18-Fire
Competing Vegetation Control Project
Environmental Assessment

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Bend-Fort Rock Ranger District, Deschutes National Forest
Deschutes County, Oregon

18 FIRE COMPETING VEGETATION CONTROL PROJECT

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Pacific Northwest Region – Deschutes National Forest

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Abstract:

This environmental assessment describes the effects of implementing each of the three (3) proposed alternatives, including one no-action alternative and two action alternatives, that address vegetation that is competing with planted seedlings in the 18 Fire area. Project activities would occur across approximately 2,000 acres of the 18 Fire area on the Bend-Fort Rock Ranger District (Figure 1, Page 5). The proposed project would focus on controlling the competing vegetation, moving resource conditions closer to the goals and desired future conditions identified in the Deschutes National Forest Land and Resource Management Plan and the 18 Fire Recovery Project.

The analysis describes the effects of using spot application of a granular (pellet) form of the herbicide hexazinone or the use of manual grubbing, over the next five (5) years, to control grasses and shrubs. Grasses and shrubs are competing with and substantially reducing the survival and growth of ponderosa pine seedlings. Planting occurred on approximately 225 acres in 2005. Approximately 1,775 acres will be planted in 2006 and 2007, with approximately 600 of the acres within a fenced big game exclosure. The area actually treated with the application of herbicide would be approximately 304 acres.

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DOCUMENT ORGANIZATION

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

Chapter 1: Purpose and Need for Action: The chapter includes information on the history of the project proposal, the purpose of and need for the project, a summary of the agency's proposal for achieving that purpose and need, the public process that was involved and the key issues that were identified around which the third alternative was developed, the planning framework, and the scope of the project and decision framework.

Chapter 2: Alternatives, including the Proposed Action: This chapter provides a more detailed description of the agency's proposed action as well as alternative methods for achieving the stated purpose. These alternatives were developed based on significant issues raised by the public and other agencies. This discussion also includes mitigation measures. Finally, this section provides a summary table of the proposed activities associated with each alternative.

***Chapter 3: Affected Environment and Environmental Consequences*:** This chapter describes the affected environment, the current conditions of the resources involved, and the environmental effects of implementing the proposed action and other alternatives. This analysis is organized by individual resource specialties.

Chapter 4: Preparers and Consultation: This chapter provides a list of preparers and agencies consulted during the development of the environmental assessment. This section also provides a glossary of terms and literature cited, and index.

Appendices (A and B): The appendices provide more detailed information to support the analyses presented in the environmental assessment.

Additional documentation, including more detailed analyses of project-area resources, may be found in the Project Record located at the Bend-Fort Rock Ranger District.

Precision of Information and Adjustments

Quantifiable measurements, such as acres and miles, and mapped unit boundaries used to describe the alternatives and effects are based on the best available information. The analysis presented in this environmental assessment is based on consideration of the full extent of the acres, miles, and other quantities depicted in the alternatives. Information used in designing the alternatives was generated from a mix of field reconnaissance, use of aerial photos, use of global positioning system (GPS) technology, and various resource-specific databases.

CHAPTER 1

PURPOSE AND NEED FOR ACTION

CHAPTER 1 – PURPOSE AND NEED FOR ACTION

INTRODUCTION

The Forest Service has prepared this environmental assessment (EA) for proposed herbicide treatment within the 18 Fire project area (Figure 1, page 5). This EA addresses the proposed action and two (2) additional alternatives, including no action; the major issues associated with the proposal; and the direct, indirect, and cumulative effects of implementation of any of the alternatives. The proposed activities would focus on reducing vegetation that is competing with planted seedlings for water and nutrients.

The 18 Fire burned approximately 3,800 acres in July 2003. The 18 Fire Salvage Recovery Project EIS analyzed the area within the fire perimeter. It was determined that there was a need to reforest approximately 2,000 acres. Following the EIS analysis, it has been determined that the areas in need of reforestation, and those areas already planted in 2005, have excessive levels of grasses, sedges, herbs, and shrubs that compete with conifer seedlings for soil moisture.

Planting of seedlings occurred during 2005 on approximately 225 acres and will occur on approximately 1,775 acres during 2006 and 2007. Elevations range from 4,200 to 5,200 feet. The terrain, where proposed treatments would occur, is generally flat to gently sloping (less than 15 percent). Bessie and Luna Buttes, with slopes ranging from 30 to 70 percent and located at the north and south ends of the project area include 70 acres proposed for treatment.

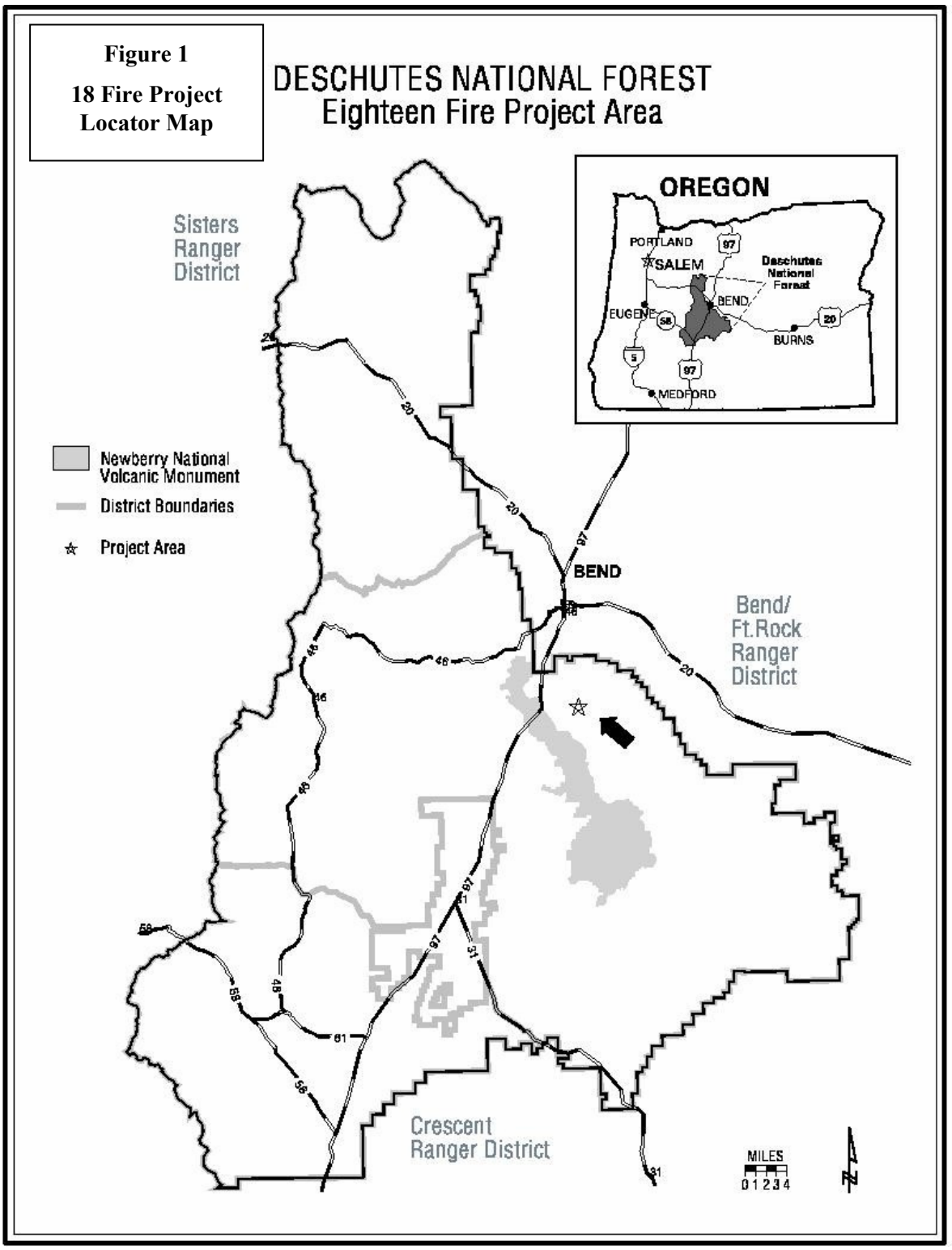
The project area is located approximately one mile south of the Bend wildland urban interface (WUI, at the most northerly boundary, and within the Pilot Butte Watershed. There are no perennial, intermittent, or ephemeral streams, wetlands, or water bodies within or adjacent to the project area. The nearest watercourse is the Deschutes River, located approximately 6 miles to the west. The entire project area was clearcut harvested by a private company in the 1920s and subsequently acquired by the federal government for incorporation into the Deschutes National Forest. The area was salvage harvested in 2004 following the 18 Fire. The vegetation consists primarily of the ponderosa pine and bitterbrush plant association with occasional juniper and lodgepole pine trees.

The area encompasses lands within the Deschutes National Forest Land and Resource Management Plan (LRMP) as amended by the Inland Native Fish Strategy (INFISH), and Regional Forester's Eastside Forests Plan Amendment No. 2 (Eastside Screens). The planning area includes the following LRMP management areas: Deer Habitat (MA-7), General Forest (MA-8), and Scenic Views (MA-9). Refer to Figure 2, page 19 for management area allocations. There are no inventoried roadless areas within the project area and the project area is east of the Northwest Forest Plan boundary (owl line).

Table 1: Legal Location – Deschutes County, Oregon - Willamette Meridian
Township 19 South, Range 12 East, Sections 2, 3, 10, 11, 14-16, 21-23, and 26-28

Figure 1

18 Fire Project Locator Map



PURPOSE AND NEED FOR ACTION

The analysis for the harvest of the fire killed trees and for the recovery (including planting of tree seedlings) of the burned area was completed in the 18 Fire Salvage Recovery Project, Environmental Impact Statement (EIS) and is incorporated by reference. The Record of Decision was signed on November 17, 2004, allowing implementation of the seedling planting to proceed.

Without treatment to reduce the competing vegetation, seedling growth and survival is expected to be poor. This proposed project is specific to areas that were and are to be planted with trees, within the perimeter of the 18 Fire.

There is a need to provide for an economical and affordable means of controlling competing vegetation so that planted ponderosa pine seedlings can become established. This would assure the successful reforestation of previously defined areas deforested by the 18 Fire (defined in the FEIS for the 18 Fire Salvage Recovery Project, USDA Forest Service, 2004)

PROPOSED ACTION

To meet the purpose and need for action: the Forest Service proposes to carry out up to two applications of a pelletized formulation of the herbicide hexazinone over the next five years within the project area to be applied in the spring or fall. Hexazinone would be applied within either a three (3) or five (5) foot radius of tree seedlings to reduce vegetative competition. For additional details on the proposed action (Alternative2), refer to Chapter 2, under Alternative Descriptions of this document.

SCOPING AND PUBLIC INVOLVEMENT

The complete record of the public involvement process to date is available for review in the project file at the Bend-Fort Rock Ranger Station. The project was listed in the ***Schedule of Projects for the Deschutes and Ochoco National Forests and the Prineville District of the BLM*** (SOP) beginning with the spring 2005 issue. The SOP is posted to the Forest Service website and mailed to approximately 90 individuals or groups.

The 18 Fire Competing Vegetation Control Project was initially presented to the public in a letter sent October 26, 2005 with comments requested by November 18, 2005. This letter was sent to approximately 88 individuals, businesses, and organizations (Refer to Chapter 4 under Consultation heading for complete listing) that have expressed an interest in the project development process. Included in this mailing were the Confederated Tribes of Warm Springs, Burns Paiute Tribe, and The Klamath Tribe. The scoping letter was also placed on the Deschutes and Ochoco National Forest web site.

Written comments were received from the Confederated Tribes of Warm Springs and two organizations in response to the scoping effort. All comments received during the latest scoping period were read to ensure consideration of all comments during the analysis process.

In addition, the agency solicited comments of the environmental assessment during a 30-day comment period beginning January 4, 2006 and ending February 3, 2006. Comments were received from Sierra Club, Blue Mountain Biodiversity, and Oregon Natural Resource Council (ONRC). All groups that commented opposed the use of herbicides on National Forest. Response to the following comments and other comments can be found in the project record.

One of the Sierra Club comments said, "Our National Forests are not industrial agricultural production operations, and toxic-chemical herbicides have no place within these natural forest ecosystems".

Blue Mountain stated that, "Your plan fails to analyze or mitigate completely the potentially greater risk to children, pregnant women and individuals with multiple chemical sensitivity".

ONRC requested . . . "adoption of Alternative 3, which would use manual treatments instead of poisonous herbicides to control competing vegetation in the area affected by the 18 fire".

IDENTIFICATION OF ISSUES

Issues are points of discussion, debate, or dispute about environmental effects that may occur as a result of the proposed action. Issues provide focus and influence alternative development, including development of mitigation measures to address potential environmental effects, particularly potential negative effects. Issues are also used to display differing effects between the proposed action and the alternatives regarding a specific resource element.

All comments received have been assessed as to their relevance to each of the resources being addressed within the project area. Many of the comments have been addressed in the Proposed Action, alternative development, and analysis of the effects of actions. These comments were used to formulate issues and to design alternative activities and mitigations. Some comments were used to explore alternatives that were not further developed. Internal Forest Service comments and analysis were also used in the development of alternatives.

Comments received during scoping were placed into categories to help track issues and responses. The issues are categorized as follows:

Key issues: Issues used to develop alternatives or specific activities of the action alternatives. These are issues that respond to the Purpose and Need that cannot be resolved without some consideration of the trade-offs involved. Trade-offs can be more clearly understood by developing alternatives and displaying the relative impacts of these alternatives.

The key issues and concerns were the basis for designing an additional action alternative other than the proposed action. Each key issue statement is followed by a more detailed explanation and has a unit of measure developed for the reader to easily distinguish between each alternative and how it responds to the issue. A comparison of the alternatives is located in Chapter 2.

- **Analysis issues:** In addition to the key issues, other environmental components are considered in the analysis in Chapter 3, though they did not result in differing design elements between alternatives. These issues are important for providing the Responsible Official with complete information about the effects of the project.

Key Issues

The alternatives respond to the key issue identified during initial project scoping, both public and internal. The key issue is specific to the proposed actions and the project area. Attributes and measures will help to evaluate how each of the alternatives addresses issues. Evaluations of each attribute and measure are provided later in this Chapter in the Comparison of Alternatives section.

Key Issue: Herbicide Toxicity

Issue Statement: There are simpler, non-toxic alternatives that are an effective means of controlling competing vegetation around seedlings.

Unit of Measure: Cost per acre of manual scalping and effectiveness of the treatment.

Analysis Issues

Other issues and concerns were raised during scoping, both internally and externally, that did not result in different alternatives or design elements, but are considered during the analysis process and discussed in Chapter 3, beginning under Forest Vegetation, Tree heading. These issues are generally less focused on the elements of Purpose and Need, than are the Key Issues.

Botany and Invasive Plants: Potential effects to Proposed, Endangered, Threatened, and Sensitive (PETS) plant species were considered and no PETS plants were found in the project area. Alternative 3 proposed management activities have the potential to introduce or spread existing populations of invasive plants and invader species. Potential spread of invasive plants is a concern across the project area.

Wildlife: The following items were analyzed and compared by alternative:

Threatened, Endangered, Candidate and Sensitive Species
Management Indicator Species
Migratory Landbirds

Water Quality: There are no permanent or ephemeral streams within the project area. Relatively flat ground and relatively high infiltration rates within the project area makes it highly unlikely that water flow from the project area would reach the Deschutes River. The Deschutes River is located approximately six miles east of the project area, and is listed on the 2002, 303(d) list as "Water Quality Limited" by the Oregon Department of Environmental Quality for temperatures exceeding State guidelines. The 2002, 303(d) list is presently being updated, and is available in the Draft 2004, 303(d) list. No management activities have the potential to reduce the quality of water and fish habitat in the event of a natural stand replacement disturbance.

Recreation: Various types of dispersed recreation occur in the vicinity of the project area. Use includes, but is not limited to, hiking, biking, horseback riding, motorized recreation, hunting, and camping.

PLANNING FRAMEWORK

CURRENT LAWS

Development of this Environmental Assessment follows implementing regulations of the National Forest Management Act (NFMA); Title 36, Code of Federal Regulations, Part 219 (36 CFR 219); Council of Environmental Quality, Title 40; CFR, Parts 1500-1508, National Environmental Policy Act (NEPA). Many federal and state laws, including the Forest and Rangeland Renewable Resources Act (RPA), Endangered Species Act, Clean Air Act, and Clean Water Act also guide this analysis. The following is a brief explanation of each of these laws and their relation to the current project planning effort.

The Endangered Species Act of 1973, as amended

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

The Migratory Bird Treaty Act of 1918

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

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

The National Environmental Policy Act is "To declare a national policy which will encourage productive and enjoyable harmony between man and his environment, to promote efforts which will prevent or eliminate damaged to the environment and biosphere and stimulate the health and welfare of man; to enrich the understanding of the ecological systems and natural resources important to the Nations; and to establish a Council on Environmental Quality" (42 U.S.C. Sec. 4321). The law further states "it is the continuing policy of the Federal Government, in cooperation, to use all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of the present and future generations of Americans. This law essentially pertains to public participation, environmental analysis, and documentation.

The Council on Environmental Quality (CEQ) promulgated the regulations for implementing NEPA (40 CFR parts 1500-1508). The CEQ has recently provided guidance on considering past actions in cumulative effects analysis (Memo to Heads of Federal Agencies, June 24, 2005).

The National Forest Management Act (NFMA) of 1976

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

The Clean Water Act, as amended in 1977 and 1982

The primary objective of The Clean Water Act is to restore and maintain the integrity of the Nation's waters. This objective translates into two fundamental national goals: 1. Eliminate the discharge of pollutants into the nation's waters; and 2. Achieve clean water quality levels for fishing and swimming. This Act establishes a non-degradation policy for all federally proposed projects. Under Section (d) of the Clean Water Act, the State has identified water quality-limited water bodies in Oregon. There are no water bodies on the 303(d) list in the project area. There are no perennial or intermittent water sources within the project area.

The Clean Air Act, as amended in 1990

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

Migratory Bird E.O. 13186

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

Executive Order 13112 (invasive species)

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

Deschutes National Forest Land and Resource Management Plan Direction

The Deschutes National Forest Land and Resource Management Plan of 1990 (LRMP) as amended, provides guidance for management activities. The LRMP establishes goals, objectives, standards, and guidelines for each specific management area of the Forest, as well as Forest-wide standards and guidelines. Management Areas and associated standards and guidelines are described in Chapter 4 of the LRMP. Management Areas within the project area are included in Figure 2, page 19.

M7: Deer Habitat (approximately 1,862 acres; 93 percent of the project area)

Vegetation management within Deer Habitat is to provide optimum habitat conditions on deer winter and transition ranges while providing some domestic livestock forage, wood products, visual quality and recreation opportunities. Vegetation will be managed to provide optimum habitat considering the inherent productivity of the land. Herbaceous vegetation will be managed to provide a vigorous forage base with a variety of forage species available. Forage conditions may be improved where conditions are poor. Foraging areas will be created where forage is lacking, maintained when in proper balance, or reduced when overabundant and more foraging areas are needed. Long-term tree or shrub cover to moderate cold weather conditions is equally important. Ideally, cover and forage areas should be in close proximity for optimum use by big game, with cover making up 40 percent of the land area. Approximately three-quarters of cover areas should be thermal cover with the remainder being hiding areas (Deschutes LRMP, p 4-113).

M8: General Forest (approximately 120 acres; 6 percent of the project area)

Within the General Forest MA, timber production is to be emphasized while providing forage production, visual quality, wildlife habitat, and recreational opportunities for public use and enjoyment. The objective is to continue to convert unmanaged stands to managed stands with the aim of having stands in a variety of age classes with all stands utilizing the site growth potential (Deschutes LRMP, p 4-117).

M9: Scenic Views (approximately 21 acres; 1 percent of the project area)

The project area contains foreground scenic views. The goal of scenic views management areas is to provide high quality scenery representing the natural character of Central Oregon. Landscapes seen from selected travel routes and use areas are to be managed to maintain or enhance their appearance. To the casual observer, results of activities either will not be evident, or will be visually subordinate to the natural landscape (Deschutes LRMP, p 4-121).

Management Indicator Species (MIS)

The Deschutes National Forest Land and Resource Management Plan (USDA 1990) identifies various species of wildlife as management indicator species (MIS). These species were selected because their welfare could be used as an indicator for other species dependent upon similar habitat conditions. Indicator species can be used to assess the impacts of management actions on habitat requirements. These species are not assigned Management Areas; rather, Standards and Guidelines are applicable Forest-wide. The species selected for the Deschutes National Forest are listed in Chapter 3, under the Wildlife section, Management Indicator Species.

Eastside Screens

The Revised Continuation of Interim Management Direction Establishing Riparian, Ecosystem, and Wildlife Standards for Timber Sales, or Eastside Screens, amended the Forest Plan in 1995. It applies to the design and preparation of timber sales on eastside Forests, is often referred to as "Regional Forester's Forest Plan Amendment #2" or as the "Eastside Screens."

FEIS for Managing Competing and Unwanted Vegetation

This project involves the control of competing vegetation in order to successfully establish tree seedlings. The analysis and decision is consistent with the Record of Decision for the Final Environmental Impact Statement for Managing Competing and Unwanted Vegetation (December 1988 and February 1992 Regional Record of Decision Amendment), and the subsequent Mediated Agreement

1998 Deschutes National Forest Noxious Weed EA

The Integrated Weed Management Plan (IWMP) provides direction for the management and control of noxious weeds on the Deschutes National Forest.

2000 Bend-Fort Rock Plantation Herbicide EA

The Bend-Fort Rock Plantation Herbicide EA analyzed herbicide use for the reduction of competing vegetation on several projects located on the Bend-Fort Rock Ranger District.

18 Fire Recovery Project EIS

Focused on the salvage of wildfire killed trees and connected actions such as fuels treatment, and road closures. Also, the need to reforest after the wildfire.

PROJECT RECORD

This EA hereby incorporates by reference the Project Record (40 CFR 1502.21). The Project Record contains Specialist Reports and other technical documentation used to support the analysis and conclusions in this EA. Chapter 3 provides a summary of the Specialist Reports in adequate detail to support the decision rationale; appendices provide supporting documentation.

The objective is to furnish adequate site-specific information to demonstrate a reasoned consideration of the environment impacts of the alternatives and how these impacts can be mitigated, without repeating detailed analysis and background information available elsewhere. The Project Record is available for review at the Bend-Fort Rock District Office, 1230 NE Third Street, Suite A-242, Bend, Oregon, Monday through Friday 7:45 a.m. to 4:30 p.m.

SCOPE OF PROJECT AND DECISION FRAMEWORK

The scope of the project and the decision to make are limited to: herbicide treatment used in connection with reforestation and mitigation and monitoring. Chapter 2 details the designs of these actions. The project is limited to National Forest System lands within the project area.

The Responsible Official for this proposal is the District Ranger of the Bend-Fort Rock Ranger District of the Deschutes National Forest. Based on response to the preliminary EA, changes made to the preliminary EA, and the analysis disclosed in this preliminary EA, the Responsible Official will make a decision and document it in a (DN and FONSI). The Responsible Official can decide to:

Select either action Alternative 2 (Proposed action) or Alternative 3 that have been considered in detail, or

Modify an action alternative, or
Select the no-action alternative.
Identify what mitigation measures will apply.

The decision regarding which combination of actions to implement or to proceed with no action will be determined by comparing how each factor of the project purpose and need is met by each of the alternatives and the manner in which each alternative responds to the public comments received during and the key issue that was raised. The alternative that provides the best mix of prospective results in regard to the purpose and need, the issues and public comments, will be selected for implementation.

In addition, the Responsible Official will determine whether the selected alternative may have a significant effect on the quality of the human environment and whether an environmental impact statement needs to be prepared.

CHAPTER 2

ALTERNATIVES INCLUDING THE PROPOSED ACTION

CHAPTER 2 – ALTERNATIVES, INCLUDING THE PROPOSED ACTION

INTRODUCTION

This section describes and compares the alternatives considered for the 18 Fire – Competing Vegetation Control. Alternative descriptions include associated mitigation measures, connected actions, and monitoring elements.

The locations of treatment units for the action alternatives are displayed in Figure 2, page 19. This section also presents the alternatives in comparative form (Table 3, pages 16-17 and Table 4, page 17), displaying the differences between each alternative and providing a clear basis for choice by the decision maker and the public. The information used to compare the alternatives is based upon the environmental, social and economic effects of implementing each alternative (such as deer hiding cover or the cost of implementing each alternative).

ALTERNATIVE DESCRIPTIONS

Alternatives were developed by the Interdisciplinary Team to address the Purpose and Need and key issues that were brought forward through public and internal comment. Three (3) alternatives are analyzed in detail. Action alternatives meet the purpose and need for action in varying degrees.

Alternative 1 (No Action)

Alternative 1 is the No Action alternative. This alternative is required by law and serves as a baseline for comparison of the effects of all of the alternatives. Under Alternative 1, there would be no change in current management direction or in the level of ongoing management activities within the project area. No control of competing and unwanted vegetation is occurring within the analysis area. Animal damage control (including existing fence), planting of units not already planted and stocking surveys would continue.

Alternative 2 (Proposed Action)

The herbicide proposed for use in this project is hexazinone. Treatment would consist of a spot application of a granular form of hexazinone. Using a hand-held granular applicator, hexazinone would be applied as dry granules within a 3 foot radius (or 5 foot radius in units 15, 16 and 17) of all planted ponderosa pine (Table 4, page 17).

Hexazinone was first registered as a pesticide in the U.S. in 1975 for general weed control in non-cropland areas. It is used to control a broad spectrum of weeds and has since been registered for control of weeds in crops of pineapples, sugar cane, and blue berries, among other uses.

The proposed application rates for this project are two (2) to three (3) pounds of active ingredient (a.i.) per acre. However, since spot application will result in hexazinone application on only 13 to 20 percent of any acre (the 3 foot or 5 foot radius around each tree treated), then only 0.26 to 0.54 lbs. a.i. per acre would actually be applied. Application would occur either in the spring after the ground thaws or in the fall before snowfall. A second application of herbicide would be done within 5 years of the initial treatment, if surveys indicate the initial treatment was not effective (For example, if plants were not killed due to insufficient moisture to transport the chemical within the target plants; there

were areas where application coverage was poor) or if competing and unwanted vegetation once again exceeds the action threshold and seedlings are expected to be adversely affected (Table 2).

Table 2: Action and Damage Thresholds for Tree Seedling/Sapling Growth and Survival				
Objective	Herbaceous Cover Thresholds		Shrub Cover Thresholds	
	Action	Damage	Action	Damage
Tree Survival	10%	25%	25%	35%
Tree Growth	10%	10%	15%	20%

Alternative 3 (Manual Treatment)

Alternative 3 proposes a 3 foot radius treatment area around each seedling where competition is mainly herbaceous and 5 foot radius where ceanothus and manzanita shrubs dominate (5 foot radius for units 15, 16, and 17). Manual treatment would be considered a corrective strategy since damage thresholds have already been exceeded (Table 2 and Table 5 in Chapter 3, Vegetation, Trees, Existing Condition). All vegetation within 3 feet of a seedlings stem would be manually cut, pulled, or scraped from the ground in a manner that removes the root crown and roots of herbaceous vegetation to a minimum depth of six inches below the soil surface.

COMPARISON OF THE ALTERNATIVES

Table 3 provides a comparison of the alternatives. Refer to the Silviculture Report in the Project Record for assumptions and calculations.

Table 3: Comparison Of Key Attributes of Alternative Vegetation Treatments[1]			
Attribute	Alternatives		
	Alternative 1 (No Action)	Alternative 2 (Proposed Action) Spot Herbicide	Alternative 3 Manual Treatment
Acres to be Treated	0	2,003	2,003
Net Acres to be Treated	0	304	304
Number of Seedlings to be Treated[2]	N/A	100, 200, 300 TPA	100, 200, 300 TPA
Treatment Area per Tree[3]	No Treatment	3 or 5 foot radius (28 or 78 square feet)	3 or 5 foot radius (28 or 78 square feet)
Number of Treatments	N/A	One	One
Duration of Treatment	N/A	2 to 3 years	1 to 2 years
Survival Percent at Year 10	35 percent	70 percent	65 percent
TPA at Year 10	35, 70, 105 TPA	70, 140, 210 TPA	65, 130, 195 TPA
Average Height Growth per Year	2.5 inches	5.2 inches	5.1 inches
Number of Gopher Treatments	Four	Two	Two
Time Browse Protection Needed[4]	20 years	10 year	10 years
Time Until Deer Cover Provided	42 years	16 years	17 years
Percent of Full Timber Yield	65 percent	92 percent	88 percent
Direct Vegetation Control Cost per Acre[5]	N/A	$50 per acre	$247 per acre

[1] Refer to EA Silviculture Report for assumptions and calculations.
[2] Range of attributes is reflective of units planted at different initial planting densities (100, 200, 300 TPA).
[3] Three foot radius applied to 200 and 300 TPA; 5 ft radius applied to 100 TPA.
[4] Assumes browse protection needed until seedlings reach 4.5 feet tall. This is also the length of time the fence will need to be kept in place on 511 ac. Does not take into account additional years of browse protection if replant needed.

Table 3: Comparison Of Key Attributes of Alternative Vegetation Treatments[1]			
Attribute	**Alternatives**		
	Alternative 1 (No Action)	**Alternative 2 (Proposed Action) Spot Herbicide**	**Alternative 3 Manual Treatment**
Direct Vegetation Control Cost per Treated Seedling[5]	N/A	$0.22 per seedling	$1.10 per seedling
Total Vegetation Cost	N/A	$100,520	$494,720
Reforestation Cost per Acre[4,5,,6]	$641 per acre[7]	$538 per acre	$734 per acre
Reforestation Cost per Surviving Tree[4,5,6]	$8.16 per tree[7]	$3.43 per tree	$5.04 per tree
Total Reforestation Cost[4,5,6]	$1,283,319[7]	$1,078,361	$1,470,765

Table 4: Planting Units, Attributes, and Net Treatment Area for Each Action Alternative						
Unit	**Plant Year**	**Trees Per Acre To Plant**	**Alternative 2**		**Alternative 3**	
			Gross Plant Acres	**Net Herbicide Treatment Acres[8]**	**Gross Plant Acres**	**Net Scalping Treatment Acres[8]**
Ate #1	2005	200	53	6.9	53	6.9
Ate #2B	2006	200	16	2.1	16	2.1
Ate #3B	2006	200	1	0.1	1	0.1
18 Fire #1B	2005	200	41	5.3	41	5.3
18 Fire #1C	2006	200	114	14.8	114	14.8
18 Fire #1D	2006	200	151	19.6	151	19.6
18 Fire #1E	2007	200	113	14.7	113	14.7
18 Fire #1F	2007	200	98	12.7	98	12.7
18 Fire #1G	2007	200	101	13.1	101	13.1
18 Fire #1H	2006	200	80	10.4	80	10.4
18 Fire #1I	2006	300	132	25.7	132	25.7
18 Fire #1J	2006	200	20	2.6	20	2.6
18 Fire #1K	2006	200	3	0.4	3	0.4
18 Fire #1L	2006	300	99	19.3	99	19.3
18 Fire #1M	2006	200	22	2.9	22	2.9
18 Fire #1N	2006	300	29	5.6	29	5.6
18 Fire #1O	2006	300	39	7.6	39	7.6
18 Fire #1P	2006	300	102	19.9	102	19.9
18 Fire #1Q	2006	200	20	2.6	20	2.6
18 Fire #1R	2006	200	32	4.2	32	4.2
18 Fire #1S	2006	300	89	17.4	89	17.4
18 Fire #1T	2006	200	22	2.9	22	2.9
18 Fire #1U	2007	200	34	4.4	34	4.4

[5] Discounted cost of materials and treatment. Does not include Forest Service overhead.

[6] Includes planting, cost of seedlings, vegetation treatment, animal damage, and stocking survey costs from the year of initial planting until seedlings average 6' tall. Does not include Forest Service overhead. Per tree costs are based on the number of treated surviving seedlings at age 10.

[7] Does not include replanting, estimated at $500/ac. for 109 acres that are expected to fall below the minimum stocking level of 60 TPA.

[8] Assumes 3 ft. treatment radius and 13% of reforestation acres where 200 TPA planted and 19.5% where 300 TPA planted; 5 foot radius and 18% of reforestation acres where 100 TPA planted.

