Integrated Invasive Plant Management For the Lakeview Resource Area Revised Environmental Assessment

(DOI-BLM-OR-L050-2014-0021-EA)

U.S. Department of the Interior
Bureau of Land Management

Lakeview Resource Area
Lakeview District Office
1301 South G Street
Lakeview, Oregon 97630

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Acronyms and Abbreviations

ACEC	Areas of Critical Environmental Concern
ALS	Acetolactate synthase
APHIS	Animal and Plant Health Inspection Service
ARBO	Aquatic Restoration Biological Opinion
ARI	Aggregated Risk Indices
ATV	All-Terrain Vehicle
BA	Biological Assessment
BEE	With triclopyr, butoxyethyl ester
BLM	Bureau of Land Management
BPA	Bonneville Power Administration
CWMA	Cooperative Weed Management Area
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESI	Ecological Site Inventory
FEIS	Final Environmental Impact Statement
GLEAMS	Groundwater Loading Effects of Agricultural Management Systems
HMA	Herd Management Area
ICBEMP	Interior Columbia Basin Ecosystem Management Project
K_{oc}	Soil Adsorption Value
LC_{50}	Lethal Concentration to 50% of a population
LD_{50}	Lethal Dose to 50% of a population
LOC	Level of Concern
MM	Mitigation Measure
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NIOSH	National Institute for Occupational Safety and Health
NISIMS	National Invasive Species Information Management System
NMFS	National Marine Fisheries Service
NRCS	Natural Resources Conservation Service
ODA	Oregon Department of Agriculture
ODEQ	Oregon Department of Environmental Quality
ODFW	Oregon Department of Fish and Wildlife
ONDA	Oregon Natural Desert Association
ONHP	Oregon Natural Heritage Program
Oregon FEIS	Vegetation Treatments Using Herbicides on BLM Lands in Oregon FEIS (2010)
PEIS	Vegetation Treatments Using Herbicides on BLM Lands in 17 Western States Programmatic FEIS (2010)
pH	potential of Hydrogen (measure of acidity)
PM	Particulate Matter
POEA	Polyoxyethylenamine, a surfactant found in some glyphosate formulations
PUP	Pesticide Use Proposal
RMP	Resource Management Plan
RNA	Research Natural Area
ROW	Right-of-Way
TEA	With triclopyr, triethylamine salt
TCP	3,5,6-trichloro-2-pyridinol (major metabolite of triclopyr)
USDA	United States Department of Agriculture
USDI	United States Department of the Interior
VRM	Visual Resource Management
WSA	Wilderness Study Area

Photos on cover provided by Grace Haskins, BLM Lakeview District Weed Coordinator

Changes made in this Revised EA are as follows:

Further information was added about targeted grazing. This can be found in the No Action and Proposed Action Treatment Key tables (Table 2-5, EA:46-49, and Table 2-7 EA:54-61), and effects can be found in the *Invasive Plants* (EA:78-79), *Water Resources* (EA:140), *Riparian and Wetlands* (EA:150), *Fish and Other Aquatic Resources* (EA:164), and *Wildlife* (EA:177-179) sections. A targeted grazing definition was also added to the *Glossary* (EA:260).

Information about the Fort McDermitt Paiute - Shoshone Tribe (a tribe with an interest in the area) was added to the *Consultation* / *Tribes* section of Chapter 1 (EA:21).

The *Consultation* / *U.S. Fish and Wildlife Service* section of Chapter 1 was re-written(EA:22) and Figure 1-2 (*Warner Basin Action Area for Endangered Species Act Consultation*) was added (EA:23). Edits were made to the aquatic buffers Project Design Feature in the *Water Resources* section (EA:135-136). These changes were made as a result of Endangered Species Act consultation.

A section called *Supplemental Wilderness Inventory Information* was added to the Lands *with Wilderness Characteristics* section and Appendix B to address new information submitted to the BLM by ONDA on wilderness characteristics (EA:228, 324-325). In addition, edits were made to clarify the intent of the project design feature in *Lands with Wilderness Characteristics*, and a second project design feature was added to that section (EA:226).

Project Design Feature in *Cultural Resources* were reworded to clarify intent (EA:206).

Minor edits were also made throughout the document to fix typos or sentence structure.

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Chapter 1 – Purpose and Need

Introduction

The Lakeview Resource Area (Resource Area), a unit of the Bureau of Land Management's (BLM) Lakeview District, manages approximately 3.2 million acres located primarily in Lake County with portions in Harney County, in southern Oregon (see Figure 1-1). The Resource Area is proposing to expand and update its existing integrated noxious weed management program. The Resource Area already controls noxious weeds using a range of methods including manual, mechanical, biological controls (mostly insects), targeted grazing, prescribed fire, and herbicides (2,4-D, dicamba, glyphosate, and picloram). The Resource Area proposes to expand this program by:

- Increasing the kinds of plants controlled from noxious weeds to all invasive plants; and,
- Increasing the number of herbicides to be used from 4 to 14.

> **Invasive plants** are non-native aggressive plants with the potential to cause significant damage to native ecosystems and/or cause significant economic losses.
>
> **Noxious weeds** are a subset of invasive plants that are county-, state-, or federally-listed as injurious to public health, agriculture, recreation, wildlife, or any public or private property.
>
> Thus, the term "invasive plants" includes noxious weeds in this EA. (Oregon FEIS – USDI 2010a)

Invasive annual grasses like cheatgrass (that are not designated as noxious) are causing widespread ecological damage including damage to habitats for Special Status species such as Greater sage-grouse. The additional herbicides are generally newer, more selective, provide better control, have fewer adverse environmental effects, are effective at lower doses, are better suited for controlling an increasing number of species of invasive plants and responding to concerns about herbicide resistance, and can be used to make associated non-herbicide methods (including prescribed fire) more available and more effective.

The additional herbicides, and their use on invasive plants rather than just on noxious weeds, were addressed in the 2010 Final Environmental Impact Statement (Oregon FEIS) and Record of Decision for *Vegetation Treatments Using Herbicides on BLM Lands in Oregon*, and subsequent amending of a 1984/87 court injunction (USDI 2010a:3). This Environmental Assessment (EA) examines the environmental effects of the proposal at a site-specific scale within the Resource Area. It will replace the 2004 EA for *Integrated Noxious Weed Management Program for the Lakeview Resource Area*.

The Need

Over 30 species of invasive plants now occupy over 44,000 acres in over 2,700 separate documented[1] locations, with individual locations ranging from a few plants to sites as large as 5,000 and 10,000 acres for medusahead rye and perennial pepperweed respectively. Additional unmapped invasive annual grass infestations (including the noxious weed medusahead rye) occupy hundreds of thousands of additional acres. In spite of the efforts of the existing noxious weed program, noxious weeds are continuing to spread at an estimated rate of 12 percent per year (USDI 2010a:133).[2] Adverse effects include displacement of native vegetation; reduction in habitat and forage for wildlife and livestock; loss of federally listed and other Special Status species' habitat; increased soil erosion; reduced water quality; reduced soil productivity; reduced wilderness and recreation values; and, changes in the intensity and frequency of fires (USDI 2010a:7).

[1] See Table E-1, *Documented Invasive Plant Sites, Lakeview Resource Area*.
[2] See also the rate of spread discussion in the *Invasive Plants* section early in Chapter 3.

Figure 1-1: Lakeview Resource Area

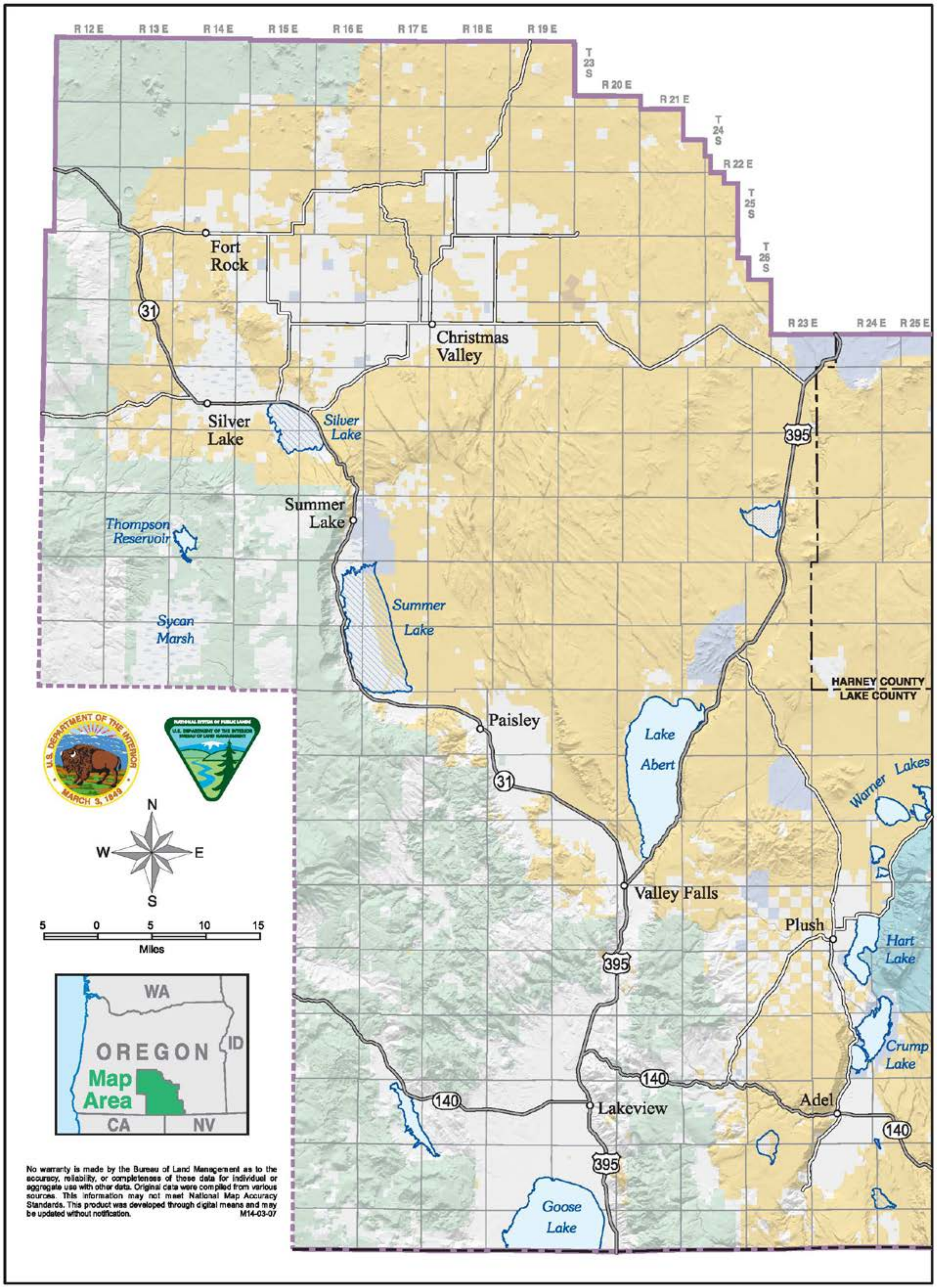
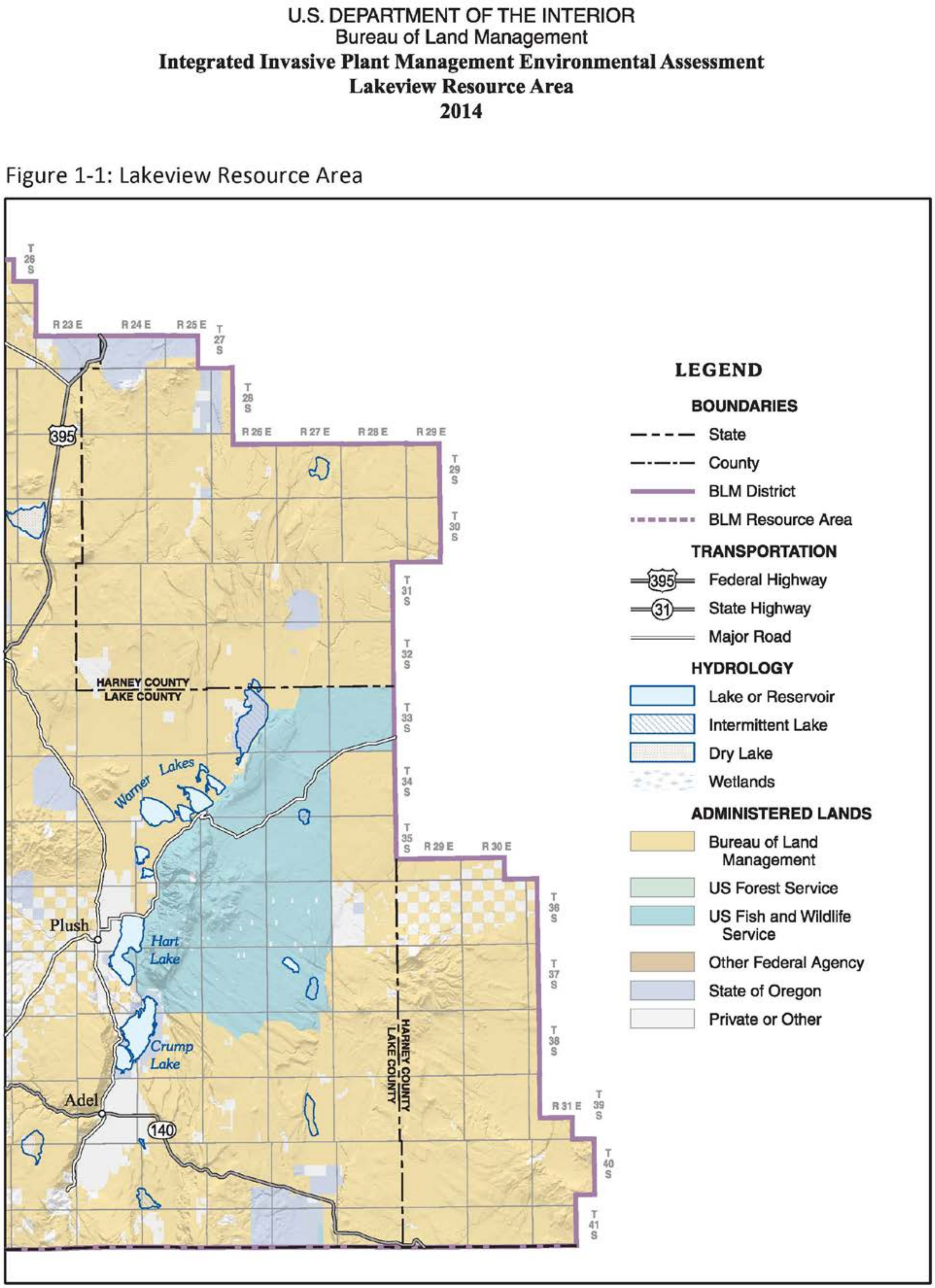


Figure 1-1: Lakeview Resource Area



For some invasive plant species such as perennial pepperweed (*Lepidium latifolium*) and medusahead rye (*Taeniatherum caput-medusae*), neither non-herbicide methods nor the four herbicides currently utilized result in effective control (USDI 2010a:6, 588, 618-19). The existing program also does not have effective methods to control other invasive annual grasses such as cheatgrass (*Bromus tectorum*) or North Africa grass (*Ventenata dubia*) that are primary invaders following wildfires. Without effective controls, these invasive annual grass infestations continue to increase in size and density, displacing native vegetation, preventing wildfire rehabilitation, degrading Greater sage-grouse habitat, and increasing the risk of wildland fire.

There are newer, more species-specific herbicides available to treat invasive plants. These herbicides can be used in lower quantities, and they pose less environmental and human health safety risk than the four herbicides currently being utilized (USDI 2010a:80 and others). In addition, if these additional herbicides were available, the likelihood that invasive plant treatments would result in complete control would improve from an estimated 60 percent to 80 percent (USDI 2010a:136).

Invasive plants may also spread to adjacent non-BLM-administered lands, increasing control costs for affected landowners and degrading land values. The BLM participates in cooperative public/private invasive plant control efforts such as those for the Lake County Cooperative Weed Management Area. However, its current inability to use herbicides commonly used by cooperators on adjacent lands results in less effective control and/or coordination difficulties.

Executive Order 13112 (February 1999) requires Federal agencies to "(i) prevent the introduction of invasive species; (ii) detect and respond rapidly to and control populations of such species in a cost-effective and environmentally sound manner; (iii) monitor invasive species populations accurately and reliably; [and] (iv) provide for restoration of native species and habitat conditions in ecosystems that have been invaded…" In addition, section 302(b) of the *Federal Land Policy and Management Act* of 1976 directs BLM to "take any action necessary to prevent unnecessary or undue degradation of the lands" (43 U.S.C. 1732(b)(2)).

All of the foregoing factors indicate a *Need* for a more effective invasive plant control program.

The Purposes

The Resource Area proposes to expand the existing noxious weed management program so it would more effectively:

- Control invasive plants to protect native ecosystems and the flora and fauna that depend on them.
- Manage invasive plants to reduce the risk that large-scale high-intensity fires would unacceptably damage resources and human developments.
- Cooperatively control invasive plants so they do not infest or re-infest adjacent non-BLM-administered lands.
- Prevent control treatments from having unacceptable adverse effects to applicators and the public, to desirable flora and fauna, and to soil, air, and water.
- Minimize treatment costs and improve treatment effectiveness, so resource and economic losses from invasive plants are reduced and more of the Need can be met within expected funding.

Each of these purposes is addressed by one or more of the issue statements listed below and used to guide the effects analysis in Chapter 3. Additional background information for each of these purposes can be found in the Oregon FEIS (USDI 2010a:9-12).

Scoping

External scoping for the EA was conducted June 13 through July 12, 2011. In addition to a news release in the Lake County Examiner and the Klamath Falls Herald and News newspapers, scoping letters were sent to 273 individuals, groups, and agencies. Reply letters were received from Oregon Wild, Northwest Environmental Defense Center, and Oregon Department of Fish and Wildlife. These letters, along with other pertinent information, were used to help develop the *Purposes* and *Issues*. (Internal BLM scoping and the Purposes examined in the Oregon FEIS also contributed to the *Purposes*.)

Issues

Issues are analyzed when:

- analysis is necessary for making a reasoned choice from among the alternatives (e.g., is there a measureable difference between the alternatives with respect to the issue);
- the issue identifies a potentially significant environmental effect; or,
- public interest or a law/regulation dictate that effects should be displayed.

A variety of issues were identified during internal (BLM) and external (public) scoping. Those meeting the criteria described above have been framed as questions and are listed below. These issues are used to guide the effects analysis in Chapter 3.

Issues for Analysis

Invasive Plants

- How would the alternatives reduce the spread of noxious weeds and other invasive plants?
- How would the alternatives respond to a tendency for some populations of invasive plants to develop resistance to an herbicide?

Native Vegetation

- How would the alternatives affect native plant communities?

Soil Resources

- How would the alternatives affect microbiotic soil crusts?
- Are there soils/conditions where particular herbicides included in the alternatives could be transported off site?
- What is the fate of herbicides in soils?

Water Resources

- How would the alternatives affect surface water quality including sediment, temperature, dissolved oxygen, and chemical contamination?
- How would the alternatives affect the safety of drinking, irrigation, or stock water?
- How would the alternatives affect 303(d)-listed streams? Are the alternatives consistent with the *Clean Water Act*?
- How would the alternatives affect bioaccumulation of herbicides in hydrologic systems including groundwater and streams?
- How would the alternatives affect stream channel stability and structural complexity?
- How would the alternatives affect water supply (yield), infiltration, runoff, and other hydrologic processes?

Riparian and Wetlands

- How would the alternatives affect the health and function of riparian and wetland areas?
- How would the alternatives affect riparian/wetland dependent species and their diversity?
- What is the likelihood of long-term alterations to riparian vegetation; would herbicide use result in loss of riparian and wetland function?

Fish and Other Aquatic Resources

- How would sediment or chemical deposition from the alternatives affect fish, including Special Status fish?
- How would the alternatives affect fish habitat, including water quality, aquatic and riparian vegetation, and habitat complexity?

Wildlife

- How would large-area treatments affect smaller resident species and publicly important species such as mule deer, elk, pronghorn, and bighorn sheep?
- How would treatment disturbances (noise, presence of humans) and the timing of that disturbance affect migratory bird nesting and migration, as well as Special Status wildlife species?
- How would the alternatives affect Greater sage-grouse?
- How would the alternatives affect habitat quality (forage and cover availability/quality/quantity over the short/long term)?

Livestock Grazing

- How would herbicide treatments and restrictions affect livestock grazing on BLM allotments?
- How would the use of herbicides affect livestock and their forage?

Wild Horses

- How would consuming herbicide-treated vegetation affect wild horse health?

Fire and Fuels Management

- How would the alternatives affect wildfire frequency and intensity?
- How would the alternatives affect the use of fire as a resource management tool?

Air Quality

- How would the alternatives affect air quality?

Native American Interests, Resources, and Concerns

- How would the alternatives affect fungi, plants (including fruit), and wildlife used for Native American subsistence, religious, or ceremonial purposes?
- How would the alternatives affect historic and prehistoric cultural sites?

Visual Resources

- How would treatments affect Visual Resource objectives?

Special Management Areas

- How would Special Management Areas like Wilderness Study Areas (WSAs), Areas of Critical Environmental Concern (ACECs), and Research Natural Area (RNAs) affect the BLM's ability to implement the alternatives?
- How would the alternatives affect Special Management Areas like WSAs, ACECs, RNAs, and those areas determined to be administratively suitable for national wild and scenic rivers designation?

Lands with Wilderness Characteristics

- How would the alternatives affect lands with wilderness characteristics?

Lands and Realty

- How would the alternatives affect rights-of-way and administrative site grants and leases?

Socioeconomics

- How would the alternatives affect nearby organic farms or permittees certified organic?
- How would alternatives affect adjacent landowners?

Implementation Costs

- How would the alternatives affect the cost of invasive plant control?

Human Health and Safety

- What is the risk from possible exposure of the public to herbicides for each alternative?
- How will the public be notified that areas have been sprayed with herbicides?
- How would the alternatives affect worker safety?

Issues Considered but not Analyzed in Detail

Several issues identified during internal and external scoping were considered but not analyzed in detail in this EA, and they are not included in the list of issue identified in Chapter 1. In general, the issues have already been addressed in documents to which this EA tiers and a) there is not enough difference between the alternatives relative to the issue for an analysis to aid the decision-maker and b) because of required project design features (see Appendix A, *Project Design Features, Standard Operating Procedures, Mitigation Measures, Conservation Measures, Prevention Measures, and Best Management Practices Standard Operating Procedures and Mitigation Measures*), there is negligible likelihood that detailed analysis of these issues would reveal a potentially significant effect to the human environment which hasn't already been disclosed in the documents to which this EA tiers.

