests, and Columbia River Gorge National Scenic Area – Calendar Years 2005-2006 Habitat Modification Activities within the Willamette Province. U.S. Fish and Wildlife Service (FWS Reference Number 1-7-05-F-0228) 3/29/05.
- Verts, B.J. and Leslie N. Carraway. 1998. Land mammals of Oregon. University of California Press, Berkeley and Los Angeles, California.
- Vesely, D. and G. Tucker, 2004. A landowner's guide for restoring and managing Oregon white oak habitats. Pacific Wildlife Research, October 2004 for USDI Bureau of Land Management, Oregon State University Extension Service, The American Bird Conservancy, The Nature Conservancy, USDA Forest Service, USDI Natural resource Conservation Service. 65pp.
- Whalen, A., 2004. Oregon Oak Trees Are More Valuable Than You Think. in: Forest Log, Oregon Department of Forestry, Spring, 2004.
- Williamson, R. L., 1973. Results of Shelterwood Harvesting of Douglas-fir in the Cascades of Oregon. USDA Forest Service Research Paper PNW-161, 13 p. Pacific Northwest Forest and Range Experiment Station, Portland Oregon, 1973.
- Winkler, Carol, 1984. A site Location Analysis for the Middle Fork of the Willamette River. Paper submitted in fulfillment of a Master of Arts degree. University of Oregon, May 14, 1984.
- Winkler, Carol, and T. Bailey, 2002. Restoring the Cultural Landscape At Jim's Creek: Challenges to Preserving a Spirit of Place. Paper presented at the 55<sup>th</sup> Annual Northwest Anthropological Conference, Eugene, Oregon. April 11-13, 2002

- Wisdom, M., L.R. Bright, C.G. Carey, W.W. Hines, R.J. Pedersen, D.A. Smithey, J.W. Thomas, and G.W. Witmer. 1986. A model to evaluate elk habitat in western Oregon. USDA Forest Service, Pacific Northwest Region Report R6-F&WL-216-1986. March 1986.
- Wondzell, S.M. and King, J.G. 2002. Post-Fire Erosional Processes in the Pacific Northwest and Rocky Mountain Regions. Pacific Northwest Research Station, Olympia, WA and Rocky Mountain Research Station, Boise, ID.
- Wright, Jonathan W. Introduction to Forest Genetics. Academic Press Inc.; New York, San Francisco, London. 1976, pg. 80.
- Zabel, C.J. and R.G. Anthony. 2003. Mammal community dynamics – management and conservation in the coniferous forests of Western North America. Cambridge University Press. 709pp.
- Zielinski, William J., K.M. Slauson, C.R. Carroll, C.J. Kent, and D.G. Kundrna. 2001. Status of American martens in coastal forests of the Pacific states. *Journal of Mammalogy*, 82(2):478-490.