Table 4: Planting Units, Attributes, and Net Treatment Area for Each Action Alternative						
Unit	Plant Year	Trees Per Acre To Plant	Alternative 2		Alternative 3	
			Gross Plant Acres	Net Herbicide Treatment Acres[8]	Gross Plant Acres	Net Scalping Treatment Acres[8]
18 Fire #2	2006	200	27	3.5	27	3.5
18 Fire #3B	2006	200	20	2.6	20	2.6
18 Fire #4B	2006	200	68	8.8	68	8.8
18 Fire #4C	2006	300	51	9.9	51	9.9
18 Fire #5B	2006	200	29	3.8	29	3.8
18 Fire #6B	2006	200	13	2.5	13	2.5
18 Fire #6C	2006	200	8	1.6	8	1.6
18 Fire #7B	2006	200	25	3.2	25	3.2
18 Fire #7C	2006	200	4	0.5	4	0.5
18 Fire #8B	2007	200	50	6.5	50	6.5
18 Fire #8C	2007	300	32	6.2	32	6.2
18 Fire #9	2005	200	37	4.8	37	4.8
18 Fire #10	2005	200	17	2.2	17	2.2
18 Fire #11	2005	200	53	6.9	53	6.9
18 Fire #12	2005	200	23	3.0	23	3.0
18 Fire #13	2006	200	18	2.3	18	2.3
18 Fire #14	2006	200	8	1.0	8	1.0
18 Fire #15	2006	100	15	2.7	15	2.7
18 Fire #16	2006	100	17	3.1	17	3.1
18 Fire #17	2006	100	77	13.9	77	13.9
Total Acres	**--**	**--**	**2,003**	**304.2**[9]	**2,003**	**304.2**[9]

[9] Equates to 15.2 percent of total unit acreage

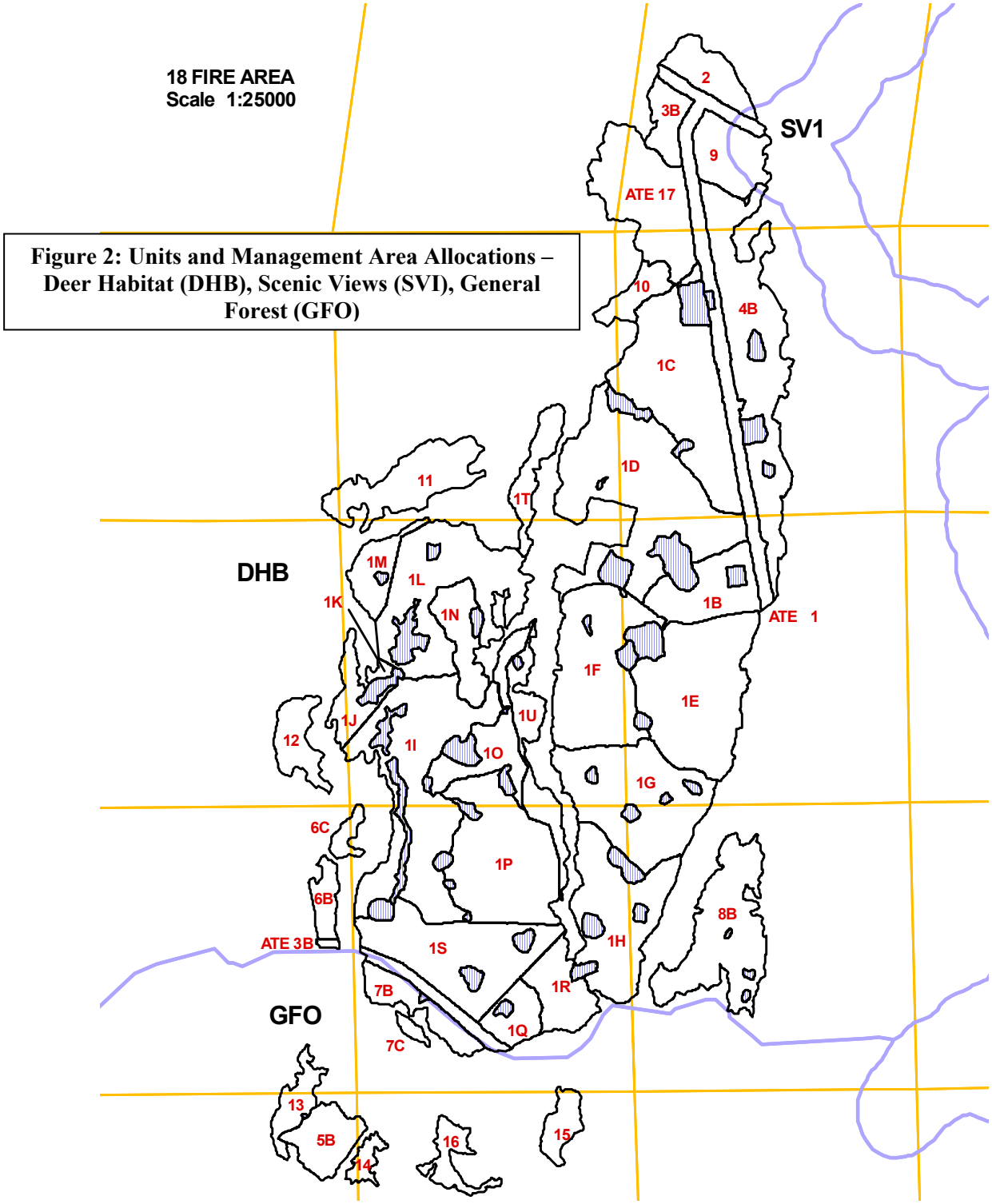


Figure 2: Units and Management Area Allocations – Deer Habitat (DHB), Scenic Views (SVI), General Forest (GFO)

Mitigation Measures

Mitigation measures are specific actions that could be taken to minimize, avoid or eliminate potentially significant impacts on the resources that would be affected by the alternatives, or rectifying the impact by restoring the affected environment (40 CFR 1508.02). The following design features and mitigation measures were developed to ease some of the potential impacts the various alternatives may cause. They would be applied to both action alternatives. These mitigation measures and design elements are considered in the effects analysis.

The effectiveness of each measure is rated as high, moderate, or low to provide a qualitative assessment of expected effectiveness that the implemented practice will have on preventing or reducing impacts on resources. Effectiveness ratings are based on the following criteria:

a) Literature and Research,
b) Administrative Studies (local or within similar ecosystem),
c) Experience (judgment of qualified personnel by education and/or experience), and
d) Fact (obvious by reasoned, logical response).

***High*:** Practice is highly effective (greater than 90%), meets one or more of the rating criteria, and documentation is available.

Moderate: Documentation shows that practice is 75 to 90 percent effective; or Logic indicates that practice is highly effective, but there is no documentation. Implementation and effectiveness of this practice needs to be monitored and the practice will be modified if necessary to achieve the mitigation objective.

Low: Effectiveness is unknown or unverified, and there is little or no documentation; or applied logic is uncertain and practice is estimated to be less than 60 percent effective. This practice is speculative and needs both effectiveness and validation monitoring.

Mitigations Specific to Alternative 2

The following mitigation measures are designed to reduce potential adverse impacts that may result from implementation of Alternative 2. To ensure worker and public health safety, and mitigate potential natural resource effects, the following mitigation measures would apply to the contractor or Forest Service crews that conduct pesticide applications.

All applicable mitigation measures required by the "Mediated Agreement for the Final Environmental Impact Statement for Managing Competing and Unwanted Vegetation" (USDA Forest Service 1989 and as amended 1992) are included.

General Mitigation Measures

1. All applicable state and federal laws, including the labeling instructions of the Environmental Protection Agency, will be strictly followed. **(Effectiveness: High)**
2. Monitoring must be planned as an integral part of the overall vegetation management project. Monitoring of a spray operation will be conducted to determine if mitigation measures are being observed and are in compliance with label requirements. **(Effectiveness: High)**
3. Herbicides will be applied in accordance with Forest Service Manual 2150 (Pesticide-Use Management and Coordination). This identifies the authority for Forest Service use of pesticides (the Forest Insecticide, Fungicide, and Rodenticide Act) and establishes the objectives and responsibilities of managers at all administrative levels. It describes the requirements for environmental documentation, safety planning, and training. **(Effectiveness: High)**

4. Forest Service Handbook 2109.11 (Pesticide Project Handbook) will be used to direct project planning. This establishes procedures to guide managers in planning, organizing, conducting, and reporting pesticide use projects. It also describes the requirement for a post-treatment evaluation report and the pesticide – use report. **(Effectiveness: High)**
5. Standards and guidelines in Forest Service Handbook 2109.12 (Pesticide Storage, Transportation, Spills, and Disposal Handbook) will be met. This defines standards for storage facilities, disposing and handling, accountability, and transportation. It covers spill prevention, planning, cleanup, and container disposal requirements. **(Effectiveness: High)**
6. Forest Service Handbook 2109.13 (Pesticide Project Personnel Handbook) will be used to define responsibilities and personnel needs, training, and experience needed for large scale aerial or ground application projects. **(Effectiveness: High)**
7. Individual National Forests will provide guidance for large and complex projects, as appropriate. This will be in the form of Forest Application Handbooks, Project Safety Plans, Environmental Monitoring Plans, Public Contact Plans, or Law Enforcement Plans. This is where specific requirements for equipment standards, training and quality control, and safety needs are identified for project implementation. Special measures such as spray drift control technology, water monitoring standards, calibration of equipment, and on-site weather limitations are prescribed. These documents also define coordination needs with support organizations and facilities. **(Effectiveness: High)**
8. The Operator would possess a valid, Commercial Operators License in accordance with Oregon State Law. The Operator's on-site representative would possess a valid Commercial Applicators License. Contract crews would be supervised full-time by a licensed pesticide applicator. Forest Service crews would be supervised full-time by a licensed public pesticide applicator. **(Effectiveness: High)**
9. A daily log of pesticides used must be kept and a copy supplied to the District. The diary would identify the type, formulation and quantity of the pesticide used on each unit, the number of acres treated and the name of the licensed applicator applying the pesticide. **(Effectiveness: High)**
10. Herbicides will be applied within the prescribed environmental conditions stated on the label, in the environmental assessment, and in issued permits. This includes considerations of wind speed, relative humidity, air temperature, chemical persistence, and time since last rainfall when determining the timing of applications in relation to drift reduction. Of special note are the following: a) Since hexazinone is relatively mobile in water, do not apply to frozen soil, or to water saturated soils when rainfall is expected within the next 24 hours and b) to minimize the effects on non-target vegetation, do not apply herbicides when sustained wind speeds exceed 14 miles per hour. **(Effectiveness: High)**
11. Pesticide containers would be disposed of in a State approved disposal site following procedures for Category 3 pesticide containers; rinse three times, crush, and bury in a sanitary landfill. If they cannot be rinsed, they would be buried in a specially designated landfill. **(Effectiveness: High)**
12. Crew would be responsible for an immediate cleanup of any spilled herbicide in compliance with State regulations and the Deschutes National Forest Hazardous Substance and Release Response Plan (updated January 1998). **(Effectiveness: High)**
13. Use herbicide formulations that contain only inerts recognized as safe by EPA, or which are of a low priority for testing by EPA. Use of other inerts (identified by EPA as high priority for testing or those that have been shown to be hazardous) requires full assessment of human health risks incorporated into the NEPA decision-making process. **(Effectiveness: High)**
14. Pesticide Applicator Licensing and Training will be used as a quality control measure. The Pacific Northwest Region will continue to utilize the programs administered by the Departments of Agriculture in Washington and Oregon. Training and testing of applicators covers law and safety, protection of the environment, handling and disposal, pesticide formulations and application

methods, calibration of devices, use of labels and data sheets, first aid, and symptoms of pesticide exposure. **(Effectiveness: High)**

Human Health and Safety

15. Agricultural Use Requirements: Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR, part 170. This standard contains requirements for the protection of agricultural workers on farms, forests, nurseries, and greenhouses, and handlers of agricultural pesticides. Do not apply in a way that would contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of forty-eight hours. Early entry into treated areas that is permitted under the Worker Protection Standard is allowed as long as the personal protective equipment (PPE) is worn. **(Effectiveness: High)**

16. Both workers and public exposure monitoring is required for all herbicide application projects. Pertinent details will be documented, including herbicides used, land area treated, date and times of application, people involved, and mitigation measures followed. **(Effectiveness: High)**

17. Project safety will be guided by Forest Service Handbook 6709.11 (Health and Safety Code Handbook, Chapter 9). This directive establishes the basic safety rules, as well as, storage, transportation, and disposal safety aspects. References and publications to aid in worker safety training are also identified. **(Effectiveness High)**

18. Field workers would be trained in proper safety and application procedures prior to starting work; they would also be informed of the risks and symptoms of accidental poisoning and treatment procedures. **(Effectiveness: High)**

19. Protective clothing will be worn by all workers (both Forest Service and contract workers) involved in herbicide handling, loading, unloading, and application of hexazinone. The following equipment or supplies would be required: a long sleeve shirt and trousers, chemical-resistant gloves (such as barrier laminate, butyl rubber, nitrile rubber or viton), boots and socks, and protective eyewear. **(Effectiveness: High)**

20. Herbicides would not be carried inside the same vehicle compartment as personnel. **(Effectiveness: High)**

21. Pesticides would be stored in the original container with a visible label. Containers would be tightly sealed and checked periodically for leaks. All pesticides would be kept in a separate building that is well ventilated and well lighted. The building would be locked when not in use to prevent access by unauthorized personnel. Some pesticides would not be stored together. An up to date inventory would be kept of all stored pesticides. **(Effectiveness: High)**

22. Areas treated with herbicides would be posted with public warning signs. The signs would be posted along roads or other points where people would be likely to enter the unit. Signs should include treatment date, the activity performed and who to contact for further information. **(Effectiveness: High)**

23. Public notification will be used for all applications requesting that people who know or suspect that they are hypersensitive to herbicides contact the Forest Service to determine appropriate risk management measures. If requested, individuals may be notified in advance of spray dates and times. **(Effectiveness: High)**

24. Workers (both Forest Service and contract) who know of a hypersensitivity to herbicides would not be used. Workers who display hypersensitivity would be removed from the project site. **(Effectiveness: High)**

25. Material Safety Data Sheets would be posted at storage facilities and in vehicles, and would be made available to workers. These sheets provide physical and chemical data, fire or reactivity data, specific health hazard identification, spill or leak procedures, instructions for worker hygiene, and special precautions. **(Effectiveness: High)**

26. Each worker on herbicide application projects, whether Forest Service employee or contract employee, shall be informed of any known potential human health effects of the specified herbicides to be used prior to starting the project. Each worker will be provided with a copy of the "Methods Information Profile for Herbicides: and relevant "Herbicide Information Profiles" produced by the Pacific Northwest Region. Prior to beginning the project, each worker shall sign a statement indicating that they have reviewed the material, and either agrees to work on the project as assigned, or requests a reassignment. **(Effectiveness: High)**

27. All herbicide application projects shall have available at the work site a permanent or portable eyewash unit and other washing facilities with a supply of uncontaminated water and soap sufficient to wash hands as required and the entire body in event of accidental contact with herbicides. **(Effectiveness: High)**

28. All workers should have a complete change of clothes available at the work site in case of accidental exposure to herbicides. A complete set of clean clothes should be worn daily. **(Effectiveness: High)**

29. In order to avoid potential synergistic or antagonistic effects created by the application of multiple chemical compounds, areas with existing noxious weed populations that will be treated under the Deschutes and Ochoco Invasive Plant Treatment EIS will be marked and will not be treated with hexazinone. **(Effectiveness: High)**

Range

30. To prevent residues of hexazinone in meat or milk, do not graze domestic animals on treated areas within 30 days following treatment. Notify the range program manager when herbicides are applied so that contact with herbicides by livestock within the vicinity of the project does not occur. **(Effectiveness: High)**

Heritage

31. None

Recreation

32. See Human Health and Safety

Soil, Water, and Air

33. Precautions will be taken to assure that equipment used for storage, transport, mixing, or application will not leak herbicides into water or soil. **(Effectiveness: High)**

34. Areas used for mixing herbicides and cleaning equipment shall be located where spillage will not run into surface waters or result in ground water contamination. **(Effectiveness: High)**

35. The burning of vegetation in the same year in which it has been treated with herbicides is prohibited. **(Effectiveness: Moderate)**

Mitigation Specific to Alternative 3

The following mitigation measures are designed to reduce potential adverse impacts that may result from implementation of Alternative 3.

All applicable mitigation measures required by the "Mediated Agreement for the Final Environmental Impact Statement for Managing Competing and Unwanted Vegetation" (USDA Forest Service 1989 and as amended 1992) are included.

Heritage

1. Mark heritage sites with flagging and avoid. Remove flagging upon project completion. **(Effectiveness: High)**

Noxious Weeds

2. Educate personnel conducting the manual removal of plants as to what dalmatian toadflax, spotted knapweed, Russian thistle, prickly lettuce, and tumblemustard look like, and instruct them to pull if any one of them occurs within the scalping area. They will also be issued a weed map for the 18 Fire. **(Effectiveness: Moderate)** The District will be notified of any dalmation toadflax or spotted knapweed sites encountered and their locations, if they do not exist on the district's weed map. **(Effectiveness: Moderate)**

Mitigation Common to Alternatives 2 and 3

The following mitigation measures are designed to reduce potential adverse impacts that may result from implementation of Alternatives 2 and 3.

All applicable mitigation measures required by the "Mediated Agreement for the Final Environmental Impact Statement for Managing Competing and Unwanted Vegetation" (USDA Forest Service 1989 and as amended 1992) are included.

Noxious Weeds

1. The District will be notified of any dalmation toadflax or spotted knapweed sites encountered and their locations, if they do not exist on the district's weed map. **(Effectiveness: Moderate)**

Human Health and Safety

2. For manual methods of controlling vegetation (including herbicide application and scalping) an analysis of worker exposure to potential hazards and risks must be performed. Measures for reducing the risk will be implemented when circumstances require. Depending on the tools which are employed, a risk assessment should include the following: a.) Physical dangers: falls, sprains, falling snags, cuts, exposure to poisonous plants, snakes or insects; b) Exposure to dust or temperature extremes. **(Effectiveness: High)**

Wildlife

3. In the event an active raptor nest is located during project activities, work should immediately stop and the seasonal operating restriction applied:

March 1 – August 31: red-tailed hawk and northern goshawk
February 1 – July 31: golden eagle
April 14 – August 31: Cooper's hawk and sharp – shinned hawk
(Effectiveness: High)

4. Do not treat unburned patches of bitterbrush during application of herbicide. Mortality of a few individual plants is anticipated. Wildlife personnel will identify and flag unburned patches of bitterbrush prior to the application of herbicide. **(Effectiveness: High)**

Monitoring For Alternative 2

Project monitoring includes "implementation monitoring" to assure the selected alternative and mitigation measures are implemented on the ground as designed and achieve the desired results. Monitoring also includes "effectiveness and validation monitoring" to confirm assumptions used for effects analysis.

Human Health

Objective: Reduce worker exposure
Monitoring Elements: Insure handling and application procedures are followed
Type of Monitoring: Implementation
Methods/Parameters: Development of job hazard analysis followed by visual inspections
Frequency/Duration: Duration of contract or in-house application
Responsibility: If the project is carried out by a contractor, the Forest Service Contracting Officers Representative (C.O.R.) would conduct the monitoring. If the project is carried out by the Forest Service, the crew leader would be responsible to conduct the monitoring.

Livestock Grazing

Objective: Insure domestic livestock do not graze area treated with herbicide within 30 days following application
Monitoring Elements: Presence of grazing by domestic livestock
Type of Monitoring: Implementation
Methods/Parameters: Visual observations
Frequency/Duration: At minimum weekly for 30 days following application
Responsibility: Reforestation personnel

Soil and Water

Objective: To determine if surface flow of water occurred and non-target plants were affected
Monitoring Elements: Evidence of surface water flow
Type of Monitoring: Implementation
Methods/Parameters: Visual observations of surface disturbance by water movement
Frequency/Duration: In conjunction with wildlife monitoring following implementation
Responsibility: Wildlife and reforestation personnel

Monitoring For Alternative 3

Heritage

Objective: Insure heritage sites are avoided.
Monitoring Elements: Make sure sites are flagged and contractors avoid them Remove flagging following inspection
Type of Monitoring: Implementation

Methods/Parameters: Visual observations
Frequency/Duration: During project implementation
Responsibility: Contract, C.O.R.

Heritage

Objective: To determine effectiveness of site avoidance
Monitoring Elements: Evidence of site disturbance
Type of Monitoring: Effectiveness monitoring
Methods/Parameters: Visual observations
Frequency/Duration: Following treatment
Responsibility: District Archeologist

Monitoring Common to Alternatives 2 and 3

Human Health

Objective: To determine human health effects of vegetation control
Monitoring Elements: Nature and frequency of injuries and accidents to personnel associated with project implementation
Type of Monitoring: Effectiveness of mitigation measures
Suggested Methodology: Use form R6-FS-2100-10
Responsibility: Contract, C.O.R.

Noxious Weed

Objective: Prevent establishment or spread of noxious weeds
Monitoring Elements: Presence of noxious weeds
Area of Consideration: Planting units
Suggested Methodology: Ocular survey for 2 years following treatment

Vegetation Response to Treatment

Objective: Determine project efficiency in controlling competing vegetation
Monitoring Elements: Seedling growth and mortality rates, as well as, the condition of surviving seedlings after one year and three years, and at the time of seedling establishment; efficiency of the treatment for controlling vegetation; cost of treatments and associated animal damage control costs
Type of Monitoring: Effectiveness monitoring
Methods/Parameters: Visual observations and fixed plots
Frequency/Duration: Following treatment
Responsibility: District reforestation personnel

Alternatives Considered but Eliminated from Further Analysis

Prevention Strategy – Prevention has been identified as the preferred strategy by the USDA Forest Service Pacific Northwest Region where feasible in managing unwanted vegetation. Prevention means to detect and ameliorate the conditions that cause or favor the presence of competing or unwanted vegetation in the forests. Use of natural controls that prevent competing

vegetation from reaching damage threshold levels is a key concept with this strategy. The prevention strategy differs from other action strategies in that it does not directly treat competing or unwanted vegetation.

Implementation of a prevention strategy includes the following methods: 1) leaving sites occupied by natural vegetation to prevent competing or unwanted vegetation from pioneering; 2) using ecological requirements of either the desired species (i.e., conifer seedlings), the undesirable species, or both, to manipulate environmental conditions in favor of the desired species, and 3) using species-specific strategies based on life cycle information to identify strengths and weaknesses that can be exploited to the advantage of the desired species (USDA Forest Service 1990).

The method is not feasible for reducing competing vegetation in any of the proposed treatment areas because the situation was created by wildfire; and damage and action thresholds (Table 2) have already been greatly exceeded. Natural controls such as shading by a forest canopy do not exist on the sites to reduce the amount of shrubs and grasses that will compete against seedlings. Efforts are underway to reforest the burn as quickly as possible, which could be considered a prevention strategy for noxious weeds growing on the site.

Tree Shelters – the use of tree shelters to try to beneficially change the seedling moisture balance was considered. Tree shelters are tall plastic solid tubes that are placed around a seedling. While preventing animal browse, they also produce a green house effect. The tubes create a microclimate around each seedling by trapping carbon dioxide and moisture (Windell 1993). In addition, the shelters collect frost and dew on their surfaces at night which results in increased soil moisture within the seedling rooting zone when the moisture drips down the tube surface to the soil. When used in conjunction with mulch mats, tree shelters have been found to be beneficial to hardwood seedling survival and growth (Windell 1992).

Research from the northeast U.S. indicates that shelter use may be detrimental to seedling survival under certain conditions (Windel 1992). There may be drawbacks to tree shelter use under specific environmental conditions, such as heat buildup within the tube in hot climates, stem abrasion in windy locations and dieback in frost prone areas.

A recent study using tree shelters on ponderosa pines has study plots located two and eight miles east of the 18 Fire, respectively. Fifth-year results show ponderosa pine seedlings protected with brown colored tree shelters but with no vegetation control had survival rates of about 70% compared to almost 90% for the control (Fitzgerald 2003). Most of the mortality of seedlings protected with tree shelters occurred during the first two growing seasons and was attributed to moisture and heat stress.

When blue colored tree shelters were installed in 2003 in new plantings in the Horse Butte Fire, third-year survival rates based on staked – row plot data ranged from 56 percent to 76 percent. How much, if any, of this poor survival is attributable to the use of tree shelters is unknown. Vegetative competition was high, 60 to 70 percent on average, but below the 70 to 90 percent that is currently present on the 18 Fire. In other District fires such as Evans West where there was considerably less vegetation at the time of planting and vegetation control was implemented, seedling survival rates after the third growing season were around 90 percent. In a case study on the District at the Green Mountain Fire, ponderosa pine seedlings protected with blue tree shelters initially had better height growth. However, overall survival rates were better with vexar cages

(mesh material rather than solid) and by the 5th year average height and diameter were greater for the seedlings protected by vexar.

Based on mixed results from studies and operational uses of tree shelters, the use of tree shelters was dropped from further consideration because of insufficient evidence that their use without simultaneously controlling competing vegetation would ensure desired growth and survival of tree seedlings on the harsh 18 Fire sites.

Grazing by Domestic Livestock – Cattle and sheep grazing can be used to control composition of vegetation on a site. In most cases this would be considered a maintenance strategy. The intent would be to reduce the amount of grass and sedge competition while maintaining the integrity of the tree seedling. Grazing should be timed to reduce vigor of competing vegetation, maximize soil moisture and nutrients for tree growth, and minimize browsing of conifer seedlings (Doescher et al. 1987).

Research results on the effectiveness of grazing are mixed, with some studies finding little damage to seedlings and an increase in conifer seedling growth (Krueger 1987, Ratliff and Denton 1995, Monfore 1992) while others found little or no seedling release from grazing (McDonald and Fiddler 1988). Experience on the District has shown a high incidence of damage to mesh tube installations (use to protect seedlings from big game browse) by cattle when the cattle come into contact with plantations. Repairing the damage has been expensive. Even where mesh tubes are not installed in plantations, newly planted seedlings are at risk of damage by trampling and browsing. An attempt was made in 1996 to graze sheep within the fenced portions of the Horse Butte Fire plantations. The need for ranchers to haul water is a major drawback for grazing livestock on the District. A sheep rancher interested in grazing their sheep within the plantation could not be located. Based on past experiences of cattle damaging seedlings, not finding a willing sheep rancher, mixed research results from other areas, and no local research; this alternative was dropped from further consideration.

Prescribed Fire – Underburning is not a viable alternative because a portion of the burn has already been planted, and seedlings are highly susceptible to death or damage by event the coolest fires. The target vegetation is growing in close proximity to, or is in contact with, many of the seedlings. In addition, while tops of grasses are killed by fire, many grasses and sedges will grow more vigorously after a burn (Oester 1991).

Mulch Mat Installation – The placement of 6-foot-square polypropylene mulch mats around seedlings to exclude and kill herbaceous vegetation and thus increasing seedling survival and growth was considered. This treatment was mentioned in the 18 Fire Salvage Recovery Project EIS as a suggested method for controlling the expected high levels of competing vegetation. Little analysis was done and the treatment is not mentioned in the Decision. Mulch mats have been used on the District over the past 10 years on several thousand acres with mixed results. When herbaceous vegetation did not grow through the center slit where the tree was planted and the mats stayed in place, growth and survival enhancement objectives were met. However, the mats were difficult to install on existing vegetation, had grass grow through the center slit on a large percentage of them, and easily blew loose, resulting in the death or injury of the seedlings. The metal pins used to hold them down did not work well on the sandy soils found on the District, and it was necessary to shovel soil on top of them or add rocks and other debris to keep them in place. The mats are a petrochemical based product, dark in color, and visually stand out in the landscape. If they burn, as occurred to some during the 18 Fire, they produce lethal temperatures for the seedlings and smoke that can adversely affect the health of firefighters. They break down slowly

in the environment and if not removed after serving their purpose would prevent the introduction of prescribed fire until they had almost completely disintegrated. Additionally, the cost based on past experience of purchasing, transporting, installing, and maintaining mulch mats is estimated to be $550 per acre for 200 trees per acre (TPA) and $800 acre for 300 TPA. Because funding at these levels is not available and because of the other stated disadvantages, the use of mulch mats was dropped from further consideration.

Mechanical Control – Control of vegetation by means of ripping, disking, and brush blading has been shown to increase ponderosa pine survival and growth (Ross et al. 1986). Mechanical methods were used extensively on the District throughout the 1960s and 1970s and were quite successful in controlling competing vegetation and establishing fast growing trees. These methods are most applicable prior to planting and areas relatively free of surface rock. Two-hundred and twenty-five acres of the fire have already been planted and would be precluded from using these methods without significant seedling damage or mortality. Much of the remainder of the project area is very rocky. Mechanical methods can have adverse impacts to soils and would also have the potential to spread cheatgrass and noxious weeds. For these reasons, mechanical control was dropped from further consideration.

Broadcast Application of the Herbicide Hexazinone – This alternative was considered and would be accomplished either from the ground or aerially. Hand application of the "paelletized" version "was found to create a worker safety hazard in Forest Service monitoring in 1998-99 when applied by hand using seed spreaders or "belly grinders". Dust inhalation was found to be above levels desirable for worker safety, requiring the need for approved respirators. Alternatives to the use of respirators include the use of the liquid version of hexazinone in a ground application or an aerial application of either form. (See Schmechel and Benech (2004) for a discussion of the advantages and disadvantages of each). Oester (2000) reported "one or two broadcast applications (of hexazinone) increased survival an additional 30% over spot application. Differences in stem volume (a measure of seedling vigor) were impressive. Two broadcast applications, timed a year apart, yielded more than twice the volume of a single broadcast treatment and more than five times the volume of seedlings treated with spot applications." Broadcast applications were eliminated from detailed study because of the large adverse effect the treatment would have on forage for big game, especially in deer winter range.

Mechanical Control on Selected Trees and No Treatment of the Remaining Trees – Treatment by manual scalps would be implemented so that on average, total treatment costs would not exceed $50 per acre (the same cost as herbicide application). Additionally, a mosaic of surviving seedling density would occur.

The seedlings have or will be planted in a patchy mosaic (100, 200, and 300 trees per acre). Additionally, much of the fire is rocky and planting spots will be unevenly distributed. If only $50 per acre were available for vegetation treatment and this amount applied to manual treatments, it is estimated that between 15 to 20 percent of the trees could be treated. Treating so few trees would result in many attributes from Table 4 being very similar to those shown for Alternative 1 (survival percent trees per Acre at year 10, and the length of time animal damage protection is needed). Similarly it is likely that 109 acres would fall below minimum stocking levels. Overall, using the money that an herbicide treatment would cost and applying the money instead to manual treatments would result in achievement of objectives slightly better than Alternative 1, but at a much higher cost ($100,000).

CHAPTER 3

AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

CHAPTER 3 – AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

INTRODUCTION

The Affected Environment refers to the existing biological, physical, and social conditions of an area that are subject to change, directly, indirectly, or cumulatively as a result of a proposed human action. Information on the affected environment is found in each resource section under "Existing Condition." The effects may be direct, indirect, or cumulative.

The Affected Environment (existing condition) and Environmental Consequences (Effects) section provides the scientific and analytical basis for alternative comparison. This chapter summarizes the various environments of the project area and the anticipated effects of implementing each alternative on that environment. Probable effects are discussed in terms of environmental changes from the existing condition and include qualitative as well as assessments of direct, indirect, and cumulative effects.

For the cumulative effects analysis, consideration of past actions followed guidance provided by the Council of Environmental Quality (June 24, 2005 Memorandum from James L. Connaughton, Project Record).

Direct effects: Those effects that occur at the same time and in the same general location as the activity causing the effects.
Indirect effects: Those effects that occur at a different time or different location than the activity to which the effects are related.
Cumulative effects: – Those effects that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions.

For supplemental and supporting documentation, refer to the Appendices listed in the Table of Contents of this environmental assessment and the Project Record. The appendices include the Wildlife Biological Evaluation, Botany Biological Evaluation, and the Noxious Weed Risk Assessment.

FOREST VEGETATION – TREES

The Silviculture Report for the 18 Fire Competing Vegetation Control EA (Project Record, written by Matt Deppmeier and dated December 19, 2005) is incorporated by reference and summarized below.

STAND HISTORY

Prior to European settlement in the area (beginning around 1860), ponderosa pine stands in the Project Area were commonly composed of relatively open stands of large ponderosa pines. The undergrowth generally consisted of Idaho fescue with relatively few shrubs, principally bitterbrush. Low intensity surface fires were frequent enough (every 10 to 12 years) to maintain most of the stands in an open "park-like" condition (J. Bork, cited in Cochran and Hopkins 1991; Agee 1981).

Fires were ignited by lighting and Native Americans (Biswell 1972). These aboriginal forests consisted of clusters of small even-aged groups. Tree regeneration was clumpy and somewhat centered around trees that were downed by wind. When these patches of heavy fuels burned at high intensity, grasses were killed by the heat and eliminated for a period of time as a source of competition for ponderosa pines. This decreased competition for soil moisture during the seedlings establishment period in conjunction with adequate seed production and favorable moisture conditions in the spring and early summer are thought to have played a critical role in the establishment of new ponderosa pines (White 1985).

Alteration of these forests by settlers commenced in the 1880's with livestock grazing. Fire protection and suppression began in about 1917. Intensive logging followed several decades later. The project area was railroad logged by the early 1920s. Merchantable ponderosa pines other than one or two seed trees per acre were cut.

Following the logging, seedlings became established naturally from seed provided by the few seed trees retained. With such few seed trees available, the re-establishment of trees in such large numbers owes its success to good seed crops and abnormally favorable moisture in the years following logging. Very little natural regeneration has occurred in the area since. Some planting of ponderosa pine occurred just south of Bessie Butte in the 1960s. Portions of the northeastern and eastern sides of the project area were planted following the Bessie Butte Fire of 1996.

Many areas of the District that did not regenerate naturally following the railroad logging or after wildfires were planted. The need for control of competing vegetation in order to gain adequate seedling survival and growth was recognized early-on.