These issues, and the reason(s) for not addressing them in the EA, are as follows:

Treatment Methods and Monitoring

- How will the BLM measure effectiveness? Will monitoring include control sites?

This issue was not analyzed in detail because required monitoring is described under *Background-Invasive Plant Management, Monitoring* in Chapter 2.

- How will the BLM monitor the effects of herbicides on vegetation, water, soil, and other resources?

This issue was not analyzed in detail because the Oregon FEIS, Appendix 3, describes BLM-required monitoring when toxic materials are introduced near sensitive areas such as residences or domestic water supplies. Suggested monitoring points include air, vegetation soil, and water (USDI 2010a:474-5). The Oregon Record of Decision goes on to require at least three years of monitoring at the Oregon-wide level for FEIS-identified environmental concerns, and lists several examples where resource concerns or herbicide applications would trigger monitoring consideration (USDI 2010b:16). The Oregon Record of Decision also requires drift monitoring of all aerial application of ALS-inhibitors conceivably affecting private lands or Special Status species (see *Background-Invasive Plant Management, Monitoring* in Chapter 2 of this EA).

- How can the EA ensure alternatives to herbicides are used first, herbicides are used only where absolutely necessary, and use is limited and decreases in the future?

This issue was not analyzed in detail because existing Department of the Interior policy, applicable to all alternatives, states that, "Bureaus will accomplish pest management through cost-effective means that pose the least risk to humans, natural and cultural resources, and the environment" and requires bureaus to "[e]stablish site management objectives and then choose the lowest risk, most effective approach that is feasible for each pest management project" (USDI 2007c), and "Determine, for each target pest, the possible courses of action and evaluate relative merits for controlling the pest with the least adverse effects on the environment" (Chemical Pest Control Handbook, BLM Manual 9011 - USDI 1992a)(USDI 2010a:68). By definition, noxious weeds are difficult to control and herbicide applications may be necessary to prevent undue degradation and promote land health.

Given the continued spread of invasive plants and an increasing emphasis on protecting threatened habitats, it is unlikely the need for effective invasive plant control would decrease in the foreseeable future.

Air Quality and Climate

- How would the use of fossil fuels and carbon used to produce herbicides impact carbon pollution?

This issue was not analyzed in detail the effects of BLM treatment methods on the release of carbon dioxide and other regulated pollutants were analyzed on a more appropriate regional scale in the Oregon FEIS (USDI 2010a:163-168). That analysis reports that the Lakeview Air Quality Maintenance area may experience short-term visibility impairment because of burning related to rehabilitation of annual grass areas, and that issue is analyzed in this EA. The amount of carbon used to manufacture the various herbicides was not included in that analysis because it is unknown. However, given that the newer herbicides are typically used in lower quantities, the total pounds of herbicide used is expected to be lower under the Proposed Action than under the No Action Alternative (USDI 2010a:80, comparison of total pounds between Alternatives 2 and 3).

Wildlife

- How would the alternatives affect wildlife by direct contact or ingestion of herbicides on browse or prey species, especially smaller species that are unable to move away from treatments?

The Oregon FEIS notes that some sessile animals, such as mollusks and other invertebrates, ground-dwelling mammals, or pre-fledgling birds could be restricted to the treatment area. These organisms could be adversely affected by broad scale treatments using herbicides with moderate to high toxicity (USDI 2010a:246). The risk tables (see Appendix D, *Herbicide Risk Tables*) indicate, however, that the risk from direct spray is low or zero for almost all scenarios involving typical application rates, and is moderate for five herbicides applied at maximum rates (USDI 2010a:96-98, and discussion at 247-250). Exposure is reduced because relatively intact habitats would be spot treated. Broadcast or aerial treatments would only occur where invasive plants are wide spread.

- How would the alternatives affect lynx and wolves on the Resource Area?

Lynx and wolves have not been detected on the Resource Area, although there is marginal habitat and they are assumed an occasional visitor to the area. Invasive plant control treatments are not expected to disturb or affect these species other than to protect or restore native vegetation contributing to their habitats.

Wild Horses

- How would the alternatives affect forage and habitat for wild horses?

Treatments under both alternatives would be directed only at invasive plants. Most invasive plants provide poor feed and habitat for wild horses. Invasive annual grasses could be fed upon, but herbicide treatments are generally applied pre-emergent or when plants are very small. The decrease in the spread of invasive plants under the Proposed Action, described in the *Invasive Plant* section of this EA, would provide a corresponding percentage increase in the protection of existing forage and habitat for wild horses, and reduce the number of invasive plants toxic to wild horses (USDI 2010a:270).

Recreation

- How would treatments affect the recreational experience, including conditions in campgrounds and other recreation areas?

The Oregon FEIS notes that under the No Action Alternative and under Alternative 3 (comparable to the Proposed Action), herbicide use in particular could result in brown vegetation and temporary closures of recreation sites and trailheads, potentially inconveniencing users but reducing exposure. The FEIS notes that the additional herbicides available under Alternative 3 would "often allow the use of an herbicide that is more target specific and generally less toxic to humans, and more effective in lower doses, thereby reducing the adverse impacts of herbicide use on the recreational resource and reducing the chance for accidental exposure to recreationists" (USDI 2010a:308-9). An issue regarding the potential health risks of actual exposure is included in the *Human Health and Safety* section of Chapter 3. Treatments that require a recreation site to be closed are usually scheduled away from peak use seasons, and treatments on nearby sites are staggered so all sites in an area would not be closed at the same time. An existing Standard Operating Procedure requires postings to list nearby alternative recreation areas. Herbicide-related closures are typically a day or less, unless restoration activities require a longer time for the establishment of new plants.

- How would herbicide treatments affect pets brought to recreation areas?

Required posting of recreation and other public and subsistence use sites (see Appendix A, *Project Design Features, Standard Operating Procedures, Mitigation Measures, Conservation Measures, Prevention Measures, and Best Management Practices Standard Operating Procedures and Mitigation Measures*) would notify the public of treatment methods, hazards, and times. It is highly unlikely a pet would suffer a toxic herbicide dose once site closure periods have passed.

- How would the alternatives affect the availability of big game species (e.g., deer, pronghorn, California bighorn sheep, or elk) and game birds (e.g., quail, pheasant, or chukars) for hunting and wildlife viewing?

The Oregon FEIS notes that treatments would be focused on invasive plants and generally would "not [be] applied to extensive acreage across all occupied wildlife habitat. It is likely that larger animals and birds would avoid the treatment area during treatment because of noise and activity. Animals that temporarily leave the treatment area have reduced risk of directly ingesting the herbicide while grooming, or from ingesting herbicides on vegetation or prey (insects or other animals that were directly sprayed), because most of the herbicides proposed in this EA have a very short active period where wildlife toxicity could occur" (USDI 2010a:246). Further, native wildlife may use invasive plants but they are seldom dependent upon them; they would typically fare better with native vegetation (USDI 2010a:252). Large animal habitat stands to gain from the control of invasive plants (USDI 2010a:251-2). Further, the Resource Area avoids conducting aerial operations in some hunting areas during hunting seasons, particularly during bighorn sheep or pronghorn season. See the *Wildlife* section earlier in this Chapter for the effects to wildlife from implementation of the alternatives.

Environmental Justice

- How would the use of herbicides affect minorities and low-income populations?

Executive Order 12898 requires Federal agencies to "identify and address the disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations." This applies to users of BLM-administered lands and facilities, and to contractors and others who would implement the selected alternative. The Oregon FEIS analysis found that although existing BLM Standard Operating Practices, Mitigation Measures, and tribal consultation would reduce the likelihood of herbicide exposure to low income populations and tribes doing subsistence or ceremonial gathering, there was a small and growing risk of disproportionate adverse effects to these groups (USDI 2010a:331-333). The level of such gathering is low; there is no major special forest products gathering except some juniper cutting for firewood. In Lakeview, risk to low income workers is mitigated in part by most of the herbicide applications being applied by BLM seasonal employees or by contract with established companies hiring local residents. There is no evidence to suggest other avenues of exposure would affect these groups.

It should also be noted that, as described in the Oregon FEIS, the Proposed Action could benefit low-income ranchers and other residents by reducing costs and losses associated with noxious weeds from BLM-administered lands intruding on private lands.

Socioeconomic

- How will the fact that manual treatments create jobs and avoid herbicides be weighed into treatment method selection?

Creating jobs and avoiding herbicides are not objectives per se. The selection of a treatment method is guided by Department of the Interior policy which includes "Bureaus will accomplish pest management through cost-effective means that pose the least risk to humans, natural and cultural resources, and environment" and requires bureaus to "[e]stablish site management objectives and then choose the lowest risk, most effective approach that is feasible for each pest management project" (USDI 2007c). The amount of the invasive plant control need that can be accomplished is limited by available funding, so efforts are made to efficiently treat as much area as possible. Herbicides are often the least habitat and ground-disturbing treatment available.

The integrated invasive plant management approach includes manual and mechanical treatments, so if these are the most-effective, lowest-risk procedures to meet a specific objective, they would be chosen and any job benefits could accrue. However, the other possible treatments—targeted grazing, biological control, prescribed fires, planting and seeding, and herbicide application—also either create jobs or provide work for existing BLM employees and contractors, so they are not without economic benefit.

Human Health and Safety

- Are there health risks to firefighters from fires in recently sprayed areas?

An analysis of the risk from volatilization of herbicide residues was done as part of the 1991 *Vegetation Treatment on BLM Lands in Thirteen Western States FEIS*. Based on this assessment, neither workers nor the public would be expected to be at risk from herbicide residues volatilized in a brown-and-burn operation (USDI 1991a).

Decision to be Made

The Resource Area Manager for the Lakeview Resource Area will decide whether to adopt the Proposed Action and whether to modify the action based on factors identified during public review of this EA and Finding of No Significant Impact. The decision-maker will make the decision based on the analysis of the issues and how well the alternatives respond to the *Need* and *Purposes*. The decision-maker will also decide whether the analysis reveals a likelihood of significant adverse effects from the selected alternative that cannot be mitigated or that were not already revealed in one of the Environmental Impact Statements that this EA tiers to. The decision would apply to all invasive plant control activities conducted on BLM-administered lands within the Lakeview Resource Area by its own personnel, contractors, permittees, grantors, leasees, and others conducting activities on BLM-administered lands.

Consultation

Tribes

There are four potentially affected Native American tribes with rights in the Lakeview Resource Area. These are the Klamath Tribes, the Confederated Tribes of Warm Springs, the Burns Paiute Tribe, and the Fort Bidwell Indian Community. These tribes were sent letters in June 2011 and again in August 2013 describing the EA and asking if they wished to enter into Government-to-Government consultation. A fifth tribe (Fort McDermitt Paiute-Shoshone) with an interest in the area was also contacted. Prior and subsequent discussions with Resource Area staff identified many areas and resources about which one or more Tribes have concerns. These concerns and their relationship to the alternatives are discussed in the *Native American Interests, Resources, and Concerns* section in Chapter 3. This section describes future actions that would be undertaken by the BLM annually to help ensure resources important to the tribes are protected. The four potentially affected tribes were contacted by mail and phone prior to the beginning of the public review period and invited to consult. All five tribes received the EA during the public comment period.

National Marine Fisheries Service

The Resource Area administers a few acres in the uppermost reaches of the Sacramento and Deschutes Rivers at least 40 miles from the nearest Federally Listed anadromous fish. Because of distance and types of treatments proposed, the Proposed Action poses no credible possibility for effects to anadromous fish.

U.S. Fish and Wildlife Service

There are two Federally-listed fish, the Warner sucker and the Foskett speckled dace, on BLM-administered lands within the Resource Area that could potentially be affected by the Proposed Action. In addition, the Hutton tui chub is located on private lands surrounded by BLM-administered lands. Wolf and Canada lynx have not been detected on the Lakeview Resource Area, and thus have not been included in the consultation process. There are no other Federally-listed, proposed, or candidate species on the Resource Area.

BLM prepared a Biological Assessment (BA, USDI 2015) addressing the 3 fish species and determined that the:

- proposed treatments will have "no effect" on the Hutton tui chub or its habitat.
- proposed treatments within the Section 7 consultation Action Area[3] "may affect, and are likely adversely affect" the Warner sucker and the Foskett speckled dace.
- proposed treatments will have "no effect" on Foskett speckled dace critical habitat because no critical habitat has been designated.
- proposed treatments "may affect, and are likely to adversely modify" Warner sucker critical habitat in the short-term.
- proposed treatments outside of the Action Area (the majority of the Lakeview Resource Area) would have "no effect" on either the Warner sucker or the Foskett speckled dace or its habitat, specifically because neither of these species or its habitat is present.

BLM has initiated formal consultation with the U.S. Fish and Wildlife Service on the three fish species and is seeking concurrence regarding its Biological Assessment. The Action Area extends from the upper watershed extent of BLM-administered lands downstream to the Warner Lakes and Coleman Lake and includes occupied Warner sucker habitat, Warner sucker designated critical habitat, and occupied Foskett speckled dace habitat (see Figure 1-2).

Until formal consultation on the three fish species is complete, the BLM shall only treat in areas outside of the Action Area which complies with the U.S. Fish and Wildlife Service Aquatic Restoration Biological Opinion II (ARBO II, USDI 2013c). Proposed treatments outside of the Action Area would have "no effect" " on either the Warner sucker or the Foskett speckled dace or its habitat, specifically because neither of these species or its habitat is present.

Once formal consultation on the BA for Integrated Pest Management, Lakeview Resource Area (USDI 2015) is complete, a Decision Record will be signed for the area covered by the consultation (see Figure 1-2) that includes Project Design Criteria outlined in the BA.

Tiering and Reference

This EA tiers to the Oregon FEIS for its herbicide treatments analysis.[4] This EA also incorporates by reference elements of the 2007 *Vegetation Treatments on BLM Lands in in 17 Western States Programmatic Environmental Report,* which describes the integrated vegetation management program and discloses the general effects associated with non-herbicide control methods (USDI 2007b). The EA also tiers to the *Lakeview Proposed Resource Management Plan and Final Environmental Impact Statement* (USDI 2003a).

[3] An Action Area is defined as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR section 402.02).
[4] The Oregon FEIS tiers to the 2007 Vegetation Treatments Using Herbicides on Bureau of Land Management Lands in 17 Western States Programmatic Environmental Impact Statement (PEIS) and incorporates the PEIS in its entirety as Appendix 1.

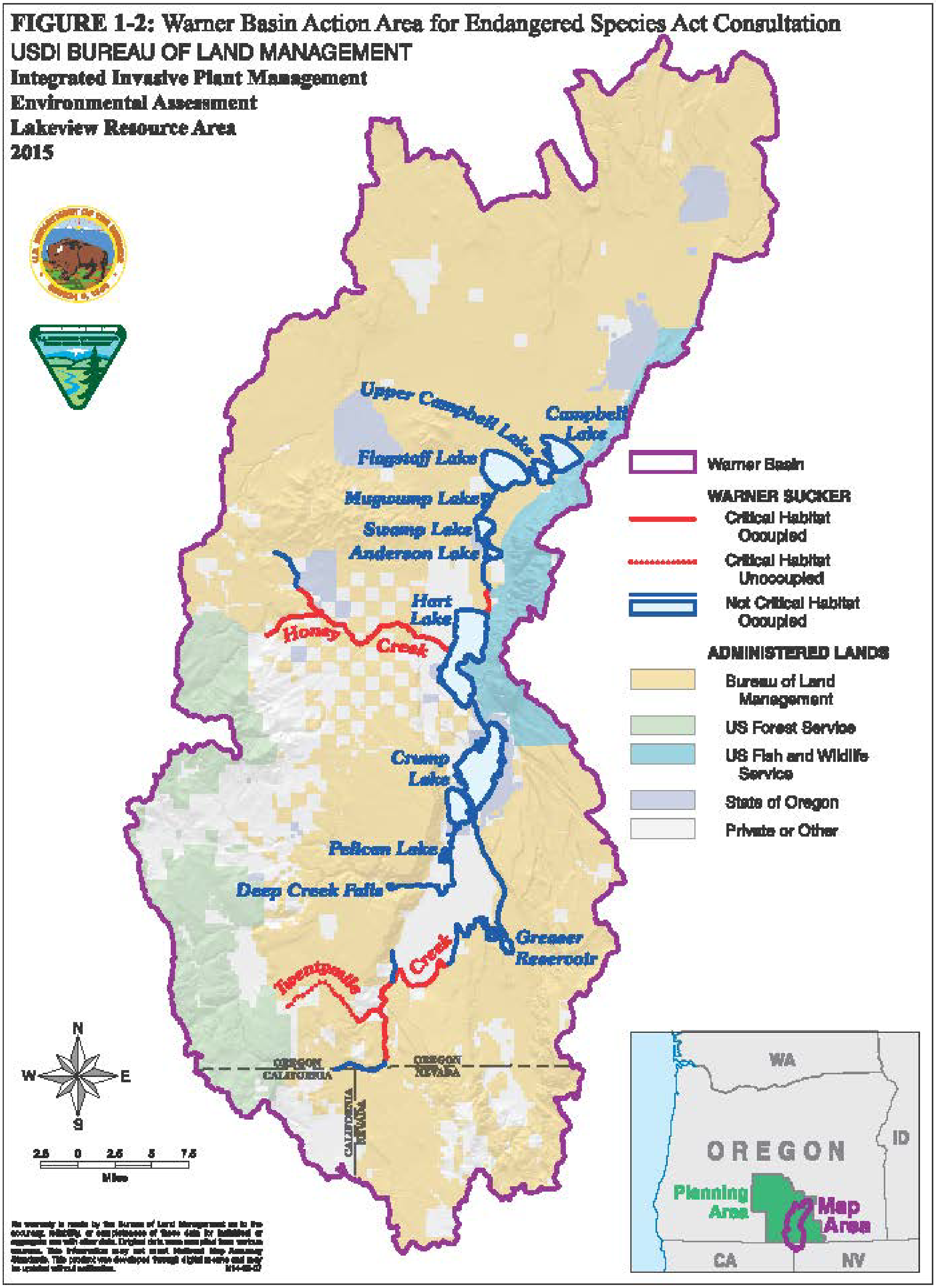


FIGURE 1-2: Warner Basin Action Area for Endangered Species Act Consultation
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Consistency with other Plans and Laws

Several Federal laws also direct the BLM to aggressively manage invasive plants and other vegetation to improve ecosystem health and reduce fire risk. Section 302(b) of the *Federal Land Policy and Management Act* of 1976 directs BLM to "take any action necessary to prevent unnecessary or undue degradation of the lands" (43 U.S.C. § 1732(b)(2)). Executive Order 13112 (February 1999) requires Federal Agencies to "(i) prevent the introduction of invasive species; (ii) detect and respond rapidly to and control populations of such species in a cost-effective and environmentally sound manner; (iii) monitor invasive species populations accurately and reliably; [and] (iv) provide for restoration of native species and habitat conditions in ecosystems that have been invaded…" In particular, the *Carlson-Foley Act* of 1968 (43 U.S.C. §§ 1241-1243) and the *Plant Protection Act* of 2000 (7 U.S.C. § 7702), authorize the BLM to manage noxious weeds and to coordinate with other Federal and State agencies in activities to eradicate, suppress, control, prevent, or retard the spread of any noxious weeds on Federal lands. The *Federal Noxious Weed Act* of 1974 (7 U.S.C. § 2814(a)) established a program to manage undesirable plants, implemented cooperative agreements with State agencies, and established integrated management systems to control undesirable plant species.

Lakeview Resource Management Plan and Record of Decision

The *Federal Land Policy and Management Act* (1976) requires that all management decisions be consistent with the approved land use plan (43 CFR 1610.5-3). The *Lakeview Resource Management Plan and Record of Decision* (USDI 2003b) is the primary governing land use plan for the area and provides the following goals and management direction related to noxious weed management, vegetation management, and fire restoration activities:

Invasive Plants: The Resource Management Plan includes a Management Goal of controlling the introduction and proliferation of noxious weeds and competing undesirable vegetation[5] (USDI 2003b:37). Other management direction in the Resource Management Plan pertinent to invasive plants includes conducting fire area rehabilitation to "…minimize the possibility of…invasion of weeds" and "reduce the invasion and establishment of undesirable or invasive vegetation species" (USDI 2003b:81); a Management Goal to "restore, protect, and enhance the diversity and distribution of desirable vegetation communities, including perennial native and desirable introduced plant species" (USDI 2003b:28); a Management Goal to "Protect healthy, functioning ecosystems consisting of native plant communities" (USDI 2003b:29); and "[noxious weed control E]mphasis is on detection of new invaders and inventory and control in proven hot spots such as roads, rights-of-way, waterholes, and recreation sites, but with an expanded program to inventory areas that are less disturbed, remote, or previously uninventoried. Weed sites will be restored to desirable species. Control efforts will be expanded to include any new sites detected. Education and outreach efforts will be expanded to include areas outside of Lake County in an effort to "head-off" species that may spread into the resource area" (USDI 2003b:37).

In addition, a list of herbicides that was tentatively expected to be made available for future use (once the injunction was addressed for BLM-administered lands in Oregon) was also included in the Resource Management Plan, Appendix G. This list has effectively been amended by the Oregon FEIS and Record of Decision (USDI 2010a, 2010b).

Special Management Areas: For Special Management Areas (Areas of Critical Environmental Concern (ACECs) and Research Natural Areas (RNAs)), relevant Resource Management Plan direction states "Noxious weeds would be aggressively controlled in all ACEC/RNAs using integrated weed management methods such as, biological control, site-specific spraying [of herbicides], and grubbing by hand, consistent with protection or enhancement of relevant and important values…" (USDI 2003b:57).

[5] The Lakeview Resource Management Plan definition for noxious weeds includes invasive plants. "Undesirable" native vegetation, while addressed in the Resource Management Plan, is outside the scope of this EA.

All management activities, including invasive plant control measures, proposed in Wilderness Study Areas would be consistent with the latest Wilderness Study Areas management policy (USDI 2012b). Direction for treatment of invasive plants within stream sections identified as suitable for designation as a Wild and Scenic River corridor is the same as for ACECs (USDI 2004).