Dozer stripping, which used a tractor to remove all vegetation in a 12 foot strip (and the top layers of the soil profile), was a popular method throughout the 1960s and 1970s. These reforestation efforts included difficult sites to reforest and were mostly successful. Most of the success was attributed to the reduction of competitive vegetation prior to planting. Dozer stripping in conjunction with planting was done during this era on the north end of the 18 Fire, just south of Bessie Butte. Success was poor because of high levels of big game browse related tree mortality. Another method of vegetation control used on the District during the 1960s and 1970s was the application of herbicides. Photos from that era show broadcast applications by both tractors and helicopters.

One of the major concerns for the Project Area units comes from animal damage by northern pocket gophers, porcupines, mule deer, and Rocky Mountain elk which can cause extensive damage and

mortality to planted seedlings when control measures are not implemented. Larger, faster growing, and more vigorous seedlings are better able to withstand and recover from browse damage and shorten the period of time where control measures are needed.

EXISTING CONDITION

Scattered residual live ponderosa pine trees are found adjacent and sometimes within planting units proposed for vegetation control. These trees range in size from 6 to 40 inches in diameter at breast height (dbh). Snags are found throughout the units.

Table 5 displays the existing condition of shrub and herbaceous vegetative cover in a representative sample of the proposed treatment units. Vegetative cover is not expected to exceed these total amounts to any significant degree in the future, though the relative amount of shrubs is expected to increase and herbaceous vegetation decrease where manzanita and ceanothus are found. A survey indicates that cheatgrass is present on 53 percent of the plots recorded.

Table 5: Average Existing Vegetative Cover From An October 2005 Formal Survey Of 18 Fire Units

Unit Name	Existing Vegetative Cover		
	Total	Shrub	Herbaceous
18 Fire #1	71%	16%	55%
18 Fire #2	87%	19%	68%
18 Fire #3	87%	32%	55%
18 Fire #4	84%	20%	64%
18 Fire #5	84%	30%	54%
18 Fire #6	90%	32%	58%
18 Fire #7	86%	31%	55%
Weighted Average (By Acre)	85%	26%	59%

In all existing plantations and units to be planted, existing herbaceous (grasses, sedges, and forbs) cover has already exceeded damage thresholds for both tree survival and growth (Table 2, page 16 and Table 5). Current site conditions favor the continued presence of this competing and unwanted vegetation.

Shrubs are found in varying amounts in all the Project plantations. Their site occupancy in most areas currently exceeds action and damage thresholds for growth and action thresholds for survival (Table 2, page 16 and Table 5). Shrub damage thresholds for survival for the most part have only been exceeded in areas where ceanothus and manzanita are dominant vegetative components. Shrub cover of ceanothus and manzanita are expected to continue to increase over the next five years and in the absence of control measures are expected to exceed damage thresholds within the next two years. Once the pine seedlings become established and shrub cover increases, shrubs will have a greater influence on pine growth and survival than herbaceous vegetation (McDonald and Fiddler 1989).

Eventually, as seedlings grow, mature, and more fully occupy the site, herbaceous vegetation and shrubs will decrease. This could begin to occur in approximately 20 years, but is dependent on the length of time for tree establishment and subsequent growth rates. Tree canopy cover will not, however, achieve a high enough level to completely eliminate shrubs and herbaceous vegetation.

Plant Communities

There are three plant associations identified in the project area as defined by Volland in Plant Associations of the Central Oregon Pumice Zone (1988). The ponderosa pine/bitterbrush/Idaho fescue plant association is a moderately productive plant association found primarily in the northern end of the project area. As one travels south within the project area, manzanita increases in coverage and the ponderosa pine/bitterbrush-manzanita/fescue (moderate site productivity) and to a lesser extent ponderosa pine/bitterbrush-manzanita/needlegrass (low site productivity) plant associations are found. The key point is that for all three plant communities Volland (1988) identifies the control of competing vegetation as necessary for successful artificial regeneration.

Alternative 1 (No Action)

Direct and Indirect Effects: Grass and sedge control would not occur. Under this alternative, approximately 2,003 acres of ponderosa pine plantations in the 18 Fire would experience strong competition from herbaceous vegetation and shrubs for site resources. Animal damage control activities and stocking surveys would continue.

Seedling survival is expected to be 35 percent after 10 years without vegetation control (Table 3, pages 16-17) summarizes important attributes of seedling survival and growth for each alternative). These estimates are based on formal survival surveys of units planted in 1995 in the Horse Bute Fire that had 25 to 50 percent vegetative cover and no vegetation control. If 109 acres are planted at the rate of 100 trees per acre (TPA), 1300 acres at 200 TPA and 594 acres at 300 TPA as initially planned, a survival rate of 35 percent would equate to 35, 70 and 105 TPA, respectively – below the **desired** stocking objectives of 80 to 200 TPA. For Alternative 1, the tree numbers would not meet big game hiding and thermal cover objectives, nor the minimum acceptable stocking level where 100 TPA are planted initially.

Slow seedling growth is expected if the competing vegetation is not controlled. Seedling growth rates for each alternative were predicted based on measurements from research plots and stocking surveys of seedlings growing under vegetative conditions thought to be representative of moisture regimes that seedlings under the different alternatives would experience. The growth objective (Powers 2004) is for seedlings to average at least 5 inches of height growth per year over the first 10 years, resulting in trees 4 to 5 feet tall at age 10. With this growth rate it is hoped that animal damage costs would be minimized, the big game exclosure can be removed within 10 to 15 years, and deer cover objective can be achieved quickly. Surviving seedlings under Alternative 1 are expected to average only 2.5 inches per year of height growth until reaching 6 feet tall. Big game browse protection would be needed for 20 years, until seedlings reach 4.5 feet tall and are out of reach of browsing deer. Because of low stocking resulting from high levels of seedling mortality and because of slow growth rates, plantations on average under this alternative would not be expected to begin providing deer hiding cover for approximately 40 years.

For the same reasons previously mentioned, timber yields would be expected to be 65 percent or less of full yields. This was estimated from yield tables produced using the SORNEC variant of the PROGNOSIS growth and yield model (Wykoff et al 1982). Analysis in the Region 6 Vegetation EIS for similar ponderosa pine sites predicts timber yields per acre will be 52 percent below yields where vegetation management is implemented.

A financial analysis was carried out for each alternative, both in the Table 3 summary and in the Economics section of this chapter. There are no direct vegetation treatment costs for Alternative 1 since vegetation treatment is not done under this alternative. The financial analysis also includes all costs (Total Reforestation Cost (Table 3, page 16-17) associated with planting and growing seedlings until they reach 4.5 feet tall and are no longer threatened by deer browse. Costs include seedlings, planting, animal damage protection measures, vegetative contol maintenance (where applicable) stocking surveys, and project monitoring. The cost for Alternative 1 is $641 per acre or $8.16 per established tree (Table 3, pages 16-17). Costs estimated at $500 per acre for replanting 109 acres that are expected to fall below the minimum stocking level of 60 TPA were not included in the analysis. If replanting costs for these 109 acres is included, the total reforestation cost for this alternative would increase to $1,326,374 or $662 per acre or $8.24 per surviving seedling. The cost for reforesting the entire 2,003 acres for this alternative is estimated at $1,283,319.

Alternatives 2 (Proposed Action)

Direct and Indirect Effects: Alternative 2 proposes an application of hexazinone in a 3 foot radius treatment area around each seedling where competition is mainly herbaceous and 5 foot radius where ceanothus and manzanita shrubs dominate (units 15, 16, and 17).

The following excerpt is from the SERA risk assessment:

The mechanism of action of hexazinone in plants is well-characterized. Hexazinone and other s-triazine herbicides act by inhibiting photosynthesis. . . At higher levels of exposure, hexazinone also inhibits the synthesis of RNA, proteins, and lipids . . . Hexazinone is readily absorbed by plant roots . . . and, once absorbed, is readily translocated in most species . . . [H]exazinone is metabolized by plants and differences in sensitivity among species appear to be related to differences in the rates at which the plants metabolize hexazinone. For terrestrial plants, the available information clearly indicates that this metabolism is a detoxification – i.e., the metabolites of hexazinone appear to be much less phytotoxic than hexazinone itself . . . The relatively low phytotoxicity of hexazinone metabolites may account at least partially for differences in toxicity among plant species. The differential toxicity of hexazinone to various plant species is based on variations in the ability of different plants to degrade the herbicide. . . . In some cases, differential toxicity may also be partially attributable to differences in absorption rates . . . or the restriction of translocation. . . .

Hexazinone has relatively little effect on seed germination with an NOEC[10] of 12 lbs/acre in standard seed germination studies . . . This relatively low toxic potency for seed germination is confirmed by published bioassays indicating substantial effects on seed germination for Velpar L only at hexazinone concentrations of 5000 ppm[11]. Pronone 10G, however, appears to be somewhat more toxic with some inhibition occurring at soil concentrations of 10 to 1000 ppm and a complete inhibition of seed germination at 5000 ppm . . . The greater activity of Pronone 10G may be due to the slow release of hexazinone from the clay matrix over the 29 day duration of the study. . . [A]pplications of granular formulations or spot applications of liquid formulations involve soil treatments (pre-emergence) with subsequent absorption by the roots (SERA 2005; pages 4-5, 4-6).

[10] NOEC (Definition) – No-Observed-Effect Concentration – The concentration of a chemical at [which] no treatment-related effects were observed.

[11] Parts per million.

Hexazinone would be toxic to non-conifer plants. It would be non-toxic to ponderosa pine. Expected toxicity is consistent with vegetation response observed on the Bend/Fort Rock Ranger District following past applications of hexazinone.

Vegetation within approximately a three foot radius (5 ft. for units 15, 16, and 17) around ponderosa pine seedlings would be directly exposed to the herbicide. Approximately 13 to 20 percent of each unit proposed for herbicide application would be exposed to the herbicide. Nontarget terrestrial plants may be exposed to the herbicide through unintended direct deposition or by the herbicide being "transported off-site by percolation or runoff or by wind erosion of soil" (SERA 2005, page 4-15).

Outside the area of direct herbicide application, there would be limited potential for nontarget terrestrial plants to be exposed to hexazinone. Ground applications of granular formulations of hexazinone should be associated with little significant drift (SERA 1997, Page 4-19). There would be limited potential for non-target plants to be exposed to herbicide through soil transport. ". . . [T]he off-site transport of hexazinone by runoff and sediment loss could cause substantial damage under conditions that favor runoff and sediment loss – i.e. high rainfall rates and clay soil. . . . In predominantly sandy soils, the major transport mechanism is percolation into the soil with very little risk of off-site loss due to runoff or sediment loss" (SERA 2005, page 4-29). The project area soils are sandy and receive relatively low levels of precipitation. Slopes are relatively gentle (average 5 to 10 percent) in most areas proposed for herbicide treatment. Therefore, the risk of off-site movement of hexazinone from runoff is considered low for this project. Monitoring of the granular application of hexazinone on the Bend-Fort Rock Ranger District has shown that little mortality of vegetation has occurred beyond the circle of direct herbicide application.

"Wind erosion leading to off-site contamination of pesticides will be highly site specific. The amount of hexazinone that might be transported by wind erosion depends on several factors, including the application, the depth of incorporation into the soil, the persistence in the soil, the wind speed, and the topographical and surface conditions of the soil. Under desirable conditions, like relatively deep (10 cm) soil incorporation, low wind speed, and surface conditions that inhibit wind erosion, it is likely that wind transport of hexazinone would be neither substantial nor significant" (SERA 2005, page 4-18). The District has not observed any effects of off-site hexazinone contamination caused by wind erosion in any of its previous hexazinone application projects. ". . . [R]elatively conservative estimates of pesticide transport by wind erosion of soil (Worksheets G07a-c) suggest that this process is not likely to result in exposures that would be of concern" (SERA 2005, page 4-29).

Proposed herbicide application will not eradicate any plant species or population of vegetation, only alter successional stages. A relatively small percent of each treatment unit would be treated with herbicide.

McDonald and Fiddler (1990) found that applying hexazinone when ponderosa pine seedlings were two years old gave statistically significant results earlier than grubbing treatments, effectively controlled competing vegetation for at least three years, and cost less than other manual treatments. Applying treatments at an early age led to statistically significant differences among treatments earlier than in other studies, and suggested the worth of treating competing vegetation as soon as possible. They also concluded that where growth enhancement of seedlings is desired and competing plants are dense perennial or annual grasses, herbicides in most instances are superior to mulches for

economical, but also for biological reasons. Refer to the Silviculture Report in the Project Record for additional studies which draw similar conclusions.

Seedling survival is expected to average 70 percent after 10 years. For 100, 200 and 300 TPA planted initially, this equates to 70, 140 and 210 TPA surviving. All planted areas are expected to meet minimum stocking and to closely approximate desired stocking levels of 80 to 200 TPA. Seedlings are expected to average 5.2 inches of height growth per year until they reach 6 feet tall (Table 5, page 33). Ten years of big game browse protection will be needed, at which time the seedlings would reach 4.5 feet tall and be out of the reach of deer. Deer hiding cover is expected to be provided after 16 years on average.

The direct cost of applying hexazinone is estimated to average $50 per acre (Table 3, pages 16-17). Reforestation costs for this alternative are estimated to be $538 per acre or $3.43 per established seedling. The cost of reforesting all 2,003 acres is estimated at $1,078,361. If two (2) applications were made (an unlikely scenario), costs would increase by an estimated $100,152. Timber yields under Alternative 2 are expected to average 92 percent of full yields.

Cumulative Effects: There would be no expected cumulative effects expected from this or other alternatives. The proposed activities are site specific and would not go outside of the bounds of proposed areas for herbicide use.

Alternatives 3

Direct and Indirect Effects: Alternative 3 proposes a 3 foot radius treatment area around each seedling where competition is mainly herbaceous and 5 foot radius where ceanothus and manzanita shrubs dominate (Units 15, 16, and 17). Fiddler (1991) found manual (grubbing, scalping, cutting and pulling) treatments to be costly, but worthwhile, for controlling non-sprouting species, especially if applied when competing plants are young and not well established. Manually treating a radius of 5 feet around seedlings consistently released conifers relative to controls and often led to statistically significant differences between the two treatments. However, the treatment cost was found to be 10 to 15 times that of applying herbicides for the same conifer growth response (Fiddler 1991). Unless scalps are very large, they do little to improve the performance of seedlings, and their cost can easily exceed $1.25 per scalp (Oester 2000). Vegetation free areas of at least 3 feet radius are recommended for herbaceous plants and 5 feet for woody shrubs (McDonald and Fiddler 1989).

McDonald and Fiddler (1990) reported that grubbing small radii (4 feet or less) around ponderosa pine seedlings did not appear to be effective in improving seedling growth and was expensive. However, much of the competition in their study was from shrubs, and seedling survival was excellent. Oester (2000) recommends a scalp of 3 feet square or larger and adds that grass roots must be removed.

Grubbing has limited effectiveness because of its short duration of control (Oester 2000). Vegetation usually begins to reestablish itself within a few months of treatment. This is especially true of cheatgrass which is present throughout most of the 18 Fire. McDonald et al. (1994) found encroachment of vegetation into two-foot-square scalps by plants just outside the treatment borders averaged 58 percent after one growing season, 92 percent after two growing seasons and nearly 100 percent after the third growing season. Because of the short duration of control and the expense, Fiddler and McDonald (1993) recommend grubbing not be done in grass plant communities.

Grubbing a 3 foot radius treatment area was done operationally on the District in the Horse Butte Fire in 1997 to release seedlings planted two years prior that had poor vigor and growth with vegetative competition of 25 to 50 percent. Areas with cheatgrass competition were excluded from the treatment,

a practice that would be difficult to accomplish on the 18 fire because of its widespread presence. The seedlings responded positively to grubbing within a 3 foot radius, however, the response also corresponded with two wet growing seasons. Cost was nearly $1.00 per seedling.

District operational cutting of ceanothus and manzanita to release ponderosa pine seedlings was carried out on the Topso and Red Butte fires. The benefit was short-lived as most treated areas returned to pre-treatment levels within two years.

Scalping removes much of the nutrient rich humus layer of soil in close proximity to the tree. Removal of the duff layer can result in the top layer of soil drying more quickly and could partially offset gains in soil moisture resulting from the reduction in vegetative competition.

A seedling which has the surrounding vegetation roots grubbed can be left growing on a pedestal of soil. This can result in greater susceptibility of the seedling to frost heaving (E. Uebeler, personal communication, 1998).

Seedlings are expected to average 5.1 inches of height growth per year until they reach 4.5 feet tall and are out of reach of big game (Table 3, pages 16-17). This would require an average of 10 years of big game browse protection. Survival of the treated trees is expected to be 65 percent after 10 years. Deer hiding cover is expected to be provided in 17 years on average.

Using production rates from McDonald and Fiddler (1990) and current wage rates, costs for scalping were estimated to average $247 per acre or $1.10 per treated seedling (Table 3, pages 16-17). Total reforestation costs for this alternative are estimated to average $734 per acre or $5.04 for each surviving tree. The cost of reforesting all 2,003 acres is estimated at $1,470,765. Timber yields are expected to average 88 percent of full yields.

The proposed manual treatment would not eradicate any plant species or population of vegetation, only alter successional stages. A relatively small percentage of each treatment unit would be affected.

***Cumulative Effects*:** There would be no expected cumulative effects expected from this or other alternatives. The proposed activities are site specific and would not go outside of the bounds of proposed areas for herbicide use.

WILDLIFE – THREATENED, ENDANGERED AND SENSITIVE SPECIES AND HABITAT_____

SUMMARY OF EFFECTS

The Wildlife biological evaluation (BE) determined there would be "No Effect" to any PETS (Proposed, Endangered, Threatened, Sensitive – bald eagle and bufflehead) or Candidate wildlife species or associated habitat.

INTRODUCTION

It is Forest Service policy to avoid all adverse impacts on threatened and endangered species and their habitats except when it is possible to compensate for those adverse impacts. Measures are to be identified and prescribed to prevent adverse modification or destruction of critical habitat and other habitats essential for the conservation of endangered, threatened, and proposed species (Forest Service Manual, FSM 2670.31). The biological evaluation process (FSM 2672.4) reviews the proposed actions to determine the potential for effect on threatened and endangered species and species proposed for listing (FSM 2670.31). Species classified as sensitive by the Forest Service are to be considered by conducting biological evaluations to determine the potential effect of activities on these species (FSM 2670.32). No impacts may be allowed on sensitive species that would result in loss of population viability or create significant trends toward federal listing.

The following biological evaluation evaluates the effects of all proposed alternatives for the 18 Fire Competing Vegetation Control Project, including the No Action alternative. Existing management direction is found in the Deschutes National Forest Land and Resource Management Plan (LRMP; USDA, 1990), as modified by the Regional Forester's Forest Plan Amendment #2 (referenced as the "Eastside Screens"; USDA, 1995). Projects proposed in occupied or potential habitat of any candidate, threatened, or endangered species on the Forest must be consistent with the Project Design Criteria (PDC) for the Joint Aquatic and Terrestrial Programmatic Biological Assessment (BA) for Fiscal Years 2003 through 2006 (USDA et al. 2003), referred to as the Programmatic BA. Projects that affect the species addressed by the document, and do not meet the applicable PDCs, must initiate the appropriate level of consultation with the U. S. Fish and Wildlife Service. PDCs for proposed species may be included in the BA, but are optional for the management agencies. For species other than those classified as Proposed, Endangered, Threatened or Sensitive (PETS) refer to the next section, Wildlife – Management Indicator Species (MIS) and Habitat, page 43.

SPECIES AND HABITATS EVALUATED

Table 6 (following) displays threatened, candidate for listing, or sensitive animal species that are either known to occur or may potentially occur on the Bend-Fort Rock District. Those with bold type are known, suspected or have some potential to occur within the project boundary and are further evaluated in this analysis.

Table 6 R6 TES Species List

SPECIES	COMMON NAME	FEDERAL & FOREST CLASSIFICATION
Birds		
Haliaeetus leucocephalus	**Northern bald eagle**	**T, MIS**
Strix occidentalis caurina	Northern spotted owl	T, MIS
Falco peregrinus anatum	**American peregrine falcon**	**S, SOC*, MIS**
Bucephala albeola	Bufflehead	S
Histrionocus histrionicus	Harlequin duck	S, SOC
Centrocercus urophasianus	**Greater sage-grouse**	**S, SOC**
Podiceps auritus	Horned grebe	S
Podiceps grisegena	Red-necked grebe	S
Coturnicops noveboracensis	Yellow rail	S
Agelaius tricolor	Tricolored blackbird	S
Mammals		
Lynx canadensis	Canada lynx	T
Martes pennanti	Pacific fisher	C, SOC
Gulo gulo luteus	California wolverine	S, SOC, MIS
Sylvilagus idahoensis	**Pygmy rabbit**	**S, SOC**
Amphibians		
Rana pretiosa	Oregon spotted frog	C
Mollusks		
Pristiloma arcticum crateris	Crater Lake tightcoil snail	S

Note: E = Endangered, T = Threatened, C = Candidate for Federal listing, S = USFS Region 6 Sensitive, SOC = USFWS Species of Concern, MIS = LRMP Management Indicator Species, * = Birds of Conservation Concern (USDI, 2002).

CONCLUSION

The pre-field review determined that the northern bald eagle currently has no nesting or roosting habitat in the project area, and there was none prior to the fire. Any bald eagle use would be incidental. All species on the R-6 TES Species List that have potential habitat on the Bend-Ft. Rock District were considered (Table 6 and Table 7).

Table 7 Pre-field review summary and field survey results

Species	Step #1 Pre-field Review	Step #2 Field Reconnaissance	Step #3 Determination of Effects	Step #4 Significance	Step #6 USFWS Review
Question to Answer	Habitat Present?	Species Present	Conflict?	Important?	T&E only
Species					
Northern Bald Eagle	N	Y	N	N	N
Northern Spotted Owl	N	N	N	N	N
Canada Lynx	N	N	N	N	N
Oregon Spotted Frog	N	N	N	N	N
Harlequin Duck	N	N	N	N	
Bufflehead	N	N	N	N	
American Peregrine Falcon	N	N	N	N	
Tricolored Blackbird	N	N	N	N	
Greater Sage-Grouse	N	N	N	N	
Yellow Rail	N	N	N	N	
Horned Grebe	N	N	N	N	
Red-necked Grebe	N	N	N	N	
California Wolverine	N	N	N	N	
Pacific Fisher	N	N	N	N	
Pygmy Rabbit	N	N	N	N	
Crater Lake tightcoil snail	N	N	N	N	

STATUS AND PRE-FIELD REVIEW

Northern Bald Eagle (Haliaeetus leucocephalus)

Status: U.S. Fish and Wildlife Service = Threatened; State of Oregon = Threatened

Pre-field Review: Bald eagle use is incidental, occurring primarily during fall and winter months when a few eagles have been observed feeding on winter-killed and road-killed deer. Bald eagle use of the majority of the Kelsey project area is considered unlikely due to the forested condition and poor foraging habitat. There are no Bald Eagle Management Areas (BEMAs), as identified by the Deschutes National Forest Land and Resource Management Plan (LRMP), or bald eagle nest sites in or adjacent to the project area.

ENVIRONMENTAL CONSEQUENCES

Northern Bald Eagle (Haliaeetus leucocephalus)

Alternative 1 (No Action)

Direct, Indirect, and Cumulative Effects: The no action alternative would maintain current habitat conditions. No direct, indirect, or cumulative effects to the bald eagle are expected to occur. Alternative 1 would have "No Effect" to the bald eagle.

Effects Common to Alternative 2 (Proposed Action) and Alternative 3

Direct, Indirect, and Cumulative Effects: Because any bald eagle use is incidental and opportunistic, no direct, indirect, or cumulative effects to the bald eagle are expected to occur. Alternative 2 would have "No Effect" to the bald eagle.

Greater Sage-Grouse (Centrocercus Urophasianus), Pygmy rabbit (Sylvilagus idahoensis), and American peregrine falcon (Falco peregrinus anatum)

Alternative 1 (No Action)

Direct, Indirect, and Cumulative Effects: The no action alternative would maintain current habitat conditions. No direct, indirect, or cumulative effects to these species would occur. Alternative 1 would have "No Effect".

Effects Common to Alternative 2 (Proposed Action) and Alternative 3

Direct, Indirect, and Cumulative Effects: Because any bald eagle use is incidental and opportunistic, no direct, indirect, or cumulative effects to the bald eagle are expected to occur. Alternative 2 and Alternative 3 would have "No Effect" to these species.

WILDLIFE – MANAGEMENT INDICATOR SPECIES (MIS) AND HABITAT

The following subsections summarize information from and incorporate by reference:

Biological Evaluation (BE) of Threatened, Endangered and Sensitive (PETS) Wildlife for the 18 Fire Competing Vegetation Control Project: Project Record, prepared by Mark Lehner and approved by James Lowrie on February 15, 2006.

Wildlife Specialist Report for the 18 Fire Competing Vegetation Control Project Area: Project Record, prepared by Mark Lehner, dated February 15, 2006.

SUMMARY

None of the alternatives proposed, with the mitigations described, would result in negative effects to the Management Indicator Species (MIS), Species of Concern (SOC), or Focal species considered in this analysis. All effects would be local and not negatively affect wildlife populations.

EXISTING CONDITION

There are no natural streams, springs, ponds, lakes in the project area. The nearest perennial water is the Deschutes River located approximately six (6) miles to the west of the project area. Other than minor lava outcrops, there are also no special or unique habitats including cliffs, talus, caves, aspen, mountain mahogany, quaking aspen, or extensive areas of forested lavas. The elevation averages approximately 4,400 feet within the project area and the topography is nearly flat.

Prior to the fire, the project area provided a low level of habitat diversity for wildlife; dry, even-aged black bark ponderosa pine forest dominated the area, generally 50 to 60 years old with one canopy layer. The relatively low elevation and limited precipitation of the area likely preclude the site capability to develop multi-stratum late and old structure (LOS) forest. However, it is capable of producing single-story LOS. The project would have no effect on road densities or Old Growth Management Areas.

The total project acreage is approximately 2,003 acres. Of this gross acreage, 304 net acres, of the project acreage, would be directly affected by herbicide application (15 percent). Approximately 93 percent of the project area is classified as big game winter range (LRMP MA-7) that is important to mule deer and elk. Other management allocations include 6 percent general forest (LRMP MA-8) and <1 percent Scenic Views (LRMP SV-1). Mule deer are the dominant big game species and are distributed across the area throughout the year. Other medium and large mammal species potentially inhabiting this area include black bear, mountain lion, badger, coyote, and bobcat. A variety of small mammals and birds were present in the project area prior to the wildfire. Refer to the summary table in the Wildlife Report for a partial listing of species. As previously noted, this project falls within the boundaries of the 18 Fire Salvage project; the species addressed in this analysis are primarily the same that were addressed in the 18 Fire Salvage Wildlife Report (USDA DNF 2004). Reference the District files for the Fuzzy and Kelsey Projects which conducted surveys throughout the project area and in an extensive area around the project. Table 8 outlines the species known or suspected to occur in the project area. These species will be further analyzed under this report.

Photo 1. General landscape of project area, note absence of shrubs.

Big Game

As previously noted, approximately 93 percent of the project area is classified as winter range (LRMP MA-7). Both deer and elk use of the area continues post-fire; however, it will take several years of recovery before use levels begin to increase. Bitterbrush, *Purshia tridentata*, and other shrubs sustained a high level of mortality from the fire, except in a few patches in openings. Bitterbrush and sagebrush, *Artemisia spp*., are species that are easily killed by fire. In low intensity fires bitterbrush may sprout from root collar buds, but it is unlikely in high severity intensity fires. Sagebrush does not sprout. Rodent caches of bitterbrush seed may have survived the fire and assist in recovery. Grass species such as Idaho fescue, *Festuca idahoensis*, will likely recover very quickly. Herbaceous plants will be more valuable to wintering elk than mule deer, which prefer woody browse plants in the winter months. Areas over 600 feet from the remaining hiding/thermal cover around the fire perimeter will likely not be fully utilized by big game species (Thomas et al. 1979).

Coniferous hiding and thermal cover for big game has been eliminated by the fire. Some marginal vegetative cover still remains in those areas of lower intensity burn next to the project boundary. Topographic features and burnt snags provide some screening for big game. Unburned areas adjacent to the fire are dominated by single-story black-bark ponderosa pine which generally provides marginal cover at best. Previously designated deer movement corridors have also been eliminated by the fire. An approximately 600 acre fenced enclosure is being constructed to protect planted seedlings from big game.

Other Species

Animals requiring dense or mature forest will be reduced or eliminated in the areas affected by wildfire. Others favoring open habitats, snags, and grass dominated environments will be favored. Woodpeckers, sapsuckers, robins, juncos, red-tailed hawks, and gophers will all be present in the fire area in the near-term. There were no known raptor nest sites within the project area prior to the fire. The relatively uniform "black-bark" pine habitat provided limited nesting habitat for sharp-shinned hawk, Cooper's hawk, and northern goshawk. Wildlife surveys were conducted by the Fuzzy Project (implementation phase), which overlapped a minor amount of the project on the east side, and by the Kelsey Project (planning phase), which covers the majority of the 18 Fire area. Field reconnaissance was done post-fire but no formal surveys for any species were done.

Shrub Habitat

As previously noted, bitterbrush and other shrubs sustained a high level of mortality from the fire. Shrubs, primarily bitterbrush, provide critical mule deer winter forage. They also provide nesting and foraging habitat for shrub-associated species (such as the yellow-pine chipmunk and golden-mantle ground squirrel), and neotropical migrant birds, such as green-tailed towhee (Paige and Ritter 1999). Many of these species, particularly the seed-caching rodents, such as the yellow-pine chipmunk, serve an important ecological role in the regeneration of shrub species (Vander Wall 1994).

The project area has a road density of 5.7 miles per square mile. There is one horse trail in the vicinity of Bessie Butte adjacent to the project area. Direct and indirect impacts to habitats from existing roads have been moderate to high depending on the class (i.e. width, level of use) of road, its location, and the season of use. This project will not affect road densities.

Late and Old Structure Habitat (LOS) and Old Growth Management Areas (OGMA)

There was no classified LOS present in the project area or designated OGMAs (USDA 1990). There is an OGMA approximately one mile west of the project area.

Connectivity and Fragmentation

Prior to the 18 fire, several connectivity areas had been designated and maintained through the project area for deer movement and OGMA/LOS connectivity. The fire has eliminated major portions of two corridors, which are not recoverable in the short-term. The southern corridor has been partially disturbed. Fragmentation was low in the area and was primarily related to the effects of the adjacent Bessie Butte fire and roads. Past timber harvest had been selective cutting and not seed tree harvest or clear-cuts, which could fragment the landscape.

Snags, Green Trees and Coarse Woody Materials (CWM) Habitats

A snag is defined as a dead or partly dead tree (or stump per Johnson and O'Neil 2001) that is over 4 inches in diameter-at-breast-height (dbh) and taller than 6 feet (Thomas et al. 1979). Coarse woody material (CWM) or woody debris is the accumulation of dead woody material on the forest floor including limbs and logs (Thomas et al. 1979). Numerous species of animals use snags and CWM for

foraging, nesting, denning, roosting and resting. The most notable of the wood-using wildlife species are the primary cavity nesters including woodpeckers and nuthatches that excavate nest cavities in decayed wood in standing dead and green trees. Vacated cavities are subsequently used by many other birds and small mammals (i.e. secondary cavity users). Selected wildlife species known or suspected to occur in the pre-fire project area that utilize these habitats include the flammulated owl, northern pygmy owl, white-headed woodpecker, Williamson's sapsucker, pygmy nuthatch, white-breasted nuthatch, mountain bluebird, western small-footed myotis, long-eared myotis, long-legged myotis, pallid bat, and silver-haired bat. This project will not directly affect standing snags or CWM. This project would indirectly improve recruitment of CWM habitats in the long-term by enhancing reforestation efforts.

Generally, three documents provide guidance or species lists for consideration in the management of federal lands. The three documents and associated species lists include the Deschutes National Forest – Management Indicator Species, the US Fish and Wildlife Service Birds of Conservation Concern, and a Conservation Strategy for Landbirds of the East-Slope of the Cascade Mountains in Oregon and Washington. Species listed in these documents overlap with each other as well as the threatened, endangered and sensitive species lists. Management actions should minimize negative impacts, promote habitat development or provide habitat protection to some degree for those species that occur within the habitats of federally managed land.

Habitat manipulation affects species differently. An action that may increase habitat for one species may decrease habitat for another species. Federal threatened, endangered, and regionally sensitive species lists are always consulted first. Species that do not appear on these lists but show up as a management indicator species or focal species, or species of concern may have persistence issues at a regional or national level but may not have persistence issues at the state or local level. In order to get an idea of the level of concern for these species, rankings were obtained from Natureserve Explorer: an online encyclopedia of life available at www.natureserve.org/explorer. Rankings are given for global, national, and state levels. Only the state rankings will be used in this analysis.

During the preparation of the Deschutes National Forest LRMP (1990), a group of eighteen wildlife species were identified as management indicator species (MIS). These species were selected because their welfare could be used as an indicator of other species dependent upon similar habitat conditions. Indicator species can be used to assess the impact of management actions on a wide range of other wildlife with similar habitat requirements. The species selected for the Deschutes National Forest include the marten, wolverine, Cooper's hawk, sharp-shinned hawk, elk, golden eagle, great blue heron, mule deer, bald eagle, goshawk, spotted owl, osprey, great gray owl, peregrine falcon, red-tailed hawk, western big-eared bat, waterfowl, and the woodpecker guild. The following species groups are also included in this analysis: species Associated with Logs and Down Woody Debris (MIS), Species Associated with Various Plant Communities and Successional Stages (MIS) and Species with Special or Unique Habitats (MIS)

Table 8 contains a list of wildlife species with special designations or status from the aforementioned sources (LRMP, Natureserve, Birds of Conservation Concern, and Conservation Strategy for Landbirds). Those species known to exist or may potentially exist within the planning area are further discussed in this document. The bald eagle, sage-grouse, pygmy rabbit, and peregrine falcon have been covered under the BE for this project.

Table 8: Selected Wildlife Species Summary				
Species	**Status**	**Local (State) Status (NatureServe Database)**	**Habitat Or Species Present? Occurrence?**	**Will The Project Potentially Impact Species Or Habitat?**
Birds				
Golden eagle	MIS	G5	**Y**	**Y**
Red-tailed hawk	MIS	G5	**Y**	**Y**
Northern goshawk	MIS, SOC	G5	**Y**	**Y**
Cooper's hawk	MIS	G5	**Y**	**Y**
Sharp-shinned hawk	MIS	G5	**Y**	**Y**
Great gray owl	MIS		N	N
Cavity nesters (woodpeckers)	MIS	G5	**Y**	**Y**
Great blue heron	MIS		N	N
Neotropical Migratory Birds	Ecological Indicator		**Y**	**Y**
Green-tailed towhee	Ecological Indicator (mature shrubs)	G5	**Y**	**Y**
Waterfowl species	MIS		N	N
Ferruginous hawk	SOC, Focal		N	N
Olive-sided flycatcher	SOC, Focal		**Y**	**Y**
Greater sage-grouse (see BE)	S, SOC, Focal		N	N
Tri-colored blackbird (see BE)	S		N	N
Harlequin duck (see BE)	S, SOC		N	N
Black tern	SOC		N	N
Lewis's woodpecker	MIS **&** Focal		N	N
White-headed woodpecker	MIS **&** Focal		**Y**	**Y**
Williamson's sapsucker	MIS **&** Focal		**Y**	**Y**
Red-naped sapsucker	MIS **&** Focal		N	N
Black-backed woodpecker	MIS **&** Focal		**Y**	**Y**
Pygmy nuthatch	Focal		**Y**	**Y**
Chipping sparrow	Focal		**Y**	**Y**
Brown creeper	Focal		**Y**	**Y**
Flammulated Owl	Focal		**Y**	**Y**
Hermit thrush	Focal		**Y**	**Y**
Nashville warbler	Focal		N	N
Ash-throated flycatcher	Focal		N	N
Clark's nutcracker	Focal		N	N
Sandhill crane	Focal		N	N
Loggerhead shrike	Focal		N	N
Sage sparrow	Focal		N	N
Brewer's sparrow	Focal		N	N
Sage thrasher	Focal		N	N
Gray flycatcher	Focal		N	N
Prairie falcon	Focal		N	N
Virginia warbler	Focal		N	N
Mammals				
Deer	MIS		**Y**	**Y**
Elk	MIS		**Y**	**Y**
California wolverine (see BE)	S, MIS, SOC,		N	N
American marten	MIS		N	N
Pacific fisher (see BE)	C, SOC		N	N

Table 8: Selected Wildlife Species Summary				
Species	**Status**	**Local (State) Status (NatureServe Database)**	**Habitat Or Species Present? Occurrence?**	**Will The Project Potentially Impact Species Or Habitat?**
Pygmy rabbit (see BE)	S, SOC		N	N
Preble's shrew	SOC		N	N
Western big-eared bat	MIS, SOC		**Y**	**Y**
Fringed myotis	SOC		**Y**	**Y**
Long-eared myotis	SOC		**Y**	**Y**
Small-footed myotis	SOC		**Y**	**Y**
Yuma myotis	SOC		N	N
Amphibians and Reptiles				
Northern sagebrush lizard	SOC		N	N
Cascade frog	SOC		N	N
Tailed frog	SOC		N	N

***** MIS = Management Indicator Species, Deschutes National Forest LRMP
SOC = USFWS Species of Concern
S = Federal sensitive species
C = Federal candidate species
Focal = Species identified in the Conservation Strategy for Landbirds of the East-Slope of the Cascade Mountains in Oregon and Washington (Altman 2000) and the Conservation Strategy For Landbirds in the Columbia Plateau of Eastern Oregon and Washington (Altman and Holmes 2000).
Ecological Indicator - Any species determined to be necessary for evaluation in order to represent special/unique habitats.Global Conservation Status (Local Status)—from NatureServe database: G4 Apparently Secure, G5 Secure

Historic Range of Conditions (18 Fire Salvage EIS—Wildlife Report)

The historic population levels of wildlife species endemic to the project area are unknown. It is likely those species associated with relatively dry, open ponderosa pine forest with frequent, low intensity wildfire were more common. Fire suppression, timber harvest, road construction, and nearby development on private lands have impacted the wildlife populations of the local area. Species including the flammulated owl, white-headed woodpecker, pygmy nuthatch, Lewis' woodpecker, and olive-sided flycatcher are examples of species that were likely more common historically. Mule deer utilize the area year-around, and due to its low elevation it is particularly important as winter range. Deer numbers have declined from past levels in the North Paulina herd unit due to cumulative effects from elimination or degradation of their habitats.

Prior to the wildfire, the project area was dominated by a relatively young i.e. "black-bark", even-aged ponderosa pine stand. There was no late successional forest present prior to the fire. The understory was also relatively simple with bitterbrush, green manzanita, and Idaho fescue being the dominate species. Openings allowed for greater shrub cover. A plantation of ponderosa pine created after the Bessie Butte Fire in 1996 is present in the northwestern portion of the area adjacent to the project boundary. Rocky outcrops with low tree stocking create some horizontal diversity. In general the area was very homogenous and the nearby buttes (i.e. Luna and Bessie) provided the only topographic diversity.

ENVIRONMENTAL CONSEQUENCES

Analysis Methods

This analysis tiers to the 18 Fire Salvage EIS wildlife report. Species populations and distributions are not discussed in depth, as little quantitative data and a lack of current surveys are available for most species. Rather, effects on habitats are discussed, with the assumption that if appropriate habitat is available for a species, then that species occupies or could occupy the habitat. Population trends will be determined by assessing how the alternatives impact the structure and function of the vegetation (i.e. habitat) relative to current and historic availability. Inferences regarding species diversity and relative population levels were made based upon habitat quality, condition, and quantity. Where needed and applicable, professional judgment, supported by the limited information that was available, was used to assess habitat conditions and quality. The project silviculture report details the projected growth patterns within the project area. Best available science is utilized to assess chemical effects to specific animals where relevant. Field reconnaissance information and Geographical Information System databases provided additional information.

Two principal effects have been analyzed for this project:

1) Chemical Effects
2) Vegetation/habitat loss

General Chemical Effects (Hexazinone)

Direct and Indirect Effects

Hexazinone inhibits photosynthesis and at higher levels of exposure, inhibits the synthesis of RNA, proteins, and lipids in plants. Based on classification schemes developed by the U.S. Environment Protection Agency (EPA), hexazinone is practically nontoxic to birds, fish, and aquatic invertebrates (SERA 2005 p. 4-1). The effects of hexazinone on plants can cause secondary effects in animals, e. g., changes in food availability or habitat. This has been demonstrated for mammals and birds. These secondary effects are not necessarily adverse. Relatively little information is available on the toxicity of hexazinone to insects (SERA 2005 p. 4-1). Refer to the project Silviculture Report for an additional analysis of chemical effects to plant and animal species.

1) Alternative 2 has the potential for effects to wildlife in the form of direct exposure to the herbicide both during and after the application. Terrestrial animals might be exposed to any applied pesticide from direct spray (not relevant to this project), the ingestion of contaminated media (vegetation, prey species, or water), grooming activities, or indirect contact with contaminated vegetation (SERA 2005, page 4-12). The 1997 SERA Risk Assessment identified the potential risk that involves small mammals or birds would ingest some of the granules directly and acknowledged that this would be a concern at application levels of 3-6 pounds of a.i./acre. However, there are no data indicating that birds will consume any of the granular formulations that contain hexazinone (SERA 1997, p. 22). Although there is a high likelihood that wildlife will be exposed to hexazinone, the risk of negative impacts is low. Granular formations of hexazinone appear to pose a very low risk to any terrestrial or aquatic animal (SERA 2005 p. 4-25). Hexazinone has a low-probability of being toxic to wildlife at the levels of application proposed (SERA 1997; US EPA 1994; USDA Forest Service 1992). The U.S. EPA has conducted risk assessments for hexazinone as part of the registration process and has

determined that the registration for this herbicide should be maintained because the herbicide can be used without significant risk to humans or wildlife (SERA 2002, p. vii).

Mammals

The 2005 SERA risk assessment states: '[T]he toxicity of hexazinone to mammals is relatively well-characterized in a large number of standard acute, subchronic, and chronic (laboratory) toxicity studies on mice, rats, rabbits, and dogs, an acute toxicity study in guinea pigs and a number of standard skin sensitization studies in guinea pigs. . . . the mode of action in mammals is unclear. The most consistent effect of hexazinone in mammals is weight loss, an effect that has been seen in acute and longer-term toxicity studies by multiple routes of exposure. While this effect often appears to be attributable to decreased food consumption, decreased food conversion efficiency has been noted in some instances. . . . [T]he acute oral toxicity of hexazinone in mammals is classified by U.S. EPA/Office of Pesticide Products (OPP) . . . as Category III, the second lowest oral toxicity category. . . . In laboratory studies, hexazinone has been determined to have a very low acute toxicity, meaning it takes a large quantity of the herbicide to result in mortality. There are no clear patterns in sensitivity among different species of mammals. . . .'

Furthermore, hexazinone is poorly absorbed through the skin (EPA 1994). In studies on animals, the acute dermal toxicity (skin) LD50 was found to be >5,278 mg/kg in male rabbits (USDA 1995). For ingestion, hexazinone has been determined to be slightly toxic. In rats, the oral acute toxicity LD50 (the dose which will kill approximately 50 percent of the subjects) is 1,690 mg/kg and in male guinea pigs is 860 mg/kg (USDA 1992, Extoxnet). Acute sublethal effects in dogs have been reported at doses of 1000 to 3400 mg/kg. In terms of assays for chronic toxicity, the most sensitive mammalian species is the dog – i.e., a chronic NOAEL (no observed adverse effect level) of about 5 mg/kg/day with a LOAEL (lowest observed adverse effect level) of about 40 mg/kg/day (SERA 2005 p. 4-25). There are few field studies available in the literature. One study in forests treated with Pronone 10G (one of the hexazinone formulation being proposed for use) showed no acute or chronic health effects on rodent species over two years of monitoring (USDA 1992).

For granular formulations of hexazinone, none of the hazard quotients for mammals exceed a level of concern even at the highest application rate of 4 lbs/acre. At the highest application rate, the direct spray (not proposing to utilize this method in Proposed Action) of a mammal reaches a level of concern (HQ=1) only under the assumption of 100 percent absorption. This is not a reasonable assumption for dermal absorption but is included in order to consider other factors such a grooming that may increase exposures for some mammals. . . . The verbal interpretation of the quantitative risk characterization is relatively simple after the application of granular formulations: no adverse effects are anticipated at any application rate (SERA 2005, pages 4-26, 4-27).

Birds

The 2005 SERA risk assessment states: 'While several field studies are available on the effects of hexazinone on plants, none of the field studies have addressed direct toxic effects in birds. Based on a single acute gavage (introduction of material into the stomach by a tube) LD50 value, birds may be somewhat less sensitive to hexazinone than mammals. . . Acute dietary studies have been conducted in both Mallard ducks and bobwhite quail. Mortality was sporadic among the various studies and dose

groups. No consistent concentration-response relationships are apparent. The U.S. EPA classified the hexazinone as practically non-toxic to birds with dietary LC50 values of >5000 ppm or >10,000 ppm . . . Standard avian reproduction toxicity studies have been conducted on bobwhite quail and mallard ducks . . . . The mallard study noted no effects at dietary concentrations of up to 1000 ppm, the maximum concentration tested. This exposure was classified as an NOEC (no observed effect concentration) by the U.S. EPA . . .'

'**[**B]irds appear to be substantially more tolerant of hexazinone than do mammals in terms of both the acute NOAEL (a factor of 5.5 higher in birds) and the longer-term NOAEL (a factor of 30 higher in birds). . . . At the highest anticipated application rate and at the upper limit of exposure, none of the hazard quotients exceed a level of concern (HQ=1). Thus, there is no basis for asserting that any adverse effects are plausible in birds with the application of liquid or granular formulations of hexazinone. This unambiguous risk characterization is consistent with the risk characterization for birds given by the U.S. EPA/OPP . . . in the registration document for hexazinone.'

Invertebrates

As is the case with most herbicides, relatively little information is available on the toxicity of hexazinone to terrestrial invertebrates (SERA 2005). In a field study conducted in northern California, hexazinone was applied to pine plantations at a rate of 2.7lb a.i./acre on volcanic soils (Busse et al. 2001). No significant differences between treated and control plots in numbers of mites, spiders, beetles, or springtails. Hexazinone had little or no measurable effect on microbial community size, activity, or function. There were minor shifts in arthropod assemblage structure, but all appear to be transitory and none were statistically significant. Results suggest that hexazinone treatment does not disrupt microbial communities or soil arthropod assemblages. The results of this study raise no concern about direct toxic effects of hexazinone for the soil organisms and processes that were measured (SERA 2005). The soils and climate in both of these studies are similar to the 18 Fire project area. See project Soils Report for additional information.

Inerts and Adjuvants

Hexazinone inert ingredients were categorized as either: low priority for health effects testing based on absence of data or suspect chemical structure to cause toxic effects; or generally recognized to be safe (USDA 1992). There is no information available in the open literature on the identity or toxicity of any impurities in hexazinone. The identity of impurities in hexazinone has been disclosed to the U.S. EPA but has not been made available for the current (SERA 2005) risk assessment. The U.S. EPA, however, has reviewed the information on the impurities and determined that: *there are no reported impurities of toxicological concern in hexazinone (U.S. EPA/OPP, 2002h).*

2) Indirect chemical effects specific to the proposed action include the potential effects to predators from accumulations of herbicides in the tissue of prey species or forage. Treated plants can sequester herbicides in their folate (a salt or ester of folic acid), which could be ingested by foraging wildlife. (Sidhu and Feng 1993) found that at an application rate of 4kg a.i./ha, the maximum level of hexazinone and its metablolites in foliage would be below the levels known to cause toxic effects in animals. When animals ingest hexazinone, it is broken down into metabolites, which are rapidly excreted in the urine and feces (USDA 1992). In a study of rat metabolism of hexazinone, at least 93.3% of the radio labeled hexazinone was excreted by the animals and none of the compound was

detected in the rats after 72 hours (Rhodes and Jewell 1980). The 2005 SERA Risk Assessment states that: '[H]exazinone is virtually completely metabolized in mammals. There is relatively little information available regarding the toxicity of the metabolites. . . .[T]he metabolism of hexazinone by mammals appears to be a detoxication step, at least in terms of acute lethality. The U.S. EPA has made the more conservative assumption that: "the metabolites and parent hexazinone are assumed to have equal toxicity based upon similarity in chemical structure". . . .Any uncertainty with the estimates of the toxicity of the metabolites of hexazinone does not have a significant impact on this risk assessment.'

Furthermore, the 2005 SERA Risk Assessment summarized various exposure scenarios for birds, mammals including the ingestion of contaminated media (vegetation and prey species). The risk assessment concluded that granular formulations of hexazinone appear to pose a 'very low risk' to any terrestrial animal, compared to liquid formulations that will result in much higher concentrations of hexazinone in terrestrial vegetation. For granular formulations, none of the hazard quotients for mammals exceed a level of concern even at the highest application rate of 4 lbs/acre (SERA 2005 p. 4-26). The highest acute dose is estimated at about 280 mg/kg bw (the consumption of contaminated grass by a large mammal at an application rate of 4lbs/acre), this is below the acute NOAEL of 400mg/kg/day. The verbal interpretation of the quantitative risk characterization is relatively simple after application of granular formulations: *no adverse effects are anticipated at any application rate* (SERA 2005 p. 4-27). Again, birds appear to be substantially more tolerant of hexazinone than do mammals. At the highest anticipated application rate and at the upper limit of exposure, none of the hazard quotients exceed a level of concern (HQ=1). Thus, there is no basis for asserting that any adverse effects are plausible in birds with the application of liquid or granular formulations of hexazinone (SERA 2005 p. 4-27).

In monitoring conducted for the Grass Control Demonstration Project, application rates for hexazinone were determined to be approximately .968 pounds per acre. When converted to milligrams (mg) per kilogram (kg) of soil it was found to be approximately 3.60 mg/kg (Sussmann 1998). The application rate proposed in the proposed action is approximately 2-3 pounds of active ingredient per acre. Considering the percent of an acre to be treated, approximately 0.26 to 0.54 lbs. a.i. per acre would actually be applied. In the event that a second application of hexazinone would be necessary to meet treatment objectives, the second treatment would be six months to several years later. The half-life of hexazinone is approximately 2 to 3 months (Craigg 2000). Even assuming no break-down of hexazinone, the total accumulation of two applications would result in a total actual amount of 0.52 (2 x .26) to 1.08 (2 x .54) lbs. a.i./ac. still at the low end of applications rates assessed by SERA (2005). These quantities are well below levels considered to cause adverse effects to animals as described above and mentioned in other laboratory tests; EPA guidelines put a threshold of application at 8 lbs a.i./ acre (EPA 1994). The application rate of 3 pounds of active ingredient per acre is below the endangered species levels of concern (LOCs') for grass and insect eating mammals at use rates of 3.6 lb a.i./acre or greater (EPA 1994). Therefore, there does not appear to be a significant risk to animals from the accumulation of herbicide in the tissues of prey species or forage.

3) Secondary effects on mammals may occur due to changes in habitat associated with the effect of hexazinone on vegetation. The effect of hexazinone on vegetation may alter habitat and these alterations may increase or decrease food availability. These effects are likely to be variable over time and vary among different species of animals. Often the target species for elimination are those that are used by a variety of birds and mammals for forage, nesting, and/or cover (e.g., snowbrush, manzanita,

grasses). Again, the proposed application of herbicide would reduce vegetation on 2,003 acres by an average of 15.2 percent, which is equivalent to 304 acres, for approximately 3 years.

Decreased foraging by white-tailed deer on plots treated with hexazinone has been noted in a recent study; decreased foraging was noted only in the first year after application. This is consistent with the observation . . . that the plants on sites treated with hexazinone have more abundant food for deer one year after hexazinone application (SERA 2005, page 4-2). As with mammals, secondary effects on some species of birds may occur through changes in vegetation that may impact food availability and habitat. . . The only such effect noted in the literature [reports] that areas treated with hexazinone produce more food plants for bobwhite quail. Such an effect is also likely to be time dependant and it seems plausible that transient decreases in food plants could occur for some species of birds. Again, these effects may be beneficial or detrimental and are likely to vary over time. There is no basis for asserting, however, that negative impacts on populations of birds will be substantial or severe (SERA 2005, page 4-27). Hexazinone may also have secondary effects on terrestrial invertebrates. The extent with which such effects would be regarded as beneficial or detrimental is speculative. Some field studies suggest that changes in the distribution of soil invertebrates could occur. In an earlier study, the indirect effect of vegetation removal resulting from herbicide application was found to be inconsequential to soil biota (Busse et al. 2001). It is not clear if these effects are due to the toxicity of hexazinone to the soil invertebrates or secondary to other changes in the soil associated with effects on plants (SERA 2005, page 4-28).

Finally, Bend-Ft.Rock District monitoring of past hexazinone applications indicates that the minor reduction of vegetation associated with proposed herbicide application would have little to no effect on wildlife populations (Keown, K. and Clark, L. 2001).

Application Timing

Application in fall would reduce the exposure of the chemical to nesting birds since the breeding season would be over and many migrants will have left. There would be fewer shrubs to nest within the following spring, but there would no longer be the risk of direct consumption of herbicide granules. Application in the spring would also assure that there would be less forage in the fall and winter for deer and big game migrating onto their winter range. Fall application would reduce some forage but likely there would not be much plant death until the following spring.

Toxicologic Interactions

There is no direct information available on the interaction of hexazinone with other compounds. It is plausible that the toxicity of hexazinone may be affected by and could affect the toxicity of many other agents. The nature of the potential effect (i.e., synergistic or antagonistic) would depend on the specific compound and perhaps the sequence of exposure (SERA 2005, p. 3-17). The DNF Invasive Weed Project proposes to treat less than 2 acres of invasive plants through application of herbicide within the project area. The Proposed Action for this project will avoid any direct treatment of competing vegetation of those areas previously proposed under the Deschutes National Forest Invasive Weed Project, thus avoiding any potential overlap of herbicide applications.

MULE DEER AND ELK (MIS)

Alternative 1 (No Action)

***Direct and Indirect Effects**:* The overall effect on deer and elk would be negative as the project area would reforest very slowly; this would be an undesirable rate of recovery of important hiding and thermal cover on winter range (1,885 acres, 93 percent of project acreage). The development of hiding and thermal cover for deer and elk would be delayed for several years (10 to 15). This delay would be mitigated by the availability of suitable habitat in adjacent areas. The summer range portion of the project is small (116 acres, approximately 6 percent of project acreage) and the recovery of hiding cover less critical. Forage resources would be good as shrubs and forbs recovered, however the majority of forage areas are too far from existing cover for full utilization by deer (that is, in excess of 600 feet; reference LRMP and Thomas et al. 1979). Under this alternative the deer and elk proof fence would be in place an additional 10 years (estimated) than for the action alternatives. The effects are similar for elk, except that dominance by grass species would be more beneficial for elk.

Alternative 2 (Proposed Action)

***Direct and Indirect Effects**:* Herbicide application is not expected to have a direct effect on big game or other mammals. Hexazinone has a low-probability of being toxic to wildlife at the levels of application proposed (SERA 1997; US EPA 1994; USDA Forest Service 1992). The 2005 SERA Risk Assessment concluded that granular formulations of hexazinone appear to pose a 'very low risk' to any terrestrial animal, see previous chemical effects discussion. Current lack of deer forage (i.e. bitterbrush) in the project area due to loss of shrub habitat would further reduce this potential effect; elk utilization of the project area is low. This alternative would benefit mule deer and elk because controlling competing vegetation at the reforestation sites would recover hiding and thermal cover more quickly. Cover would be achieved more than two times faster on average with herbicide treatment than without, as displayed in table 9 (also see project silviculture report). Optimal deer and elk hiding cover would be provided when tree heights are tall enough to provide visual screening.

Table 9 Estimate of time until hide cover provided per alternative and planting density.

Time Until Deer Cover Provided (Years)	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3 Manual Treatment
100 TPA	Mod. shrub hide cover, approx. 10 yrs.	Mod. shrub hide cover, approx. 10 yrs.	Mod. shrub hide cover, approx. 10 yrs.
200 TPA	48	17	18
300 TPA	36	14	15
Average (weighted) of planting densities	42	16	17

*TPA = trees per acre.

Alternative 2 would reduce 304 net acres of available forage (marginal), primarily on winter range. Due to the construction the fence that will enclose 600 acres, approximately 114 acres (net acres) of

this forage habitat would be inside the deer and elk proof fence, and therefore not available to animals. The amount of forage actually reduced by the proposed action would be 190 net acres. That is the cumulative amount of habitat (forage) affected by the proposed treatment around each seedling and totaled within the project acreage (2,003 acres). Fence construction around planted seedlings was analyzed in the 18 Fire Salvage Recovery Project EIS (USDA DNF 2004). This effect is not anticipated to have a significant impact on deer winter range, since the amount of available forage, especially shrubs have been reduced from the fire. Although the quantity of shrub and herbaceous cover will be reduced for deer and elk, vegetation will still be available as forage in the project area (patches and individual trees) in between the proposed treatments.

Forage for elk in particular, is expected to be less favorable than current conditions, as the herbaceous component will be reduced. Also, elk generally require larger cover patches and will benefit from the fenced reforested area after they regain access. However, the area is much more important to deer, as elk use is incidental. Application within the spring would also assure that there would be less forage in the fall and winter for deer and big game migrating onto their winter range. Fall application would reduce some forage but likely there would not be much plant death until the following spring. This alternative will also have the indirect benefit of reducing the amount of time the deer and elk proof fence is required to protect conifer seedlings. Forage abundance in treated areas is expected to decrease in the next 5 to 25 years, as conifer regeneration will suppress herbaceous species and shrub regeneration.

Alternative 3

Effects from this alternative would be similar to Alternative 2, though there would be no chemical effects. There may be a greater risk of introducing more invasive weeds to the project area from this alternative, which may further, though incrementally, reduce the amount of potential forage. This alternative would also have the indirect benefit of reducing the amount of time the deer and elk proof fence is required to protect conifer seedlings because of increased growth rates due to scalping.

OTHER MAMMALS

Townsend's big-eared bat (MIS), western small-footed myotis (SOC), long-eared myotis (SOC), and long-legged myotis (SOC)

There is no roosting or maternity habitat for these bats (that is, caves or lava tubes) in the project area. The nearest occupied site is Skeleton Cave, about 3.5 miles northeast of the project. There are other caves in the adjacent planning areas. Most of these caves are known hibernacula (winter hibernating) for some bat species, including the western small-footed myotis, long-eared myotis and long-legged myotis. Available roosting habitat in the project area would be very limited for all species; the small-footed myotis will utilize rock crevices and the long eared myotis will utilize tree bark and snags, and is generally associated with old-growth forests. Day and night roost habitat for the long-legged myotis mainly consists of large diameter snags and rock crevices (Ormsbee 1995). Foraging for this species occurs in mature open stands and early seral stage stands (Erickson and West 1995). Forage habitat for the small-footed myotis and long-eared myotis are not well characterized. The Townsend's big-eared bat will forage in a broad range of forested conditions, from open savanna to fully stocked conifer stands. Insect prey species (primarily moths) are strongly associated with bitterbrush, ceanothus, and other shrub species. However, few shrubs survived the fire, and there are extensive shrub patches adjacent to the project boundary. Most foraging is suspected to occur within five miles of their day

roosts. Past studies have shown that foraging along forest edges occurred most often, apparently related to availability of prey species and protective habitat for predation.

Alternative 1 (No Action)

This alternative would provide more shrubs, and subsequently more forage, in the long-term due to delays in reforestation. This would be beneficial to the Townsend's big-eared bat but not necessarily for the other bat species that might occur in the project area including: western small-footed myotis, long-eared myotis and long-legged myotis. These other bat species are known to utilize the bark of mature trees to forage.

Alternative 2 (Proposed Action)

The application of herbicides is not anticipated to directly affect bat species. Indirect effects include the potential effects to bats from the accumulation of herbicide in the tissue of prey species while potentially foraging in the project area. No indirect effects are anticipated to bats from this exposure route, see chemical effects discussion. Existing marginal forage habitat for bats further reduces this potential indirect effect. As previously described, this alternative would reduce 304 acres (15 percent of total project area) of shrub and herbaceous habitat. This would likely result in minor and localized reductions of terrestrial and flying insects such as moths, beetles, flies and spiders which are prey species of the Townsend's big-eared bat. This effect is not anticipated to have a significant impact on foraging, since the amount of available forage, especially shrubs have been reduced from the fire. This action would have a minor effect on foraging in the short-term because vegetation will still be available as a forage base in the project area in patches and individual trees in between the proposed treatments. There is also sufficient foraging habitat in adjacent areas that are closer to nesting and roosting sites. There would likely be no negative effect to the foraging habitats to western small-footed myotis, long-eared myotis and long-legged myotis either. Efforts to control vegetative competition with pine seedlings will accelerate the development of a mature pine forest. As stated above, this would provide a positive indirect effect to those species (western small-footed myotis, long-eared myotis and long-legged myotis) that will forage in a variety forested environments.

Cumulative Effects: There would be no anticipated cumulative effects.

Alternative 3

Effects from manual treatment would be similar to the effects described under Alternative 2, although there would be no chemical effects.

Pine (American) Marten (MIS)

Alternative 1 (No Action), Alternative 2 (Proposed Action), Alternative 3

Direct, Indirect, and Cumulative Effects: Pine marten generally use higher elevation lodgepole pine and mixed conifer habitat types with a preference for mesic, late successional forests. Heavy canopy cover is also important in marten habitat (Ruggiero et al. 1994). No habitat or occupancy occurs within the project area. There are no recorded observations in or near the project area. There would be no direct, indirect, or cumulative effects to the Pine marten.

Wolverine (MIS): Refer to the Biological Evaluation/Assessment for details.

RAPTORS

There are no known raptor nests in the project area. The following species specific information was obtained from the 18 Fire Salvage EIS, wildlife report.

Golden eagle (MIS)

No existing nesting habitat is within the project area. Development of open canopied forest structure and large trees in the long-term may provide potential nesting habitat (Marshall et al. 2003). The action alternatives would promote successful reforestation and would be more beneficial than the No Action alternative. Foraging habitat would exist for the short and mid-terms in all alternatives. This species has been observed in the project area post-burn.

Red-tailed hawk (MIS)

No existing nesting habitat within the project area. Development of open canopied forest structure and large trees in the long-term (80 years) may provide potential nesting habitat (Marshall et al. 2003). The action alternatives would promote successful reforestation and would be more beneficial than the No Action alternative. Foraging habitat would exist for the short and mid-terms in all alternatives.

Northern goshawk (MIS)

No existing nesting or foraging habitat occurs within the project area. Potential habitat identified by the Kelsey Project on Luna Butte has been seriously impacted by the fire. The nearest known nest site is about 1.5 miles southwest of the project. Development of LOS forest in the long-term may provide potential habitat (Marshall et al. 2003). The action alternatives would promote successful reforestation and would be more beneficial than the No Action alternative. Refer to the Kelsey and Fuzzy Projects wildlife reports for details on pre-fire surveys in the vicinity.

Cooper's hawk (MIS)

No existing nesting habitat occurs within the project area. Potential habitat identified by the Kelsey Project on Luna Butte has been seriously impacted by the fire. Development of semi-open canopied (patchy) forest structure and medium sized trees in the long-term (50 to 80 years) may provide potential nesting habitat (Marshall et al. 2003). The action alternatives would promote successful reforestation and would be more beneficial than the No Action alternative. Foraging habitat would exist for the short and mid-terms in all alternatives, particularly after shrubs recover. Refer to the Kelsey and Fuzzy Projects wildlife reports for details on pre-fire surveys in the vicinity.

Sharp-shinned hawk (MIS)

No existing nesting or foraging habitat occurs within the project area. Potential habitat identified by the Kelsey Project on Luna Butte has been seriously impacted by the fire. Development of closed or semi-closed canopied forest structure with thickets of dense, young trees in the long-term may provide potential nesting habitat (Marshall et al. 2003). Foraging habitat would exist in the mid-term after a young forest is well established. The action alternatives would promote successful reforestation and

would be more beneficial than the No Action alternative for both nesting and foraging habitats. Refer to the Kelsey and Fuzzy Projects wildlife reports for details on pre-fire surveys in the vicinity.

Osprey (MIS)

No habitat or occupancy occurs within the project area. The nearest known use sites on national forest lands are located near the Deschutes River. Ospreys are also found at East and Paulina lakes approximately 12 miles south of the project.

Summary of Effects to Raptors

Alternative 1 (No Action)

Direct and Indirect Effects: There would be no direct effects to any of the MIS or SOC known or suspected to occur in or adjacent to the project area as a result of implementation of this alternative. The indirect effect of the No Action alternative is to delay the development of either nesting or foraging habitat, or both, of the northern goshawk, Cooper's hawk, sharp-shinned hawk, red-tailed hawk and golden eagle. This delay is not expected to cause negative effects to these species, as suitable habitat is readily found in adjacent areas. Open habitat, maintained by slower tree regeneration will provide suitable foraging habitat for some raptors, such as the redtail hawk and golden eagle.

Alternative 2 (Proposed Action)

Direct and Indirect Effects: The application of herbicides is not expected to directly affect raptors since they do not directly occupy or nest in the project area. If a nest is found during implementation, the appropriate mitigations would be applied (see mitigations section in the back of this report for additional information). Additionally, based on classification schemes developed by the U.S. EPA, hexazinone is *practically nontoxic* to birds, fish, and aquatic invertebrates (SERA 2005 p. 4-1). Indirect effects considered, include the potential effects to raptors from the accumulation of herbicide in the tissue of prey species while potentially foraging in the project area. This potential route of exposure is not anticipated to affect raptors, see previous chemical effects discussion. Existing marginal forage habitat for raptors (primarily red-tailed hawk and golden eagle) further reduces this potential indirect effect.