Fire Management: The Resource Management Plan includes a Fire Management Goal to "[r]ehabilitate burned areas to … minimize the possibility of wildland fire recurrence and to minimize the possibility of invasion of weeds," and direction that "Emergency fire rehabilitation funds[6] may be used to: ….reduce the invasion and establishment of undesirable or invasive vegetation species" (USDI 2003b:81).

Warner Wetlands ACEC Plan Amendment and Management Plan

The Warner Wetlands Plan Amendment designated the Warner Wetlands as an ACEC. A subsequently developed management plan for this area contains an overall management goal emphasizing the preservation and protection of the unique wildlife, ecological, cultural, and geologic values identified within the ACEC boundary (USDI 1990).

Lake Abert ACEC Plan Amendment and Management Plan

The Lake Abert Management Plan Amendment designated Lake Abert as an ACEC and included a management plan for this area with specific invasive plant management direction:

> "An integrated noxious weed control program would be continued and include treatment of a large, existing Mediterranean sage infestation on the eastern edge of Lake Abert, extending up to the top of the rim and small satellite populations scattered throughout the area. There have been several attempts at establishing biological control organisms on this species in recent years. Additional infestations of Mediterranean sage and other noxious weeds will be treated as the need arises." (USDI 1996b)

ODFW Greater Sage-Grouse Conservation Assessment and Strategy for Oregon

A substantial portion of the Oregon Department of Fish and Wildlife (ODFW) *Greater Sage-Grouse Conservation Assessment and Strategy for Oregon* (ODFW 2005) conservation strategy was adopted by the *Lakeview Resource Management Plan and Record of Decision* through plan maintenance. In particular, this strategy calls for "minimizing the impact of noxious weeds on sage-grouse habitat." The conservation strategy includes guidelines for:

- prevention of invasion into new areas;
- conducting systematic and strategic detection surveys;
- controlling of invasive plants using the most effective tools (with a recognition that herbicides are often the most effective tool);
- containment of large infestations (using techniques such as seeding, biological control, and grazing);
- prioritizing areas for treatment based on likelihood of success; and,
- development of rehabilitation/restoration plans for degraded areas

(ODFW 2005:79-80).

[6] Now there are separate funds and objectives for Emergency Stabilization versus Burned Area Rehabilitation.

Settlement Agreement regarding Lands with Wilderness Characteristics

Following lawsuits against the Lakeview and Southeastern Oregon Resource Management Plans by the Oregon Natural Desert Association and others, the BLM entered into a Settlement Agreement on June 7, 2010, that includes (in part) a commitment to determine which BLM land inventory units, or which 2004 or 2005 citizen inventory units, possessed wilderness character (USDI et al. 2010). That agreement precludes initiating new projects in such units where such projects would diminish the size or cause the entire unit to no longer meet the criteria for wilderness character, at least until they have been inventoried and found not to contain such character. A discussion of whether, and what parts of, the alternatives comply with this agreement is included in Chapter 3, *Lands with Wilderness Characteristics* and Appendix B, *Additional Information about Lands with Wilderness Characteristics*.

Vegetation Treatments Using Herbicides on BLM Lands in Oregon FEIS and Record of Decision

This EA tiers to, and in consistent with, the Oregon FEIS and Record of Decision. The 2010 Record of Decision for *Vegetation Treatments Using Herbicides on BLM Lands in Oregon* requires, with few specific exceptions, the preparation of new site-specific analyses before herbicides other than 2,4-D, dicamba, glyphosate, or picloram can be used (USDI 2010b). This EA provides the site-specific analysis for the Lakeview Resource Area. Both the No Action Alternative and the Alternative selected by the Decision Record for this EA must adhere to the existing Standard Operating Procedures and other elements adopted by the Oregon Record of Decision (USDI 2010b:30). The “other elements” are the 2007 Mitigation Measures from *the Vegetation Treatments Using Herbicides on BLM Lands in 17 Western States Programmatic FEIS* (PEIS) shown together with the Standard Operating Procedures in the *Oregon Record of Decision* Attachment A (USDI 2010b:33), the Conservation Measures for Special Status species shown in Oregon Record of Decision Attachment B (USDI 2010b:47), and the Oregon Mitigation Measures[7] included in the Oregon Record of Decision (USDI 2010b:12-15), all included in Appendix A of this EA, as well as the typical and maximum application rates if they are less than those in the existing district NEPA documents (USDI 2010b:10-11).

Greater Sage-Grouse Interim Management Policies and Procedures

The current BLM interim policy for Greater Sage-Grouse habitat management is contained in IM 2012-043. This guidance will remain in effect until plan amendments can be completed throughout the range of the species that address a comprehensive conservation strategy (USDI 2012a). Once a comprehensive strategy is adopted, it would replace these interim measures. The IM focuses on Preliminary Priority Habitat[8] and Preliminary General Habitat. Specific to this EA, and includes various direction aimed at limiting the spread of invasive plants.

Oregon Sub-Region Greater Sage-Grouse Draft Resource Management Plan Amendment and Environmental Impact Statement

The *Lakeview Resource Management Plan* direction is expected to be amended with completion of the Oregon Sub-Region Greater Sage-Grouse Resource Management Plan Amendment and Environmental Impact Statement and appurtenant Record of Decision. The Draft EIS has undergone public review, and the Final EIS is currently being prepared. The Preferred Alternative in the Final EIS is expected to include management direction to control

[7] Mitigation measures are practices or limitations adopted to mitigate potential adverse effects identified in the PEIS and Oregon FEIS analysis.
[8] Also known as Preliminary Priority Management Areas

cheatgrass in the proximity of Greater Sage-Grouse leks. The Record of Decision will replace both IM 2012-043 and the ODFW (2005) strategies.

Federal Strategy to Promote the Health of Pollinators

On June 20, 2014, the President issued a memorandum for heads of executive departments and agencies directing the establishment of a Pollinator Health Task Force, chaired by the Secretary of Agriculture and Administrator of the EPA. The memorandum directs the creation of national Pollinator Health Strategy with research, education, and public-private partnership objectives. It further directs agencies to develop plans and practices for increasing and improving pollinator habitat, including the use of pollinator-friendly species in future restoration and rehabilitation projects, following wildfires, and in landscaping.

Nothing about the Proposed Action or the analysis in this EA conflicts with the objectives of this new direction. Memorandum-described pollinator direction, as it is developed, may supplement but are not expected to conflict with, treatments described in this EA. Further, the pollinator examinations included in some of the newer herbicide Risk Assessments, with the exception of glyphosate (upper bound estimate, maximum rate), display no risk to pollinators from the use of herbicides. It should be noted that herbicides have considerably different modes of action than the insecticides implicated in recent bee deaths in Oregon.

Chapter 2 – The Alternatives

Introduction

This Chapter describes two alternatives in detail, the No Action Alternative and the Proposed Action. These are the alternatives addressed in the effects analysis in Chapter 3. This Chapter also describes other alternatives that were considered but not carried forward for detailed study.

Both the No Action and the Proposed Action Alternatives address the dynamic nature of invasive plants[9] including increasing numbers of invasive plant species, different plant physiologies, and changing conditions of infestations. Due to the nature of invasive plants and the size of the land base involved and the nature of multiple uses that take place on it, invasive plant control would remain an ongoing need. The intent of the program is to manage invasive plants in order to minimize ecological or economic damage.

Background – Invasive Plant Management

The term "invasive plant" includes noxious weeds. The No Action Alternative focuses primarily on noxious weeds, so "noxious weeds" is used in this Chapter when referring only to the No Action Alternative or existing program.

As noted in Chapter 1, the Proposed Action would make only two changes to the existing Noxious Weed Management Program: the addition of 10 more herbicide active ingredients, and the addition of non-native invasive plants other than noxious weeds to the types of plants that can be treated with herbicides. Other elements on the program would stay the same. For context and a better understanding of the Resource Area's integrated invasive plant management program, the elements of the program that would remain unaffected by the alternatives are presented in this section. These elements are the product of decades of laws, Executive Orders and BLM and Department of the Interior policies and direction, grouped here by the goal statements in the BLM's *Partners Against Weeds, Final Action Plan for the BLM* (USDI 1996a).

Prevention, Detection, Education, and Awareness

These are the highest priority for the management of invasive plants. The Resource Area maintains a Resource Area Weed Prevention Schedule, revised annually or semiannually, that outlines prevention steps from cleaning equipment before moving onto BLM-administered lands to helping with an invasive plant education booth at the County fair (see Appendix F). Other activities will continue to educate employees, contractors, and the public; publish news articles; sign all major recreation sites; require weed-free forage for pack stock and weed-free seed for re-vegetation projects; and, coordinate with County, State, and other agency invasive plant control programs and transportation departments.

Additionally, BLM policy requires that planning for ground-disturbing projects in the Resource Area, or those that have the potential to alter plant communities, include an assessment of the risk of introducing noxious weeds[10]. If there is a moderate or high risk of spread, actions to reduce the risk must be implemented and monitoring of the site must be conducted to prevent establishment of new infestations (USDI 1992b). A complete list of prevention measures applicable to projects or vegetation treatment actions is included in Appendix A, *Project Design*

[9] The inclusive term "invasive plants" is used here for simplicity. Herbicide use under the No Action Alternative is limited to noxious weeds, a subset of invasive plants.
[10] Current handbook direction only requires this assessment for noxious weeds.

Features, Standard Operating Procedures, Mitigation Measures, Conservation Measures, Prevention Measures, and Best Management Practices.

Inventory

Inventories are conducted at least every three years to identify new infestations, and annually to update data on the extent and density of established infestations, and to help determine which activities are major contributors to spread so they may be modified with additional invasive plant prevention measures. Inventories particularly focus on road corridors and other rights-of-way, riparian/wetland areas, and public and permittee activity areas such as campgrounds, trailheads, and livestock corrals where invasive plants are most likely to occur and to spread from. Inventories also focus on Special Management Areas such as Wilderness Study Areas and Areas of Critical Environmental Concern because they are a high priority for treatment if a new infestation is found.

While certain inventories may be specific to invasive plants, other inventories also record the presence of invasive plants. Such surveys include clearance surveys for Special Status species, inventories for Special Areas such as RNAs or ACECs, fire monitoring, range condition surveys, and others.

Planning

Setting treatment priorities is primarily driven by the resources that would be adversely affected by the invasive plants such as water, riparian areas, habitats for Special Status species, native plant communities, and certain soils. Other considerations include: the risk of spread (e.g. is it along a road or recreation site where it can be easily picked up and moved long distances, or is it next to a site-disturbing activity that it can spread into); the species and its priority on State and local noxious weed control lists; special management areas such as Wilderness Study Areas or Research Natural Areas; the size of the infested area and whether the site is isolated or near others; if the plants are unacceptably increasing the risk of wildfire; effects on resources or areas important to local tribes; and, the control priorities of BLM neighbors and cooperators. Knowledge of the control methods that would work for each species and that are appropriate for the lands infested is also critical.

Annual Treatment Plans - Within the above priorities, the Resource Area determines potential treatments based in part on available tools and funding, and develops an Annual Treatment Plan prior to the beginning of control treatments in the spring. An interdisciplinary team reviews the plan to ensure it conforms to design and mitigation standards in the relevant NEPA documents, and it is forwarded to interested Tribes with an offer to consult about that year's plans. Annual Treatment Plans also help the Resource Area ensure that required NEPA, Pesticide Use Proposal (PUP), Biological Control Agent Release Proposals, and other authorizations are done in a timely manner.

Integrated Invasive Plant Management

Direct control treatments include manual (e.g., pulling, grubbing), mechanical (e.g., chainsaws, mowing, weed eating), targeted grazing (including early grazing of cheatgrass), biological controls (usually insects), prescribed fires, planting and seeding, and herbicides applied with wands, booms, and aircraft (see additional discussion in the Oregon FEIS: USDI 2010a:68-76). The selection of a treatment method is guided by Department of the Interior policy which includes "Bureaus will accomplish pest management through cost-effective means that pose the least risk to humans, natural and cultural resources, and environment" and requires bureaus to "[e]stablish site management objectives and then choose the lowest risk, most effective approach that is feasible for each pest management project" (USDI 2007c).

If herbicides are used, they are applied only to lands and uses for which they are labeled and only by certified or licensed applicators or persons working under their direct supervision (USDI 2010a:85). Herbicide application methods could include wiping or wicking, spot spraying using backpacks or vehicles with hand wands, vehicles with booms, or aerial. A Pesticide Application Record is completed within 24 hours of the application documenting environmental conditions at the time of treatment as well as actual herbicide use.

Objectives of invasive plant management include control of the highest priority noxious weeds with a goal of eradication, and control of widespread invasive plants to reduce spread, contain existing infestations, and reduce their size and density.

Coordination

The Lakeview Resource Area coordinates invasive plant management activities with local, State, and Federal agencies, tribal governments, and private landowners. Coordination includes the implementation of Prevention and Education activities, sharing of inventory and monitoring information, and developing annual treatment programs. Coordination is done both one-on-one, and within cooperative groups such as the Lake County Cooperative Weed Management Area.[11]

Monitoring

Consistent with BLM direction for monitoring invasive plants and their control, the Lakeview Resource Area Management Plan lists the following required monitoring in its noxious weed section:

> "*Management Goal:* Evaluation of treatments will continue in cooperation with the State of Oregon, Lake County, and private interests as well as, neighboring counties and Federal jurisdictions. Inventories to identify new introductions, distribution, and density of noxious weed infestations will be carried out on an annual basis in cooperation with these entities.
>
> "Known noxious weed sites which are identified for treatment will be visited each year and evaluated for effectiveness of control. Known sites not identified for treatment will be visited on a rotational basis over 3 years. All known sites visited will be located with a global positioning system unit, photographed, measured, and a determination of the need for future treatment will be made.
>
> "Inventories for new noxious weeds will be conducted each year on a 3-year rotation through the Resource Area. All burned areas (natural and prescribed) will be surveyed for noxious weeds for 3 years following the burn. Any newly discovered sites will be located with a global positioning system unit, photographed, measured, and a determination of the need for future treatment will be made.
>
> "Ecological trends due to changes in vegetation composition over time, in areas dominated by competing undesirable plant species, will be measured through periodic rangeland health assessments following procedures outlined in "Interpreting Indicators of Rangeland Health"" (Shaver et al. 2000 cited in USDI 2003b:38).

Additionally, the Oregon Record of Decision requires, for at least five years, that aerial application of acetolactate synthase (ALS)-inhibitors[12] conceivably affecting private lands or Special Status species be monitored for drift (USDI 2010b:17). Other portions of the Oregon Record of Decision-adopted monitoring may be assigned to the Lakeview Resource Area as well. For example, The Oregon Record of Decision specifies that two large imazapic

[11] The Lake County Cooperative Weed Management Area (CWMA) mission is to provide a link between landowners and agencies, and work towards cooperative noxious weed control efforts across the many jurisdictions of Lake County. The Lake County CWMA promotes noxious weed awareness through public/ landowner educations and youth education. The Lake County CWMA is known for planning and facilitating many successful large scale noxious weed control projects across Lake County.

[12] See the *Invasive Plants* section in Chapter 3 for more information about ALS-inhibitors. The five ALS-inhibitors are imazapyr, imazapic, sulfometuron methyl, chlorsulfuron, and metsulfuron methyl.

treatments will be examined approximately one year after treatment, and the resultant report circulated to other districts to help guide future planning with this newly-available herbicide (USDI 2010b:16-17).

Invasive Plant Inventory and Spread Assumptions Common to Both Alternatives

Undetected and/or undocumented invasive plants could be anywhere on the Lakeview Resource Area. This is particularly true for the invasive annual grasses cheatgrass, North Africa grass, and Medusahead rye; detailed inventories have not been conducted and maps have not been created because the Resource Area does not currently have a method for selectively controlling these grasses. However, for the purposes of this analysis, the following Treatment Categories of known or estimated invasive plant sites are considered for control treatments. Not all Categories would be treated in both alternatives.

Treatment Categories

Category 1. Existing documented sites

There are approximately 44,090 acres of documented noxious weed and other invasive plant sites spread throughout the Resource Area. These sites are listed individually on Table E-1, *Documented Invasive Plant Sites,* in Appendix E, and summarized on Table 2-1 and displayed in Figure 2-1. These maps are regularly updated, the areas are regularly monitored, the invasive plant species at the site are typically recorded, and treatment options have been identified. Eighty-seven percent of these sites are noxious weeds for which the Resource Area currently has effective or semi-effective treatments available[13], and the 3,856 acres treated in fiscal year 2013 are now entirely within this 87 percent (although some sites were in Category 2 or 3 below when first treated). Other invasive plants are known on the Resource Area but are lower priority for treatment at this time (see Table 2-2). These species may be treated during adjacent treatments or if they begin acting invasively.

Category 2. Future spread from existing sites

The 44,090 acres of documented sites are increasing. Invasive plants at established sites are spreading at the edges, and they are spreading by seeds or other propagules to new sites sometimes far from the existing site. The noxious weed portion of these acres (87 percent of the 44,090 acres) is estimated to be spreading about 12 percent annually (USDI 2010a:135).[14] Treatment methods are generally known; these are species already known in the Resource Area and control methods are described under the alternative descriptions, albeit for different sites. Most of the new sites are along streams, or along roads and other human travel and recreation sites.

Category 3. New invaders

Species of invasive plants previously unknown in the Resource Area are arriving via a variety of vectors, including people, vehicles, livestock, other animals, wind, in “weed free” seed or forage, on other plants intentionally moved, and other sources. This happens from none to a few times per year, and sites are usually, but not always, less than an acre when discovered. Treatment needs are unknown, because the species is unknown.

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[13] The other 13 percent is non-noxious invasive plants that cannot be treated with herbicides because of a court injunction specific to the No Action Alternative, and are not effectively treated with non-herbicide methods.

[14] Under the Proposed Action, the Oregon FEIS estimates the spread rate would be reduced over time to seven percent (USDI 2010a:152). These numbers are discussed in more detail in the *Invasive Plants* section near the beginning of Chapter 3 of this EA.

Figure 2-1. Documented Invasive Plant Sites

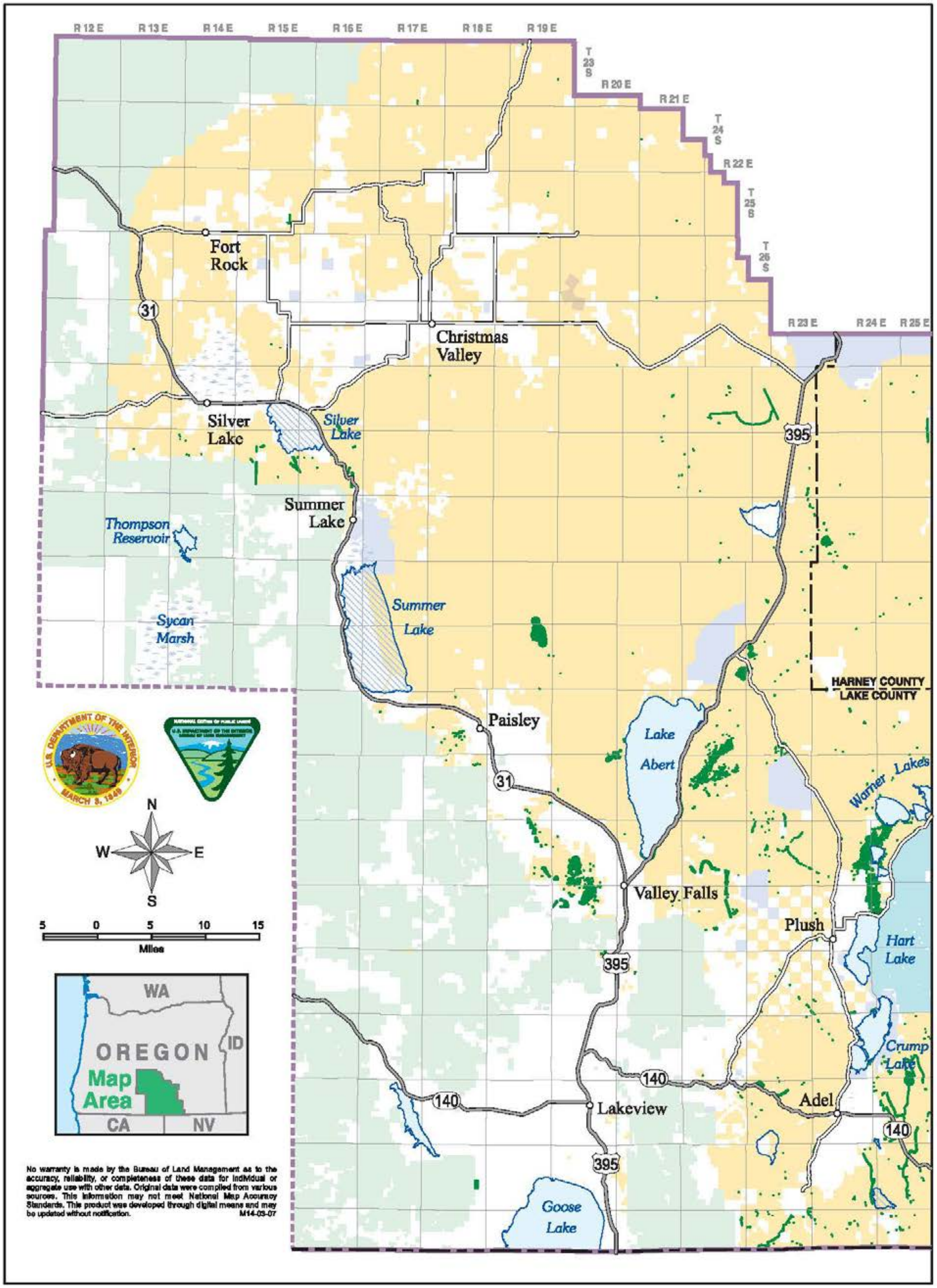

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Figure 2-1. Documented Invasive Plant Sites