Alternative 2 would result in a direct reduction of 304 acres of shrub and herbaceous habitat, or 15 percent of the total project area (2,003 acres). The majority of vegetation affected would be herbaceous vegetation developed following the 18 Fire; these areas are now dominated by herbaceous species post fire. There would be minor indirect effects to raptors (primarily the red-tailed hawk and golden eagle) as some marginal forage habitat is affected. Alternative 2 would provide a positive indirect effect to most raptors by accelerating the development of coniferous habitat utilized for nesting and foraging. The northern goshawk, Cooper's hawk and sharp-shinned hawk would benefit from a more developed forest as they primarily forage in these forests or on edges and patches within denser stands. The conversion of shrub and herbaceous dominated site to conifer dominated site will also affect these raptors by affecting habitat for prey species. Ultimately, the suitability of these sites for species such as the black-tailed jackrabbit and Nuttall's cottontail will be reduced, thereby reducing the suitability and use of these areas by the red-tailed hawk and golden eagle for foraging.

Alternative 3

Direct and Indirect Effects: Effects from this alternative would be similar to the Alternative 2, though there would be no chemical effects.

CAVITY NESTERS, WOODPECKERS AND SECONDARY CAVITY NESTERS

The following cavity nesters and woodpeckers were addressed in the 18 Fire Salvage EIS and will be addressed in this analysis: Lewis' (MIS)**,** Pileated (MIS), Black-backed (MIS), White-headed (MIS), Northern three-toed (MIS) and Hairy woodpeckers (MIS), Williamson's Sapsuckers (MIS), flammulated owls (Focal Species) and pygmy nuthatches (Focal Species).

Pileated and Lewis' woodpeckers (MIS) are not suspected nor have been found within the project area due to the dominant stand types and average size of trees in adjacent stands. The action alternatives would have no measurable effect on the Lewis' or pileated woodpecker, because they are normally absent from the area. The pileated rarely uses pure ponderosa pine habitats. Three-toed woodpeckers (MIS), a species associated with higher elevations and lodgepole pine habitat (Goggans, et al 1988), are not likely to be found within the project area because the elevations in the project are lower than those commonly reported for this species, and that there is no lodgepole pine habitat in the project. The action alternatives would have no effect on this species, because it is normally absent from the area. Any future occupancy would likely be incidental and short-term in the pursuit of insects attracted to the area (Marshall et al. 2003).

The project area is considered suitable habitat for a number of other MIS woodpecker species. The black-backed woodpecker (MIS) has been observed in the vicinity of the project area post-fire. However, it is an opportunist and seeks out burned areas. Its normal habitat is closely associated with lodgepole pine with a preference for LOS stands. Ponderosa pine is not their preferred habitat type (Marshall et al. 2003; Altman, 2000) but will be utilized after a stand replacement wildfire.

It is assumed within this document that by managing for the needs of these species, the needs of secondary cavity nesters such as flammulated owls (Focal Species) and pygmy nuthatches (Focal Species) are met (specifically by Hairy and white-headed woodpeckers (MIS) and Williamson's sapsuckers (MIS); Marshall, 2003). Generally, the action alternatives would have positive effects on the population viability of this species, because reforestation would be beneficial in the long-term. The scale of the project is small in relation to the species' range.

Alternative 1 (No Action)

Direct and Indirect Effects: There would be no direct effects to any of the MIS, SOC or Focal species known or suspected to occur in or adjacent to the project area as a result of implementation of the No Action alternative. The indirect effect of the No Action alternative would be to delay the development of either nesting or foraging habitat, or both, for the cavity nesters. This delay would not be expected to cause negative effects to these species, as suitable habitat is found in adjacent areas. The delay in forest re-establishment would be negative and more pronounced for the pygmy nuthatch and white-headed woodpecker, which depend on large, green ponderosa pine for foraging.

Alternative 2 (Proposed Action)

Direct and Indirect Effects: The application of herbicides would not be expected to directly affect cavity nesters since they do not directly utilize the project area i.e., forage or nest on the ground in planted stands, with the exception being the northern flicker. Northern flickers primarily forage on the ground for insects but nest in cavities excavated in snags and mature trees. Any effect to available forage would be minor and in the short-term because vegetation will still be available as a forage base in the project area in patches and individual trees in between the proposed treatments. There is also sufficient foraging habitat in adjacent areas. No indirect effects to cavity nesters would be anticipated as a result of accumulation of hexazinone in tissue of prey species (insects). Refer to chemical effects discussion. This alternative would provide a positive indirect effect to cavity nesters by accelerating the development of mature coniferous habitat and recruitment of snags and downed wood utilized for nesting and foraging. These positive indirect effects are long term.

Alternative 3

Direct and Indirect Effects: Effects from this alternative would be similar to the Alternative 2, though there would be no potential chemical effects.

LANDBIRDS, NEOTROPICAL MIGRATORY BIRDS (NMB) AND ECOLOGICAL INDICATORS

The following neotropical migratory birds (NMBs) were addressed in the 18 Fire Salvage EIS and will be addressed in this analysis: olive-sided flycatcher, chipping sparrow, hermit thrush, mountain bluebird (ecological indicator of burns and openings) and green-tailed towhee (ecological indicator of mature shrub habitats).

Alternative1 (No Action)

Direct and Indirect Effects: There would be no expected direct effects from implementation of the No Action alternative. The indirect effect is to delay the development of nesting and foraging habitat for NMBs. This delay is not expected to cause negative effects to these species, as most shrubs were consumed in the 18 fire. Also, suitable habitat is found in adjacent areas. Open habitat, maintained by slower tree regeneration would provide suitable foraging habitat for some species, such as the green-tailed towhee (focal species). This alternative would have a minor negative effect on birds that prefer LOS, such as the olive-sided flycatcher (SOC and focal), because of delays in forest re-establishment.

Alternative 2 (Proposed Action)

Direct and Indirect Effects: Herbicide application is not expected to have a direct effect on landbirds. Based on classification schemes developed by the U.S. EPA, hexazinone is *practically nontoxic* to birds (SERA 2005 p.4-1). The 1997 SERA Risk Assessment identified the potential risk that involves small mammals or birds ingesting some of the granules directly and acknowledged that this would be a concern at application levels of 3-6 pounds of a.i./acre. However, there are no data indicating that birds will consume any of the granular formulations that contain hexazinone (SERA 1997, p. 22). The proposed application rates for this project are two (2) to three (3) lbs. of active ingredient (a.i.) per acre. However, since spot applications will result in hexazinone application on only 13 to 20 percent

of any acre (the 3foot or 5 foot radius around each tree treated), then only 0.26 to 0.54 lbs a.i. per acre would actually be applied. Furthermore, the chemical is not anticipated to remain in a granular form on the ground for very long since rainfall dissolves the chemical into the rootzone and the product would be applied in advance of likely precipitation. EPA guidelines put a threshold of application at 8 lbs a.i./ acre. Application rates defined in the proposed action stay below threshold levels of concern for toxicity (EPA 1994). Again, birds appear to be substantially more tolerant of hexazinone than do mammals. At the highest anticipated application rate and at the upper limit of exposure, none of the hazard quotients exceed a level of concern (HQ=1). Thus, there is no basis for asserting that any adverse effects are plausible in birds with the application of liquid or granular formulations of hexazinone (SERA 2005 p. 4-27). See previous chemical effects discussion. Therefore, no indirect effects to NMB's are anticipated as a result of accumulation of hexazinone in tissue of prey species.

There would be minor secondary effects to NMB's known or suspected to occur in or adjacent to the project area due to decreasing the shrub and herbaceous vegetation potentially used by birds for nesting and foraging. This alternative would result in the loss of 304 acres of marginal shrub and herbaceous habitat; 15 percent of the total project area. However, the majority of vegetation affected would be herbaceous vegetation since most shrubs were lost during the 18 Fire, thus mitigating the effect (loss of habitat) to species such as the green-tailed towhee. Any effect to available forage and/or nesting habitat would be minor and short-term in duration because untreated habitat will still be available in the project area in and around untreated patches. Foraging habitat is available in adjacent areas for most species affected. There would also be a potential minor secondary effect to NMB's from the loss of vegetation, i.e., forage habitat (insect prey base). See previous chemical effects discussion. This alternative would provide a positive indirect effect to some species by, accelerating the development of coniferous habitat. This would be beneficial to the olive-sided flycatcher and the chipping sparrow (short-term) who will utilize the habitat for nesting and foraging. As conifers regenerate, the long-term suitability of these sites for some species will be reduced for species that prefer more open canopies e.g., chipping sparrow and mountain bluebird. This habitat is currently available in adjacent areas. Species such as the hermit thrush that require multi-layered structural diversity would benefit in the long-term (Altman 2000).

Application in fall would reduce the exposure of the chemical to nesting birds since the breeding season would be over and many migrants have left. There would however, be fewer shrubs to nest within in the following spring, but there would no longer be the risk of direct consumption of granules, though as stated previously, it is not known if birds would consume the granules. Furthermore, results from the plantation herbicide environmental assessment, herbicide monitoring report, did not document any negative observations regarding potential affects to wildlife, wildlife habitats or prey for the project (Keown, K. and Clark, L. 2001).

Alternative 3

Direct and Indirect Effects: Effects from this alternative would be similar to the Alternative 2, though there would be no chemical effects. There may be a greater risk of introducing invasive weeds to the project area from this alternative, which may reduce the amount of native shrub and forb habitat utilized by NMB's.

OTHER BIRD SPECIES

Great gray owl (MIS)

No habitat or occupancy in the project area. This species depends upon lodgepole pine forest habitat in proximity to meadows and other forest openings with good pocket gopher populations (Marshall et al. 2003).

***Waterfowl (MIS)*:** No habitat or occupancy in the project area. The nearest habitat on national forest lands is the Deschutes River about 6 miles west of the project.

***Peregrine falcon (MIS)*:** Refer to the Biological Evaluation/Assessment for details.

***Great blue heron (MIS)*:** No habitat or occupancy in the project area. The nearest potential habitat on national forest lands is the Deschutes River approximately 6 miles west of the project.

***Bald eagle (MIS)*:** Refer to the Biological Evaluation/Assessment for details.

***Northern spotted owl (MIS)*:** Refer to the Biological Evaluation/Assessment for details.

Species Associated with Logs and Down Woody Debris (MIS): Addressed by previous MIS, SOC and focal species.

***Species Associated with Various Plant Communities and Successional Stages (MIS)*:** Addressed by previous MIS, SOC and focal species.

***Species with Special or Unique Habitats (MIS)*:** No special or unique habitats (e.g. caves, riparian zones, cliffs, talus, etc.) within the project area.

Cumulative Effects

Table 10 lists the past, present, and reasonably foreseeable actions that were used for the analysis of cumulative effects. The general effects of the following past, present and future projects were included in the table below.

Table 10: Past, Present And Reasonably Foreseeable Actions In And Adjacent To The Project Area

Project Analysis	Project Activities
Fuzzy Environmental Assessment (2000): 24,231 acres in MA-7; 50,701 total acres; Project currently ongoing	Deer winter range hiding and thermal cover, and forage reduction; shrub habitat alteration

18 Fire EIS (2004): 2,030 acres Salvage completed	Deer winter range effects, increased snags recruitment, road closures
18 Fire Road Salvage Project (2003); Project completed	No anticipated cumulative effects
Draft Kelsey Environmental Impact Statement (2005): Includes 40 acres of herbicide application	Deer winter range hiding and thermal cover, and forage reduction; shrub habitat alteration
Deschutes National Forest Invasive Weed EIS (draft 2005) < 2 ac. Inside project boundary (no herbicide application by this project to known weed sites).	Forest wide invasive weed control efforts, including herbicide application (no herbicide application by this project to known weed sites).
Past prescribed burns, wildfires, and timber harvest areas (10 to 20 years old) where bitterbrush and deer cover have not fully recovered.	Deer winter range hiding and thermal cover, and forage reduction; shrub habitat alteration

There are no private lands or BLM administered lands adjacent to the project area that would have a significant contribution to the cumulative effects of this project. There is no current active livestock grazing in the project area that would contribute to cumulative effects. Active grazing by sheep and goats may occur within two years near the project area. Cumulative effects from the grazing are not expected, provided that utilization standards are met.

Alternative 1 (No Action)

Cumulative effects of the No Action alternative include: additional shrub and forb habitat loss acreage when totaled with the other fires and projects in the vicinity (such as Horse Butte, Bessie Butte, Sundance, Cabin, Horse Ridge, Evans West, and Skeleton and the Fuzzy and Kelsey vegetation management projects). These past actions and reasonably foreseeable actions are likely significant impacts on local mule deer herds and other species dependent upon this habitat including forest raptors, some landbirds and cavity nesters (long-term) because of the additional reduction of forage (herbaceous and shrubs), hiding and thermal cover on winter range. In addition, the long recovery period for areas that are not fully reforested (e.g. Skeleton fire) will further delay the attainment of LOS forest habitats and species dependent upon them over a large area.

Alternative 2 (Proposed Action) and Alternative 3

Cumulative effects on MIS, SOC and Focal species from Alternative 3 would be similar to Alternative 2, although there would be no chemical effects. There may be a greater risk of introducing invasive weeds to the project area from Alternative 3, which may further reduce the amount of native shrub and forb habitat. This effect is also expected to be negligible given the size of the project and that much of the competing vegetation intended to be removed are already invasive (see project botanical report).

Alternatives 2 and 3 mitigate the loss of deer cover in the area by enhancing reforestation efforts. The benefits would be, at best, in the mid-term (15 or more years). In general, deer thermal and hiding cover in the area is below management objectives (Keown and Webb, 2004).

The cumulative effects of the proposed action on MIS, SOC, and Focal species are as follows:

1) No cumulative effects anticipated from the future Kelsey project; 40 acres of herbicide application would occur but not in the vicinity of this project. Potential future application of herbicides from

the DNF Invasive Weed EIS on this project would not have an effect. Treatments are proposed on approximately 4 acres in and adjacent to this project including the 18 Fire Salvage project area, on Cabin Butte, and on roads in and adjacent to the project area, e.g., roads 18, 1810 and 1810-400. However, this project will avoid treating any sites proposed for the DNF Invasive Weeds EIS, therefore no overlap will occur. These treatments will focus on areas currently infested with invasive/noxious weeds and would have a beneficial effect by reclaiming native plant communities.

2) Those species requiring open canopied forest structure would benefit because the forest would be re-established more quickly. Further, maintaining 60 percent of the area in relatively low tree densities (i.e. deer forage areas) would also benefit this group.
3) Species requiring heavy canopied, multi-stratum LOS habitat would not be adversely affected, because the low site productivity of the area likely precludes developing this type of habitat
4) Cavity dependent species would be provided for by enhancing reforestation efforts and facilitating recruitment of future snags.

The size of the project is small compared to the regional distribution of all potentially affected species, so the effects are primarily local and in many cases beneficial. Further, it is not the preferred habitat type of several MIS (e.g. black-backed woodpecker), which may use the area temporarily. Species with declining populations have a number of factors affecting them. The action alternatives mitigate potential adverse effects to these species and have positive effects through enhancement of reforestation actions (i.e. control of competing vegetation). The long-term impacts of the fire will cause a deficit in snag habitat for all dependent species within approximately 25 years, because the existing snags will have fallen prior to recruitment from the re-established forest (Harrod et al. 1998). The Proposed Action would reduce the time period of the deficit by enhancing reforestation efforts. This effect is aggravated by the low snags levels common in the surrounding un-burnt forest area (Keown and Webb, 2004).

All Alternatives

Cumulative and future effects common to all the alternatives include:

Past prescribed burns, wildfires, and timber harvest areas (10-20 years old) where bitterbrush and deer cover have not fully recovered.

The Fuzzy Project (implementation) has affected deer cover and movement corridors, forage (i.e. bitterbrush), forested habitats, etc. There is a minor overlap of the two projects. Most negative effects from the Fuzzy Project were mitigated via the environmental assessment, but it was predicted that the North Paulina deer herd would be reduced (Becker 2000).

The future Kelsey Project will be affecting deer cover and movement corridors and forage and is adjacent this project. The environmental assessment is currently being revised to account for the cumulative affects of the 18 Fire and planned Kelsey activities. The 18 Fire Competing Vegetation Project does not add to the effects on deer hiding/thermal cover or raptor habitat as examples, because the fire eliminated these habitats. In fact, the action alternatives that include control of competing vegetation to enhance reforestation will facilitate the recovery of these habitats.

The cumulative effects (i.e. hiding and thermal cover) of past (Fuzzy, 18 Fire Salvage) and future (Kelsey) projects on Deer Habitat Management Area (LRMP MA-7) overlapping the North Paulina Deer Herd area are as follows: Kelsey hiding cover is 23 percent, thermal cover is 24 percent; Fuzzy hiding cover is 11 percent, thermal cover is approximately 4 percent; 18 Fire Salvage is 0 percent hiding cover, 0 percent thermal cover and 18 Fire Competing Vegetation Control is 0 percent hiding cover, and 0 percent thermal cover.

Conclusion

None of the alternatives proposed, with the mitigations described, pose a threat of negative effects to the MIS, SOC or Focal species considered in this analysis. All effects will be local and not negatively affect wildlife populations.

In summary, the No Action alternative will not have any direct effects to the species considered and will only delay the regeneration of conifer species. Species that prefer large, open areas with dominate coverage by grasses and shrubs will be positively affected by this alternative. Raptors such as the red-tailed hawk and golden eagle which forage in open habitats would benefit. Species dependent upon more extensive forest cover and/or old growth forest structure would be negatively affected; e.g., cavity nesters and the olive-sided flycatcher. This is due to the slower development of the forest (post-fire) without reforestation. Their would be some available forage for mule deer on winter range, but the recovery of hiding and thermal cover would be slow. The population viability of the species addressed would not be affected by the No Action alternative. The project area represents a small proportion of the range of these species, and it does not provide any critical resources for their overall survival.

In summary, for Alternative 2, there are no anticipated direct or indirect toxic effects to herbicide application on wildlife because of the small amount of herbicide applied and the nature of the herbicide. The secondary effects from the proposed action would reduce shrub and herbaceous cover during the short-term and accelerate the development of coniferous habitat. Those species requiring future LOS forest and open canopy forest conditions would be benefited by reforestation enhancement actions in this alternative: e.g., most raptors and cavity nesters. This alternative would generally have positive effects on the winter range, because the long-term objective of providing a 40:60 cover to forage ratio would be attained more quickly than in the other alternatives. Unlike the No Action alternative there will be a minor reduction in marginal foraging habitat of the red-tailed hawk and golden eagle, chipping sparrow and green-tailed towhee in the long term. Additionally, connectivity would be restored in the long-term by reforestation; fragmentation would be also be reduced by reforestation enhancement efforts.

Additionally, the proposed action alternative offers the benefit of removing the deer and elk proof fence earlier than with implementation of the no action alternative. The Proposed action provides the benefit of reduced human disturbance due to the reduced amount of time involved in the application of the herbicide versus manual treatment, which is also a more ground disturbing action. Overall, none of the species addressed would have their population viability affected by the Proposed Action alternative. The project area represents a very small proportion of the range of these species, and it does not provide any critical resources for their overall survival.

In summary, the effects for Alternative 3 are very similar to the proposed action; except that this alternative would control competing vegetation by physical removal (scalping) of vegetation instead of application of herbicide. There would be no risk of direct and indirect toxicity to animals by implementing this alternative. The positive and negative effects to habitats and subsequently species are almost identical. This alternative would potentially increase the amount of invasive plant species, which would incrementally reduce wildlife habitat. None of the species addressed (MIS, SOC or Focal) would have their population viability affected by alternative 3. The project area represents a

very small proportion of the range of the these species, and it does not provide any critical resources for their overall survival.

BOTANY

THREATENED, ENDANGERED, SENSITIVE

SUMMARY OF FINDINGS

The activities that are proposed in the 18 Fire Competing Vegetation Management Project will not have adverse direct, indirect, or cumulative impacts to habitat, sites, or cause a loss of viability or a trend toward Federal listing for any species on the Region 6 Forester's Sensitive Plant List. None of the listed plant species were found to occur within the project Area.

Federally listed Threatened or Endangered plant species or habitat, or plant species proposed for listing, are not documented or suspected to occur in the project area, therefore, activities proposed in the alternatives will have no effect on federally listed plant species.

INTRODUCTION

This area of the Bend-Fort Rock Ranger District contains a relatively low number of herbaceous plant species. Reasons for this are unknown, but speculation might point to the young volcanic soils, and lack of variety of habitats within this zone which would offer niches for different kinds of plants (for example, there are no seeps, springs, creeks, or rivers here). It may be suggested that fire suppression also plays a role, but plant surveys of and visits to nearby fires in the seasons following those fires did not reveal a spike in plant species diversity, although many species were much larger and more vigorous and certain annual species were more prevalent than typical in the year or two following the fires.

The 18 fire altered the vegetation markedly. Approximately 3,800 acres were burned, at varying levels of intensity. A high percentage of shrubs, at least those detectable due to persistence of charred remains above ground appear to be dead, although sprouting was noted in the early fall months after the fire in currant species in areas where fire severity was lower. Vegetation existing prior to the fire appears to have been incinerated over most of the burned area, although observations in the fall noted the grasses, mostly Idaho fescue, were resprouting from their root crowns. This is typical for fire recovery observed elsewhere in this area; it is rare for the bunchgrasses to be eliminated, except for perhaps in only the very hottest pockets of a fire. The spring of 2005 brought considerable rainfall to the burned area and by the fall of 2005, most of the fire area was fully occupied by herbaceous plants and shrub species.

PROPOSED, ENDANGERED, THREATENED, SENSITIVE (PETS) PLANT SPECIES

Currently, the Deschutes National Forest has a Sensitive Plant List that includes 31 species. Of these, only one, *Castilleja chlorotica* (green-tinged paintbrush) had any probability for occurrence, and that probability is low, and only in the northern portion of the fire where there are no plant associations that include a shrub layer.

No habitat for Threatened, Endangered, or Proposed (Candidate) plant species (these species, and their habitats, are listed in the Biological Evaluation) exists within the project area, with the possible unlikely exception of *Botrychium linearse*, a Candidate species. Its range distribution is very wide and its habitat varies just as widely. It has not been found on the Deschutes National Forest, (or in the project area), after 15 years of project-level surveys. The nearest known site lies in northeastern Oregon, in Wallowa County. New lichens, mosses, and fungus were added to the Forest list in the summer of 2004. There is no habitat present for them in the project area. They are associated either with flowing streams in moist, high-elevation forests, and/or moist, high-elevation forests in the Cascade Mountains.

Proposed, Endangered, Threatened, and Sensitive (PETS) plant surveys had been conducted over approximately 30 percent of the project area prior to the 18 Fire, within the past 14 years for various thinning, mowing, and special uses projects. Additionally, thousands of acres in the vicinity, in similar habitats as the project area, have also been surveyed within the same time frame with no PETS plant sites located.

Alternative 1 (No Action), Alternative 2 (Proposed Action), Alternative 3

Direct, Indirect, and Cumulative Effects: No direct, indirect or cumulative effects have been identified. No PETS plants were located during survey, nor is high-probability PETS plant species habitat present.

BOTANY – INVASIVE PLANTS

INTRODUCTION

The Noxious Weed Risk Assessment for the 18 Fire Competing Vegetation Control Project (Project Record, written by Charmane Powers, dated December 7, 2005, incorporated by reference and included in Appendix C.

Forest Service Manual (FSM) direction requires that Noxious Weed Risk Assessments be prepared for all projects involving ground-disturbing activities. For projects that have a moderate to high risk of introducing or spreading noxious weeds, Forest Service policy requires that decision documents must identify noxious weed control measures that will be undertaken during project implementation (FSM 2081.03, 29 November 1995).

Project practices must be consistent with direction from the February 3, 1999 Executive Order on Invasive Species (Executive Order #13112), which requires federal agencies to use relevant programs and authorities to prevent the introduction and spread of invasive species (Noxious Weed Risk Assessment, Appendix C).

Aggressive non-native plants, or noxious weeds, can invade project areas and cause long-lasting management problems by displacing native plant communities, increasing fire hazards, reducing the quality of recreation experiences, poisoning livestock, and replacing wildlife forage. By simplifying complex plant communities, weeds reduce biological diversity and threaten rare habitats.

EXISTING CONDITION

Noxious weeds and exotic weeds of concern in the project area are listed in Table 11. In addition to noxious weeds, which are designated by the state of Oregon, there is a group of non-native plants that are also aggressive but not officially termed “noxious”. These are also included in the weed assessment.

There are many known weed sites within the project area. They include the designated noxious weeds dalmatian toadflax that is concentrated heavily on and near Bessie Butte, and spotted knapweed found in very small numbers along the 18 and 1810 roads. Also present are weeds of lesser concern over the long term, although have flourished following the fire. These weeds are prickly lettuce, tumble mustard, and Russian thistle. They are not of high concern because it is in their nature to subside in situations either where there is more competition from other plants or when they are shaded (such as by a tree canopy), or both. The ubiquitous cheatgrass is also present in small quantities across much of the project area. A sampling of vegetation cover plots within the project in 2005 revealed that this species was present in just over half of the plots and covered from 0.5 percent to as much as 6.7 percent of the vegetative cover in those plots where they were present. Many of the noxious weed sites within the project were hand-pulled in the summer of 2005. Most (especially dalmation toadflax) can be expected to return in 2006.

Table 11: Deschutes National Forest Noxious Weeds And Exotic Weeds Of Concern Project Area

Scientific Name	Common Name	Presence
Lactuca serriola	Prickly Lettuce	Documented

Table 11: Deschutes National Forest Noxious Weeds And Exotic Weeds Of Concern Project Area		
Scientific Name	**Common Name**	**Presence**
Sisymbrium altissimum	Tumblemustard	Documented
Salsola kali	Russian thistle	Documented
Centaurea maculosa	Spotted knapweed	Documented
Linaria dalmatica	Dalmation toadflax	Documented

ENVIRONMENTAL CONSEQUENCES

Alternative 1 (No Action)

Direct and Indirect Effects: Implementation of Alternative 1 has been determined to have a **low** level of risk associated with the introduction of noxious weeds because there would be no ground disturbance or elimination of competing vegetation that would create a niche for weeds to enter and occupy the site.

There are no identified direct or indirect effects from implementation of the No Action alternative.

Alternative 2 (Proposed Action)

Direct and Indirect Effects: Prevention of the introduction of noxious weed invasion is required by law (Executive Order #13112). To address noxious weed invasion issues, the USDA Forest Service has compiled a "Guide to Noxious Weed Prevention Practices". Required Prevention Measures that are applicable to the project are listed in Chapter II.

The implementation of Alternatives 2 would result in a **moderate** likelihood that weeds would be encouraged in the areas where herbicides are applied because the removal of competing vegetation opens a niche for weeds.

Alternatives 3

Direct and Indirect Effects: There is a high likelihood that weeds would be encouraged in the areas where scalping/grubbing occurs because the removal of competing vegetation. The action of disturbing the soil profile creates habitat that weeds are especially good at establishing in. A risk ranking of **high** is appropriate for Alternative 3 of this project because heavy ground disturbance will occur in areas where weeds are present, and competing vegetation would be removed. Cheatgrass may be the most likely weed to establish around most tree seedlings. This would encourage the establishment of cheatgrass in the grubbed areas around the tree seedlings because of its ubiquitous nature in the project area, and because of its ability to colonize disturbed ground quickly. It is not likely that the cheatgrass would entirely recede from the area once the trees have grown and matured; it is more likely that this species, after an initial spike in numbers, would fall to the background population levels prior to the fire (more from competition with other native grasses and forbs than from tree growth) but not entirely eliminated.

Common to Alternative 2 (Proposed Action) and Alternative 3

Cumulative Effects: Always present is the threat of new introductions or spread of existing weed populations via the road system and forest users' vehicles. To limit the spread of noxious weeds from

recreationists, Roads 18 and 1810 are the only open roads within the 18 Fires area. Ongoing monitoring of noxious weeds would continue as specified in the Burned Area Evaluation Report (BAER) for the 18 Fire.

Another consideration, which would also contribute to an elevated risk of weed spread, is the potential for cattle or other livestock to be used for targeted fuels reduction projects. In an extreme case, where grass is not available for cattle off-forest, in the allotment in which the 18 Fire is located, cattle would be allowed to graze within the project area (per the Cinderhill Environmental Assessment, 2004). At the earliest, this would occur in 2006, although use is not expected to occur based on the allotment's inactive status since 1990.

Noxious weed inventory and treatment has been occurring on the Deschutes National Forest in past years. Accurate documentation of noxious weed sites began in the early 1990s. Past treatment of noxious weeds has reduced the density of weeds on many sites, including the18 Road right-of-way. Treatments have been implemented annually on weed sites in and adjacent to the 18 Fire Recovery Project area. Chemical treatment of spotted knapweed has occurred along the 18 Road since 1999, including the area where the 18 Road bisects the fire area. The 18 Road on National Forest land is nearly free of noxious weeds, although weeds do exist in the form of seed in the soil (seedbank).

In 2004 there was a targeted chemical treatment with Dicamba. It is anticipated that in the following years, (if chemical treatment for knapweed is deemed necessary) it will be with the chemical Transline. Region 6 of the Forest Service has completed an Invasive Species EIS that analyzed the effects of Transline on the environment and has approved its use. The Deschutes and Ochoco National Forests are currently working on an Invasive Plant EIS, due as a draft for public review in September 2006.

Dicamba is a benzoate auxin herbicide that mimics a plant hormone in broadleaf plants (Syracuse Environmental 2004). It causes a hormone imbalance resulting in abnormal growth in the plant to a degree that the plant life processes no longer work and the plant dies. The hormonal imbalance is specific to plants. Studies on toxicity to animals have found at high doses (above recommended application levels) the chemical can cause skin and eye irritations (Syracuse Environmental 2004). It does not bioaccumulate.

The proposed action for this project will avoid any direct treatment of competing vegetation of these areas previously proposed for treatment under the Deschutes National Forest Invasive Weed Project, thus avoiding any potential overlap of herbicide applications and potential synergistic or antagonistic effects.

SOILS

This section summarizes the Soil Resource Specialist Report for the 18 Fire Competing Vegetation Control Project. This report (Project Record, written by Peter Sussmann, Soil Scientist, December 26, 2005) is incorporated by reference.

EXISTING CONDITION

Soil types present in the analysis area are comprised of a layer of pumiceous ash from Mt. Mazama over an older buried residual soil on bedrock or directly over basaltic bedrock. Descriptions of the soil types can be foud in the Soil Resource Inventory (SRI) of the Deschutes National Forest (Larsen 1976). A detailed description of the soil mapping units found in the project area can be found in the Soil Resource Specialist Report for the project.

The mineral soil is comprised of airfall ash from Mt. Mazama, deposited in variable depths ranging from 18 to 36 inches throughout the project area. The buried residual soils are derived from weathered basalt and andesitic lavas or older airfall ash events and are generally 6 to 24 inches in thickness. Bedrock is generally found within 24 to 60 inches beneath the surface within all map units identified. Soils on Bessie and Luna Buttes have a variable layer of Mazama ash overlying local cinders.

Soils within the treatment areas are generally coarse textured, with pumiceous loamy sands in the surface horizons and sandy loams in the subsurface and buried soil horizons. Litter and duff depths on the soil surface are variable and relatively thin, ranging from 0 to 1 inch. Mineral soil A horizons are also variable in depth and range from 1 to 3 inches. The mineral A horizon has often been mixed with the mineral A/C horizon by recent and past harvest activities or made thinner by wind erosion in many areas. The soils have a moderate cation exchange capacity and relatively low organic matter content in the surface and subsurface mineral horizons. The pH of these soil types ranges generally between 6.0 and 7.0.

Permeability of the soil types present is very rapid in the surface layer and rapid in the subsurface layers. Spring snowmelt and summer thunderstorm events rarely produce above ground accumulations or flows of water, except on compacted areas such as roads and skid trails.

Annual precipitation in the treatment areas averages about 15 inches. Groundwater is located between 300 and 800 feet beneath the surface. Site productivity of the treatment areas is low to moderate. None of the soil types identified in the treatment area are considered sensitive as defined in the Deschutes LRMP, Appendix 14, but most are a concern for regeneration due to low productivity, frost damage gophers, grass and brush competition and/or droughty aspects.

ENVIRONMENTAL CONSEQUENCES

Effects of the actions or inactions proposed under the three alternatives on the soil resource are measured by changes to the input of organic matter to the mineral soil as a result of the loss of biomass production from targeted species on site. Action alternatives would treat competing species on approximately 15 percent of the unit treatment areas with either herbicide applications or manual removal. The primary competitive species targeted by proposed treatments are perennial grasses such as Idaho Fescue and Bottlebrush Squirreltail. Ceanothus and manzanita shrubs are also competitive components on the north slopes of Bessie Butte.

Alternative 1 (No Action)

Alternative 1 proposes no treatment of competing understory vegetation immediately adjacent to planted conifer seedlings that are proposed for treatment under the action alternatives. This alternative would disturb the least amount of mineral soil from either a physical or herbicide perspective. No applications of herbicides or scalping would occur on grass and shrub species adjacent to planted conifers, allowing herbaceous grass and shrub vegetation to continue to grow unimpeded in these areas. The production of organic matter in these areas in the short-term (5 to 10 years) would be the greatest under this alternative, with continued input from herbaceous plants over the estimated 304 acres proposed for treatments under the action alternative. Organic matter input from conifers over the long-term (25 to 50 years) may be reduced somewhat compared to the other alternatives due to reduced growth rates or survival rates on site. However, total production of organic matter input under this alternative is likely to be similar to that under the treatment alternatives because of slightly increased herbaceous production within the 15 percent of treatment areas proposed for herbicide or manual treatments under the action alternatives.