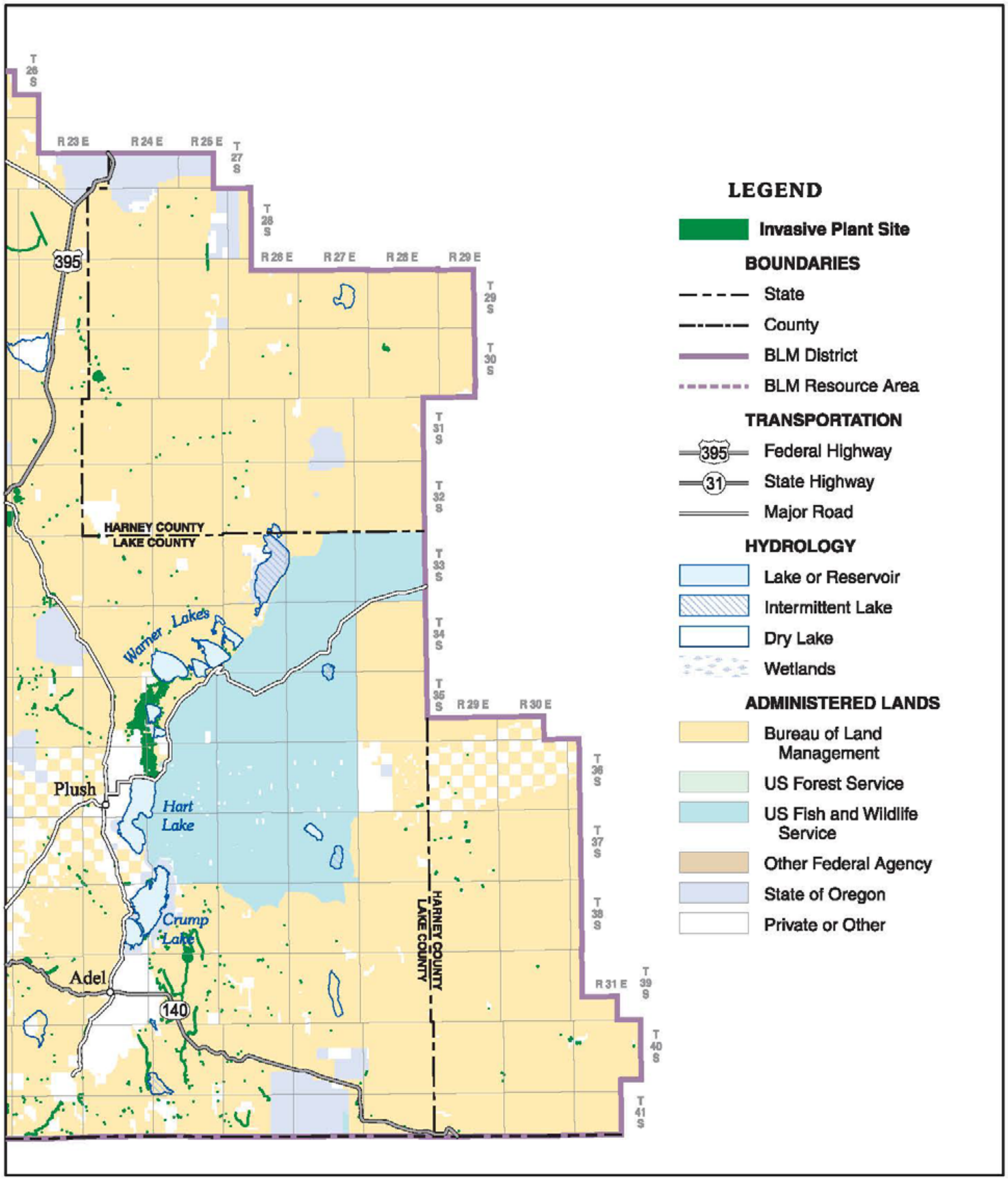
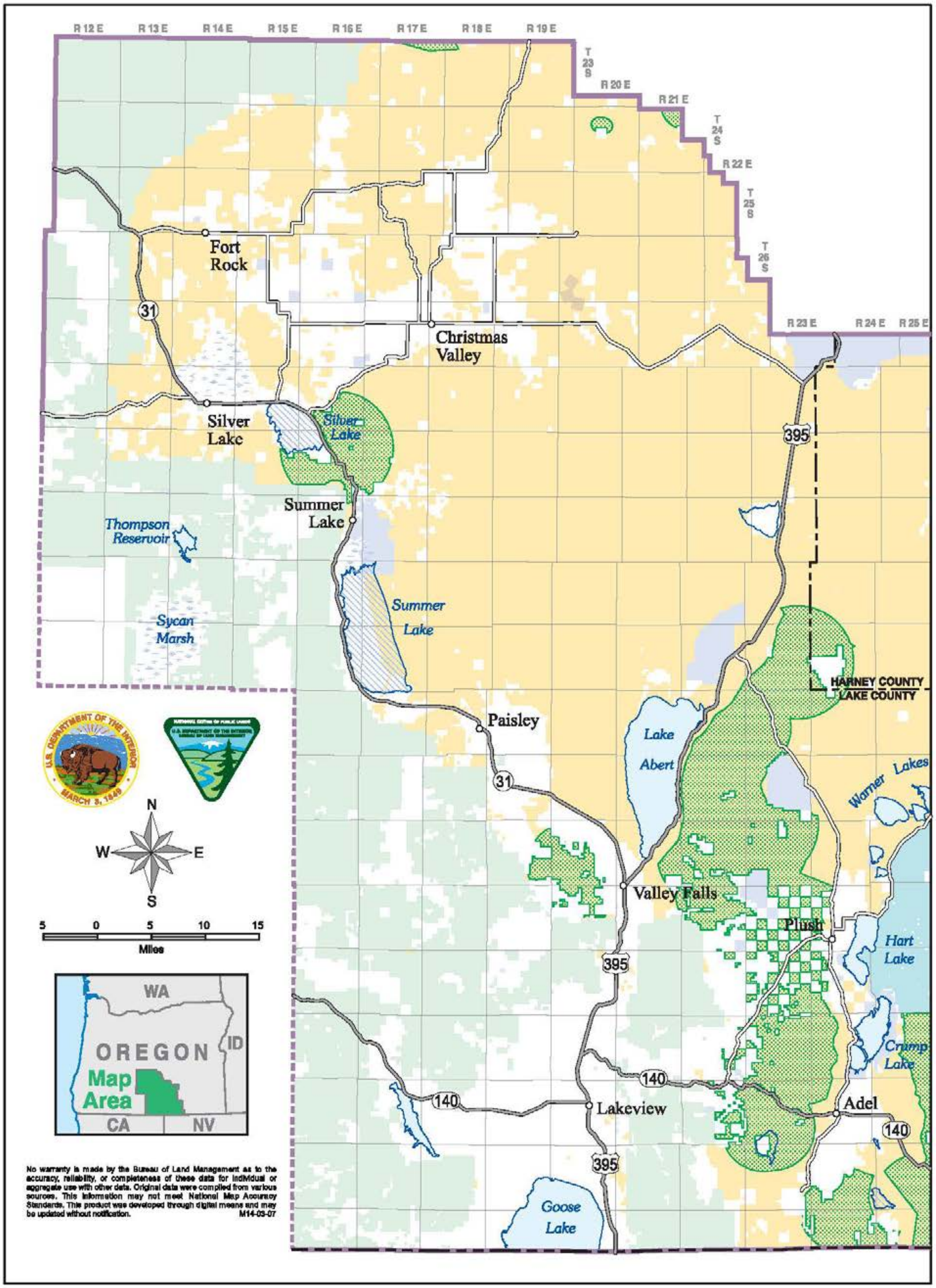


Figure 2-2. Greater Sage-Grouse Preliminary Priority Management Area



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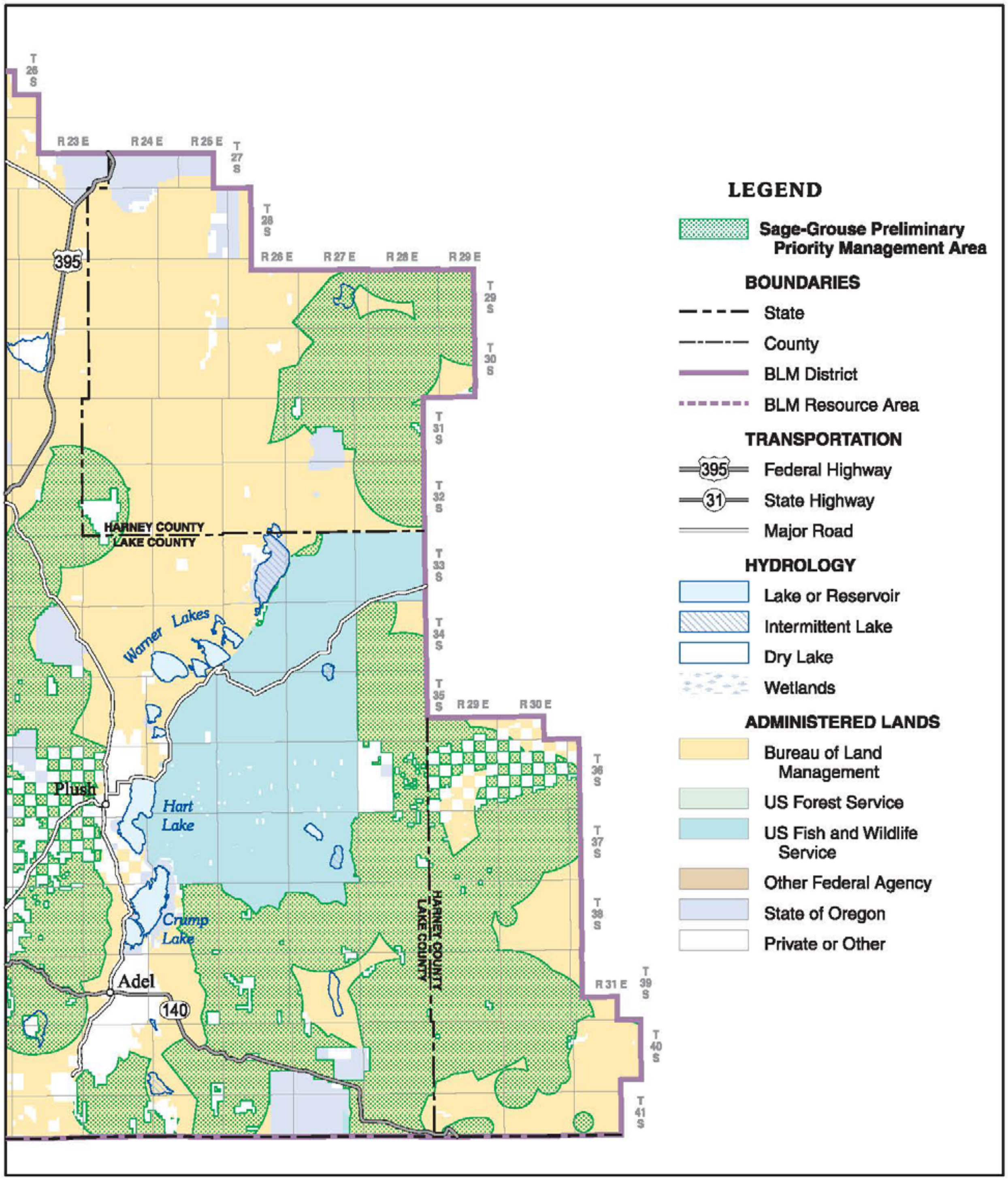

Figure 2-3. Recent Wildfires and Cheatgrass Dominated Plant Communities from Ecological Site Inventory

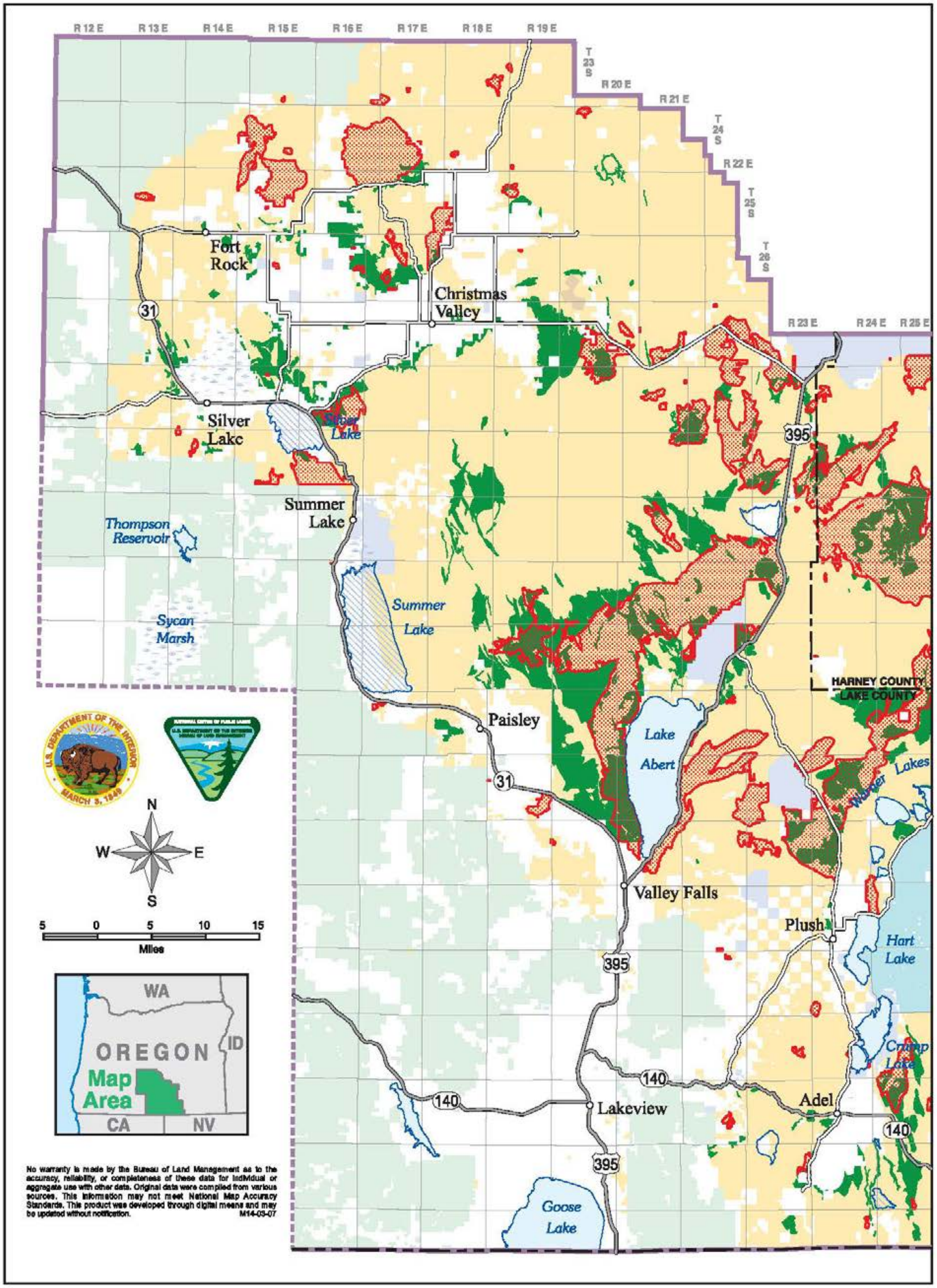

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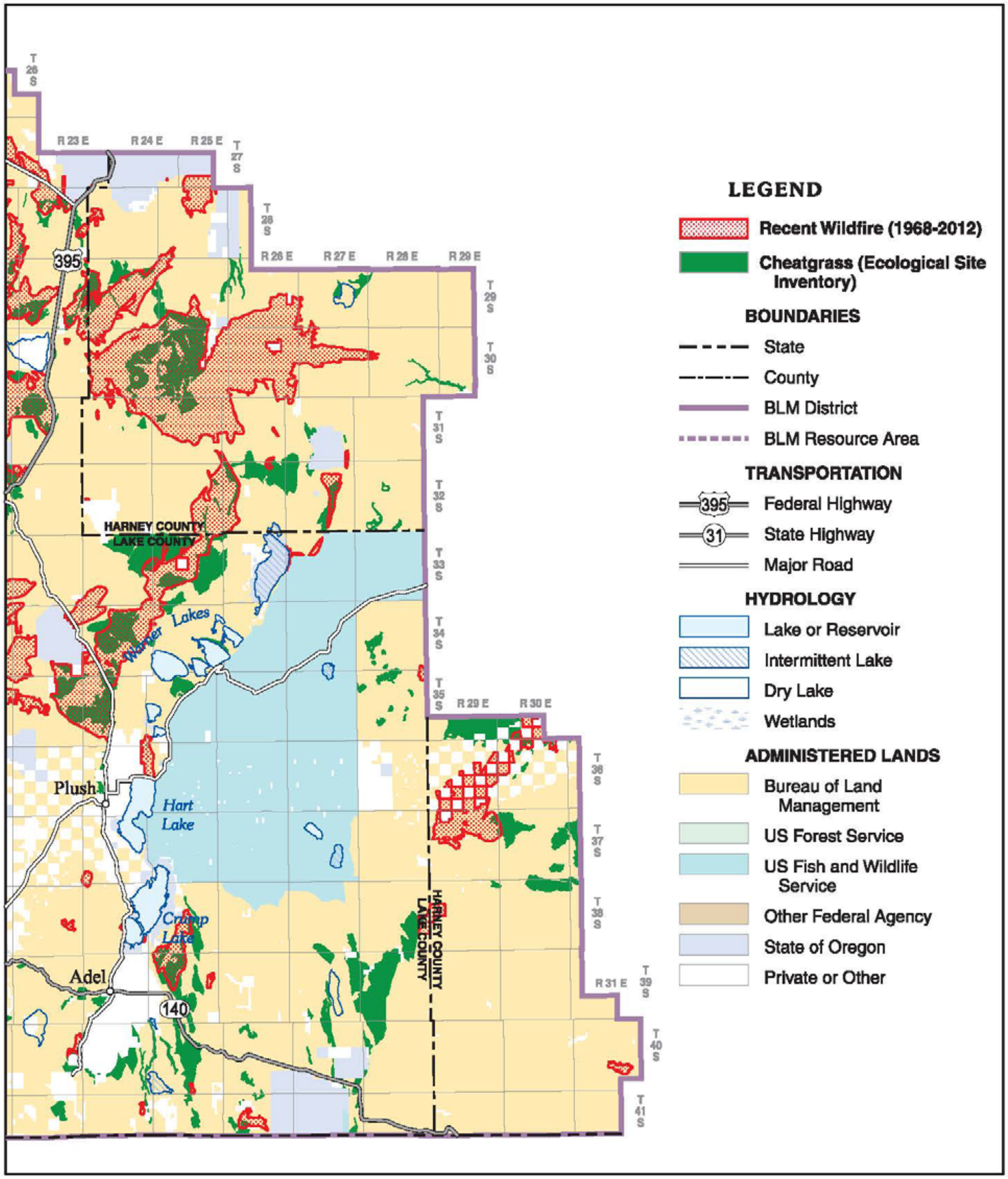
Figure 2-3. Recent Wildfires and Cheatgrass Dominated Plant Communities from Ecological Site Inventory



Category 4. Post fire emergency stabilization

Certain emergency stabilization treatments are conducted immediately following wildfires, in order to protect sensitive resources like soils from being lost to subsequent wind and rain events. Late-season fires can be followed within a few weeks by large rain events. Revegetation is a typical treatment, and herbicides can be used to control invasive annual grasses and other invasive plants from outcompeting native plant restoration efforts. For the past 45 years, the Resource Area has averaged 11,058 acres burned per year (Table 2-3).

Category 5. Greater Sage-Grouse habitat protection and restoration

Greater Sage-Grouse is in decline in the west in large part because of the spread of invasive annual grasses and the shorter fire return intervals that result, and the protection and restoration of habitat[15] (see Figure 2-2) is a high priority for State and Federal agencies, particularly the BLM where most of this habitat occurs. A healthy sagebrush/bunchgrass/forb plant community provides habitat for successful nesting and reproduction.

Category 6. Rehabilitation of invasive annual grass sites

The invasive annual grasses cheatgrass, North Africa grass, and Medusahead rye are estimated to infest more than 300,000 acres[16] on the Resource Area. The majority of these acres are believed to be located either within the 327,000 acres of BLM Ecological Site Inventory (ESI) where cheatgrass is labeled the dominant grass, or (because these grasses are so efficient at invading disturbed sites), within the roughly 509,000 acres in the Resource Area burned by wildfire in the past 45 years.[17] These areas are shown on Figure 2-3[18] and summarized on Table 2-3.

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[15] Greater Sage-Grouse Preliminary Priority Management Area is the primary emphasis, and it generally includes lands within four miles of the best 90 percent of known Greater Sage-Grouse leks. Approximately 975,000 acres of this habitat are mapped on the Lakeview Resource Area (Figure 2-2).
[16] Probably *much* more, but few resources have been devoted to mapping these grasses because there are no selective herbicides available under the No Action Alternative.
[17] These two areas overlap by about 145,000 acres, so the total acres of Category 6 is 692,000 acres.
[18] The individual fires, and their size and year, are listed on Table E-2, Wildfires 45 Acres or Larger, 1968-2012, Lakeview Resource Area, in Appendix E.

Table 2-1. *Summary of Documented Invasive Plant Sites, Lakeview Resource Area*

Species Code	Common Name *Scientific Name*	Documented Acres[1]	Primary Site Types and/or Location(s)[2]	Treatment Methods: No Action Alternative	Treatment Methods: Proposed Action
LELA2	Perennial pepperweed *Lepidium latifolium*	15,065	Warner Wetlands ACEC	see Table 2-5 (*Treatment Key, No Action Alternative*): Perennial Mustards	see Table 2-7 (*Treatment Key, Proposed Action*): Perennial Mustards
TACA8	Medusahead rye[3] *Taeniatherum caput-medusae*	12,890	Red Knoll ACEC	see Table 2-5: Annual Grasses	see Table 2-7: Annual Grasses
SAAE	Mediterranean sage *Salvia aethiopis*	4,627	Roads, Lake Abert ACEC, Abert Rim WSA, Diablo WSA	see Table 2-5: Mediterranean sage	see Table 2-7: Mediterranean sage
BRTE	Cheatgrass[3] *Bromus tectorum*	4,280	South Warner, invasive plant control after Juniper removal projects	Not treated (**not a noxious weed**)	see Table 2-7: Annual Grasses
CIAR4	Canada Thistle *Cirsium arvense*	1,855	Roads, water developments, Warner Wetlands ACEC, riparian exclosures	see Table 2-5: Russian Knapweed and Canada Thistle	see Table 2-7: Russian Knapweed and Canada Thistle
VEDU	North Africa grass[3] *Ventenata dubia*	1,500	North and South Warner Mountains, Red Knoll, roads	Not treated (**not a noxious weed**)	see Table 2-7: Annual Grasses
CADR	Whitetop (Hoary Cress) *Cardaria draba*	1,205	Roads, water developments, Warner Wetlands ACEC	see Table 2-5: Perennial Mustards	see Table 2-7: Perennial Mustards
CACH42	Whitetop (Lens-Podded) *Cardaria chaliepensis*				
CAPU6	Whitetop (Hairy) *Cardaraia Pubescens*				
CANU4	Musk Thistle *Carduus nutans*	1,025	Juniper Mountain	see Table 2-5: Thistles	see Table 2-7: Thistles
HAGL	Halogeton *Halogeton glomeratus*	550	Roads, water developments	see Table 2-5: Halogeton	See Table 2-7: Halogeton
CIVU	Bull Thistle *Cirsium vulgare*	485	Roads, water developments, Burned areas	see Table 2-5: Thistles	see Table 2-7: Thistles
ACRE4	Russian Knapweed *Acroptilon repens*	165	Warner Wetlands ACEC, Warner Valley, Water developments, exclosures, roads	see Table 2-5: Russian Knapweed	see Table 2-7: Russian Knapweed

Species Code	Common Name *Scientific Name*	Documented Acres[1]	Primary Site Types and/or Location(s)[2]	Treatment Methods	
				No Action Alternative	Proposed Action
XASP2	Spiny cocklebur *Xanthium spinosum*	55	Roads, Foley Lake ACEC	see Table 2-5: Annual Broadleaves	See Table 2-7: Annual Broadleaves
CEDI3	Diffuse Knapweed *Centaurea diffusa*	50	Roads, Rangeland	see Table 2-5: Knapweed (Diffuse and Spotted)	see Table 2-7: Knapweed (Diffuse and Spotted)
CEST8	Spotted Knapweed *Centaurea stoebe (C.maculosa)*	50	Roads, Fence rows	see Table 2-5: Knapweed (Diffuse and Spotted)	see Table 2-7: Knapweed (Diffuse and Spotted)
ONAC	Scotch Thistle *Onopordum acanthium*	45	Roads, Rangeland	see Table 2-5: Thistles	see Table 2-7: Thistles
DIFU2	Common teasel *Dipsacus follonum*	30	Roads, Riparian	Not treated (**not a noxious weed**)	see Table 2-7: Teasel
COAR4	Field bindweed *Convolvulus arvensis L.*	30	Roads, Rangeland	see Table 2-5: Field Bindweed	see Table 2-7: Field Bindweed
CESO3	Yellow starthistle *Centaurea solstitialis*	30	Roads, Rangeland	see Table 2-5: Starthistles	see Table 2-7: Starthistles
HYPE	St. John's wort *Hypericum perforatum*	25	Roads, Riparian	see Table 2-5: St. John's wort	see Table 2-7: St. John's wort
ISTI	Dyers woad *Isatis tinctoria*	15	Roads, Ruby Pipeline right-of-way (ROW), Riparian, Rangeland	see Table 2-5: Perennial Mustards	see Table 2-7: Perennial Mustards
TRTE	Puncturevine *Tribulus terrestris*	10	Roads, Campgrounds, Day use Areas.	see Table 2-5: Annual Broadleaves	See Table 2-7: Annual Broadleaves
LIDA	Dalmatian Toadflax *Linaria dalmatica*	10	Roads, Bonneville Power Administration (BPA) ROW	see Table 2-5: Toadflax	see Table 2-7: Toadflax
CETE5	Bur Buttercup[3] *Ceratoephala testiculata*	5	Campgrounds	Not treated (**not a noxious weed**)	See Table 2-7: Annual Broadleaves
LIVU2	Yellow Toadflax *Linaria vulgaris*	5	Roads, Rangeland	see Table 2-5: Toadflax	see Table 2-7: Toadflax
SAKA	Russian thistle[3] *Salsola kali L*	5	BPA ROW	Not treated (**not a noxious weed**)	see Table 2-7: Thistles
ELAN	Russian olive *Elaeagnus angustifolia*	<1		Not treated (**not a noxious weed**)	See Table 2-7: Tamarisk and Russian Olive
PORE5	Sulfur cinquefoil *Potentilla recta*	<1	Riparian	See Table 2-5: Sulfur cinquefoil	See Table 2-7: Sulfur cinquefoil
CYSC4	Scotch Broom *Cytisus scoparius*	<1	Riparian	See Table 2-5: Tamarisk and Russian Olive	See Table 2-7: Tamarisk and Russian Olive

Species Code	Common Name *Scientific Name*	Documented Acres[1]	Primary Site Types and/or Location(s)[2]	Treatment Methods	
				No Action Alternative	**Proposed Action**
TARA	Saltcedar *Tamarix ramosissima*	<1		See Table 2-5: Tamarisk and Russian Olive	See Table 2-7: Tamarisk and Russian Olive
COMA2	Poison hemlock *Conium maculatum*	<1		see Table 2-5: Hemlock (Poison)	see Table 2-7: Hemlock (Poison)
SORO	Buffalobur *Solanum rostratum*	<1		See Table 2-5: Annual Broadleaves	See Table 2-7: Annual Broadleaves
KOSC	Kochia[3] *Kochia scoparia*	<1		See Table 2-5: Annual Broadleaves	See Table 2-7: Annual Broadleaves
TAMAR2	Tamarisk *Tamarix L*	<1		Not treated (**not a noxious weed**)	See Table 2-7: Tamarisk and Russian Olive

1. This table does not include the nearly 700,000 acres of recent wildfires or Ecological Site Inventory units potentially infested with cheatgrass, Medusahead rye, and North Africa grass that are discussed in Table 2-3 (*Summary of Recent Wildfires and ESI Cheatgrass Sites, Lakeview Resource Area)*.
2. See Table E-1 (*Documented Invasive Plant Sites*) in Appendix E for site-by-site list.
3. These invasive plants are very common across the whole resource area. Acreage in this table only includes high priority documented infestations.

Table 2-2. Lower Priority Invasive Plants

Species Code	Common Name	Scientific Name	Potential Treatments Under the Proposed Action[2]
BRRA	Field Mustard[1]	*Brassica rapa*	see Table 2-7: (*Treatment Key, Proposed Action*): Perennial Mustards
CEME2	Malta starthistle	*Centaurea melitensis L.*	see Table 2-7: Starthistles
HYNI	Black Henbane	*Hyoscyamus niger*	see Table 2-7: Thistles
LASE	Prickly lettuce	*Lactuca serriola*	See Table 2-7: Annual Broadleaves
LEVU	Oxeye daisy	*Leucanthemum vulgare*	Could be treated with picloram
LOPE	Perennial ryegrass	*Lolium perenne*	See Table 2-7: Perennial Grasses
MAVU	Horehound	*Marrubium vulgare*	See Table 2-7: Horehound
PHAR3	Reed canary grass	*Phalaris arundinacea*	See Table 2-7: Perennial Grasses
RUCR	Curly Dock	*Rumex crispus* L.	See Table 2-7: Curly Dock
SODU	Climbing nightshade	*Solanum dulcamara*	See Table 2-7: Annual Broadleaves
SEJA	Tansy Ragwort	*Senecio jacobaea* L.	see Table 2-7: St John's Wort
SOAR2	Field Sow Thistle	*Sonchus arvensis*	see Table 2-7: Thistles
SOAS	Prickly Sow Thistle	*Sonchus asper*	see Table 2-7: Thistles
TAVU	Common tansy	*Tanacetum vulgare*	see Table 2-7: Common Tansy
VETH	Common mullein	*Verbascum thapsus*	see Table 2-7: Thistles
Annual Grass Species[1] *(in addition to cheatgrass, Medusahead rye, and North Africa grass)*:			
AVFA	Wild oat	*Avena fatua*	see Table 2-7: Annual Grasses
BRDI3	Ripgut brome	*Bromus diandrus*	
BRHO2	Soft brome	*Bromus hordeaceus*	
BRST2	Poverty brome	*Bromus sterilis*	
BRRU2	Red brome	*Bromus rubens*	

1. Widespread throughout the Resource Area.
2. This table includes no noxious weeds; these invasive plants would not be treated with herbicides under the No Action Alternative.

Table 2-3. *Summary of Recent Wildfires and ESI Cheatgrass Sites, Lakeview Resource Area*

Summary of Recent Wildfires 1968-2012[1]								
Years	**# of Fires**	**Total Size**	**Annual Averages**		**Size (Acres)**			
			#	**Acres**	**Minimum**	**Maximum**	**Average**	**Median**
1968-2012	122	509,131	2.65	11,058	45	83,000	5,154	1,500
ESI acres with cheatgrass the dominant grass: 327,655 acres								
Overlap and Total: 144,718 acres are both ESI and recent wildfire, so the total acres is 692,066 acres								

1. Compiled from list of 122 wildfires shown in Appendix E, Table E-2, *Wildfires 45 Acres or Larger, 1968-2012, Lakeview Resource Area*.

The Alternatives

The No Action Alternative - Noxious Weed Management

Introduction

The No Action Alternative would continue to implement the 2004 EA and Decision for the *Integrated Noxious Weed Management Program for the Lakeview Resource Area* (USDI 2004), consistent with the *Lakeview Resource Management Plan* and constrained by the Standard Operating Procedures, Mitigation Measures, Conservation Measures, and application rate limits adopted by the Record of Decision for *Vegetation Treatments Using Herbicides on BLM Lands in Oregon* (USDI 2010b:30).[19]

Treatment Sites and Priority Setting

Over the 10 to 15 year expected life of the EA, the Resource Area expects to control documented noxious weed infestations on 38,358 acres (Category 1), spread from those sites (Category 2), and newly discovered noxious weeds (Category 3) for which there are control tools available under this alternative. Although it is desirable to treat all of these acres as quickly as possible, current funding limits treatments in these three Categories to less than a combined total of 5,000 acres per year. Roughly half of the treatments in a given year are re-treatments of areas treated previously, because the herbicides and other control methods available under this alternative are estimated to be 60 percent effective on small populations on the first try.[20] These follow-up treatments are more likely to include pulling or other manual treatments as the population at a given site is reduced or is made up of seedlings from a remaining seed bank. General priorities for selecting annual treatments include:

- Eradication of new infestations of species previously unknown on the Resource Area, or of satellite infestations of plants that have spread to new locations, where the plant is a known ecologic and economic threat as determined by the Oregon Department of Agriculture (ODA) or Lake County.
- Control of existing small infestations of noxious weeds that are of known ecologic and economic threat in areas that have a high potential for spread such as along roads and trails, recreation sites, rivers/streams, mineral material sites, and other places where soil disturbance occurs.
- Containment and reduction of larger noxious weed infestations, and rehabilitation as time and funding permit.

Other priority-setting considerations include the resources that would be adversely affected by the noxious weeds such as water, riparian areas, habitats for Special Status species, and certain soils; special management areas such as Wilderness Study Areas or Research Natural Areas; the size of the infested area and whether the infestation is isolated or adjacent to others; if the plants are unacceptably increasing the risk of wildfire; effects on resources or areas important to local tribes; the emphasis of special or non-BLM funding; and, the control priorities of BLM neighbors and cooperators. The 3,856 acres actually treated in fiscal year 2013 are shown on Table E-1, *Documented Invasive Plant Sites* (Appendix E).

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[19] In June 2014, the Cahill Grazing Permit Renewal EA and Decision made six additional herbicides available for invasive plant control on 783 acres in five grazing allotments near Adel, Oregon. This decision, in effect, revised the No Action Alternative for a small portion of the Resource Area in ways not inconsistent with parts of the Proposed Action. This project decision is left out of the description of the No Action "program" for simplicity, and because the Cahill decision would effectively be eclipsed by, and its acres wholly included within treatment area estimates and the analysis of, the Proposed Action. (See Chapter 3, *Reasonably Foreseeable Actions, Invasive Plant Control Activities Authorized by the Resource Area beyond Those Described under the No Action Alternative*).

[20] 60 percent on average. Some species are killed with a single herbicide application while other species may only be suppressed, and are treated to keep them from setting seed or expanding.

Treatments might also occur on Treatment Category 4, Emergency Stabilization, if there were a concern for invasion by species other than annual grasses (for example, hoary cress or certain thistles) that were susceptible to the one of the four herbicides available under this alternative.[21] In addition, glyphosate is sometimes used for Medusahead control following fires if collateral damage to native species is not an issue. Similar treatments could occur in the other Treatment Categories as well, but that would be unusual because the alternative has no treatment method selective to the invasive annual grasses.

Herbicides and Constraints

Control efforts would use a variety of treatment methods including the four herbicides available under this alternative, Table 2-4. Herbicide formulations (brands), as well as adjuvants to be used with them, must be on the BLM lists of approved herbicides and adjuvants at the time of application. The 2014 lists are included in Appendix C, *The Herbicides, Formulations, Adjuvants, and Estimated Use*. For applications with a potential to enter streams (see required buffers for non-aquatic herbicides in Appendix A, *Project Design Features, Standard Operating Procedures, Mitigation Measures, Conservation Measures, Prevention Measures, and Best Management Practices*), herbicides are limited to aquatic formulations. Appendix C also includes adjuvants approved[22] for use with aquatic herbicides near Threatened or Endangered fish habitat.

Treatments are always constrained by a combination of existing BLM Standard Operating Procedures and subject to PEIS and Oregon FEIS Mitigation Measures. Conservation Measures may also apply to Special Status species (USDI 2010b:30)(see Appendix A).[23] These measures are designed to prevent adverse effects from control treatments including those using herbicides. Many are treatment-specific, in that they specify locations or circumstances where certain treatments would not be used unless there are other ways to accomplish the intended protection objectives. Certain special management areas can also require special emphasis and/or constraints (see *Consistency with Other Plans and Laws* section in Chapter 1).

Generally, treatments are subject to cultural resources and Special Status species clearance surveys prior to implementing control activities. Programmatic clearances[24] may be applied to urgent treatments[25] of newly discovered satellite infestations of existing invasive plants, or new infestations of species previously unknown on the Resource Area. In such cases, treatment decisions are made by personnel familiar with the Standard Operating Procedures, Mitigation Measures, and sensitive resources. Such treatments would usually be manual (e.g. grubbing) or spot spraying on less than an acre, and are most likely to be along streams, or near existing roads and other previously disturbed areas.

Selection of the Treatment Method

Selection of a treatment method considers what would work for each species and what is appropriate for the lands infested. For many species, small infestations may be controlled with manual or other non-herbicide treatments. Others may require herbicides to obtain control or lessen ground disturbance. Working within the priorities and constraints described above, the identification of what treatment to use and, where applicable, the actual herbicide to be used would follow the criteria presented in Table 2-5.

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[21] These are examples. Under this alternative, the four herbicides may be used to control noxious weeds anywhere on the Resource Area for any purpose.

[22] The approved adjuvants (shown in Appendix C, The Herbicides, Formulations, Adjuvants, and Estimated Use) are from the U.S. Fish and Wildlife ARBO II biological opinion. This list will be modified by the Decision Record if U.S. Fish and Wildlife Consultation for this EA results in a different list.

[23] For example, specific Conservation Measures apply to cutthroat trout on the Resource Area (USDI 2010b:49-51).

[24] Alternatively, identification of areas and situations not requiring clearances.

[25] Treatments can be urgent either because the plant is about to go to seed, or because, with 3.2 million acres on the Resource Area, the discoverer is so far from the office that an additional visit to treat a small site is not practical.

Treatments on Table 2-5 are listed in priority order, but the percent of time each choice would be used has been estimated, based on current information about documented invasive plant sites. Herbicide mixes, or second or third choice treatments, are also used for follow-up treatments to control plants surviving previous treatments. Where buffers are required to protect water bodies, aquatic herbicide formulations are specified. Otherwise second or third choice treatments would be used as dictated by the soil, season, and other criteria included in Table 2-5, or when Standard Operating Procedures, Mitigation Measures, or Conservation Measures (Appendix A) preclude the use of the first choice because of the presence of humans, livestock, or other resources that would be put at risk by the first choice. For example, a Mitigation Measure precludes the use of 2,4-D in wild horse Herd Management Areas during peak foaling season (March through June, and especially in May and June)(see Appendix A).

An estimate of the treatment method or herbicide to be used for each documented invasive plant site is displayed on Table E-3 *Treatment Method by Alternative by Plant Species* in Appendix E. The 2014 Treatment Plan is discussed near the end of this chapter.

Table 2-4. *Herbicide Information for the Four Herbicides Available Under the No Action Alternative*

Herbicide: Representative Trade Names[1]	**Common Targets**	**Selective to Plant Types**	**Pre/post Emergent Point of Application**	**Types of BLM Lands Included in Registration** *Rangeland*	*Forest and Woodland*	*Riparian or Aquatic*	*Oil, Gas, & Mineral Sites*	*Rights-of-Way*	*Recreation & Cultural Sites*	**Application Rate (lbs./acre/year)** Typical	Max[2]	**Aerial Spray Allowed**
2, 4-D: Many, including Amine, Hardball, Unison, Saber, Salvo, Aqua-Kleen, and Platoon	Annual and biennial broadleaf plants. W*hitetop, perennial pepperweed, Russian thistle and knapweed.*	broadleaf	Post Foliar	√	√	√	√	√	√	1	(1.9)	Yes
Dicamba: Vanquish, Banvel, Diablo, Vision, Clarity	*Knapweeds, kochia, and thistles.*	broadleaf, woody plants	Pre and post Foliar	√			√	√	√	0.3	2	Yes
Glyphosate: Many, including Rodeo, Mirage, Roundup Pro, and Honcho	Grasses, broadleaf plants, and woody shrubs.	no	Post Soil or foliar	√	√	√	√	√	√	2	3[3]	Yes
Picloram: Triumph, OutPost, Tordon	Perennial and woody species. *Knapweeds, starthistle, thistle.*	broadleaf, woody plants	Pre and post Foliar	√	√		√	√	√	0.35	1	Yes

1. See Table C-2 (*Herbicide Formulations Approved for use on BLM-Administered Lands*) in Appendix C for the full list of herbicide trade names allowed for use on BLM Lands in Oregon, including formulations with two or more active ingredients.
2. Parentheticals denote herbicides that are limited, by PEIS Mitigation Measures, to typical application rates, where feasible.
3. Limited by the *Vegetation Treatments on BLM Lands in Thirteen Western States* FEIS and ROD (USDI 1991) to 3 lbs./acre/year. The Oregon FEIS (USDI 2010a) and associated risk assessments analyze a 7 lb. maximum rate; however, that rate is not authorized with the No Action Alternative.

Table 2-5. Treatment Key, No Action Alternative (treatments ordered by preferred treatment method)

Species Group (Category 1 ac)	**Proposed Treatment**[1]	**Formulated Product Per Acre**	**Lbs./Acre**[2]	**Estimated Proportion**	**Treatment Considerations/Notes**
Annual Broadleaves (67 acres)	Manual control			1%	Most annual broadleaf species can be controlled through hand pulling if infestations are small.
	2,4-D + Dicamba	1 qt. + 1 pt.	0.95 + 0.5	99%	Effective on many of the invasive broadleaves but it offers minimal residual control.
Annual Grasses (12,890 acres)	Glyphosate	1 qt.	1	80%	Appropriate at the seedling stage. Care would be taken to minimize damage to non-targets. Carefully consider location of treatment to minimize collateral damage.
	Manual control			10%	
	Targeted grazing (cattle)			10%	Can be effective control when plants are young and palatable.

Species Group (Category 1 ac)	Proposed Treatment[1]	Formulated Product Per Acre	Lbs./Acre[2]	Estimated Proportion	Treatment Considerations/Notes
Field Bindweed (30 acres)	Manual control			5%	Hand pulling can be effective on seeding or young adults but is not effective when the plant has developed a deep, extensive systems.
	Picloram + 2,4-D	1 qt. + 1 qt.	0.5 + 0.95	40%	Apply from seedling to early bloom.
	2,4-D + Dicamba	1 qt. + 1 pt.	0.95 + 0.5	30%	Appropriate at from the seedling to flowering stage.
	Aquatic Glyphosate	1.5% solution (2 oz./gallon)	minimal (0.02lbs/gallon)	15%	Would be used where treatments might get in the water.
Halogeton (550 acres)	Manual control			20%	Hand pulling is effective for small infestations.
	2,4-D + Dicamba	1 qt. + 1 qt.	0.95 + 1	80%	Use as a residual treatment in the fall can be useful.
Hemlock, Poison (1 acre)	Manual control				Hand pulling is recommended for small infestations.
	2,4-D	2 qt.	1.9	50%	Most effective when applied soon after plants emerge.
	Glyphosate	2 qt.	2	50%	
Knapweed: Diffuse & Spotted (100 acres)	Manual control			20%	Hand pulling is feasible for scattered plants or for areas where other control methods are not feasible. Manual control will be limited to small infestations and will be needed up to 3 times a year.
	Targeted grazing (goats and sheep)			<1%	Early season grazing can reduce flower production and late season grazing can reduce the density of young plants. Grazing with goats and sheep can only occur in limited areas[3].
	Picloram	1 qt.	0.5	79%	Appropriate at sites where there is a known seed bank, and where soils are not sandy or gravelly.
	Picloram + 2,4-D	1 qt. + 1 qt.	0.5 + 0.95		Preferred treatment. Treat plants from rosette to flowering. It also offers residual control for late season applications to kill fall rosettes and to inhibit seedling growth the following year.
	Aquatic Glyphosate	1.5% solution (2 oz./gallon)	minimal (0.02lbs/gallon)		Appropriate from rosette to flowering, where there are seed banks and where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse impacts to desirables can be minimized.
	Biological controls			1%	Five biological controls are active on the Resource Area.
Mediterranean sage (4,627 acres)	Manual control			5%	With small infestations hand pulling or digging is feasible and effective.
	Biological controls			5%	Biological controls are present across the Resource Area
	Picloram + 2,4-D	1 qt. + 1 qt.	0.5 + 0.95	75%	To be used when seed bank is extensive.
	Aquatic Glyphosate or 2,4-D	1.5% solution (2 oz./gallon)	minimal (glyphosate: 0.02lbs/gallon; 2,4-D: 0.03lbs/gallon)	15%	Would be used where treatments could get into the water.
Perennial Mustards	2,4-D + Dicamba	1 qt. + 1 pt.	0.95 + 0.5	75%	Could be used in meadows where susceptible grasses are the main desirable species.