Alternative 2 (Proposed Action)

Alternative 2 proposes to apply herbicide within a three foot radius of conifer seedlings planted at 200 or 300 trees per acre, and a five radius proposed around sites located on Bessie and Luna buttes where shrub competition is severe and conifer seedlings are proposed to be planted at 100 trees per acre. These application areas would total an estimated 304 acres, or 15.2 percent of the 2,003 acres already planted or proposed for planting during the spring of 2006. Herbicide would be applied on these areas at rates of 2 to 3 lbs of active ingredient (a.i)/acre, depending on the radius of the area to be treated, equating to a total of 0.26 or 0.54 lbs of active ingredient, respectively, per gross acre at these concentrations.

Applications would utilize a granular form of hexazinone, most likely a product currently named Pronone or Velpar, applied with a hand-held granular applicator such as a Weed-A-Meter or equivalent. The intended scenario for applied herbicide is for it to be activated by sufficient amounts of precipitation within the weeks following application and transported into the rooting zone where it would be available for uptake by plant roots. Initial applications would be applied after conifer seedlings were planted in the spring. Recommended manufacturer application rates are assumed to be effective for control of competing vegetation without exceeding the uptake capability of the targeted herbaceous species. A subsequent application may be needed over the next five (5) years if sufficient moisture to activate the product does not occur after the initial application or total effectiveness is not adequate to reduce competitive growth or survival losses. Additional applications of this herbicide would likely occur during the spring or fall months in order to coincide with sufficient precipitation to activate the herbicide.

Applied herbicide is likely to follow one of four pathways identified by the literature:

1) applied and never activated into solution within the soil profile;
2) applied, activated, transported to the rooting zone and taken up by herbaceous plant roots

3) applied, activated and adsorbed on to mineral soil or organic matter in the soil profile;
4) applied, activated, dissolved into soil solution and leached further down the soil profile outside of the rooting zone or transported into groundwater;

Hexazinone is a triazene compound that is an effective inhibitor of photosynthesis in herbaceous and woody plants. Table 12 is a summary of the primary chemical, water and soil characteristics of hexazinone.

Table 12 – Environmental and Chemical Characteristics of Hexazinone

Characterstics	Hexazinone
Chemical Family	Triazine
Chemical Type	Neutral
Volatilization (Air Dissipation)	Low
Solubility in Water (ppm)	33,000
Leachability	Rapid
Soil Decomposition Rate	Slow
Soil Half-Life	2-3 months

Direct and Indirect effects

The direct and indirect effects of hexazinone applications in the soil environment have been extensively researched and documented in response to its use in agricultural and forest management settings. Research literature includes studies on the effects of hexazinone on soil micro-organisms and the degradation and mobility pathways of applied residues. In general, hexazinone appears to be relatively benign in the soil environment when applied at levels at or below those approved by the Environmental Protection Agency (EPA) Risk Assessments.

1) Herbicide remaining as unaffected residues on the surfaces of mineral soil and/or treated vegetation if sufficient precipitation did not occur to activate the product into the soil profile are likely to be degraded by UV light (Michaels et al, 1999). Degradation by UV light appears to be faster than the rate at which microbial degradation of soil activated residues would occur within the soil profile, based primarily on the ineffectiveness of hexazinone within 1 to 2 weeks of application if no precipitation occurrs to activate the herbicide. While activated hexazinone is expected to degrade to one-half the initial concentration applied in 2-3 months (Product label) under microbial degradation pathways, UV degradation would likely reduce concentrations from initial applications to some level lower than the 0.13 or 0.27 lbs of active ingredient expected under a half-life of 2 to 3 months.

2) Herbicide that is activated by sufficient amounts of precipitation would be transported into the rooting zone and primarily taken up by targeted herbaceous species and incorporated into the biomass of these plants. Residues would be contained in plant matter and relatively inactive within the system. These compounds would be further metabolized by microbes as the plant matter decays on the soil surface. Further input of residues into the soil is unlikely from this pathway, although no documented evidence of this appears on the literature.

3) Residues activated into solution that are not taken up by plant roots would be either adsorbed onto sites provided by mineral soil or organic matter or leached further down through the soil profile. The rate of adsorption of this herbicide to the mineral soil varies according to textural class and ranges from immobile to intermediate (Environmental Protection Agency Risk Assessment). The coarse textured soils present in the proposed treatment areas (i.e. sandy loams or loamy sands) can be expected to result in intermediate adsorption (Priester and Sheftic, 1990) and decay rates similar to the literature. Soil characteristics of the Mazama ash soils include a relatively high water holding capacity and moderate cation exchange capacity capable of providing sufficient sites to adsorb herbicide residues within the upper portions of the rooting zone. Once adsorbed, these residues would be in a position to be degraded by soil microbes. Local soils have sufficient organic matter content and microbial populations to limit the persistence of this herbicide to bounds described in the literature and on the product labels.

In general, hexazinone is expected to degrade to one-half the initial concentration in 2 to 3 months (Product label), although degradation rates for this herbicide depend on local soil temperatures, annual precipitation and soil characteristics such as texture and organic matter content. Hexazinone is broken down over time primarily by microbial metabolism, and soils within the analysis area have a cryic temperature regime that allows for microbial activity for the months between late spring and early fall. Under these conditions, hexazinone could remain in the soil at low concentrations for up to three years after application, as described by research and regulation (Herbicide Information Profile).

Up to eight compounds have been described (Rhodes 1980) as products of the microbial degradation of hexazinone. Two primary metabolites occur from the demethylization or hydroxylation of hexazinone, with demethylization processes appearing to be favored in coarse textured soils. The concentration of these metabolites has been shown to be relatively non-persistent in the soil over time (Roy, et al. 1989) and will not likely directly affect the soil resource in a negative manner.

4) Residues initially applied to the surface are susceptible to lateral movement via surface flows during short duration, high intensity rainfalls that exceed the infiltration capacity of the soil profile. However, infiltration rates of the soils are rapid and storm events in the analysis area generally produce little or no overland flows. The hydrology of the analysis area includes no surface drainage or water features for many miles in any direction, further increasing the likelihood of any potential overland flows carrying herbicide residues that are generated to dissipate before reaching any permanent drainage or surface water features.

Research of this pathway for hexazinone residues also supports the low risk of the lateral transport of residues from occurring. Mobility studies show little lateral movement from overland flows, as found on a sandy soil in Ontario, Canada where hexazinone residues were undetectable in runoff water collected in trenches down slope or greater than 3 meter from the points of application (Roy et al., 1989). Studies show that offsite movement via lateral surface flows is primarily a function of the method and formulation of application and the care with which the herbicide is applied (Michael, 2002). Application methods would utilize back pack sprayer units with nozzles held close to the surface in order to minimize drift and focus residues on to the desired area surrounding planted seedlings.

Hexazinone residues that are activated into the soil profile but are not adsorbed to mineral soil or taken up by plant roots would be susceptible to leaching down through the soil profile toward bedrock and groundwater. Although hexazinone is relatively mobile in the soil, the extraneous movement of this herbicide to ground water resources is expected to be minimal, primarily due to the application rates, soil characteristics, and hydrology of the analysis area. Application rates are calculated to minimize the amount of herbicide residue exceeding the targeted plant species ability for uptake, while the cation exchange capacities of the soils present provide a moderate to high number of sites for adsorption of residues in solution. Groundwater is located between 300 and 700 feet below the surface and there is little indication of established subsurface flows within the soil profile capable of transporting residues in solution to other ground or surface water features (Chitwood, personal communication). Annual precipitation in the analysis area is between 12 to 15", primarily in the form of snowfall. Accumulated precipitation on the analysis area is very unlikely to contribute re-charge to groundwater sources, primarily due to the presence of a moisture limited pine/bitterbrush/fescue plant community on site. The majority of precipitation annually contributed to the soil profile is held at plant available tensions within the rooting zone and utilized by this plant community, leaving very little to leach further down toward bedrock or groundwater resources.

Sampling of hexazinone residues 1, 6 and 12 months following application on soils on the Bend-Ft.Rock District that are also derived from Mazama ash showed no residues of hexazinone below 15 cm and very low residue levels overall one year after application (Craigg, 2000). Mobility of hexazinone down through the soil profile has been rarely observed to occur below 15 or 20 cm in other research studies conducted around the country (Roy, et al. 1989; Yarborough and Jensen, 1993). In another study, total residue accumulations of greater than 98 percent of the applied amount were measured in the organic matter and surface mineral horizons over two years following application, with minimal amounts recovered below 25 cm (Roy et al., 1989). However, movement of low levels of hexazinone was observed below 45 cm in a study conducted on sandy loam and sandy soils in Nova Scotia (Jensen and Kimball, 1987).

Groundwater Loading Effects of Agricultural Management Systems (GLEAMS) models used to estimate the maximum movement and concentrations of hexazinone in the updated Syracuse Environmental Research Associates (SERA) risk assessment for hexazinone show a maximum depth for hexazinone residues of between 45 and 60 inches for a sandy loam or loamy sand textured soil in a 15 to 20 inches annual rainfall setting. Maximum concentrations of between 0.057 and 0.594 mg/kg within the entire 60 inch column of a sandy loam or loamy sand textured soil in a 20" annual rainfall area are predicted by these same models at an application rate of 1 lb/acre, with averages between 0.0276 and 0.03 mg/kg. Concentrations predicted in the top 12 inches of the soil

column are slightly higher at the same application rate and range from an average of 0.07 to 0.115 mg/kg with maximums of 0.225 and 0.254 mg/kg (SERA, 2005).

Soil Biota

Hexazinone is a photosynthetic inhibitor in herbaceous and woody plants and should have little effect on microbial processes in the soil. The majority of soil biota are non-photosynthetic and research literature indicates that the effects of herbicide residues on microbes and ectomycorrhizal fungi are relatively benign. Hexazinone residues are unlikely to directly affect soil organisms to a measurable degree. Preliminary results from research specific to the effects of hexazinone applied at recommended field rates on soil biota in ponderosa pine plantations suggest that the use of this herbicide has minimal effects on microbial community composition or soil arthropod assemblages (Busse, 2001). Nitrogen availability in the soil profile was also shown to be unaffected by hexazinone in this study. Although research of other herbicide applications (sulfometron methyl, triclopyr and imazapyr) at 1 to 2 times the recommended application concentrations showed ectomycorrhizal development on 87 percent or more of all herbicide-stressed and non-stressed root tips of conifer seedlings (Busse, et. al, 2003), there appears to be no direct research on the effects of hexazinone on ectomycorrhizae.

Hexazinone residues are unlikely to indirectly affect soil productivity within the analysis area. Soil textures and organic matter contents are sufficient in these soils to provide “sites” on which the herbicide can be adsorbed and held within the profile where microbes can access and metabolize it at rates generally cited in the literature and EPA Risk Assessments. Bacterial and fungal populations are present within the ash soils of the analysis area at levels sufficient for degradation pathways and population replenishment.

The application of hexazinone has also been indirectly linked to a transformation of soil nitrogen into mobile and plant available ammonium forms. The application of this herbicide reduces the growth and subsequent contribution of herbaceous organic material into the mineral soil. A limited supply of carbon dominated substrates in the surface mineral horizon increases the number of microbes available to mineralize nitrogen and other inorganic forms of nutrients (Vitousek et al., 1992). Questions as to the applicability of this indirect benefit of hexazinone residues to the local soils present in the analysis area remain somewhat unclear.

Cumulative effects

There are two proposed or reasonably foreseeable projects that would use herbicide treatments within the Kelsey Butte subwatershed. The Kelsey Project EIS on the Bend/Ft.Rock District proposes herbicide treatments on competing vegetation within a number of harvest and reforestation units in the Kelsey Butte subwatershed and is currently in review/draft status before release as a Final EIS for public comment.

There would be no cumulative effects to the soil resource as a result of herbicide treatments proposed under this alternative with units proposed under the Kelsey project. There is no overlap of application areas proposed under this analysis with areas proposed for herbicide use within the Kelsey Project.

Although total input of hexazinone within the Kelsey Butte subwatershed would increase as a result of the 18 Fire herbicide project, the cumulative increase of concentrations applied to any one spot would not increase. The Kelsey treatment units are at least one half mile from the 18 Fire analysis area and have no hydrologic connection via overland flows, lateral subsurface flows or groundwater. Specifically, Kelsey units 21, 307 and 308 are within 1 mile of the 18 Fire to the west and units 258 and 259 are within 2 miles to the west. The remainder of units that are proposed for herbicide treatment under the Kelsey project are more than 2 miles from the 18 Fire along the Hwy 97 corridor extending from about 4 miles north of Lava Butte to about 4 miles south of Lava Butte.

The Deschutes and Ochoco Invasive Plant Treatment EIS is currently scheduled for release as a draft EIS for public comment in September of 2006. This project currently identifies an invasive weed treatment area directly overlaying the 18 Fire boundary comprised of approximately 11 known infestation sites of 1 acre or less. Approximately 3 net acres are located within or immediately adjacent to the 18 Fire Competing Vegetation Control EA analysis area. Chemical or manual treatment of four target species are proposed, including spotted knapweed (0.12 ac), bull thistle (0.71 ac), dalmation toadflax (1.1 ac) and Russian thistle (1.1 ac). The primary chemicals or manual treatments proposed for each species, respectively, would likely be Clopyralid, Manual, Picloram and Chlorosulfuron.

The cumulative effects to the soil resource as a result of treatments proposed under this EA with those proposed under the Deschutes/Ochoco Invasive Weed EIS are unlikely to be measurable. Although there is spatial overlap in GIS of some of the proposed invasive weed treatment sites with planting sites proposed for herbicide treatment under this EA, three of these sites are associated with road banks, five are small populations of less than 0.1 acres and the net infested extent of a Russian thistle population whose potential treatment area encompasses approximately 100 acres is currently less than an acre. Areas proposed for treatment with hexazinone in the spring of 2006 would not be chemically treated for invasive plants until the late spring/summer of 2007 at the earliest, over a year following initial treatments proposed under this decision. Degradation pathways and rates discussed previously in this effects analysis under this alternative would have occurred for an entire summer and winter before additional herbicide was applied under the Invasive weed EIS. Hexazinone residues amounts present by 2007 would be expected to have gone through at least three degradation half-life's and contribute very little to total herbicide residues on site at the time of invasive weed herbicide applications.

Never the less, the proposed action for this project will avoid any direct treatment of competing vegetation of those areas previously proposed for treatment under the Deschutes National Forest Invasive weed Project, thus avoiding any potential overlap of herbicide applications and potential synergistic or antagonistic effects.

The cumulative increase of herbicide residues into surface water as a result of these three projects would not occur since there is no surface water present in the subwatershed. Cumulative contamination of groundwater is not expected to occur as a result of implementing this alternative. The cumulative input of residues into groundwater is likely to be negligible due to a number of factors, including low initial concentrations and low total amounts of herbicides applied within the Kelsey Butte subwatershed, as well as the small area of overlap of proposed areas of treatment under the Invasive Weeds EIS and this proposal. In addition, the moisture limited plant

communities and physical soil substrates present within the application areas are capable of retaining the majority of annual precipitation within the rooting zones of conifer, shrub and herbaceous vegetation, limiting the amount of water re-charge to groundwater to very small amounts. Transport of herbicide residues in solution down through the soil profile into groundwater, which, as discussed previously, is between 300 and 700 ft below the surface, is very unlikely in this area.

Alternative 3

Alternative 3 proposes the manual treatment of all competing vegetation within the same treatment circles proposed for herbicide treatments under Alternative 2. Manual treatments would include the scalping of herbaceous vegetation and roots with hand tools from these areas prior to planting and on some areas already planted.

Direct and Indirect Effects: Manual treatments would directly remove or mix organic residues and surface mineral soil on up to 304 of the 2,003 acres (15.2 percent) already planted or proposed for planting during the spring of 2006. Disturbance of the surface mineral A horizon would be primarily in the form of mixing with A/C mineral soil horizon material beneath the surface. Some movement of this material outside of the treated circles is likely to occur as vegetation is scraped away, but this level of displacement disturbance would not meet definitions considered detrimental to soil productivity. Overall, the effects of this disturbance on soil productivity are likely to be minimal since organic and A horizon mineral soil material that is disturbed will remain on site and within the influence of planted seedlings as they mature. Microbial communities may be directly disturbed and temporarily altered within the treated areas but are likely to remain at levels conducive to nutrient recycling and would be expected to recover over subsequent years.

As a result of manual treatments proposed under this alternative, the total amount of existing organic cover would be temporarily reduced on treated sites. The total organic input from herbaceous plants would also be reduced on these sites over the short term until planted seedlings began to contribute annual needle fall and herbaceous vegetation re-established individuals in these treated areas. The current stratification of mineral soil and organic matter on site would be directly affected, although the mixing that would occur is not likely to detrimentally affect the productivity of the soil resource due to the limited scale of this disturbance.

The disturbance of mineral soil and organic residues as a result of manual treatments could indirectly affect the level of nutrient cycling on site by altering the carbon inputs into to the mineral soil in the short term. A limited supply of carbon dominated substrates in the surface mineral horizon would increase the number of microbes available to mineralize nitrogen and other inorganic forms of nutrients (Vitousek et al., 1992).

Cumulative effects: The cumulative effects of manual treatments proposed under this alternative on the soil resource are expected to be minimal. The physical disturbance of the soil resource in areas proposed for treatment is not expected to be detrimental to the productivity of the site. Current disturbance on site includes varying levels of detrimental compaction resulting from skid trails and landings associated with the 18 Fire salvage activities, many of which have been relieved of compaction via subsoiling. Total detrimental disturbance on these sites is not expected to exceed Forest Plan standards following the implementation of manual treatments proposed under this alternative.

Alternative 2 and 3

Direct and Indirect Effects: Planting units located on the steeper slopes of Luna and Bessie Buttes would have a slightly increased risk of erosion under post-fire and post treatment conditions following the changes in cover when compared to the units located on the lower gradient slopes previously described. However, the steeper slopes located on Bessie Butte (18 Fire - Unit #17 - 55 acres with average slope of 25 percent) and Luna Butte (18 Fire - Unit #15 - 15 acres with average slope of 40 percent) have cindery soils with high infiltration rates and were not salvaged, leaving larger amounts of standing and downed wood per acre in these units. Surface cover of down wood would help to reduce the energy of overland flows that could carry eroded soil particles during rainfall events. The reduction in live surface cover from the proposed herbicide or manual treatments of competing vegetation would be offset to some degree by these two factors and is unlikely to result in erosion amounts capable of reducing soil productivity below acceptable levels.

FISHERIES AND HYDROLOGY

EXISTING CONDITION

There are no known perennial, intermittent, or ephemeral stream channels, nor any riparian areas, seeps, springs, ponds, or lakes within the project area. Considering the lack of water resources, there are no fish populations or fish habitat within the project area. The nearest perennial stream channel to the project area is the Deschutes River approximately 6 miles to the west. The highly permeable volcanic soils allow rapid infiltration of precipitation and snowmelt to bedrock located just a few feet below the surface. Annual precipitation is approximately 12 to 15 inches in the project area, primarily as snowfall. The groundwater is approximately 300 to 800 feet deep, and flows directionally north or northeast, emerging as springs near Lake Billy Chinook (Gannett 2002). There is no Essential Fish Habitat, nor any Oregon Department of Environmental Quality 303(d) listed water bodies within the project area.

ENVIRONMENTAL CONSEQUENCES

Alternative 1

Direct, Indirect and Cumulative Effects: There would be no direct, indirect, or cumulative effects to water or fisheries resources. There would be no effects to Essential Fish Habitat or 303(d) listed water bodies.

Alternative 2 (Proposed Action)

Direct, Indirect and Cumulative Effects: Hexazinone is very water soluble, can be mobile in soils, and can persist for months in soil, especially under anaerobic conditions (Norris, 1991). Research conducted on soils of the Deschutes National Forest similar to those in the project area observed that residues of hexazinone did not appear to be moving past 15 centimeters in depth. Hexazinone degrades rapidly in water exposed to sunlight, and does not tend to bioaccumulate in animals (Norris 1991). All forms of this chemical are essentially non-toxic to aquatic invertebrates (U.S. EPA 1982, Michael, 1999), and only slightly toxic to fish (U.S.F.S. 1984).

Given that there is no surface water in the project area to transport chemical residues, the nearest perennial channel is located approximately 6 miles away from the treatment areas, and the 300 to 800 foot depth of groundwater, and the low toxicity to fish and aquatic invertebrates, there would be no direct, indirect, or cumulative effects to water or fisheries resources from implementing this alternative. There would be no effects to Essential Fish Habitat and 303(d) listed water bodies.

Alternative 3

Direct, Indirect and Cumulative Effects: Scalping of competing vegetation with hand tools would reduce ground cover at each site, but would not lead to overland flow of water or sediments to any stream channels. As mentioned previously, there are no stream channels or water bodies of any nature within the project area. This alternative would not result in any direct, indirect, or cumulative effects to water or fisheries resources. There would be no effects to Essential Fish Habitat and 303(d) listed water bodies.

SCENIC

EXISTING CONDITION

The second growth black bark ponderosa pine forest found within the 18 Fire area was heavily scorched by fire. An estimate of 2,420 acres burned at moderate to high intensity with tree mortality ranging from 95 to 99 percent. Approximately 2,003 acres of the fire area was harvested in salvage sales.

The 18 Fire burned part of Bessie Butte to the north and Luna Butte to the south. These are two prominent buttes that can be seen from part of the city of Bend. The fire intensity has considerably altered the existing landscape character, scenic quality and integrity level. Trees along both sides of Forest Road 18 (China Hat Road) and Forest Road 1810 were lightly to heavily scorched. The project area, because of the fire, does not meet the Landscape Character Goals and the desired future scenic conditions as specified under the LRMP for Management Area 9, Scenic Views (approximately 22 acres).

The areas harvested as part of the 18 Fire Recovery Project are expected to remain altered in appearance during the short-term (0 to 5 years). The long-term (5 years and beyond) trend is expected to be beneficial to scenery in all management areas as rehabilitation and regeneration of the new forest proceeds.

Alternative 1 (No Action)

Direct and Indirect Effects: There are no activities that would control vegetation competing with the newly established (planted) forest. Tree densities are likely to be lower and growth rates slower than the two action alternatives. Animal damage control devices (vexar tubing and fenced exclosure) would remain in place a little longer than for the two action alternatives, altering the natural appearance for a few years beyond that expected for Alternative 2 (Proposed Action) and Alternative 3.

Alternative 2 (Proposed Action) and Alternative 3

Direct and Indirect Effects*:* Activities proposed to control vegetation competing with the planted trees would result in improved tree survival and growth rates, accelerating the appearance of an established forest. This would result in a more rapid attainment of objectives with the Scenic Views Management Area, as well as, throughout the project area.

Cumulative Effects: Implementation of any of the alternatives is not expected to result in any long-term cumulative effects to scenic quality. Eventual removal of the animal control devices and fence will provide a positive future benefit for the scenic resource.

RECREATION

The Documentation of Analysis for the Recreation Resource (Project Record, prepared by Leslie J. Moscoso, Recreation Forester, December 2005) is incorporated by reference and summarized below.

EXISTING CONDITION

The 18 Fire Competing Vegetation Control Project area is located on the fringe of the high desert on the east side of the Bend-Fort Rock Ranger District. The project area is an open, high desert environment that lends itself to outdoor enthusiasts that desire wide-open spaces and solitude. The area is dominated by ponderosa pine stands and shrubs. Bessie Butte is the highest point in the project area, which provides scenic vistas and non-motorized hiking opportunities.

Dispersed recreation activities provide the attraction for those who visit the area. The area is utilized by OHV enthusiasts and horse users primarily, with other dispersed recreationists such as hikers and bikers who are looking for a more secluded setting. The area is visited mostly during the spring and fall seasons when the weather is cooler and less dusty than the hot, dry summer months. The recreation opportunities that draw people to the area include OHV trail riding, driving for pleasure, wildlife viewing, big game hunting and camping. It is an area of the Deschutes National Forest utilized less frequently by the public, but because it is close to the city of Bend, many people travel through the project area on their way to other locales. Use of the area has remained relatively unchanged for decades. Some increase in recreation use has occurred due to the increase in population and popularity of central Oregon in general and the increase in recreation use of the Deschutes National Forest as a whole. There are no developed recreation facilities in the project area.

Dispersed camping occurs mostly during the big-game (elk and deer) hunting seasons. Sites are located mostly in forested areas along main and spur roads. Most sites are relatively small, accommodating one or two camp trailers. There are some large campsites which are used quite extensively where large groups or families meet on an annual basis. Use of these areas has increased with the development and implementation of the East Fort Rock OHV system. There is no quantitative use data for dispersed camping.

A short portion of the Bessie Butte Trail is within the project area. There is another non-motorized trail (Trail 61) adjacent to the area which is part of the Swamp Wells system of trails. The Bessie Butte trail is used primarily by hikers, and Trail 61 is used primarily by horse riders from nearby subdivisions who take the trail from the Horse Butte trailhead to access Swamp Wells and the north flank of Newberry caldera.

Roads within the project area provide access for a variety of activities including driving for pleasure, 4-wheeling. big game hunting, forest product gathering, and wildlife viewing.

ENVIRONMENTAL CONSEQUENCES

Alternative 1 (No Action)

Direct and Indirect Effects: There would be no direct or indirect effects to dispersed recreation use within the project area.

Alternative 2 (Proposed Action)

Direct, Indirect and Cumulative Effects: The application of hexazinone would have little to no effect on recreation or recreationists in the project area. The areas of treatment are not directly adjacent to any trails or campsites and it would therefore be very unlikely that contact would be made with recreationists or their livestock. Given the dispersed nature of recreation in this area, it is conceivable that contact could occur with humans or stock animals. Treated areas would be posted (see mitigation measures, Chapter 2) with the information that hexazinone does not pose any serious health risks (see discussion on Human Health effects that follows). The alternative should have little direct or indirect effects on recreation with the possible exception that the public may avoid the area during and shortly after treatment. There are no cumulative effects anticipated from implementation of this alternative.

Alternative 3

Direct, Indirect and Cumulative Effects: Alternative 3 would have no effect on recreation activities in the project area.

HUMAN HEALTH AND SAFETY

Of the units proposed for herbicide application or scalping, units 2 and 3 are approximately 1.5 miles from private property and human habitation. The remainder of the project area is over 2 miles from private property and human habitation. No effects to humans or private property are expected to occur given these distances.

There are no developed recreation sites within or adjacent to units proposed for competing vegetation treatment. Dispersed recreational use would be the primary recreation use of the treatment areas. Dispersed recreation would include Off Highway Vehicle (OHV) use, hiking horseback riding, and hunting. A hiking trail to the top of Bessie Butte winds through unit 18. The 18 Fire Planning Area is not open to public woodcutting.

Alternative 1 (No Action)

Direct, Indirect and Cumulative Effects: Because there would be no implementation of activities, there would be no effects to the human environment.

Alternative 2 (Proposed Action)

Components of a risk assessment include an evaluation of hazard, exposure, and risk. A methods information profile on herbicides (USDA 1994) defines these terms as follows:

Hazard: the characteristic of an object or substance that can inflict injury or illness.
Exposure: the opportunity to receive a dose, which is the amount of a potentially harmful substance actually encountered by an organism.
Risk: the likelihood of illness or injury based on the results of hazard and exposure evaluation.

Risks associated with the application of selected formulations of hexazinone were evaluated in three human health and ecological risk assessments (SERA 1997, 2002, and 2005). These assessments (hereafter referred to as the SERA risk assessments) were commissioned by the Forest Service to assess the risk of using hexazinone in applications that are specific to Forest Service programs. In a report submitted to the Forest Service (SERA 2002), the following three specific toxicological endpoints considered in risk assessments were addressed: neurotoxicity, immunotoxicity, and endocrine disruption. The SERA risk assessment and the SERA report provide the basis for assessing risks associated with the proposed application of herbicide. Pronone^{R}MG, Pronone 10G, Velpar ULW, Velpar ULWDF, and Velpar DF are commercial granular formulations containing hexazinone covered by the SERA risk assessment. The proposed application rate for this project is within the range of application (SERA 2005, pages 2 to 4). However, since spot application will result in hexazinone application on only 13 to 20 percent of any acre, then only 0.26 to 0.54 lbs a.i[12]. per acre will actually be applied. This effective rate is at or below the low end of rates assessed by SERA (1997, 2002 and 2005).

[12] a.i. lbs/acre (Definition) – Active ingredient pounds per acre.

Hazard Evaluation

OVERVIEW

The SERA risk assessment describes hazards associated with the use of hexazinone. The following are excerpts are from the hazard overview (SERA 2005, Page 3-1):

The toxicity of hexazinone has been relatively well-characterized in a number of standard bioassays that are required by U.S. Environmental Protection Agency for the registration on pesticides. Acute oral toxicity[13] studies indicate the oral LD_{50}[14] for hexazinone in mammals is in the range of 1000 mg/kg[15]. No adverse effects are anticipated at ten-fold lower doses – i.e., 100 mg/kg/day – based on the results of short-term repeated dosing. Standard chronic toxicity studies indicate that long-term exposures to hexazinone at doses of about 5 mg/kg/day will not be associated with any identifiable adverse effect.

At very high doses – i.e., those in the range of the LD_{50} – lacrimation, salivation, vomiting, tremors/ataxia/weakness, diarrhea, and increased rates of respiration and/or labored breathing are often noted. While these types of effects can be caused by neurotoxins, they are not specific indicators of neurotoxicity and these effects may be secondary to other mechanisms of toxicity. There is no basis for assuming that hexazinone is a direct neurotoxin. In less severely poisoned animals, the most commonly noted effect induced by hexazinone is weight loss. In mice and dogs, this effect is usually associated with and attributable to a decrease in food consumption. In rats, particularly female rates, weight loss has been associated with a decrease in food conversion efficiency. The underlying mechanism for the decreased food conversion efficiency is unclear. Hexazinone appears to be rapidly absorbed after oral exposure and it is rapidly metabolized and excreted. While hexazinone seems to be absorbed much more slowly during dermal exposures compared to oral exposures, the available acute and longer-term dermal studies indicate that hexazinone may be absorbed by the skin in sufficient amounts to cause at least sensitive signs of toxicity, particularly weight loss. While hexazinone is only mildly irritating to the skin, it is severely irritating to the eyes.

. . .Hexazinone does not appear to be a direct neurotoxin and hexazinone does not appear to cause effects on the immune system. While somewhat speculative, the effects on food conversion efficiency could be related to effects on the endocrine system. This, however, has not been clearly demonstrated. Except at doses that cause frank signs of toxicity in females, hexazinone does not appear to cause birth defects or other adverse effects on the young. Two standard carcinogenicity studies are available on hexazinone, one in mice and the other in rats. The results of the assay in mice indicated no carcinogenic potential but the results in rats were equivocal. Consequently, the U.S. EPA determined that hexazinone is not classifiable as to human carcinogenicity and declined to quantify cancer risk.

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[13] Acute Toxicity (Definition) – the amount of a substance, as a single dose, to cause poisoning in a test animal (USDA 1992).

[14] LD_{50} (Definition) – Lethal Dose – The dose of a chemical calculated to cause death in 50% of a defined experimental animal population over a specified observation period. The observation period is typically 14 days. (SERA 1997).

[15] In contrast, the oral LD_{50} in mice for caffeine is approximately 127 mg/kg and for nicotine is 270 mg/kg (Rose 2002).

MUTAGENICITY AND CARCINOGENICITY

The following excerpts are from the risk assessment (SERA 2005; pages 3-11, 3-12)

No epidemiology studies have been encountered in the literature that would permit an assessment of the association of exposure to hexazinone with the development of cancer in humans. Two standard chronic toxicity /carcinogenicity studies are available, one in mice and the other in rates. . . .Under the conditions of this study, carcinogenic potential of hexazinone is considered negative. Similar results were noted in the study using mice. Based on the weight of evidence, the U.S. EPA's …Health Effects Division Carcinogenicity Peer Review Committee (CPRC) concluded that hexazinone should be classified as a Group D (not classifiable as to human carcinogenicity). . . .

NEUROTOXICITY, IMMUNOTOXICITY, AND ENDOCRINE DISRUPTION

According to the SERA report, "there is no scientific basis for asserting that hexazinone causes specific toxic effects on the nervous system, immune system, or endocrine function" (SERA 2002, Page xiii). The following are excerpts from this report and the assessment (SERA 2005).

Neurological Effects

The nervous system is the basis for learning and thinking, sensory perception and movement, behavior and emotion, and regulation of many of the important functions of the cardiovascular system and other internal organs. Chemically-induced impairment of the nervous system (neurotoxicity) can produce a variety of effects, collectively referred to as neurologic effects, which can encompass any of the above functions and behaviors. Neurotoxicants are chemicals that disrupt the function of nerves, either by interacting with nerves directly or by interacting with supporting cells in the nervous system. (SERA 2002, Page viii)

This definition of neurotoxicant distinguishes agents that act directly on the nervous system (direct neurotoxicants) from those agents that might produce neurologic effects that are secondary to other forms of toxicity (indirect neurotoxicants). Virtually any chemical will cause signs of neurotoxicity in severely poisoned animals and, thus, can be classified as an indirect neurotoxicant (SERA 2005, page 3-7).