Species Group (Category 1 ac)	**Proposed Treatment**[1]	**Formulated Product Per Acre**	**Lbs./Acre**[2]	**Estimated Proportion**	**Treatment Considerations/Notes**
(16,285 acres)	Aquatic Glyphosate or 2,4-D	1.5% solution (2 oz./gallon)	minimal (glyphosate: 0.02lbs/gallon; 2,4-D: 0.03lbs/gallon)	20%	Formulations would be used where treatments could get into the water.
	Targeted grazing (cattle)			5%	Can be effective control when plants are young and palatable.
Russian Knapweed & Canada thistle (2,020 acres)	Manual control				Seedlings can be controlled through hand pulling, but not recommended for established plants.
	Biological controls			10%	Several biological controls are currently being used to control Canada thistle on the Resource Area.
	Picloram	1 qt.	0.5	40%	Preferred treatment post-frost.
	Picloram + 2,4-D	1 pt. + 1 qt.	0.25 + 0.95	40%	Adding 2,4-D is helpful if treatment occurs at the bud to flowering stage.
	Aquatic Glyphosate	1.5% solution (2 oz./gallon)	minimal (0.02lbs/gallon)	10%	Aquatic formulations would be used where treatments could get into the water.
St John's wort (25 acres)	Manual control			10%	Only for very small infestations. Not effective control.
	Biological controls			10%	One biological control is currently active on the Resource Area.
	Picloram	2 qt.	1	55%	Post emergence when the plants are actively growing.
	Glyphosate	2 qt.	2	25%	Use aquatic formulations near water.
Starthistle (20 acres)	Manual control			10%	Effective control for small infestations.
	Biological controls				One biological control is currently active on yellow starthistle on the Resource Area.
	Picloram + 2,4-D	1 qt. + 1 qt.	0.50 + 0.95	90%	Appropriate from rosette to flowering, and would be considered for use where there are seed banks and where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse impacts to desirables can be minimized.
Sulfur cinquefoil (<1 acre)	Dicamba	2 qt.	1	25%	
	Picloram	1 qt.	0.5	25%	
	Aquatic Glyphosate or 2,4-D	1.5% solution (2 oz./gallon)	minimal (glyphosate: 0.02lbs/gallon; 2,4-D: 0.03lbs/gallon)	50%	Use aquatic formulations near water.
Tamarisk and Russian Olive (2 acres)	Manual control			20%	Hand pulling can effectively control small plants.
	Targeted grazing			1%	Cattle, sheep, and goats will graze saltceder plants if desirable vegetation is lacking. Grazing with goats and sheep can only occur in limited areas[3].
	Glyphosate	3.3 qt.	3.3	79%	Cut Stump. Broadcast treatments would be made in late summer. Aquatic formulations would be used near water.

Species Group (Category 1 ac)	**Proposed Treatment**[1]	**Formulated Product Per Acre**	**Lbs./Acre**[2]	**Estimated Proportion**	**Treatment Considerations/Notes**
Thistles: Bull, Scotch, Musk (1,555 acres)	Manual control			25%	Manual control can be effective in controlling existing plant, but will not be effective on seed bank. Would only be used on small infestations.
	Biological controls			0%	Biological controls are active on bull and Scotch thistle on the Resource Area.
	Targeted grazing			1%	Large livestock tend to avoid grazing on thistles, although cattle have been known to eat the flower heads, sheep will eat rosettes, and goats like the flower heads and are able to digest the seed. Grazing with goats and sheep can only occur in limited areas[3].
	2,4-D + Dicamba	1 qt. + 1 pt.	0.95 + 0.5	29%	Appropriate if treatment occurs at spring and fall rosettes stage.
	Picloram + 2,4-D	1 pt. + 1 qt.	0.25 + 0.95	45%	Appropriate from rosette to flowering, where there is an established seed bank at site, where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse impacts to desirables can be minimized.
Toadflax (15 acres)	Manual control			1%	Hand pulling is only effective on seedlings before plants become established and the extensive root system develops.
	Biological controls			30%	Two biological controls are currently active on toadflax in the Resource Area. Others are available in the U.S. and may be used. Biological controls will be used on any sites that have enough plants to make a successful host.
	Picloram	2 qt.	1	30%	High rates of picloram can give long-term soil activity for broadleaves. Will only give partial control.
	Picloram + 2,4-D	1 qt. + 1 qt.	0.50 + 0.95	39%	Post-emergence when plants are growing rapidly.

1. Other methods may be used based on site-specific considerations. These could include manual (e.g., pulling, grubbing), mechanical (e.g., chainsaws, mowing, disking), targeted grazing, prescribed fires, and planting and seeding.
2. lbs./acre calculated from the rates per acre column, and can vary based on formulation. Typical and maximum application rates are listed on Table 2-6 (*Herbicide Information for the 14 Herbicides Available Under the Proposed Action*).
3. Sheep and goats would only be used for targeted livestock grazing within and directly adjacent to Allotments 700, 701, 702, 703, 704 and 713 (the area south and west of Silver Lake next to the Fremont-Winema Forest) in order to reduce the risk of contact between Big Horned Sheep and domestic goats and sheep.

The Proposed Action - Invasive Plant Management

Introduction

The Proposed Action is similar to the No Action Alternative except it is expanded to allow herbicide use on all invasive plants (not just noxious weeds), and it is expanded to include the use of 14 herbicides rather than 4. The expansion to invasive plants and the inclusion of herbicides selective to invasive annual grasses greatly increases the number of acres expected to be treated under this alternative. These changes were examined at the programmatic scale in the 2010 *Vegetation Treatments Using Herbicides on BLM Lands in Oregon FEIS* (USDI 2010a).

Treatment Sites and Priority Setting[26]

Over the 10 to 15 year expected life of the EA, the Resource Area expects to control invasive plants on all 44,090 acres described in Category 1 above, as well as on all acres in Categories 2 and 3. Although it is desirable to treat all of these acres as quickly as possible, current funding levels limit treatments in these three Categories to less than a combined total of 5,000 acres per year. Because better control is expected with the broader range of herbicides, roughly one-quarter to one-third of the treatments would be re-treatments of areas treated previously. These follow-up treatments are more likely to include pulling or other manual treatments as the population at a given site is reduced or is made up of seedlings from a remaining seed bank. General priorities for selecting annual treatments include (in order of priority):

- Eradication of new infestations of species previously unknown on the Resource Area, or of satellite infestations of plants that have spread to new locations, where the plant is a known ecologic and economic threat as determined by the Oregon Department of Agriculture (ODA) or Lake County.
- Control of existing small infestations of invasive plants that are of known ecologic and economic threat in areas that have a high potential for spread such as along roads and trails, recreation sites, rivers/streams, mineral material sites, and other places where soil disturbance occurs.
- Containment and reduction of larger invasive plant infestations, and rehabilitation as time and funding permits.

Other priority-setting considerations include the resources that would be adversely affected by the invasive plants such as water, riparian areas, habitats for Special Status species, and certain soils; special management areas such as Wilderness Study Areas or Research Natural Areas; the size of the infested area and whether the area is isolated or common; if the plants are unacceptably increasing the risk of wildfire; effects on resources or areas important to local tribes; the emphasis of special or non-BLM funding; and, the control priorities of BLM neighbors and cooperators.

The Resource Area also expects to treat up to 20,000 acres per year in Categories 4, 5, and 6 combined, mostly with the herbicide imazapic. These treatments would be possible because herbicides capable of selectively controlling invasive annual grasses are included in this alternative. Although there are some documented invasive grass infestations included in the 44,090 acres described in Category 1 above, these additional 20,000 acres of treatments are separate from the above discussion because specific treatment sites have not been documented, funding sources would probably be different, and cost per acre would be lower because most treatments would be large aerial applications of a relatively inexpensive herbicide. In order of priority, these treatments are:

- Category 4, *Post-fire emergency stabilization* as needed. These treatments are needed on some newly burned areas in some years. Needs are identified by Emergency Stabilization planning teams assigned to the fire area, and treatments are paid for by special funding set up for that purpose. These treatments

[26] Invasive plant treatments planned under the June 2014 Cahill EA are included in the following treatment descriptions.

are highest priority because they are designed to protect sensitive and non-renewable resources such as soils, and are usually urgent because of approaching winter. Primary concerns relevant to this EA are invasive annual grasses and thistles that preclude reestablishment of native vegetation. Emergency stabilization treatments involving herbicides (usually imazapic) may be suggested by Emergency Stabilization planning teams on a portion of these areas.[27]

- Category 5, *Greater Sage-Grouse habitat protection and restoration* emphasis is high and expected to increase later in 2014. Management direction drafted for the *Oregon Sub-Region Greater Sage-Grouse Final Resource Management Plan Amendment and Environmental Impact Statement* suggests reducing invasive annual grasses in Preliminary Priority Management Area to less than five percent, and preventing heavy grass infestations from expanding into suitable habitat. This or similar direction is expected to be part of the Preferred Alternative in the Final EIS later in 2014. An herbicide selective to these grasses could provide control while retaining other elements of the habitat.

- Category 6, *Rehabilitation of invasive annual grass sites*. Although recently burned and ESI cheatgrass areas are known to be degraded, little mapping has been done because no selective control method has been available until recently. However, for analysis purposes, treatments in this Category are assumed to occur within these areas (see Figure 2-3). Lightly to moderately infested sites still populated with native species are the highest priority for restoration because the native species are still available to repopulate the site. Heavily infested sites might be "contained" around the edges to keep them from degrading adjacent resource values. In either case, treatments may be preceded by burning to expose the soil, and followed by seeding on moister sites if existing desirable vegetation is sparse or lacking. Selection of final treatment areas would be resource-driven. That is, rehabilitation is highest priority where important habitat has been impacted but not severely degraded. The highest such priority on the Resource Area is currently west of Lake Abert where Greater Sage-Grouse and mule deer habitat have been adversely impacted by recent large fires being invaded by annual grasses. As many as 200,000 to 300,000 acres are potentially suitable for restoration or other treatments.

Herbicides and Constraints

Control efforts would use a variety of treatment methods including the 14 herbicides available under this alternative (see Table 2-6). Herbicide formulations (brands), as well as adjuvants to be used with them, must be on the BLM lists of approved herbicides and adjuvants at the time of application. The current lists are included in Appendix C, *The Herbicides, Formulations, Adjuvants, and Estimated Use,* for information. For applications with a potential to enter streams, herbicides are limited to aquatic formulations. For applications with a potential to affect Federally Listed fish, aquatic-approved adjuvants[28] would also be used (see Appendix C).

Treatments are always constrained by a combination of existing BLM Standard Operating Procedures and subject to PEIS and Oregon FEIS Mitigation Measures. Conservation Measures also apply to Special Status species (see Appendix A, *Project Design Features, Standard Operating Procedures, Mitigation Measures, Conservation Measures, Prevention Measures, and Best Management Practices Standard Operating Procedures and Mitigation Measures*). These measures are designed to prevent adverse effects from control treatments including those using herbicides. Many are treatment-specific, in that they specify locations or circumstances where certain treatments would not be used unless there are other ways to accomplish the intended protection objectives. Certain special management areas can also require special emphasis and/or constraints (see *Consistency with other Plans and Laws* section in Chapter 1).

[27] The Resource Area averages 11,058 acres of wildfire per year (Table 2-3).
[28] The "approved adjuvants" shown in Appendix C are from the U.S. Fish and Wildlife ARBO II biological opinion. This list will be modified by the Decision Record if U.S. Fish and Wildlife Consultation for this EA results in a different list.

Generally, treatments are subject to cultural resources and Special Status species clearance surveys prior to implementing control activities. Programmatic clearances[29] may be applied to urgent treatments[30] of newly discovered satellite infestations of existing invasive plants, or new infestations of species previously unknown on the Resource Area. In such cases, treatment decisions are made by personnel familiar with the Standard Operating Procedures, Mitigation Measures, and sensitive resources. Such treatments would usually be manual (e.g. grubbing) or spot spraying on less than an acre, and are most likely to be along streams, or near existing roads and other previously disturbed areas.

Selection of the Treatment Method

Selection of a treatment method considers what would work for each species and what is appropriate for the lands infested. For many species, small infestations may be controlled with manual or other non-herbicide treatments. Others may require herbicides to obtain control or lessen ground disturbance. The identification of what treatments to use and, where applicable, the actual herbicide to be used would follow the criteria presented in Table 2-7. Treatments on Table 2-7 are listed in priority order, but the percent of time each choice would be used has been estimated, based on current information about documented invasive plant sites. Herbicide mixes, or second or third choice treatments, are also used for follow-up treatments to control plants surviving previous treatments. Where buffers are required to protect water bodies, aquatic herbicide formulations are specified. Otherwise, other treatments would be used as dictated by the soil and other criteria included in Table 2-7, or when Standard Operating Procedures, Mitigation Measures, or Conservation Measures (Appendix A) preclude the use of the first choice because of the presence of humans, livestock, or other resources that would be put at risk by the first choice. For example, a Mitigation Measure precludes the use of 2,4-D in wild horse Herd Management Areas during peak foaling season (March through June, and especially in May and June). An estimate of the treatment method or herbicide to be used for each documented invasive plant species is displayed on Table E-3 *Treatment Method by Alternative by Plant Species* in Appendix E.

[29] Alternatively, identification of areas and situations not requiring clearances.
[30] Treatments can be urgent either because the plant is about to go to seed, or because, with 3.2 million acres on the Resource Area, the discoverer is so far from the office that an additional visit to treat a small site is not practical.

Table 2-6. Herbicide Information for the 14 Herbicides Available Under the Proposed Action

Herbicide: Representative Trade Names[1]	**Common Targets**	**Selective to Plant Types**	**Pre/post Emergent Point of Application**	**Types of BLM Lands Included in Registration**						**Application Rate (lbs./acre/year)**		**Aerial Spray**
				Rangeland	*Forest and Woodland*	*Riparian or Aquatic*	*Oil, Gas, & Mineral Sites*	*Rights-of-Way*	*Recreation & Cultural Sites*	Typical	Max[2]	
2, 4-D: Many, including Amine, Hardball, Unison, Saber, Salvo, Aqua- Kleen, and Platoon	Annual and biennial broadleaf plants. W*hitetop, perennial pepperweed, Russian thistle and knapweed.*	broadleaf	Post Foliar	√	√	√	√	√	√	1	(1.9)	Yes
Chlorsulfuron[3]**:** Telar	*Thistles, poison hemlock, Russian knapweed, perennial pepperweed, puncturevine, tansy, teasel, toadflax, whitetop, dyers woad*	broadleaf	Pre and early post Soil or foliar	√			√	√	√	0.047	0.141	Restricted[5]
Clopyralid[3,4]: Transline, Stinger, Spur	*Thistles, knapweeds, yellow starthistle, oxeye daisy, teasel, buffalobur*	broadleaf	Post Foliar	√	√		√	√	√	0.35	0.5	Yes
Dicamba: Vanquish, Banvel, Diablo, Vision, Clarity	*Knapweeds, kochia, and thistles.*	broadleaf, woody plants	Pre and post Foliar	√			√	√	√	0.3	2	Yes
Diflufenzopyr + Dicamba: Overdrive, Distinct	*Knapweeds, thistles*	broadleaf	Post Foliar	√			√	√	√	0.2625	0.4375	No
Fluridone: Avast!, Sonar	Aquatic plants	submersed plants	Post Aquatic			√				0.15	(1.3)	Yes
Glyphosate[3]**:** Many, including Rodeo, Mirage, Roundup Pro, and Honcho	Grasses, broadleaf plants, and woody shrubs.	no	Post Soil or foliar	√	√	√	√	√	√	2	7	Yes
Hexazinone: Velpar	Annual and perennial grasses and broadleaf plants, brush, and trees.	grasses, broadleaf, woody plants	Pre and post Soil or foliar	√	√		√	√	√	2	(4)	Yes
Imazapic[3]**:** Plateau, Panoramic	*Cheatgrass, medusahead rye, whitetop, Dalmation toadflax and Russian knapweed*.	some broadleaf and grasses	Pre and post Soil	√	√		√	√	√	0.0313	0.1875	Yes
Imazapyr[3]**:** Arsenal, Stalker, Habitat, Polaris	Annual and perennial broadleaf plants, brush, trees. *Saltcedar, Russian olive*	no	Pre and post Soil or foliar	√	√	√	√	√	√	0.45	1.25	Yes
Metsulfuron methyl[3]**:** Escort, Patriot, PureStand	*Whitetop, perennial pepperweed and other mustards and biennial thistles.*	broadleaf, woody plants	Post Soil or foliar	√	√		√	√	√	0.03	0.15[6]	Restricted[5]

Herbicide: Representative Trade Names[1]	Common Targets	Selective to Plant Types	Pre/post Emergent Point of Application	Types of BLM Lands Included in Registration						Application Rate (lbs./acre/year)		Aerial Spray
				Rangeland	*Forest and Woodland*	*Riparian or Aquatic*	*Oil, Gas, & Mineral Sites*	*Rights-of-Way*	*Recreation & Cultural Sites*	Typical	Max[2]	
Picloram[3]: Triumph, OutPost, Tordon	Perennial and woody species. *Knapweeds, starthistle, thistle.*	broadleaf, woody plants	Pre and post Foliar	√	√		√	√	√	0.35	1	Yes
Sulfometuron methyl[3]: Oust, Spyder	*Cheatgrass, annual and perennial mustards, and medusahead rye.*	no	Pre and post Soil or foliar		√		√	√	√	0.14	0.38	No
Triclopyr[3]: Garlon, Renovate, Element	*Saltcedar, Canada thistle*	broadleaf, woody plants	Post Foliar	√	√	√	√	√	√	1	(10)	No

1. See Table C-2 (*Herbicide Formulations Approved for use on BLM-Administered Lands*) in Appendix C for the full list of herbicide trade names allowed for use on BLM Lands in Oregon, including formulations with two or more active ingredients.
2. Parentheticals denote herbicides that are limited, by PEIS Mitigation Measures, to typical application rates, where feasible.
3. These, and sethoxydim, are approved for use by the Forest Service in Oregon and Washington (USDA 2005b).
4. The State of Oregon limits the use of clopyralid. OAR 603-057-0378 states, "Any application or use of a pesticide product known to contain the active ingredient clopyralid to a location other than an agricultural site, forest site, right-of way site, golf course site, or non-turf area of a park or recreation site is prohibited. Regardless of application or use sites specified on individual product labels, no application or use may be made to lawn or turf areas such as residential lawns, commercial and public turf plantings, school grounds, parks, cemeteries or recreational areas other than golf courses."
5. Only allowed when no other means of application are possible.
6. Metsulfuron methyl is limited to a maximum rate of 0.0625 lbs. per acre on rangeland.

Table 2-7. Treatment Key[1], Proposed Action (treatments ordered by preferred treatment method)

Species Group (Category 1 acres)	**Proposed Treatment[2]**	**Formulated Product Per Acre**	**Lbs./Acre[3]**	**Estimated Proportion**	**Treatment Considerations/Notes**
Annual Broadleaves (72 acres)	Manual control			1%	Most annual broadleaf species can be controlled through hand pulling if infestations are small.
	Chlorsulfuron + 2,4-D	1 oz. + 1 qt.	0.047 + 0.95	65%	Preferred herbicide treatment. Invasive annual broadleaves often develop resistance, especially to sulfonylureas[4]. This combination adds a second method of control.
	Metsulfuron methyl + 2,4-D	1 oz. + 1 pt.	0.0375 + 0.475	20%	Harder on some wet-meadow grass species than chlorsulfuron.
	Dicamba + Diflufenzopyr ("Overdrive")	8 oz.	0.35	9%	To control species along roads or disturbed areas.
	2,4-D + Dicamba	1 qt. + 1 pt.	0.95 + 0.5	5%	Effective on many of the invasive broadleaves but it offers minimal residual control.

Species Group (Category 1 acres)	**Proposed Treatment**[2]	**Formulated Product Per Acre**	**Lbs./Acre**[3]	**Estimated Proportion**	**Treatment Considerations/Notes**
Annual Grasses (18,670 acres)	Imazapic	6 oz.	0.09	80%	Preferred treatment at the pre-emergent stage when other grasses and forbs are dormant in the Fall.
	Imazapic + Glyphosate	6 oz. + 8 oz.	0.09 + 0.14	7%	If some germination has started, this treatment could be considered, if willing to sacrifice other emerging or greening up vegetation.
	Glyphosate	1 qt.	1	1%	Appropriate at the seedling stage. Care would be taken to minimize damage to non-targets. Carefully consider location of treatment to minimize collateral damage.
	Sulfometuron methyl	0.75 to 1.5 oz.	0.035 to 0.07	5%	Fairly safe on native perennial grasses; this is an advantage in re-vegetation use. Cannot be aerially sprayed, and label prohibits use in rangeland (can be used on rights-of-way and forest and woodlands).
	Hexazinone	1.5 qt.	0.75	1%	Primarily for use on road rights-of-way
	Sulfometuron methyl + Chlorsulfuron ("Landmark")	1.5 oz.		3%	May be used when rangeland has become severely infested with invasive weed species. 12-month grazing restriction and 12 month re-plant interval. (*Information from Supplemental Label for Dupont Landmark XP Herbicide.)*
	Targeted grazing (cattle)			3%	Can be effective control when plants are young and palatable.
Aquatic Plants (unknown)	Imazapyr	1 qt.	0.5	75%	The preferred treatment is plant and location specific. Currently invasive aquatic plants are not an issue in the Resource Area but it is highly likely they will show up here in the near future.
	Aquatic Glyphosate	1 qt.	1	15%	
	Fluridone	1 qt.	1	5%	
	Triclopyr	8 qt.	6	5%	
Common Tansy (unknown)	Manual control	Hand Pulling		5%	With small infestations, hand pulling is feasible, especially when soils are moist (wear gloves).
	Mechanical control	Mowing		0%	Mowing will not kill established plants, but mowing shortly before bloom can reduce seed production. (Tillage can spread root fragments with regenerative buds.)
	Chlorsulfuron + 2,4-D	1 oz. + 1 qt.	0.047 + 0.95	55%	Combination to consider using when burn-down to prevent seed formation/set is needed or where resistance to sulfonylureas[2] is a concern. This combination adds a second method of control.
	Metsulfuron methyl + 2,4-D	1 oz. + 1 qt.	0.0375 + 0.95	20%	Combination to consider using when burn-down to prevent seed formation/set is needed or where resistance to sulfonylureas[4] is a concern. This combination adds a second method of control. Is less expensive than chlorsulfuron but is harder on some wet meadow grass species.
	Picloram + 2,4-D	1 oz. + 1 qt.	0.02 + 0.95	5%	Works from rosette to bud, where there is an established seed bank at site, where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse impacts to desirables can be minimized.
	Aquatic 2,4-D	2 qt.	1.9	5%	Post emergence, to rapidly growing plants before flowering. It provides only partial control.

Species Group (Category 1 acres)	**Proposed Treatment**[2]	**Formulated Product Per Acre**	**Lbs./Acre**[3]	**Estimated Proportion**	**Treatment Considerations/Notes**
	Aquatic Glyphosate	2 qt.	2	5%	Post emergence, to rapidly growing plants before flowering. Glyphosate will not kill seeds or inhibit germination the following season.
	Dicamba + Chlorsulfuron	1 pt. + 1 oz.	0.5 + 0.047	5%	
Curly Dock (unknown)	2,4-D + Chlorsulfuron	1 qt. + 1 oz.	0.95 + 0.047	65%	Preferred treatment in rangelands.
	Metsulfuron methyl + 2,4-D	1 oz. + 1 qt.	0.0375 + 0.95	15%	Preferred treatment near roads.
	Dicamba + Diflufenzopyr ("Overdrive")	8 oz.	0.35	20%	Use at this rate for smaller plants. Higher rates treat larger plants, but may injure grasses.
Field Bindweed (30 acres)	Manual control			5%	Hand pulling can be effective on seeding or young adults but is not effective when the plant has developed a deep, extensive systems.
	Dicamba + Diflufenzopyr ("Overdrive")	8 oz.	0.35	10%	Preferred treatment in disturbed areas.
	Metsulfuron methyl + 2,4-D	1.7 oz. + 1 qt.	0.06375 + 0.95	40%	Apply from seedling to flower.
	Picloram + 2,4-D	1 qt. + 1 qt.	0.5 + 0.95	30%	Apply from seedling to early bloom.
	2,4-D + Dicamba	1 qt. + 1 pt.	0.95 + 0.5	10%	Appropriate at from the seedling to flowering stage.
	Aquatic Glyphosate	1.5% solution (2 oz./gallon)	minimal (0.02lbs/gallon)	5%	Would be used where treatments might get in the water.
Halogeton (550 acres)	Manual control				Hand pulling is effective for small infestations.
	Dicamba + Diflufenzopyr ("Overdrive")	8 oz.	0.35		Preferred herbicide treatment and is a good combination to consider using where resistance to sulfonylureas[4] is a concern or when burn-down to prevent seed formation/set is needed.
	Chlorsulfuron	1.3 oz.	0.0611	50%	Apply from rosette to flowering ,where soils are not sandy or gravelly, and where treatments are within labeled distances from water or wells.
	2,4-D + Dicamba	1 qt. + 1 qt.	0.95 + 1		Use as a residual treatment in the Fall.
	Metsulfuron methyl + 2,4-D	1.5 oz. + 1 qt.	0.05625 + 0.95	50%	Will take current year's growth if treatment occurs at Spring and Fall rosette stage.
Hemlock, Poison (1 acre)	Manual control				Hand pulling is recommended for small infestations.
	Imazapyr	1 qt.	0.5	40%	Non-selective. Apply pre-emergence or in the rosette stage.
	Metsulfuron methyl	1.78 oz.	0.06675	10%	Treat marshes, swamps and bogs after water has receded as well as seasonally dry flood deltas. (Do not make application to natural or man-made bodies of water such as lakes, reservoirs, ponds, streams and canals.)
	2,4-D	2 qt.	1.9	10%	Most effective when applied soon after plants emerge.
	Glyphosate	2 qt.	2	10%	
	Dicamba + 2,4-D + Metsulfuron methyl	1 pt. + 2 qt. + 0.5 oz.	0.5 + 1.9 + 0.01875	30%	

Species Group (Category 1 acres)	Proposed Treatment[2]	Formulated Product Per Acre	Lbs./Acre[3]	Estimated Proportion	Treatment Considerations/Notes
Horehound (unknown)	Manual control			10%	Small patches will be controlled through hand pulling when plants are new seedlings.
	Metsulfuron methyl	1 oz.	0.0375	40%	Apply to young rapidly growing plants in Spring before flower.
	2,4-D	2 qt.	1.9	20%	Apply to young rapidly growing plants
	Triclopyr	3.33 pt.	1.25	20%	Post-emergence to rapidly growing weeds.
	Picloram + 2,4-D	4 pt.	Gunslinger®	10%	Apply during active growth.
Knapweed: Diffuse & Spotted (100 acres)	Manual control			10%	Hand pulling is feasible for scattered plants or for areas where other control methods are not feasible. Manual control will be limited to small infestations and will be needed up to 3 times a year.
	Biological controls			1%	Five biological controls are active against diffuse and spotted knapweed on the Resource Area. Will only be used on large uncontrollable infestations.
	Targeted grazing (goats and sheep)			<1%	Early season grazing can reduce flower production and late season grazing can reduce the density of young plants. Grazing with goats and sheep can only occur in limited areas[5].
	Clopyralid	1.3 pt.	0.49	50%	Applied pre-emergence to seedlings, post-emergence to seedlings or mature plants.
	Picloram	1 qt.	0.5	10%	Appropriate at sites where there is a known seed bank, and where soils are not sandy or gravelly.
	Clopyralid + 2,4-D	1 pt. +1 qt.	0.375 + 0.95	14%	Treat weeds from rosette to flowering. It also offers residual control for late season applications to kill Fall rosettes and to inhibit seedling growth the following year.
	Picloram + 2,4-D	1 qt. + 1 qt.	0.5 + 0.95	10%	Treat plants from rosette to flowering. It also offers residual control for late season applications to kill Fall rosettes and to inhibit seedling growth the following year.
	Aquatic Glyphosate	1.5% solution (2 oz./gallon)	minimal (0.02lbs/gallon)	4%	Appropriate from rosette to flowering, where there are seed banks and where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse impacts to desirables can be minimized.
	Imazapyr	1% solution		1%	Would be used where treatments could get into the water.
Mediterranean sage (4,627 acres)	Manual control			5%	With small infestations, hand pulling or digging is feasible and effective.
	Biological controls			5%	Biological controls are present across the Resource Area
	Metsulfuron methyl + 2,4-D	1.7 oz. + 1 qt.	0.06375 + 0.95	25%	Preferred treatment if treated from rosette to flowering. It ensures burn-down and additional method of control to reduce resistance.
	Picloram + 2,4-D	1 qt. + 1 qt.	0.5 + 0.95	25%	Use when seed bank is extensive.

Species Group (Category 1 acres)	**Proposed Treatment**[2]	**Formulated Product Per Acre**	**Lbs./Acre**[3]	**Estimated Proportion**	**Treatment Considerations/Notes**
	Clopyralid	1.33 pt.	0.5	25%	Appropriate from rosette to flowering, where there are seed banks and where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse impacts to desirables can be minimized.
	Clopyralid + 2,4-D	4 qt.	Curtail	5%	Combination mix would be used when plants have bolted.
	Aquatic Glyphosate or 2,4-D	1.5% solution (2 oz./gallon)	minimal (glyphosate: 0.02lbs/gallon; 2,4-D: 0.03lbs/gallon)	5%	Would be used where treatments could get into the water.
	Chlorsulfuron	1.3 oz.	0.0611	5%	Post emergent from the rosette to bolting stage.
Perennial Grasses (unknown)	Manual control				Only practical for small infestations
	Glyphosate	3 qt.	3	15%	Appropriate at the seedling stage. Care would be taken to minimize damage to non-targets. Carefully consider location of treatment to minimize collateral damage. Use aquatic formulations near water.
	Imazapyr	1.8 pt.	0.45	30%	Apply early Spring when reed canary grass is just sprouting and before other species germinate or emerge.
	Sulfometuron methyl	3 oz.	0.14	55%	
Perennial Mustards (16,285 acres)	Chlorsulfuron	1.3 oz.	0.0611	10%	Treatment good at the flowering stage, although it is very effective over a wide phenologic range (bud to soft dough). This treatment is particularly useful when Canada thistle occurs in the infestation mix. (Rotate with metsulfuron methyl to prevent resistance.)
	Metsulfuron methyl	1.78 oz.	0.06675	10%	Preferred treatment at the flowering stage, although it is very effective over a wide phenologic range (bud to soft dough). This treatment is particularly useful when Canada thistle occurs in the infestation mix. (Rotate with chlorsulfuron to prevent resistance.)
	Chlorsulfuron + 2,4-D	1.3 oz. + 1 qt.	0.0611 + 0.95	30%	Combination to consider using where resistance to sulfonylureas[4] is a concern. It is especially helpful for halting seed production on Dyer's Woad. It adds a 2nd mode of action. Proximity to water needs to be considered for the product choice.
	Metsulfuron methyl + 2,4-D	1.78 oz. + 1 qt.	0.06675 + 0.95	25%	Combination to consider using where resistance to sulfonylureas[4] is a concern. Proximity to water needs to be considered for the product choice.
	2,4-D + Dicamba	1 qt. + 1 pt.	0.95 + 0.5	10%	Could be used in meadows where susceptible grasses are the main desirable species.
	Aquatic Glyphosate or 2,4-D	1.5% solution (2 oz./gallon)	minimal (glyphosate: 0.02lbs/gallon; 2,4-D: 0.03lbs/gallon)	10%	Formulations would be used where treatments could get into the water.
	Targeted grazing (cattle)			5%	Can be effective control when plants are young and palatable.

Species Group (Category 1 acres)	**Proposed Treatment**[2]	**Formulated Product Per Acre**	**Lbs./Acre**[3]	**Estimated Proportion**	**Treatment Considerations/Notes**
Russian Knapweed & Canada thistle (2,020 acres)	Manual control				Seedlings can be controlled through hand pulling, but not recommended for established plants.
	Biological controls			5%	Several biological controls are currently being used to control Canada thistle on the Resource Area.
	Clopyralid	1.3 pt.	0.49	20%	One of the preferred herbicide treatments, post-frost.
	Picloram	1 qt.	0.5	20%	One of the preferred herbicide treatments, post-frost.
	Clopyralid + 2,4-D	1.3 pt. + 1 qt.	0.49 + 0.95	20%	Appropriate at sites where there is a known seed bank, where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse impacts to desirables can be minimized.
	Picloram + 2,4-D	1 pt. + 1 qt.	0.25 + 0.95	20%	Adding 2,4-D is helpful if treatment occurs at the bud to flowering stage.
	Aquatic Glyphosate	1.5% solution (2 oz./gallon)	minimal (0.02lbs/gallon)	10%	Would be used where treatments could get into the water.
	Chlorsulfuron	1.3 oz.	0.0611	5%	Can be used for Canada thistle at any Stage.
	Targeted grazing			*(10%)*	Used in conjunction with herbicide use; can be used as a pretreatment to reduce vigor the plants prior to herbicide application, or in the fall to reduce vigor of plants for the following year. Grazing with goats and sheep can only occur in limited areas[5].
St John's wort (25 acres)	Manual control				Only for very small infestations. Not effective control.
	Biological controls				One St John's wort biological control is currently active on the Resource Area. Biocontrols are available for tansy ragwort, but would not be used unless infestation was large.
	Metsulfuron methyl + 2,4-D	1.7 oz. + 1 qt.	0.06375 + 0.95	50%	Preferred treatment for large infestation in rangelands.
	Picloram	2 qt.	1	30%	Post-emergence when the plants are actively growing.
	Glyphosate	2 qt.	2	10%	Use aquatic formulations near water.
	Dicamba + Diflufenzopyr ("Overdrive")	8 oz.	0.35	10%	Primarily for use on roadsides
Starthistles (30 acres)	Manual control			10%	Effective control for small infestations.
	Biological controls				One biological control is currently active on yellow starthistle in the Resource Area.
	Clopyralid + 2,4-D	1 pt. + 1 qt.	0.375 + 0.95	50%	Preferred treatment from seedling to bud.
	Picloram + 2,4-D	1 qt. + 1 qt.	0.50 + 0.95	40%	Appropriate from rosette to flowering, and would be considered for use where there are seed banks and where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse impacts to desirables can be minimized.
	Imazapyr	1 qt.	0.5		Appropriate from dormant/pre-emergent.
Sulfur cinquefoil	Dicamba	2 qt.	1	25%	

Species Group (Category 1 acres)	**Proposed Treatment**[2]	**Formulated Product Per Acre**	**Lbs./Acre**[3]	**Estimated Proportion**	**Treatment Considerations/Notes**
(<1 acre)	Picloram	1 qt.	0.5	25%	
	Aquatic Glyphosate or 2,4-D	1.5% solution (2 oz./gallon)	minimal (glyphosate: 0.02lbs/gallon; 2,4-D: 0.03lbs/gallon)	50%	Use aquatic formulations near water.
Tamarisk and Russian Olive (4 acres)	Manual control				Hand pulling can effectively control small plants.
	Imazapyr	2 qt.	1	70%	Preferred treatment applied to actively growing foliage during flowering. Use formulations labeled for aquatic use if treatments might get into the water.
	Triclopyr	Undiluted	<10	20%	Works when applied as a cut stump treatment. Use formulations labeled for aquatic use if treatments might get into the water.
	Targeted grazing			<1%	Cattle, sheep, and goats will graze saltceder plants if desirable vegetation is lacking. Grazing with goats and sheep can only occur in limited areas[5].
	Glyphosate	3.3 qt.	3.3	10%	Cut stump. Broadcast treatments would be made in late summer. Aquatic formulations would be used near water.
Teasel (30 acres)	Manual control			5%	With small infestation, digging or hand pulling before flowering are effective controls.
	Chlorsulfuron	1.3 oz.	0.0611	30%	Post-emergence from the rosette to bolting stage.
	Metsulfuron methyl	1 oz.	0.0375	30%	Post-emergence from the rosette to bolting stage.
	Clopyralid	1.33 pt.	0.5	30%	Most effective for young plants.
	Aquatic 2,4-D	1.5% solution (2 oz./gallon)	minimal (0.03lbs/gallon)	5%	Applied to rosettes in Spring in wet situations.
Thistles: Bull, Russian, Scotch, Musk (1,560 acres)	Manual control			5%	Manual control can be effective in controlling existing plant, but will not be effective on seed bank. Would only be used on small infestations.
	Biological controls				Biological controls are currently active on bull, Scotch, and Russian thistle the Resource Area.
	Clopyralid	1.33 pt.	0.5	44%	Very safe on grasses. Apply post-emergent in Spring.
	Clopyralid + 2,4-D	1 pt. + 1 qt.	0.375 + 0.95	10%	Treatment for young plants (actively growing thru flowering).
	Chlorsulfuron	1 oz.	0.047	5%	Preferred treatment at the rosette to bud stage. This treatment is particularly useful when Canada thistle occurs in the infestation mix.
	Metsulfuron methyl	1 oz.	0.0375	5%	Good choice at the rosette to bud stage. It is harder on some wet-meadow grass species than chlorsulfuron.
	Chlorsulfuron + 2,4-D	1 oz. + 1 qt.	0.75 + 0.95	5%	Combination to consider using when burn-down to prevent seed formation/set is needed or where resistance to SUs is a concern. It adds a 2nd mode of action.
	Chlorsulfuron + Clopyralid	1 oz. + 1 pt.	0.047 + 0.375	10%	Great choice when there is an established seed bank at site, treat from rosette to flowering.

Species Group (Category 1 acres)	**Proposed Treatment**[2]	**Formulated Product Per Acre**	**Lbs./Acre**[3]	**Estimated Proportion**	**Treatment Considerations/Notes**
	Chlorsulfuron + Picloram	1 oz. + 1 qt.	0.047 + 0.5	5%	Use when there is an established seed bank at site, treat from rosette to flowering, where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse impacts to desirables can be minimized.
	Triclopyr	2 qt.	1.5	5%	If plants are in water, do not treat more than 1/3 to ½ of water area in a single operation. Check water restrictions on label.
	2,4-D + Dicamba	1 qt. + 1 pt.	0.95 + 0.5	1%	Appropriate if treatment occurs at Spring and Fall rosettes stage.
	Picloram + 2,4-D	1 pt. + 1 qt.	0.25 + 0.95	4%	Appropriate from rosette to flowering, where there is an established seed bank at site, where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse impacts to desirables can be minimized.
	Targeted grazing			1%	Large livestock tend to avoid grazing on thistles, although cattle have been known to eat the flower heads, sheep will eat rosettes, and goats like the flower heads and are able to digest the seed. Grazing with goats and sheep can only occur in limited areas[5].
Toadflax (15 acres)	Manual control			1%	Hand pulling is only effective on seedlings before plants become established and the extensive root system develops.
	Biological controls			10%	Two biological controls are currently active on toadflax in the Resource Area. Others are available in the U.S. and may be used. Biological controls will be used on any sites that have enough plants to make a successful host.
	Chlorsulfuron	2 oz.	0.094	25%	Most recommended. Application would be made post-emergence when plants are growing rapidly in the bud to bloom stage.
	Imazapic	12 oz.	0.1875	10%	Post-emergence in Fall. Typically apply after frost.
	Imazapyr	3 pt.	0.75	10%	Apply mid Fall to dormant plants. Long soil residual activity.
	Metsulfuron methyl + 2,4-D	1.7 oz. + 1 qt.	0.06375 + 0.95	15%	Efficacy is improved with the addition 2, 4-D at a rate of 1 qt. per acre.
	Picloram	2 qt.	1	14%	High rates of picloram can give long-term soil activity for broadleaves. Will only give partial control.
	Picloram + 2,4-D	1 qt. + 1 qt.	0.50 + 0.95	15%	Post-emergence when plants are growing rapidly.

1. Many treatments suggested by *Weed Treatments in Natural Areas in the Western United States* (DiTomaso et al. 2013)
2. Other methods may be used based on site-specific considerations. These could include manual (e.g., pulling, grubbing), mechanical (e.g., chainsaws, mowing, disking), targeted grazing, prescribed fires, and planting and seeding.
3. lbs./acre calculated from the rates per acre column, and can vary based on formulation. Typical and maximum application rates are listed on Table 2-6 (*Herbicide Information for the 14 Herbicides Available Under the Proposed Action*).
4. The sulfonylureas are chlorsulfuron, metsulfuron methyl, and sulfometuron methyl. The Oregon FEIS states these herbicides can quickly confer resistance to plant populations, particularly where they are used extensively as the primary invasive plant control method in cropping systems (USDI 2010a:145).
5. Sheep and goats would only be used for targeted livestock grazing within and directly adjacent to Allotments 700, 701, 702, 703, 704 and 713 (the area south and west of Silver Lake next to the Fremont-Winema Forest) in order to reduce the risk of contact between Big Horned Sheep and domestic goats and sheep.

The 2014 Treatment Plan

Invasive plant control activities planned for the Lakeview Resource Area in 2014 are summarized on Table 2-8. The information is summarized here to present an example of implementing the priorities described in the alternatives. Most of the 2014 planned control activities have been or will be conducted in the spring and summer of 2014, and would thus be conducted under the 2004 Integrated Noxious Weed Management Program for the Lakeview Resource Area, the No Action Alternative. Other control projects would be conducted under the Cahill Environmental Analyses completed in May 2014, which was tiered to the Oregon FEIS. Other projects are listed pending completion of this Environmental Analysis and decision.

Table 2-8. 2014 Treatment Plan Summary

Project Name	Done By	Treatment Method	Acres	Comments	Treatment Category
2014 Projects funded and ready for treatment, 2004 Noxious Weed Management EA					
Warner Wetlands, ACEC	ODA[1]	Herbicide	1999	Perennial pepperweed. Survey, treatment, and monitor. Long term investment	1-2
Warner Wetlands, ACEC	BLM	Herbicide	100	Perennial pepperweed. Survey, treatment, and monitor. Long term investment	1-2
West Abert Lake, ACEC	ODA	Herbicide	100	Musk thistle and Mediterranean sage survey, treatment, and monitor. Large infestation containment	1-2
Calderwood Res	ODA	Herbicide	25	Mediterranean sage and halogeton survey, treatment, and monitor. Long term investment	1-2
Riparian noxious weed control	BLM	Biological	100	Monitoring and releasing additional biological control agents	1-2
Riparian noxious weed control	BLM	Manual	10	Small isolated infestation along riparian areas. Annuals and perennials. Threatened and Endangered species habitat	1-3
Riparian noxious weed control	BLM	Herbicide	10	Small isolated infest along riparian areas. Annuals and perennials. Threatened and Endangered species habitat	1-3
Juniper Mountain RNA	BLM	Herbicide	250	Musk thistle. Post-fire restoration. Long-term investment.	1-3
Juniper Mountain RNA	Contract	Manual	10	Follow up manual control and monitoring	1-3
Roadside noxious weed control	BLM	Herbicide & Manual	250	Noxious weeds along roadsides. High Priority to prevent spread	1-3
Water Developments	BLM	Herbicide & Manual	25	Small infestation of bull thistle.	1-2
2014 Priority Surveys					
Riparian & Aquatic noxious weed Survey	Contract		200	Survey only	
Warner Medusahead rye	Contract		30,000	Greater Sage-Grouse Habitat	5
Roadside Survey	BLM		40,000	Survey and treatment of new invaders, 1/3 of Resource Area	1-3
2014-15 Upcoming Projects					
Willow Creek/Clover Flat Monitoring	BLM	Survey, Manual	30	Survey and treatment. High priority. Permit renewal project Fall 2014	1-3
Ward Lake/Squaw butte	BLM	Survey, Manual	30	Survey and treatment. High Priority. Permit renewal project Fall 2014	1-3
Shale Rock, FRF Fitzgerald, NE Warner, Coyote Calvin, Abert Seeding, South Rabbit	BLM	Survey, Manual, Herbicide	30	Survey and treatment. High Priority. Permit renewal project Fall 2014	1-3
Coglan Hills, Pine Creek,	BLM	Survey,			1-3

Project Name	Done By	Treatment Method	Acres	Comments	Treatment Category
Tim Long Creek, Jones Canyon, South Poverty		Manual, Herbicide			
Dick's Creek	Cont. , BLM, Agreement	Herbicide & Manual	50	Invasive plants	1-3
Cahill Allotments	BLM	Herbicide	250	Invasive plants	1-3
Murdock, Egli Rim	BLM, Agreement[1]	Herbicide & Manual	50	Invasive plants	1-3
Pike Ranch, XL, Coleman seeding, Alkali Winter	Cont., BLM	Herbicide & Manual	50	Invasive plants	1-3
Potential 2014-15 Treatments Analyzed in the Proposed Action of this EA					
Crack in the Ground Post-Fire Restoration	Cont., BLM	Herbicide	100	Invasive winter annual grasses	6
Warner Medusahead rye	Cont., BLM, Agreement[1]	Herbicide	500	Invasive winter annual grasses, Greater Sage-Grouse habitat	5
Clover Flat Medusahead rye containment, ACEC	Cont., BLM, Agreement[1]	Herbicide	500	Invasive winter annual grasses	6

1. Contract with Oregon Department of Agriculture in cooperation with the Lake County Cooperative Weed Management Area.

Projects placed on this treatment plan are a combination of follow-up of previous treatments, ongoing agreements or contracts with the Lake County Cooperative Weed Management Area and/or the Oregon Department of Agriculture, and Resource Area priorities as follows:

- New species invading the Resource Area, with noxious weeds being highest priority
- New satellite infestations of Invasive Plant species found elsewhere in the Resource Area
- Protect and improve Threatened and Endangered (Federally Listed) species habitat
- Other Special Status species and species made a priority by the Resource Area
- High traffic areas – sites that can be easily spread (roads, trails, recreation areas, water developments, communication sites)
- Infestations adjacent to other landowners, preventing spread onto adjacent landowners property
- Contain existing infestations
- Projects with cooperator or other agency funding
- Areas with upcoming/existing projects
- Areas that have been treated for many years to contain infestations
- Low-density invasive plant infestations (e.g. cheatgrass) – where control can be achieved without additional long-term restoration required
- High-density invasive plant infestations – where control would include a long-term restoration commitment

Within burned areas, general treatment priorities are as follows:

- Emergency Stabilization
- (One year post fire rehabilitation (Burned Area Rehabilitation), normally with separate plan.)
- Up to five year post fire rehabilitation
- Post fire treatment for annual grass infestations within Greater Sage-Grouse habitat
- Removal of annual grass species before fuels removal projects
- Removal of annual grass species after fuels removal projects
- Post fire treatment for annual grass infestations to prevent future fires
-

Alternatives Considered but Eliminated from Detailed Study

No Herbicides

This alternative would manage invasive plants with a full range of treatment methods except herbicides. This alternative was eliminated from detailed study because a no-herbicides reference analysis was included in the Oregon FEIS (USDI 2010a:27) and indicated the rate of spread for noxious weeds would increase over time. A no-herbicides alternative would not meet the *Need* for more effective invasive plant control.