There is no evidence for hexazinone having a direct neurotoxic effect in humans or other animals. Studies designed specifically to detect impairments in motor, sensory, or cognitive functions in mammals or other species exposed subchronically or chronically to hexazinone have not been conducted. These studies have not been conducted because the clinical and experimental toxicology experience with hexazinone provides no reason to suspect a neurotoxicity potential. (SERA 2002, Page ix)

. . .[A]cute toxicity studies conducted in various mammalian species as well as in birds have noted lethargy, impaired coordination, weakness, labored respiration, and tremors in animals exposed to lethal or near-lethal does levels of hexazinone. . . .While these signs can be considered neurologic, there is no indication that the effects are attributable to direct action on the nervous system (SERA 2005, page 3-8).

Immunologic Effects

Immunotoxicants are chemical agents that disrupt the function of immune system. These agents can impair immune responses (immune suppression) or produce inappropriate

stimulation of immune responses (hyperreactivity). Suppression of immune responses to microbes or abnormal cells can enhance susceptibility to infectious diseases or cancer. Hyperreactivity can give rise to allergy or hypersensitivity, in which the immune system or genetically predisposed individuals inappropriately responds to chemical agents (e.g., plant pollen, cat dander, flour gluten) that pose no threat to other individuals or autoimmunity, in which the immune system produces antibodies to self components leading to destruction of the organ or tissue involved. (SERA 2002, Page ix)

There is very little direct information on which to assess the immunotoxic potential of hexazinone. The only information with which to assess the potential immune suppressive effects of hexazinone is largely indirect. Hexazinone has been subject to a large number of standard toxicity studies required for pesticide registration by the U.S. EPA. Although these studies are not designed to specifically detect changes in immune function, significant effects on immune function would likely be evidenced by observable changes in lymphoid tissue as well as changes in differential blood cell counts and an increase in the incidence of animals with infection. No such effects are reported by the U.S. EPA in the Registration Eligibility Decision (RED) and such effects were not encountered in the risk assessment prepared by SERA. While chronic studies on hexazinone cannot rule out the possibility of immunologic effects, they provide no evidence that such effects occurred. (SERA 2002, Page xi)

Endocrine Disruption

The endocrine system participates in the control of metabolism and body composition, growth and development, reproduction, and many of the numerous physiological adjustments needed to maintain constancy of the internal environment *(homeostasis)*. The endocrine system consists of endocrine glands, hormones, and hormone receptors. (SERA 2002, Page xi).

Hexazinone has not undergone evaluation for its potential to interact or interfere with the estrogen, androgen, or thyroid hormone systems. Extensive testing in experimental animals provides reasonably strong evidence against hexazinone being an endocrine disruptor. Epidemiological studies of health outcomes of hexazinone have not been reported, nor is there clinical case literature on human hexazinone intoxication. Nonetheless, several long-term experimental studies in dogs, mice, and rats have examined the effects of exposure to hexazinone on endocrine organ morphology, reproductive organ morphology, and reproductive function; treatment-related effects on these endpoints were not observed. In addition, hexazinone did not produce abnormalities in frog embryos at exposures below the LC_{50}.[16] (SERA 2002, pages xii and xiii).

> Assessment of the direct effect of chemicals on endocrine function are most often based on mechanistic studies on estrogen, androgen, or thyroid hormone systems. . . . The U.S. EPA has not yet adopted standardized screen test for endocrine disruptors. . . .(SERA 2005, page 3-8).

[16] LC_{50} (Definition) – Lethal $Concentration_{50}$ – A calculated concentration of a chemical in air to which exposure for a specific length of time is expected to cause death in 50% of a defined experimental animal population (SERS 1997).

> Hexazinone has been tested in the E-SCREEN assay. . . . This test system uses a human breast cell line (MCF-7) and measures estrogen-induced proliferation in the number of these cells and the inhibition or enhancement of this proliferation by the test agent. . . Hexazinone as well as a number of other herbicides were found to influence the activity of estrogen in this assay system (SERA 2005, page 3-8).

Additional inferences concerning the potential effect of hexazinone on endocrine function must be based on results from standard toxicity studies. The EPA has concluded that: "In the available toxicity studies on hexazinone, there was no evidence of endocrine disruptor effects." While this statement is substantially correct, some studies have suggested that hexazinone exposures may be associated with reduction in food conversion efficiency . . . (SERA 2005, page 3-9).

METABOLITES AND IMPURITIES

The following are excerpts from the SERA risk assessment:

> . . . [T]he available data suggest that hexazinone is metabolized via oxidation and demethylation. This type of metabolism is often mediated by mixed-function oxidases often referred to as the cytochrome P-450 system. In addition, hexazinone can cause increased liver weight (Section 3.1.5) and this effect is often seen in chemicals that induce cytochrome P-450. Cytochrome P-450 is a very important enzyme in the metabolism of many endogenous as well as xenobiotic compounds. While speculative, it is possible that the toxicity of hexazinone may be affected by and could affect the toxicity of many other agents. The nature of the potential effect (i.e., synergistic or antagonistic) would depend on the specific compound and perhaps the sequence of exposure (SERA 2005, page 3-41).

> . . . [H]exazinone is virtually completely metabolized in mammals. There is relatively little information available regarding the toxicity of the metabolites. . . . [T]he metabolism of hexazinone by mammals appears to be a detoxication step, at least in terms of acute lethality. The U.S. EPA has made the more conservative assumption that: "the metabolites and parent hexazinone are assumed to have equal toxicity based upon similarity in chemical structure." . . . Any uncertainty with the estimates of the toxicity of the metabolites of hexazinone does not have a significant impact on this risk assessment. The toxicity studies on which the hazard identification and subsequent does-response assessment are based involve in vivo[17]exposure to the hexazinone and the subsequent formation of hexazinone metabolites. Therefore, the toxicological effects, if any, of the metabolites are likely to be captured by animal toxicology studies involving exposure to hexazinone. The available data, however, suggest that hexazinone is handled similarly by rats and humans as well as plant species.

> There is no information available in the open literature on the identity or toxicity of any impurities in hexazinone. The identity of impurities in hexazinone has been disclosed to the U.S. EPA but has not been made available for the current risk assessment. The U.S. EPA, however, has reviewed the information on the impurities and determined that: "There are no

[17] *In vivo* (Definition) – Occurring in the living organism; (in contrast to *in vitro* which means isolated from the living organism and artificially maintained, as in a test tube) (SERA 1997).

reported impurities of toxicological concern in hexazinone." In addition, most toxicity studies covered in this risk assessment use technical grade hexazinone – i.e., a material that contains about 98% hexazinone with the remaining amount consisting of impurities. Although the lack of information in the open literature on impurities may be disconcerting to some individuals, the use of technical grade hexazinone in the toxicity studies that form the basis of the dose-response assessment for both human health and ecological effects is likely to encompass any potential toxic effect of the impurities (SERA 2005; pages 3-16, 3-17).

INERT AND ADJUVANT INGREDIENTS

The following are excerpts from the SERA assessment (SERA 2005; pages 3-15, 3-16):

. . . [T]here is very little basis for asserting that inerts play a significant role in the potential toxicity of hexazinone formulations to humans. . . . The identity of the carrier or carriers in the granular formulations of hexazinone is considered proprietary. Based on references from the published literature, however, the major component of granular formulations of hexazinone is clay. Based on the acute toxicity of these formulations relative to technical grade hexazinone, there is no indication that the carriers contribute to the toxicity of the granular formulations of hexazinone. For example . . . the non-lethal dose of Pronone 10G is 5000 mg/kg, corresponding to 500 mg a.i./kg, in rats. This is only somewhat less than the lower range of the LD50 of hexazinone in male rats. . . . Pronone formulations appear to be less toxic than hexazinone in dermal and ocular exposures and this may be due to the sequestering of the hexazinone in the clay formulation. This is also consistent with the aquatic toxicity studies using Pronone relative to hexazinone itself . . .

TOXICOLOGIC INTREACTIONS

The following are excerpts from the SERA assessment (SERA 2005, page 3-17):

There is no direct information available on the interaction of hexazinone with other compounds. Hexazinone may be metabolized by cytochrome P-450, an enzyme system that is commonly involved in the oxidation of many xenobiotics[18]. Thus, it is plausible that the toxicity of hexazinone may be affected by and could affect the toxicity of many other agents. The nature of the potential effect (i.e., synergistic or antagonistic) would depend on the specific compound and perhaps the sequence of exposure.

Exposure Assessment

WORKERS

Occupational exposure generally involves inhalation and dermal exposure, with the dermal route generally contributing far more to exposure than the inhalation route (SERA 1997, Page 3-11). "In

[18] Xenobiotic (Definition) – A chemical that does not naturally occur in an organism.

one study, about 97 percent of the estimated absorbed dose was attributable to dermal absorption" (SERA 2005, page3-20).

With the proposed application of hexazinone, workers would likely be exposed to doses less than those assumed in the SERA risk assessment. The proposed actual amount of .26 to .54 lbs a.i./acre for this project is less than the typical application rate (2 lbs a.i./acre) and near or below the lower application rate (0.5 lbs a.i./acre) evaluated in the SERA risk assessment (SERA 2005, page xiii).

With the proposed application of herbicide, worker exposure to hexazinone would be limited by the following: method of application, vegetation and ground conditions, use of personal protective equipment, and restricted entry into the treatment area for 48 hours following herbicide application. The tool used for applying the herbicide would direct the herbicide down to the ground, minimizing potential for the herbicide to come in dermal contact with the worker. Herbicide would be applied on a relatively small percent of each site (approximately 13 to 20 percent of an acre). In a treatment area there would be a low potential of walking through an area treated with herbicide. Shrubs or grasses that resprout following prescribed underburn and mechanical shrub treatments would be generally less than 1 foot tall. With this vegetation condition and the application method, there would be limited potential for workers to have dermal exposure by rubbing against herbicide intercepted by vegetation. Sites proposed for application of herbicide are mostly on relatively flat ground, with slopes averaging 5 to 10 percent. The potential for workers falling and coming into contact with herbicide on the ground would be limited because of the relatively gentle terrain.

Greatest potential for inhalation of dust from the granular form of hexazinone would occur when loading the spot-applicator with herbicide. Use of a respirator or mask during the loading process would minimize the potential for dust inhalation.

PUBLIC

In the FEIS Characterization and Management of Risk (USDA Forest Service 1988) it was identified that members of the public may be exposed to herbicide drift, to vegetation with herbicide residues, and to accidental spraying. It also identified they could eat food or drink water with herbicides residues. These routes of exposure are similar to those analyzed in the SERA risk assessment. "Under normal conditions, members of the general public should not be exposed to substantial levels of hexazinone" (SERA 2005, Page 3-23).

With the proposed spot application of granular hexazinone, exposure of the public to the herbicide would be limited. There would be no potential for the public to receive a dermal dose of the herbicide from drift or from accidental direct spraying. Following herbicide application, potential for coming in contact with herbicide found on vegetation or the soil would be relatively low. Treatment areas would be signed to restrict entry for 48 hours. Herbicide would be applied on a small percent of each site (approximately 13 to 20 percent of an acre). Public use of the treatment areas is relatively low and infrequent, including use of the Bessie Butte trail. Given the type of vegetation in the proposed treatment areas, there is little to no potential the public would consume plants from the area that might have herbicide residues.

Potential for the public to be exposed to water with herbicide residues would be low. With the proposed method of herbicide application and the lack of surface water in the immediate vicinity of the treatment units, there is no potential the public would drink surface water contaminated with

herbicide residues. Exposure by way of groundwater contamination should be minimal due to the great depth to groundwater (Refer to Soils, Existing Condition).

Risk Characterization

OVERVIEW

The U.S. Environmental Protection Agency (EPA) has conducted risk assessments for hexazinone as part of the reregistration process and has determined that the registration for this herbicide should be maintained because the herbicide can be used without significant risk to humans or wildlife (SERA, 2002, Page vii).

The SERA risk assessment (SERA 1997) used a hazard quotient to characterize risk for workers and the general public. The following excerpts from the assessment describe how the hazard quotient (HQ) was determined and what interpretation can be made regarding the quotient:

> *Risk is characterized as the hazard quotient, the ratio of the anticipated level of the exposure to some index of acceptable exposure or exposure associated with a defined risk. Thus, if the hazard quotient is less than unity[19], concern for the exposure is minimal. As the hazard quotient increases above unity, concern also increases.*

The index used in the hazard quotient is the reference dose (RfD[20]) for hexazinone.

WORKERS

The risk assessment characterizes chronic risks and acute accidental /incidental exposures of hexazinone to workers as follows (SERA 2005, pages 3-38, 3-39):

. . . For longer term general exposures – i.e. that could occur over the course of several days, weeks, or months during an application season – the chronic RfD of 0.05 mg/kg/day is used. . . . At the maximum (evaluated in the SERA risk assessment) application of 4 lbs/acre, the lower bound of the hazard quotients associated with general exposures of different groups of workers range from 0.02 to 0.05, indicating that no risks are plausible. The simple interpretation of these hazard quotients is that hexazinone can be applied safely so long as measures are taken to minimize exposure.

Conversely, all of the upper bounds of the hazard quotients for the different groups of workers exceed the level of concern (HQ=1) for both the typical application rate of 2 lbs/acre (HQs ranging from 3 to 6) and the highest anticipated application rate (HQs ranging from 6 to 12). Even at the lowest anticipated application rate, 0.5 lb/acre, the upper range of the hazard quotient for workers involved in broadcast ground applications modestly exceeds the level of concern with an HQ of 1.5. The simple interpretation of these hazard quotients is that worker exposures to hexazinone are likely to exceed exposures that would generally be regarded as acceptable if workers do not follow prudent handling practices that will minimize exposure. Based on central estimates of exposure, the level of concern for

[19] Unity (Definition) – the number 1 (Webster 1984).

[20] Reference Dose (RfD) (Definition) – a daily dose which is not anticipated to cause any adverse effects in a human population over a lifetime of exposure. These values are derived by the U.S. EPA. (SERA 1997)

workers is exceeded only at the highest anticipated application rate but the hazard quotient for ground broadcast workers approaches a level of concern at the typical application rate (HQ=0.9).

The level of concern for this project will be lower than those just mentioned for ground broadcast because hexazinone on this project would be applied on the ground by the spot application method at effective rates near the low end analyzed by the risk assessment,.

For acute accidental/incidental exposures, the acute RfD of 4 mg/kg is used. . . .Based on the acute RfD of 4 mg/kg . . . none of the accidental exposure scenarios exceed a level of concern. The highest hazard quotient for any accidental exposure scenario is 0.08 (the upper bound of the hazard quotient for wearing gloves contaminated with a liquid formulation for one hour). [Not applicable for granular applications]. In addition to hazards associated with systemic toxicity, hexazinone can cause eye irritation. . . . Quantitative risk assessments for irritation are not derived; however, from a practical perspective, eye irritation is probably the overt effect th[at] is most likely to be observed as a consequence of mishandling hexazinone. This effect can be minimized or avoided by prudent industrial hygiene practices during the handling of the compound (SERA 2005; pages 3-38, 3-39).

Risks also include those associated with the application process such as falls and insect bites and are similar to those for the manual treatment which are discussed under Alternative 3.

PUBLIC

Risk characterization for the general public is summarized in the SERA risk assessment. The following are excerpts (SERA 2005; 3-38, 3-39, 3-40):

For members of the general public, none of the acute exposure scenarios result in hazard quotients that exceed a level of concern with the exception of the accidental spill of a liquid or granular formulation into a small pond. The only non-accidental scenarios that result in hazard quotients which substantially exceed the level of concern are those associated with longer-term exposure to contaminated vegetation after the application of Velpar L, the only liquid formulation of hexazinone considered in this risk assessment (SERA 2005, page 3-38). [Velpar L would not be used for this project].

In characterizing the risk of hexazinone, the SERA risk assessment (SERA 2005, page 3-41) identified a sensitive subgroup of people. The following excerpt is from the assessment:

Because hexazinone can induce fetal resorptions and other adverse developmental effects. . ., pregnant women and developing offspring are an obvious group at increased risk. As discussed above, the potential developmental effects of hexazinone are explicitly considered in the dose-response assessment and this endpoint is central to the risk characterization. There are no other reports in the literature suggesting subgroups that may be sensitive to hexazinone exposure. There is no indication that hexazinone causes sensitization or allergic responses.

Cumulative Effects

The following are excerpts from the SERA assessment:

Connected actions typically refers to activities other than those associated with the agent of concern (hexazinone in this risk assessment) that might impact an individual's response to the agent of concern. Potentially significant connected actions associated with a chemical risk assessment would include exposures to other agents that might alter an individual's response to the agent of concern.

There is very little information available on the interaction of hexazinone with other compounds. . . . [T]here is no indication that the inerts and adjuvants in hexazinone formulations will enhance the toxicity of hexazinone in humans or mammals.

. . . [T]he available data suggest that hexazinone is metabolized via oxidation and demethylation. This type of metabolism is often mediated by mixed-function oxidases often referred to as the cytochrome P-450 system. In addition, hexazinone can cause increased liver weight (Section 3.1.5) and this effect is often seen in chemicals that induce cytochrome P-450. Cytochrome P-450 is a very important enzyme in the metabolism of many endogenous as well as xenobiotic compounds. While speculative, it is possible that the toxicity of hexazinone may be affected by and could affect the toxicity of many other agents. The nature of the potential effect (i.e., synergistic or antagonistic) would depend on the specific compound and perhaps the sequence of exposure (SERA 2005, page 3-41).

The consideration of cumulative effects typically refers to the consequences of repeated exposure to the agent of concern (i.e., hexazinone) as well as exposures to other agents that an individual might be exposed to that have the same mode of action as the agent of concern.

It is beyond the scope of the current risk assessment to identify and consider all agents that might have the same mode of action as hexazinone. To do so quantitatively would require a complete set of risk assessments on each of the other agents that would be considered. The U.S. EPA similarly declined to consider cumulative risk associated with other chemicals having the same mode of action as part of the recent risk assessment of hexazinone (U.S. EPA/OPP 2002h). The rationale presented by U.S. EPA is as follows: "HED [Health Effects Division] did not perform a cumulative risk assessment for hexazinone because HED has not yet initiated a comprehensive review to determine if there are any other chemical substances that have a mechanism of toxicity common with that of hexazinone. The Agency has assumed that hexazinone does not have a common mechanism of toxicity with other substances."

Nonetheless, the current Forest Service risk assessment does specifically consider the effect of repeated exposures to hexazinone for both workers and members of the general public. The chronic RfD is used as an index of acceptable longer-term exposures. Consequently, the risk characterizations presented in this risk assessment specifically addresses and encompasses the potential impact of long-term exposure and the effects that could be caused by such exposures (SERA 2005; pages 3-41, 3-42).

In the event that a second application of hexazinone would be necessary to meet treatment objectives, the second treatment would be six months to several years later. The half-life of hexazinone is 2 to 3 months. Sampling of hexazinone residues 1, 6, and 12 months following application on the Bend/Ft. Rock R.D. on soils similar to this Project showed no residues of hexazinone below 15 cm and very low residue levels overall one year after application (Craigg, 2000). Even assuming no break down of

hexazinone, the total accumulation of two applications would result in a total actual amount of 0.52 (2 x .26) to 1.08 lbs. a.i./ac. (2 x .54), still at the low end of applications rates assessed by SERA (2005).

There are two proposed or reasonably foreseeable projects that would use herbicide treatments within the Kelsey Butte subwatershed. The Kelsey Project EIS on the Bend/Ft. Rock District proposes spot hexazinone application on competing vegetation within a number of units planned for reforestation in the Kelsey Butte subwatershed and is currently in review/draft status before release as a Final EIS for public comment. Application rates would be similar to this project. The Kelsey units are at least one half mile from the 18 Fire analysis area and have no hydrologic connection to this project area. Cumulative health effects to humans, therefore, would be limited to individuals traveling through both areas. Even then, the potential for coming in contract with herbicide would be relatively low. Treatment areas would be signed to restrict entry for 48 hours, the herbicide would be applied on only a small percent of each site, and public use of the two areas is infrequent. There would be no change in the risk evaluation done for members of the general public.

The U.S. EPA evaluated the dietary risks associated with hexazinone. It determined there is a reasonable certainty that no harm to any population subgroup will result from aggregate exposure to hexazinone when considering dietary, drinking water and residential exposure and all other non-occupational sources of pesticide exposure for which there is reliable information (U.S. EPA 2002).

The Deschutes and Ochoco Invasive Plant Treatment EIS is currently scheduled for release as a draft EIS for public comment in September of 2006. This document has an invasive weed treatment area directly overlaying the 18 Fire, with a few known infestations proposed for chemical treatment totaling 3 acres located within the 18 Fire Competing Vegetation Control EA analysis area. There are four target species proposed for treatment: spotted knapweed, bull thistle, Dalmatian toadflax, and Russian thistle. The primary chemicals proposed for each species, respectively, would be Clopyralid, Clopyralid, Picloram, and Chlorosulfuron. The Proposed Action for this project will avoid any direct treatment of competing vegetation of those areas previously proposed for treatment under the Deschutes National Forest Invasive Weed Project, thus avoiding any potential of overlap of herbicide applications and potential synergistic or antagonistic effects.

Alternative 3

Potential health risks are discussed at length in the FEIS (pages IV-113-115). Risks to workers are from cuts from hand tools, eye injuries, insect bites and stings, falls, being hit by brush, falling on stumps or sharp brush ends, and heat exhaustion. Work under steep, rugged conditions can initiate or worsen chronic problems such as knee problems or bring on heart attacks or stroke. Minor injuries are almost certain to occur with a potential for more severe injuries. Serious injuries occur at low frequencies. Appropriate training, protective clothing, rest breaks, and proper equipment maintenance can mitigate these hazards to a large extent. Risks to the public are almost nonexistent due to lack of exposure to the project, but individuals could be injured while walking through the areas containing sharp brush ends from cut shrubs.

CULTURAL RESOURCES

The Documentation of Analysis for the Archaeological Resource (Project Record, prepared by Janine McFarland, District Archeologist, December 7, 2005) is incorporated by reference and portions are included in the summary below.

FINDINGS

Following guidelines in the 1995 Regional Programmatic Agreement (PA) among USDA Forest Service, the Advisory Council on Historic Preservation, and the Oregon State Historic Preservation Office, a finding of "No Effect" under Section 106 of the National Historic Preservation Act (NHPA) has been determined for this project. Consultation has occurred under the Programmatic Agreement with the State Historic Preservation Office (SHPO) and Tribes.

INTRODUCTION

Cultural resources include historic and archaeological sites and resources used by humans in the past. Cultural resources are fragile and non-renewable resources that chronicle the history of people using the forested environment. They include:

> Historic properties; places that are eligible for inclusion in the National Register of Historic Places (NRHP) by virtue of their historic, archaeological, architectural, engineering, or cultural significance. Buildings, structures, sites, and non-portable objects (such as signs, heavy equipment) may be considered historic properties. Historic properties are subject to the NRHP Section 106 review process;
> Traditional cultural properties (TCPs); localities that are considered significant in light of the role(s) they play in a community's historically rooted beliefs, customs, and practices may also be considered historic properties;
> American Indian sacred sites located on federal lands. These may or may not be historic properties; and
> Cultural uses of the natural environment (such as subsistence use of plants or animals) that must be considered under NEPA.

EXISTING CONDITION

In July of 2003 the 18 Fire swept through the project area and burned 3,810 acres. Included in this area are historic sites associated with the Bessie Butte Logging Camp, owned and operated in the early part of the 1900s by the Brooks-Scanlon Company. In the 1950s the Forest Service acquired this land through a land exchange. The fire totally consumed the undergrowth, completely destroying or exposing cultural resources associated with this historic site. The analysis for the 18 Fire Recovery Project showed that 276 acres of the fire had been previously survey. An additional 474 acres were surveyed in the aftermath of the fire for a total of 756 acres. Three historic sites associated with the logging camp were identified from previous surveys. No new sites were identified during the new survey. Three previously recorded sites were revisited. Two of the sites were found to be not eligible for the National Register of Historic Places. The remaining site has not been evaluated and is potentially eligible, but was excluded from ground disturbing activities from the 18 Fire Recovery Project.

Alternative 1 (No Action)

Direct and Indirect Effects: Under this alternative none of the proposed actions would be implemented and there would be no direct, indirect or cumulative impacts to cultural resources.

Alternative 2 (Proposed Action)

Direct, Indirect, and Cumulative Effects: Under this alternative the application of herbicide would not cause ground disturbance and there would be no direct, indirect or cumulative impacts to cultural resources.

Alternative 3

Direct, Indirect, and Cumulative Effects: The scalping of competing vegetation has the potential to disturb cultural resource sites. The primary management option to mitigate potential adverse impacts to these sites caused by ground disturbance is site avoidance.

Under this alternative the sites would be designated and avoided. Markings that designate the sites would be removed following completion of the project. Implementation of mitigation measures will result in no direct, indirect or cumulative effects resulting from scalping the competing vegetation from around the pine seedlings. The archeologist will monitor the heritage sites following project completion.

ROAD ACCESS

Road access would not be changed with implementation of any alternative. No road reconstruction or new road construction would occur. No temporary road construction would occur.

None of the alternatives will have direct, indirect or cumulative impacts on road access within the project area. Alternatives 2 and 3 will control competing vegetation around planted seedlings. Higher survival and faster growth rates for trees may contribute to limiting vehicle use to existing roads and travelways and reducing cross country vehicular travel.

RANGE

The Documentation of Analysis for livestock grazing (Project Record, prepared by Don Sargent, Forest Range Technician, November 29th, 2005) is incorporated by reference and summarized below.

EXISTING CONDITION

The 2004 Cinder Hill Environmental Assessment authorized grazing within the Bessie Grazing Allotment that overlaps the 18 Fire Recovery Project area. Grazing activities were restricted within the 18 Fire Recovery Project and the Record Decision states that there will be no grazing in the fire area within the reasonably foreseeable future. Grazing may occur outside the 18 Fire Recovery Project area within the Bessie Allotment, as needed to manage vegetation. Grazing on the Bessie Allotment will occur on a periodic basis as needed to meet the objectives of fuels management and vegetation treatment and/or to provide for forage reserves as needed.

In addition, the combination of deer fencing and vexar tubing to eliminate deer browse and damage to planted trees means that cattle, goat and sheep grazing would not occur for the reasonably foreseeable future in the 18 Fire Recovery Project area (18 Fire Recovery Project EIS 2004). The reason that no grazing would be allowed is to prevent damage to planted trees. Based on experience with tree growth from other nearby fires it would be a minimum of ten years and likely much longer before the planted trees are no longer susceptible to livestock damage and grazing could once again occur.

Alternative 1 (No Action)

Direct, Indirect and Cumulative Effects: To reduce risks to plantation trees and meet reforestation objectives, grazing within the fire area would not occur until reforestation efforts have achieved the desired level of recover specified in the 18 Fire Recovery Project. Reforestation objectives including trees reaching approximately 5 feet tall are expected to be achieved in 19 year or more after the last trees are planted. Under this alternative, grazing could likely resume in 2025.

There would be no negative direct, indirect or cumulative effects associated with this alternative to the grazing program because there will be no grazing.

Alternative 2 (Proposed Action) and Alternative 3

Direct, Indirect and Cumulative Effects: To reduce risks to plantation trees and meet reforestation objectives, grazing within the fire area would not occur until reforestation efforts have achieved the desired level of recover specified in the 18 Fire Recovery Project. Reforestation objectives including trees reaching approximately 5 feet tall are expected to be achieved in 9 years or more after the last trees are planted. Under this alternative, grazing could likely resume in 2015. Forbs and grasses that can be utilized by livestock are expected to recover from treatment by the time livestock would be allowed to again graze the area.

There would be no negative direct, indirect or cumulative effects associated with this alternative to the grazing program because there will be no grazing. There would be a positive effect on the grazing program because the more rapid establishment and growth of trees under these alternative that remove vegetation competing with tree seedlings will allow grazing to likely resume in 2015, ten years earlier than under the No Action Alternative.

AIR QUALITY

Alternative 1 (No Action)

Direct and Indirect Effects: There would be no effects to air quality, allowing tree seedlings to grow without competing vegetation control.

Alternative 2 (Proposed Action)

Direct, Indirect, and Cumulative Effects: No effects on air quality are expected as a result of the application of hexazinone. Hexazinone does not evaporate easily. The burning of hexazinone-treated wood does not create additional toxic byproducts (compared to the burning of untreated wood) (Information Ventures, Inc. 1995).

Alternative 3

Direct, Indirect and Cumulative Effects: There would be no effects to air quality with removal of vegetation through the use of hand scalping around tree seedlings**.**

ECONOMIC

The following summarizes the economic analysis completed for the 18 Fire Competing Vegetation Control project and can be found in the Silviculture Report for the 18 Fire Competing Vegetation Control EA (Project Record, written by Matt Deppmeier and dated January 31, 2006). It is incorporated by reference and summarized below. Refer to Table 3, pages 16-17 for a comparison of the economic cost with implementation of each alternative.

This analysis does not place a value on indirect benefits which may occur (such as increased future timber yields). Other amenity values, such as dispersed recreation or wildlife habitat, also were not included in the analysis.

The analysis includes planting, cost of seedlings, vegetation treatment, animal damage control, and stocking survey costs from the year of initial planting until seedlings average 6 feet in height. It does not include Forest Service overhead. Per tree costs are based on the number of treated surviving seedlings at age 10.

Alternative 1

There would be no cost associated with vegetation control. The total reforestation cost for this alternative is $641 per acre or $8.16 per established seedling. The total discounted cost associated with reforestation of the entire 2,003 acres is $1,283,319.

The cost for anticipate replanting is estimated at $500 per acre for 109 acres ($54,500) that are expected to fall below the minimum stocking level of 60 trees per acre. This cost is not reflected in the discounted costs associated with reforestation of the 2,003 acres.

Alternative 2

The cost for vegetation control is estimated to be $50 per acre. The total reforestation cost for this alternative is $538 per acre or $3.43 per established seedling. The total discounted cost associated with reforestation of the entire 2,003 acres is $1,078,361. The cost to reapply herbicide in a second treatment (deemed unlikely) would be approximately $100,000 if the entire area required re-treatment (also deemed unlikely).

Alternative 3

The cost for vegetation control is estimated to be $247 per acre. The total reforestation cost for this alternative is $734 per acre or $5.04 per established seedling. The total discounted cost associated with reforestation of the entire 2,003 acres is $1,470,765.

CIVIL RIGHTS AND ENVIRONMENTAL JUSTICE

Government-to-government consultation with the tribes has occurred in the form of a scooping letter describing the project area and proposed action. The tribes were invited to comment. No special concerns about Tribal resources were identified. Sally Bird, Cultural Resource Program Manager of the Confederated Tribes of the Warm Springs Reservation of Oregon was also contacted by phone at the request of Scott Turo, Off Reservation Tribal Biologist. An attempt to contact Ms Bird was made and it was requested that she contact the project Team Leader or Archaeologist if she had any additional comments or concerns regarding this project.

There are no known direct, indirect, or cumulative effects on Native Americans, minority groups, women, or civil rights beyond effects disclosed in the Deschutes LRMP.

Executive Order 12898 on environmental justice requires federal agencies to identify and address any disproportionately high and adverse human health or environmental effects on minority and low-income populations. For all alternatives, there would be no disproportionately high or adverse effects to minority or disadvantaged groups qualifying under the environmental justice order identified.

OTHER EFFECTS AND FINDINGS

No old growth stands, wild and scenic rivers, farmlands, wetlands, or parkland would be adversely affected by the proposed activities. No significant irreversible or irretrievable commitment of resources would occur under Alternative 2 (Proposed Action) or Alternative 3. There would be some negligible irretrievable losses of wildlife forage in the treated areas around each seedling.

The alternatives are consistent with the goals, objectives and direction contained in the Deschutes National Forest Land and Resource Management Plan and accompanying Final Environmental Impact Statement and Record of Decision dated August 27, 1990 as amended by the Regional Forester's Forest Plan Amendment #2 (6/95) and Inland Native Fish Strategy, and as provided by the provisions of 36 CFR 219.35 (f) (2005), which address Management Indicator Species.

Implementation of Alternative 1 (No Action), Alternative 2 (Proposed Action), or Alternative 3 would be consistent with relevant federal, state and local laws, regulations, and requirements designed for the protection of the environment including the Clean Air and Clean Water Act. Effects meet or exceed state water and air quality standards.

NEPA requires that environmental analysis include identification of ". . . any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented." Irreversible and irretrievable resource commitments are related to the use of nonrenewable resources and the effects that the use of these resources have on future generations. No significant irreversible or irretrievable commitment of resources would occur under Alternative 2 (Proposed Action) or Alternative 3.

> **Irreversible**: Those resources that have been lost forever, such as the extinction of a species or the removal of mined ore. The proposed activities would result in a commitment of rock for road reconstruction.
>
> **Irretrievable:** Those resources that are lost for a period of time, such as the temporary loss of timber productivity in forested areas that are kept clear for use as a power line rights-of-way or road.

The proposed activities would not result in few direct and indirect commitments of resources; these would be related the temporary, short-term irretrievable loss of the grass and shrub component treated around seedlings. There would not be an irreversible loss of resources.

The Secretary of Agriculture issued memorandum 1827 which is intended to protect prime farm lands and rangelands. The project area does not contain any prime farmlands or rangelands. Prime forestland is not applicable to lands within the National Forest System. National Forest System lands would be managed with consideration of the impacts on adjacent private lands. Prime forestlands on adjacent private lands would benefit indirectly from a decreased risk of impacts from wildfire. There would be no direct, indirect, or cumulative adverse effects to these resources and thus are in compliance with the Farmland Protection Act and Departmental Regulation 9500-3, "Land Use Policy".

The effects of implementation of the alternatives are well known and do not involve any unique or unknown risks.

None of the alternatives establishes a precedent for future actions, nor a decision in principle about a future consideration.

Chapter 4

LIST OF PREPARERS AND CONSULTATION

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Tom Walker	Fisheries Biologist

CONSULTATION

FEDERAL, STATE, AND LOCAL AGENCIES

Bend Water Resources Department
Deschutes County Public Works Department
Oregon Department of Fish and Wildlife
Oregon Department of Environmental Quality
Oregon State University Extension Services
Oregon Water Resources Department
US Fish and Wildlife Service

TRIBES

Burns Paiute Tribe
Confederated Tribes of Warm Springs
The Klamath Tribe

OTHERS

Action for Animals
American Forest Resource Council
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Oregon Natural Desert Association
Oregon Natural Resources Council
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Upper Deschutes Watershed Council
The Wilderness Society
Wild Wilderness
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Woodside Ranch Homeowners Association
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APPENDIX A

WILDLIFE BIOLOGICAL EVALUATION (BE)

APPENDIX B

BOTANY BIOLOGICAL EVALUATION (BE)

Biological Evaluation

Threatened, Endangered, Proposed, and Sensitive Plants

18 FIRE PLANTATION HERBICIDE PROJECT

* *

PREPARED BY: _____
Charmane Powers
Ecologist

DATE: _____

PROJECT LOCATION: Bend/Ft. Rock Ranger District, Deschutes National Forest

* *

SUMMARY OF FINDINGS

The analysis of effects on species viability found the following:

***For all alternatives*: There will be no impact to Proposed, Endangered, Threatened, or Sensitive plant species.**

INTRODUCTION

This Biological Evaluation documents the review and review findings of Forest Service planned programs and activities for possible effects on species (1) listed or proposed for listing by the USDI Fish and Wildlife Service (USFWS) as Endangered or Threatened; (2) designated by the Pacific Northwest Regional Forester as Sensitive. It is prepared in compliance with the requirements of Forest Service Manual (FSM) 2630.3, FSM 2672.4, FSM 10/89 R-6 Supplement 47 2670.44, and the Endangered Species Act (ESA) of 1973 (Subpart B; 402.12, Section 7 Consultation).

Proposed, Endangered, Threatened, or Sensitive (PETS) species considered in this evaluation are those listed in FSM 2670.4 Region 6 list dated July 2004 as suspected or documented to occur on the Deschutes National Forest. Listed plant species and their listing status are in Appendix A.

This document is organized as follows:

1. PROPOSED ACTION AND ALTERNATIVES--Description of the proposed project and its alternatives

2. EVALUATION & MITIGATION—Description of the process used to evaluate effects on non-Federally listed plant species, and evaluation of effects, including recommended mitigation measures

3. REFERENCES--Documents referred to during the evaluation

4. APPENDICES--Appendices of sensitive species that are suspected to occur on the Bend/Ft. Rock Ranger District, and habitat descriptions of species suspected to occur within the project area

ALTERNATIVE DESCRIPTIONS

***NO ACTION* (Alternative 1)**

Hexazinone would not be applied within the project area.

***PROPOSED ACTION* (Alternative 2)**

The proposed action would include up to two applications of a pelletized formulation of the herbicide hexazinone within the project area to be applied in the spring or fall. It would be applied within a three (3) foot radius of seedlings to be protected.

***MANUAL TREATMENT* (Alternative 3)**

No herbicides would be used under this alternative.

When live vegetation is within 3 feet (or 5 foot radius) of the stem of a live seedling, the live vegetation will be pulled, cut, or scraped from the ground in a manner that removes all of the plant above the root crown and removes the root crown and roots of grasses and sedges to a minimum depth of six inches below the soil surface.

EVALUATION

This evaluation of the project area includes:

_X_ A pre-field review
_X_ A field survey
_X_ An effects analysis
__ Management recommendations (if a sensitive plant population exists).

PREFIELD REVIEW - METHODS AND RESULTS

Project area description: The project area is characterized by a ponderosa pine/manzanita/western needlegrass plant association, and sandy to loamy volcanic soils. Soils within the 18 Fire project area are mainly comprised of sandy volcanic ash over sandy to loamy buried soils, while in some areas in the middle and southern end, mixed with highly fractured lavas.

The plant associations that dominate the 18 Fire project area are ponderosa pine/bitterbrush/fescue roughly in the north half, and ponderosa pine/bitterbrush-manzanita/fescue in the south half.

Elevations within the project area range from about 4200' at the north end of the project to about 4700' at the south end of the project. Average annual precipitation ranges from approximately 15-20".

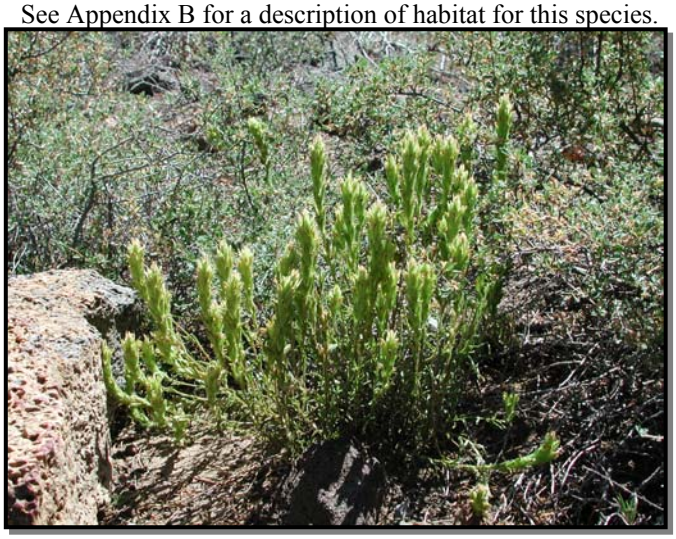
The potential for sensitive plant species' habitat to occur in the project area was evaluated using the preceding information, as well as the following resources: aerial photo interpretation, vegetation map information, as well as personal knowledge of the project area.

Based on the preceding information, a comparison with the habitat requirements of Bend/Ft. Rock Ranger District potential sensitive species indicates that there is no likely habitat for PETS species within the project area; only one species is suspected but was unlikely to exist there either prior to or in the years after fire recovery.

Based on the preceding information, a comparison with the habitat requirements of Bend/Ft. Rock Ranger District potential sensitive species, including three mosses, two lichens, and one fungus added to the list in summer 2004, indicates that the following species has the possibility of occurring within the project area outside of the riparian zone:

Species	Probability
Castilleja chlorotica (Green-tinged paintbrush)	Low

See Appendix B for a description of habitat for this species.



Castilleja chlorotica

Castilleja chlorotica habitat

No habitat for Threatened, Endangered, or Proposed (Candidate) plant species (these species, and their habitats, are listed in Appendices C and D) exists within the project area, with the possible wildcard exception of *Botrychium lineare*, a Candidate species. Its range distribution is very wide and its habitat varies just as widely. However, it has not been found on the Deschutes National Forest, (nor, more specifically, in the project area), after 15 years of project-level surveys, which include complete lists of plants encountered. The nearest known site lies in northeastern Oregon, in Wallowa County.

As for the new lichens, mosses, and fungus added to the Forest list in summer 2004, there is no habitat present for them in the project area. They are associated either with flowing streams in moist, high-elevation forests, and/or moist, high-elevation forests in the Cascades.

FIELD RECONNAISSANCE

Proposed, Endangered, Threatened, and Sensitive (PETS) plant surveys had been conducted over roughly 30% of the project area prior to the 18 Fire, within the past 14 years, for various thinning, mowing, and special uses projects. Additionally, thousands of acres in the vicinity, in similar habitats as the project area, have also been surveyed within the same time frame with no PETS plant sites located.

SURVEY RESULTS

No PETS plants were located. Survey forms are on file at the Bend/Ft. Rock Ranger District.

PROJECT EFFECTS

This section discusses what effects may occur as a result of the proposed project and what risks the effects may have on the viability of proposed, threatened, endangered, and sensitive species.

Alternative 1 (No Action Alternative)

Direct, Indirect, and Cumulative Effects: None have been identified, because no PETS plants were located during survey, nor is high-probability PETS plant species habitat present.

Alternative 2 (Proposed Action) and Alternative 3 (Manual Treatment)

Direct, Indirect, and Cumulative Effects: None have been identified, because no PETS plants were located during survey, nor is high-probability PETS plant species habitat present..

COMPARISON OF ALTERNATIVES

There is no difference among alternatives as far as PETS plant species are concerned, because no known PETS plant species have been found, or likely habitat for them.

FINDINGS

The analysis of effects on species viability found the following:

For all alternatives: There will be no impact to Proposed, Endangered, Threatened, or Sensitive plant species.

REFERENCES

18 Fire Salvage Project Plant Biological Evaluation, 2004. Charmane Powers, author.
Bend/Ft. Rock Ranger District Sensitive Plant GIS layer
Bend/Ft. Rock Ranger District Cleared Areas Atlas
Larsen, 1976. Deschutes National Forest Soil Resource Inventory.

APPENDIX A

DESCHUTES NATIONAL FOREST SENSITIVE PLANT LIST

Thirty-one plants are currently on the Regional Forester's Sensitive Species List (FSM 2670.44, 7/04) for the Deschutes National Forest, as follows (BFR = Bend/Fort Rock District, CRE = Crescent District, SIS = Sisters District):

Scientific Name	Common Name	Listing Status		District	
			BFR	CRE	SIS
Agoseris elata	Tall agoseris	ONHP List 2	S	S	D
Arabis suffrutescens var. *horizontalis*	Crater Lake rockcress	Sp. Of Concern ONHP List 1	---	S	---
Arnica viscosa	Shasta arnica	ONHP List 2	D	S	S
Artemisia ludoviciana ssp. *estesii*	Estes' artemisia	Sp. Of Concern ONHP List 1	D	S	---
Aster gormanii	Gorman's aster	ONHP List 1	S	S	S
Astragalus peckii	Peck's milk-vetch	ONHP List 1	D	D	S
Botrychium pumicola	Pumice grape-fern	ONHP List 1	D	D	---
Calamagrostis breweri	Brewer's reedgrass	ONHP List 2	S	S	S
Calochortus longebarbatus var. *longebarbatus*	Long-bearded mariposa lily	ONHP List 4	S	S	S
Carex hystricina	Porcupine sedge	ONHP List 2	S	S	S
Carex livida	Pale sedge	ONHP List 2	S	S	S
Castelleja chlorotica	Green-tinged paintbrush	ONHP List 1	D	S	S
Cicuta bulbifera	Bulb-bearing water-hemlock	ONHP List 2ex	S	S	S
Collomia mazama	Mt. Mazama collomia	ONHP List 1	S	S	S
Dermatocarpon luridum (LICHEN)		ONHP List 3	S	S	S
Gentiana newberryi var. *newberryi*	Newberry's gentian	ONHP List 2	D	S	D
Leptogium cyanescens (LICHEN)		ONHP List 3	S	S	S
Lobelia dortmanna	Water lobelia	ONHP List 2	S	S	D
Lycopodiella inundata	Bog club-moss	ONHP List 2	S	D	S
Lycopodium complanatum	Ground cedar	ONHP List 2	S	S	S
Ophioglossum pusillum	Adder's-tongue	ONHP List 2	S	S	S
Penstemon peckii	Peck's penstemon	Sp. Of Concern ONHP List 1	S	S	D
Pilularia americana	American pillwort	ONHP List 2	S	S	---
Ramaria amyloidea (FUNGUS)		ONHP List 2	S	D	S
Rorippa columbiae	Columbia cress	ONHP List 1	S	S	S
Rhizomnium nudum (MOSS)		ONHP List 2	D	S	S
Scheuchzeria palustris ssp. *americana*	Scheuchzeria	ONHP List 2	D	S	S
Schistostega pennata (MOSS)		ONHP List 2	S	D	S
Scirpus subterminalis	Water clubrush	ONHP List 2	S	D	S
Scouleria marginata (MOSS)		ONHP List 3	S	S	S
Thelypodium howellii ssp. *howellii*	Howell's thelypody	ONHP List 2ex	S	S	S

CODES:
--- = Not documented or suspected; D = Documented; S = Suspected
Species of Concern = Federal Designation; neither Endangered or Threatened

ONHP List 1 = Oregon Natural Heritage Program List: Contains species which are endangered or threatened throughout their range or which are presumed extinct.

ONHP List 2 =: Contains species which are threatened, endangered or possibly extirpated from Oregon, but more common or stable elsewhere; ex = Extirpated in Oregon.

ONHP List 3 = Oregon Natural Heritage Program List: Contains species for which more information is needed before status can be determined, but which may be threatened or endangered in Oregon or throughout their range.

ONHP List 4 = Oregon Natural Heritage Program List: Contains species of concern which are not currently threatened or endangered.

APPENDIX B

Deschutes National Forest Sensitive Plant Habitat Descriptions

Vascular Plants

Agoseris elata. This species occurs in nonforest areas and openings in ponderosa pine forest between 3000 and 4800 feet elevation. Habitat includes dry edges of moist ecotones adjacent to moist meadows, lakes, stream courses, and riverbanks. The closest known sighting is on the Sisters Ranger District.

Arabis suffrutescens* var. *horizontalis. Crater Lake rockcress is found in meadows, woods, summits, ridges, and steep, exposed rock outcrops between 5500-8900'. Oregon Natural Heritage records (as recent as 1993) are only from Crater Lake National Park, Lake of the Woods, and Mt. McLoughlin, all in south-central and southern Oregon.

Arnica viscosa. Shasta arnica is found on the Bend/Ft. Rock Ranger District. Typical habitat is rock, scree, talus, and lava flows, between 6500-9200'. May be w/in moraine lake basins or crater lake basins. At or above subalpine mixed conifer in western white pine and mountain hemlock, sparsely vegetated openings.

Artemisia ludoviciana* ssp. *estesii. This robust herbaceous perennial is found within the Deschutes River floodplain habitat amidst sparse vegetation in sandy pockets among rocks and river gravel. It has been found on the Bend/Ft. Rock Ranger District.

Aster gormannii. A perennial member of the sunflower family that is found on dry cliffs, open rocky ridges, steep rocky washes, or fine gravelly andesic scree in subalpine and alpine areas at elevations of 5000 to 6100 feet. Dry SW, S, ESE, E exposures are most common. The closest documentation of this species is in the Mt. Jefferson Wilderness on the Willamette National Forest.

Astragalus peckii. A perennial legume that is found in non-forested areas, forest openings, and open forest. It is most commonly found in shrub-steppe plant associations, but has also been reported from common juniper woodlands, ponderosa pine forest edge and lodgepole pine forest openings. It grows in loose, deep pumice, loamy sand, or sandy soils with flat to gentle slopes. It has often been found in or along dry watercourses, old lakebeds (basins), pumice flats and other natural openings. It has been found in previously-disturbed areas on the Crescent Ranger District.

Botrychium pumicola. This inconspicuous plant is a perennial which may regrow from a bud located 1-3 inches below the ground surface. It reproduces through spore dispersal, and, vegetatively, through the formation of tiny underground buds called gemmae. This species is endemic to Central Oregon open-canopy pumice soils at high elevations in the Oregon Cascades and Newberry Crater, and at lower elevations within a lodgepole pine matrix. Within the lodgepole pine matrix, it prefers relatively flat, open basins where frost heaving tends to prevent the establishment of tree seedlings and most other vegetation as well.

Calamagrostis breweri. A perennial tufted grass found in moist to dry alpine and subalpine meadows, open slopes, streambanks, and lake margins.

Calochortus longebarbatus var. longebarbatus. Also known as the long-bearded mariposa lily, it is found in dry portions of low meadows and grassy openings in pine forest or in moist open ground along rills at 1800-3600 feet. It has not been found on the Deschutes National Forest.

Carex hystricina. Porcupine sedge is found in wet to moist conditions in riparian zones, and in or along ditches/canals in prairies and wetlands, and is associated with *Carex-Juncus* communities within true fir-douglas-fir-ponderosa pine forests and juniper woodlands between 3400-4300'.

Carex livida. Pale sedge is found within all forest types in peatlands including fens and bogs, as well as wet meadows with still or channelled water.

Castilleja chlorotica. Also known as the green-tinged paintbrush, this species is a perennial eastern Oregon endemic, known only from Deschutes, Lake, and Klamath Counties. It occurs on the Bend/Ft. Rock Ranger District in numerous populations. It has been found at 4300' to 8200' elevation in open and forested ponderosa, lodgepole, and mixed conifer. It has also been found in nonforested sagebrush-bitterbrush types. Soils are often very poor and rocky.

An important life history factor to note about the *Castilleja* genus is that it is hemiparasitic, which means it contains chlorophyll and may or may not be able to complete its life cycle without a host species; hemiparasites primarily draw water and minerals from the host. It is not known which species is the host for CACH, although it is suspected to be a shrub (Dr. Richard Everett, pers. comm.). On the Fremont National Forest, upon which the majority of the known CACH population exists, the host is suspected to be sagebrush; on the Deschutes National Forest sites, it may be bitterbrush. Successful CACH reestablishment after a fire or other disturbance may depend upon the reestablishment of its host.

Cicuta bulbifera. Considered by Oregon Natural Heritage ranking to be extirpated from Oregon. Shoreline marshes. Only Nature Conservancy records are for margins of Klamath Lake in 1902 and 1950. Persistence at these sites considered doubtful.

Collomia mazama. Meadows (dry to wet, level to sloping); stream banks and bars; lakeshores and vernal pool margins; forest edges and openings; alpine slopes. Numerous recent sites within Klamath, Jackson, and Douglas Counties.

Gentiana newberryi var. newberryi. Newberry's gentian is a perennial species occurring between 4700 and 8700 feet in subalpine and alpine meadows in moist to moderately dry sandy loam, on level to moderate slopes. It is also found in mesic to moderately well-drained meadows or mesic grassy borders and flats adjacent to lakes and streams. It occurs on the Bend/Ft. Rock Ranger District.

Lobelia dortmanna. Water lobelia is a fibrous rooted aquatic perennial species, found in water of lake, pond, slow river or stream, or wet meadow. Sisters Ranger District site is the only Oregon locality.

Lycopodiella inundata. Deflation areas in coastal back-dunes; montane bogs, including sphagnum bogs; less often, wet meadows. Known on Deschutes National Forest from the Crescent Ranger District.

Lycopodium complanatum. Edges of wet meadows; dry, forested midslope with 25% canopy cover. Associated with Englemann spruce, Douglas-fir on the Wallowa-Whitman National Forest. Has been found on the Sisters Ranger District.

Ophioglossum pusillum. Northern adder's tongue is a fernlike plant associated with dune deflation plains, marsh edges, vernal ponds, and stream terraces in moist meadows. In Oregon, only known from Lane County; chiefly on the Siuslaw and Willamette National Forests. Not yet found on the Deschutes National Forest.

Penstemon peckii. Peck's penstemon occurs on the Sisters Ranger District in ponderosa pine openings, open ponderosa pine forests, pine/mixed conifer openings, recovering fluvial surfaces (streambnaks, overflow channels, inactive floodplains), seeps, rills, springs, vernal pools; draws, ditches, skid roads; dry or intermittant stream channels; moist-wet meadows.

Pilularia americana. American pillwort is a small grasslike plant that is found in alkali and other shallow vernal pools; not recently used stock ponds; reservoir shores. In Oregon, recent collections have been made in Deschutes, Klamath, and Jackson Counties. There is an historical site from about 100 years ago from the extreme eastern edge of the Bend/Ft. Rock Ranger District, but targeted surveys in recent years has not re-discovered it.

Rorippa columbiae. This perennial from the mustard family occurs in wet to vernally moist sites, meadows, fields, playas, lakeshores, intermittent stream beds, banks of perennial streams, along irrigation ditches, river bars and deltas. In Oregon, this species is found in Klamath, Lake, and Harney Counties.

Scheuchzeria palustris ssp. americana. Open canopied bogs, fens, and other wetlands where often in shallow water. Pacific silver fir and douglas-fir forests (in west Cascades).

Scirpus subterminalis. Generally submerged to emergent in quiet water 2-8 decimeters deep, in peatlands, sedge fens, creeks, ditches, ponds and lakes.

Thelypodium howellii* ssp. *howellii. Considered by Oregon Natural Heritage ranking to be extirpated from Oregon. No recent collections; closest Nature Conservancy sites are Paulina Marsh, Tumalo State Park (approx.), Camp Polk, and Big Summit Prairie.

Bryophytes

Schistostega pennata. On mineral soil in damp caves and crevices and on the soil-bearing root masses of fallen trees. Often near streams or other wet areas. Requires humid, heavily shaded microsites. Most commonly found within silver fir plant series but also common in western hemlock and mountain hemlock series. Also in lodgepole pine stands near water. Stands are typically late seral or old growth.

Lichens

Leptogium cyanescens. On trees in humid forests; widely scattered. On mossy trees and rocks or directly on rock when near water. Considered riparian through 2001. Recently documented in upland settings on vine maple, big leaf maple, and in moss on white oak. Associated with Western Hemlock and Pacific Silver Fir Zones in mixed conifer stands, mature big leaf maple and Douglas-fir stands, maple and willow thickets.

Surveys impractical or known sites likely managed

Ramaria amyloidea. Fungus. Coral-like fungi on moist humus or wood, or under duff. May favor hemlock. Fall species. Associated with *Abies* spp., *Pseudotsuga menziesii* and *Tsuga heterophylla.*

Dermatocarpon luridum. Lichen. Usually submerged most of the year. Rocks or bedrock in streams, rivers, or seeps, usually submerged or inundated for most of the year. Associated with *Alnus rubra, Pseudotsuga menziesii, Tsuga heterophylla, Acer* spp., subalpine or alpine meadow vegetation.

Rhizomnium nudum. Moss. On humus or mineral soil in seepages, vernally (at least) wet depressions or intermittently wet, low gradient channels. Exposure varies from full sun to full shade. On Deschutes NF, associated conifer types include lodgepole pine, Engelman spruce, mountain hemlock and western white pine.

Scouleria marginata. Moss. Often forming dark mats on exposed to shaded rocks in streams; seasonally submerged or emergent.

APPENDIX C

List of Federally Endangered, Threatened, and Candidate Plant Species*

Plants listed as Endangered

Arabis macdonaldiana
Astragalus applegatei
Erigeron decumbens var. *decumbens*
Fritillaria gentneri
Lilium occidentale
Limnanthes floccosa ssp. *grandiflora*
Lomatium bradshawii
Lomatium cookii
Plagiobothrys hirtus
Stephanomeria malheurensis

Plants listed as Threatened

Castilleja levisecta
Howellia aquatilis
Lupinus sulphureus ssp. *kincaidii*
Mirabilis macfarlanei
Sidalcea nelsoniana
Silene spaldingii
Thelypodium howellii ssp. *spectabilis*

Candidate Plants for listing

Artemisia campestris var. *wormskioldii*
Botrychium lineare
Calochortus persistens

* Source: Oregon Natural Heritage Program web site, February 2005

APPENDIX D

List of Federally Endangered, Threatened, and Candidate Plant Species' Habitats and Ranges*

Plants listed as Endangered

Arabis macdonaldiana
Habitat Description
Open rocky areas, outcrops and cliffs, with little associated vegetation.

Range Description
Del Norte, Trinity, and Mendocino counties; along north fork of Smith River and at Red Mountain, California. Also in Curry and Josephine Counties, Oregon.

Astragalus applegatei
Habitat Description
Occurs in meadows and moist ground along wayside ditches and along the Klamath River at ca. 1250 m. Primarily in grasslands dominated by Puccinella lemmonii and Poa juncifolia, with Chrysothamnus nauseosus usually present. Alfalfa and other weeds also common.

Range Description
Found only in Lower Klamath Basin, e.g., near the city of Klamath Falls, in Klamath County, Oregon. Perhaps in adjacent Siskiyou County, California ('to be sought', Barneby 1964).

Erigeron decumbens var. decumbens
Habitat Description
Erigeron decumbens ssp. decumbens is found in all native grasslands in the Willamette Valley, including the wet tufted hairgrass bottomland prairies, and the well drained, deep soiled red fescue grasslands. Associated species: Aster hallii, Festuca rubra, Danthonia californica, Deschampsia cespitosa, Fragaria virginiana, and the other WV endemic plants.

Range Description
Occurs only in the southern end of the Willamette Valley, Oregon.

Fritillaria gentneri
Habitat Description
Inhabits dry open woods of fir or oak at lower elevations. Associated species: Brodiaea spp., Ceanothus cuneatus, Phacelia spp., Microseris spp., and Erythronium spp.

Range Description
Scattered localities in southwest Oregon along the Rogue and Illinois River drainages in Josephine and Jackson Counties, Oregon.

Lilium occidentale
Habitat Description
Occurs in forest or thicket openings, often along the margins of ephemeral ponds and small channels, and usually established under cover of shrubs. Associates are Gaultheria shallon, Myrica californica, Vaccinium spp., Rubus spp, Lonicera involucrata, Ledum glandulosum, Pinus contorta, Picea sitchensis, Chamaecyparis lawsoniana, Salix hookeriana, Calamagrostis nutkaensis, Carex lyngbyei, Cornus canadensis, Tofieldia glutinosa, Gentiana sceptrum, Sphagnum spp., and Darlingtonia californica.

Range Description
Extremely limited distribution: a 2-mile wide strip of land along the coast in northern California and southern Oregon. Endemic to three counties. Historical occurrence in Coos County, Oregon and extant occurrences in Curry County, Oregon. One extant occurrence in Humboldt County, California.

Limnanthes floccosa ssp. grandiflora
Habitat Description
Inhabits the periphery of vernal pools at ca 375-400 m, near the wetter, inner edges as opposed to the drier outer fringes like the sympatric ssp. floccosa. Assoc. species: Lupinus sp., Trifolium sp., Myosurus minimus & Baeria chrysostoma.

Range Description
Endemic to the Rogue River Valley of Jackson County. Most populations centered in the Agate Desert region near the city of Medford, Oregon. Known populations occur within an 8 x 15 km area (5 x 9 mile area).

Lomatium bradshawii
Habitat Description
Occurs in flat bottomlands, usually Deschampsia cespitosa valley prairies, with heavy clay soils. Grows in depressions or seasonal channels or rarely in vernal pools. In the northern sites, it occurs in moist, vernal stream corridors with minimal soil over basalt.

Range Description
Regional endemic; found mainly in the south end of the Willamette Valley, in two counties. A large population has recently (1994) been discovered in Clark County, in the state of Washington.

Lomatium cookii
Habitat Description
Occurs along the margins of vernal pools in the Agate Desert, usually with native forbs and introduced annual grasses. In the Illionis Valley, it occurs in moist alluvial floodplains, with native bunchgrasses (Poa scrabrella and Danthonia californica) adjacent to Pinus ponderosa - Quercus garryana savanna with Ceanothus cuneatus and Arctostaphylos species.

Range Description
Narrow, local endemic. Restricted to two counties in the southwestern portion of the state of Oregon. It is limited to two small areas: the Agate Desert area north of the city of Medford, Jackson County, and the Illinois River Valley area near Cave Junction, Josephine County. Both are highly developed valley bottoms.

Plagiobothrys hirtus
Range Description
Plagiobothrys hirtus occurs only in Douglas County, Oregon, near the towns of Sutherlin and Yoncalla, although habitat in the valley 50 miles to the north appears to be appropriate for this species.

Stephanomeria malheurensis
Habitat Description
Found only on the top of a broad hill above surrounding flats. The soil is derived from volcanic tuff layered with thin crusts of limestone. The surrounding soils are derived from basalt. Assoc. species: Artemisia tridentata, Chrysothamnus nauseosus, C. viscidiflorus, Salsola kali, and most recently, Bromus tectorum.. The closest similar substrate is miles away. S. malheurensis seems to be one of the few species able to survive near harvester ant hills.

Range Description
Endemic to central Harney Co., Oregon, U.S.A. near Malheur and Harney lakes.

Plants listed as Threatened

Castilleja levisecta
Habitat Description
Inhabits gravelly prairies at low elevations, generally where damp in the winter but not from standing water. Associated species: Sidalcea campestris, Camassia spp., Potentilla spp., Delphinium pavonaceum, Aster hallii, & Deschampsia sp.

Range Description

Historically known from low elevations west of the Cascades from Vancouver Island south through the Puget Trough of Washington to the Willamette Valley in Oregon. Currently thought to have been extirpated from Oregon and southwestern Washington.

Howellia aquatilis
Habitat Description
Inhabits low elevation ponds or sloughs, submersed or partially floating on the surface of slow moving water. Seasonal pools in Fraxinus latifolia woodland is one known locality in Clark County, WA. Associated species include Spiraea douglasii, Callitriche heterophylla, Fontinalis antipyretica, Ranunculus aquatilis, and Veronica spp. Absent from pools with introduced carp. Carp muddy water and eat all aquatic vegetation.

Range Description
W Washington and NW Montana; Idaho?; 6-10 sites recently found in Mendocino County, California (K. Wolcott, Northern Central Valley Fish and Wildlife Office, pers. comm. to K. Maybury, 7/97). Possibly extirpated in Oregon.

Lupinus sulphureus ssp. kincaidii
Habitat Description
Grasslands and open woodlands at low elevations in the Willamette and Umpqua Valleys.

Range Description
Willamette and Umpqua Valleys, Oregon.

Mirabilis macfarlanei
Habitat Description
Prefers steep slopes with sunny exposure at approx. 330-450m elevation. The substrate is talus loosely covered with soil. Assoc. species: Agropyron spicatum, Balsamorhiza sagittata, Phacelia heterophylla, Phacelia linearis, Cryptantha sp.

Range Description
Mirabilis macfarlanei is narrowly endemic to portions of the Snake, Salmon, and Imnaha river canyons in Wallowa County in northeastern Oregon, and adjacent Idaho County in Idaho. The species global range is approximately 28.5 miles (46 km) by 17.5 miles (28.5 km).

Sidalcea nelsoniana
Habitat Description
Inhabits gravelly, wet soils. Once an undisturbed wet prairie species, now it's found primarily where remnant patches of native grassland species still occur, often where prairie merges with deciduous woodland.

Range Description
75-80% are in Oregon's Willamette Valley; the rest are in the Coast Range (except for 1 pop. in WA, which may have been introduced).

Silene spaldingii
Habitat Description
Inhabits undisturbed prairie on loessal hills, at low to mid elevations. Occassionally found in sagebrush scabland or open woodland. Associated species: Crataegus douglasii, Symphoricarpos albus & Festuca idahoensis. In Oregon, most sites are east or northeast slopes, in the Festuca idahoensis-Koeleria nidita plant association. The largest populations, however, occur on the Wallowa Lake terminal and lateral moraines in various aspects, and in an unusual habitat dominated by Artemisa ludiviciana and Festuca idahoensis.

Range Description
Regional endemic restricted to remnants of the Poulouse Prairie grasslands of eastern Washington, northeastern Oregon, northern Idaho, and western Montana (barely extending into British Columbia, Canada).

Thelypodium howellii ssp. spectabilis
Habitat Description

Occurs in moist, alkaline valley bottoms, dominated by basin wildrye, alkali-grasses (Distichlis stricta, Puccinella lemmonii, Poa juncifolia), and black greasewood. Sites are usually in alluvial outwash areas, near streams or rivers, with seasonal moisture.

Range Description

Endemic to the northeastern corner of Oregon, occurring in the Baker-Powder River valley in Baker and Union Counties (Fish and Wildlife Service 1999).

Candidate Plants for listing

Artemisia campestris var. wormskioldii

Habitat Description

Rocky, sandy and cobbly shoreline and banks of rivers.

Range Description

The taxon is restricted to the Columbia Basin Province in Washington and historically Oregon. Only 2 EOs are known, separated by about 200 river miles. Reports of this variety from Canada, California, and Greenland (Kartesz, pre-1997 datasets) are erroneous; in the August, 1997, review draft of his revised distribution data, Kartesz accepts only the Oregon and Washington reports for this plant.

Botrychium lineare**

Habitat Comments: Wagner and Wagner (1994) stated that it is difficult to describe a typical habitat for this species because the known sites are so different. It has been found mostly at higher elevations (about 1500-3000 m) in mountains, but specific habitats have ranged from a meadow dominated by knee-high grass, shaded woods and woodlands, grassy horizontal ledges on a north-facing limestone cliff, and a flat upland section of a river valley. Possibly a colonizer of disturbed, early seral habtiats (USFWS 2003).
Range: B. lineare is curently known from 12 widely disjunct sites in Colorado, Idaho, Oregon, Montana, Nevada, and Washington, with historic collections from California, Quebec, and possibly New Brunswick. Limited monitoring and survey efforts continue to locate some new populations (USFWS 2003).

Calochortus persistens**

Habitat Comments: Rocky, open areas within coniferous forests. 1000-1500 m elevation.
Range: Endemic to the Siskiyou Mountains of northern California and southwest Oregon.

APPENDIX C

INVASIVE WEED ASSESSMENT

APPENDIX D

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LITERATURE CITED

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