No Aerial Herbicide Application

This alternative is the same as the Proposed Action, except it would not use aircraft for any herbicide application. This alternative was eliminated from detailed study because it was considered in the PEIS and, as described in the Oregon FEIS, was rejected because large expanses of cheatgrass and other invasive plants in remote areas or areas with rugged terrain would be difficult and cost-prohibitive to treat. In addition, using ground-based methods in rugged terrain would increase injury and herbicide exposure risks for workers (USDI 2010a:34). It would also limit the ability to conduct large-scale treatments with minimal disturbance in sensitive areas such as Wilderness Study Areas and cultural sites, where other ground equipment would not be allowed or would cause unacceptable levels of ground disturbance. In addition, nothing in the issues identified during scoping suggested a need to analyze such an alternative.

Use Fewer of the Herbicides Approved for Consideration for Invasive Plants by the Oregon FEIS

This alternative would remove one or more herbicides from consideration for various reasons including stated risks or apparent lack of need. This alternative was eliminated from detailed study because all of the herbicides have specific species or conditions for which they are the most suitable control. Having a larger range of herbicides available helps applicators select the most appropriate one for site conditions, timing, and management objectives, and helps avoid resistance to specific herbicides. Nothing in the EA analysis indicated a need to remove any of the herbicides. The herbicides included in the Proposed Action are the same as those examined in the Oregon FEIS for Alternative 3, the FEIS alternative that addresses invasive plants and is most like the Proposed Action in this EA.

Limit Herbicide Treatments to Early Detection Rapid Response

An alternative was considered that used the 14 herbicides included in the Proposed Action, but their use would be limited to early detection rapid response-type treatments of new sites or new species. Prevention and education would become the primary focus of the invasive plant management program for the Lakeview Resource Area. No large-scale herbicide treatments would be implemented and existing invasive plant sites would not be actively controlled with herbicides.

This alternative was eliminated from detailed analysis because the BLM considers active control of established infestations essential to preventing or reducing ecologic and economic degradation. Preventing invasive plant spread to uninfested areas is cost-effective and consistent with current laws, administrative direction, and the *Lakeview Resource Management Plan and Record of Decision* and plans that tier to it.

Include the use of Herbicides for Vegetation other than Invasive Plants

General Road and Administrative Site Maintenance

An alternative was considered that would make all 17 herbicides from the Oregon Record of Decision available and allow them to be used on both invasive and ***native*** vegetation to meet safety and operations objectives (clearing) along roads and around administrative sites. The Oregon Department of Transportation and others responsible for road maintenance use herbicides to maintain site clearances and protect investments, for example. The BLM agrees herbicides may be a needed maintenance tool, and acknowledges that such treatments would have a significant added benefit of inadvertently controlling invasive plants not detected by invasive plant control crews. However, this alternative was eliminated from detailed analysis because the *Need* for more effective road and site maintenance tools is different from the invasive plant control *Need* for this EA and is thus outside the scope of this analysis.

Fuels and Habitat Management

An alternative was considered that would make all 17 herbicides from the Oregon Record of Decision available and allow them to be used on both invasive and ***native*** vegetation to improve Special Status species habitat and accomplish fuels reduction treatment objectives. Examples of this could include treatment of small juniper trees with herbicide, thinning of sagebrush with tebuthiuron to improve Greater Sage-Grouse habitat, and treatment of other native species to promote special Status Species habitat restoration.

This alternative was eliminated from detailed analysis because consideration of fuels management and/or habitat management are themselves broad topics beyond the invasive plant control *Need* guiding the analysis in this EA, and are thus outside the scope of this analysis.

Chapter 3 – Affected Environment and Environmental Effects

Introduction and Issues

This chapter describes the natural, cultural, and social environment of public lands in the Lakeview Resource Area that would potentially be affected by the alternatives under consideration. It focuses on resource issues that were identified during scoping, and presents the consequences of the No Action and Proposed Action alternatives relative to those issues. The primary issues identified, and thus the primary focus of the EA analysis, relate to that part of the proposal involving herbicide use.

Internal and external scoping identified the issues to be addressed in the effects analysis in this chapter. Issues are analyzed when:

- analysis is necessary for making a reasoned choice from among the alternatives (e.g. is there a measureable difference between the alternatives with respect to the issue);
- the issue identifies a potentially significant environmental effect; or,
- public interest or a law/regulation dictate that effects should be displayed.

Issues meeting these criteria have been framed as questions and used to guide the analysis in the individual resource effects sections in this Chapter. The issues are stated at the start of each effects section in this chapter, and they are all listed in Chapter 1. Effects sections focus on these issues, avoiding discussions of resource parameters not relevant to the decision to be made.

Human Health and Ecological Risk Assessments

The following section is adapted from Appendix 8 of the Oregon FEIS (USDI 2010a:605-606).

One of the Purposes identified in Chapter 1 is: d. *Prevent control treatments from having unacceptable adverse effects to applicators and the public, to desirable flora and fauna, and to soil, air, and water*. To help address this Purpose, the EA and the Oregon FEIS that it tiers to for herbicides relies on BLM and/or Forest Service-prepared Human Health and Ecological Risk Assessments for the 14 herbicides included in this EA. The Risk Assessments are used to quantitatively evaluate the probability (i.e. risk) that herbicide use in wildland settings might pose harm to humans or other species in the environment. As such, they address many of the risks that would be faced by humans, plants, and animals, including Special Status species, from the use of the herbicides. The level of detail in the Risk Assessments for wildland use exceeds that normally found in Environmental Protection Agency (EPA)'s registration examination. Court decisions and others affirmed that although the BLM can use EPA toxicology data, it is still required to do an independent assessment of the safety of pesticides rather than relying on *Federal Insecticide, Fungicide and Rodenticide Act* registration alone.

Risks to non-target species associated with herbicide use are often approximated via the use of surrogate species, as toxicological data does not exist for most native non-target species. Survival, growth, reproduction, and other important sub-lethal processes of both terrestrial and aquatic non-target species were considered. Assessments considered acute and chronic toxicity data. Exposures of receptors[31] to direct spray, surface runoff, wind erosion, and accidental spills are analyzed.

[31] An ecological entity such as a human, fish, plant, or slug.

The Risk Assessments, related separate analyses, and the Oregon FEIS include analyses of inerts and degradates for which information is available and not constrained by confidential business information (CBI) restrictions. To the degree a toxic substance is known to pose a significant human or ecological risk, the BLM has undertaken analysis to assess its impacts through Risk Assessments. Information about uncertainty in Risk Assessments is included in the Oregon FEIS, Appendix 13.

A summary of the risk ratings from the various Risk Assessments, along with an explanation of how the risk ratings were derived, is included in Appendix D, *Herbicide Risk Tables*, of this EA. The risk ratings included in that appendix are the source for much of the individual herbicide information, including the high-moderate-low risk ratings, presented in each of the resource effects sections in this chapter.

It is important to remember that risk ratings are based on exposure scenarios described in the Risk Assessments. The likelihood of actual exposures comparable to those described in the Risk Assessments is reduced by application of Standard Operating Procedures and Mitigation Measures (see below), as well as by the nature of the application and the location and actions of the receptor.

Relationship of Effects to the Standard Operating Procedures and Mitigation Measures

Standard Operating Procedures have been identified to reduce adverse effects to environmental and human resources from vegetation treatment activities based on guidance in BLM manuals and handbooks, regulations, and standard BLM and industry practices (listed in Appendix A, *Project Design Features, Standard Operating Procedures, Mitigation Measures, Conservation Measures, Prevention Measures, and Best Management Practices*).[32] The list is not all encompassing, but is designed to give an overview of practices that would be considered when designing and implementing a vegetation treatment project on public lands (USDI 2007c:2-29). Effects described in this EA are predicated on application of the Standard Operating Procedures or equivalent, unless an on-site determination is made that their application is unnecessary to achieve their intended purpose or protection. For example, the Standard Operating Procedure to "complete vegetation treatments seasonally before pollinator foraging plants bloom" would not be applied to treatments not likely to have an effect on pollinators.

PEIS Mitigation Measures (MMs) were identified for all potential adverse effects identified for herbicide applications in the *Vegetation Treatments Using Herbicides on Bureau of Land Management Lands in 17 Western States Programmatic Environmental Impact Statement* (PEIS; USDI 2007a), and adopted by its Record of Decision (also listed in Appendix A). In other words, NO potentially significant adverse effect identified in the PEIS analysis remained at the programmatic scale after the Mitigation Measures were adopted. Like the Standard Operating Procedures, application of the Mitigation Measures is assumed in the analysis in this EA, and on-site determinations can decide if their application is unnecessary to achieve the intended purpose or protection.

Oregon FEIS Mitigation Measures were identified and adopted for adverse effects identified in the *Final Vegetation Treatments Using Herbicides on BLM Lands in Oregon Environmental Impact Statement* (Oregon FEIS; USDI 2010a). Application of these measures (also listed in Appendix A) is also assumed in the analysis in this EA unless on-site determinations are made that they are not needed, or there are alternative ways, to meet the intended purpose or protection. Again, no potentially significant adverse effect was identified at the programmatic scale in the Oregon FEIS with the Standard Operating Procedures and Mitigation Measures assumed.

[32] Manual-directed Standard Operating Procedures and other standing direction may be referred to as best management practices in resource management and other plans, particularly when they apply to water.

Effects Determinations in this Environmental Analysis

The individual resource effects sections in this chapter typically cite various risk levels from the Risk Assessment tables in Appendix D, *Herbicide Risk Tables*. These serve as indicators of a potential adverse effect from an herbicide application. The analysis sections then reference key Standard Operating Procedures and Mitigation Measures, describe the proposed applications, describe the potential for their resource to experience the modeled exposure scenarios, and draw conclusions as to whether the alternatives have the potential for significant adverse effects at the site-specific scale. The individual resource sections also tier to the Oregon FEIS. Anticipated herbicide treatments on BLM administered lands in Oregon were analyzed in the Oregon FEIS at the programmatic scale.

Cumulative Effects

Cumulative effects are addressed for each of the individual resource sections. Cumulative effects to the environment are defined in the CEQ regulations as those that result from the incremental effects of a proposed action when added to other past, present and reasonably foreseeable future actions, regardless of which agency or person undertakes them (40 CFR 1508.7). Effects from past actions are, consistent with CEQ direction, generally considered part of the description of the Affected Environment in the resource effects sections in this chapter. Reasonably foreseeable actions from the discussions below, and others, are addressed in the cumulative effects discussions for each resource as applicable.

Reasonably Foreseeable Actions

Invasive Plant Control Activities Authorized by the Resource Area Beyond Those Described under the No Action Alternative

In May 2014, the Resource Area issued a decision for the Cahill EA to renew five grazing allotment permits in the Warner Mountains, and to conduct invasive plant control and ecological improvement activities within those allotments. This decision tiers to the analysis in the Oregon FEIS, and authorizes continuation of an integrated invasive plant management approach that includes the use of six new herbicides (in addition to the four already authorized under the Resource Area's *Integrated Noxious Weed Management Program EA* (USDI 2004). The new herbicides are chlorsulfuron, clopyralid, diflufenzopyr (formulated with dicamba in the product Overdrive®), imazapic, metsulfuron methyl, and sulfometuron methyl. The decision authorizes the use of these herbicides to control invasive plants on sites scattered throughout the five allotments, and to control cheatgrass in a 500-acre area to improve ecological condition in the Coleman Lake Pasture in the Rahilly Gravelly Allotment (USDI 2014). The size and location of the five allotments is displayed in Table 3-1. The treatment areas are estimated at 783 acres. Because this authorized use fits wholly within the scope and intent of the Proposed Action and only represents only a small part of the Proposed Action, the invasive plant treatment acres authorized by the Cahill decision are included in the estimated treatment acres for the Proposed Action, Categories 1, 2, 3 and 6, and are thus included in the effects analyses in this Chapter. However, if the Proposed Action were not selected, treatments under the Cahill decision would still proceed.

Table 3-1. Allotments Approved for Invasive Plant Treatments using Six New Herbicides

Allotment Name	Allotment Acres	Treatment Acres	Approximate Location
Round Mountain	17,092	60	10 miles SW of Adel, Oregon
Rahilly Gravelly	34,059	598	5 miles S or Adel, Oregon
Burro Springs	7,004	15	6 miles SE of Adel, Oregon
Hill Camp	32,138	60	10 miles SE of Adel, Oregon
FRF Cahill	571	50	5 miles NE of Adel, Oregon

Neighboring Lands Pesticide Use

For two years beginning in 2007, the State of Oregon compiled pesticide use in the State via the self-reporting Pesticide Use Reporting System. Reports compile the resultant information by major water basin. There were a number of problems with pesticide use reporting; it was voluntary and some of the reporting fields were ambiguous, so the amount of pesticide use reported was likely underestimated. However, the 2009 report does provide the best available information on the use of pesticides in Oregon (USDI 2010a, ODA 2009).

Over 98 percent of the BLM-administered lands in the Lakeview Resource Areas lies within the Oregon Closed Basins (see Figure 3-1). The Oregon Closed Basins essentially covers Lake and Harney Counties,[33] and the Lakeview Resource Area occupies 31 percent of the Basins. For 2008, 63,531 pounds of the pesticides (including herbicides) were reported used in the Oregon Closed Basins, as shown in Table 3-2. Estimates of the annual pounds of herbicide to be applied on BLM-administered lands under the No Action and Proposed Action Alternatives are also shown.

Figure 3-1. Oregon Closed Basins

Table 3-2. Pounds of Herbicides used in Oregon Closed Basins 2008[1], and BLM Current/Proposed Use

Herbicide	Total lbs. in Oregon Closed Basins	No Action Alternative (Lakeview Resource Area)		Proposed Action (Lakeview Resource Area)	
		Lbs.[2]	*% of Oregon Closed Basins*	*Lbs.*[2]	*% of Oregon Closed Basins*
Glyphosate	16,987	1,285	8%	495	3%
2,4-D	15,453	2,204	14%	1,532	10%
Diuron	6,846	0	0%	0	0%
Atrazine	5,877	0	0%	0	0%

[33] The Oregon Closed Basin is essentially Lake and Harney Counties except for small areas of Lake County draining to Goose Lake or the Deschutes River, and the northeastern corner of Harney County draining to the Snake River.

Herbicide	Total lbs. in Oregon Closed Basins	No Action Alternative (Lakeview Resource Area)		Proposed Action (Lakeview Resource Area)	
		Lbs.[2]	***% of Oregon Closed Basins***	***Lbs.***[2]	***% of Oregon Closed Basins***
Hexazinone	5,009	0	0%	14	<1%
All Others	13,360	981	N/A[3]	1,076[4]	N/A[3]
Total	63,531	4,470	N/A[3]	3,117	N/A[3]

1. Source: Oregon Department of Agriculture, Pesticide Use Reporting System 2008 Annual Report (June 2009)
2. Assumes one-tenth of the 44,090 Treatment Category 1 acres per year (4,410 acres) and 5,000 acres per year of imazapic for Treatment Categories 4, 5, and 6 under the Proposed Action.
3. The *All Others* line includes herbicides with application rates ranging from less than an ounce to pounds per acre, so a direct comparison may not be meaningful.
4. Includes 450 pounds of imazapic for Treatment Categories 4, 5, and 6.

It is clear from Table 3-2 that, unlike much of the rest of the State, the primary pesticides used in Lake and Harney Counties are herbicides. A small portion of these are used on Federal lands, almost exclusively to control invasive plants (see below). An unknown quantity is used by State and County road departments primarily for road maintenance. Most of the remainder appears to be used on agricultural lands, primarily hay and other feed crops but also including other crops, and for the control of invasive plants on private lands.

Other Federal Lands

At the 278,00 acre Hart Mountain National Antelope Refuge, three percent of the Oregon Closed Basins, four invasive plants (Mediterranean sage, white top, Canada thistle, and cheatgrass) are actively controlled according to the 1994 Hart Mountain Management Plan (USDI 1994:140). The plan does not identify treatment method, but some use of herbicides is assumed.

On the Fremont/Winema National Forests, approximately 40 percent of which is in Lake County (and none in Harney County), herbicide use is limited to invasive plants, and no more than 8,700 acres per year can be treated under direction adopted in 2011. The Forests' 10-15 year plan identifies nearly 5,000 acres of planned treatment area within 100 feet of water within the Oregon Closed Basins (USDA 2011:3.3◊19-21).

The Bonneville Power Administration (BPA) has responsibility for noxious weed control on their rights-of-way, but the BLM monitors noxious weed populations and works cooperatively with the BPA to control these plants. BPA noxious weeds and planned treatments are included in the treatment estimates, and the analysis, for both alternatives in this EA.

There is nothing in the analysis that suggests effects would cross federal administrative boundaries except, possibly, for downstream herbicide accumulation in larger streams and smoke from pre-burning invasive annual grass rehabilitation treatments using pre-emergents like imazapic. The cumulative effects section for air quality considers the potential for smoke from other lands, and the cumulative effects discussion for other sections in the analysis (e.g. those for water and fish) consider the use of herbicides on adjacent lands where appropriate.

Other Foreseeable Actions

The following additional foreseeable actions on the Lakeview Resource Area (see Table 3-3) could create effects to some of the same resources potentially affected by application of one or both of the alternatives in this EA.

Table 3-3. Foreseeable Actions Potentially Relating to Cumulative Effects

Project / Activity	Description	Implementation Date
South Warner Sagebrush-Greater Sage-Grouse Habitat Restoration	Cut and burn juniper in sagebrush habitat within 50,000-acre South Warner Rim project area	2014-2022
Bridge Creek Prescribed Burn	Burning of individual juniper trees in sagebrush habitat to improve sagebrush/Greater Sage-Grouse habitat (800 ac.)	2015
Silver Creek juniper cutting	Cut juniper in sagebrush habitat to improve sagebrush/Greater Sage-Grouse habitat (1,000 ac.)	2015
Fuel break mowing[1] • Brown's Valley • Paisley Desert	Mowing fuel breaks immediately adjacent to existing roads to prevent large-scale wildfires in sagebrush habitat 535 ac. 770 ac.	2015
Livestock Grazing	Lakeview Resource Area contains 120 allotments representing an estimated 2,917,000 acres of public land open to grazing and up to 164,124 animal unit months of authorized forage that is utilized on an annual basis.	Annual
Mining	Past and on-going disturbances associated with locatable, leasable, and salable mining activities, 1,650 to 2,900 acres	Ongoing

1. These projects have a direct, negative impact on sagebrush habitat in the location of the fuel break, but benefit much larger blocks of habitat by helping limit the size of future wildfires in such habitat.

Overview of the Affected Environment

Of the nearly 3.2 million acres in the Lakeview Resource Area, approximately 91 percent supports shrub dominated plant communities. About seven percent of the land base supports tree dominated forest and woodlands, while less than two percent is water influenced riparian and wetland vegetation. These plant community groupings are introduced below, and described in more detail in the *Native Vegetation* and *Riparian and Wetlands* sections later in this Chapter.

Shrub Steppe/Sagebrush Steppe[34]

This category includes all of the shrub dominated communities and grasslands that occur on approximately 90 percent Resource Area (2,857,785 acres). Dominant shrubs are primarily sagebrush, including three species of big sagebrush, and lower growing low, silver and black sagebrush. These communities typically have an understory of perennial bunchgrasses and assorted forbs. Some former shrub steppe communities have been transformed into grasslands following fire. Introduced perennial crested wheatgrass (*Agropyron cristatum*) has been seeded. Salt desert scrub, consisting of salt tolerant plants, is included here. Documented invasive plants cover about one percent of lands in this category.

Forests and Woodlands/Eastern Forest

Tree-dominated plant communities including western juniper woodlands, ponderosa pine forests, mixed conifer forests, and aspen groves occur on 232,446 acres or seven percent of the Resource Area. These are more productive sites than shrub dominated land. Woodlands and forests typically have understory layers of shrubs, forbs, and grasses. Some juniper has expanded into sagebrush communities, primarily because of fire suppression. Documented invasive plants (Treatment Category 1) occur on less than one percent of the lands in individual plant communities, except for ponderosa pine and juniper where four percent and two percent have documented infestations respectively.

[34] Lakeview Resource Management Plan Plant Community/2010 Oregon FEIS Biome (USDI 2003a:2-2 & USDI 2010a:123).

Riparian and Wetland Vegetation/East Side Riparian

Riparian and wetland vegetation covers less than two percent of the Resource Area. Documented invasive plants occur on nearly seven percent of lands in this plant community.

Analysis of the Issues, by Resource

Invasive Plants

Issues

- How would the alternatives reduce the spread of noxious weeds and other invasive plants?
- How would the alternatives respond to a tendency for some populations of invasive plants to develop resistance to an herbicide?

Affected Environment

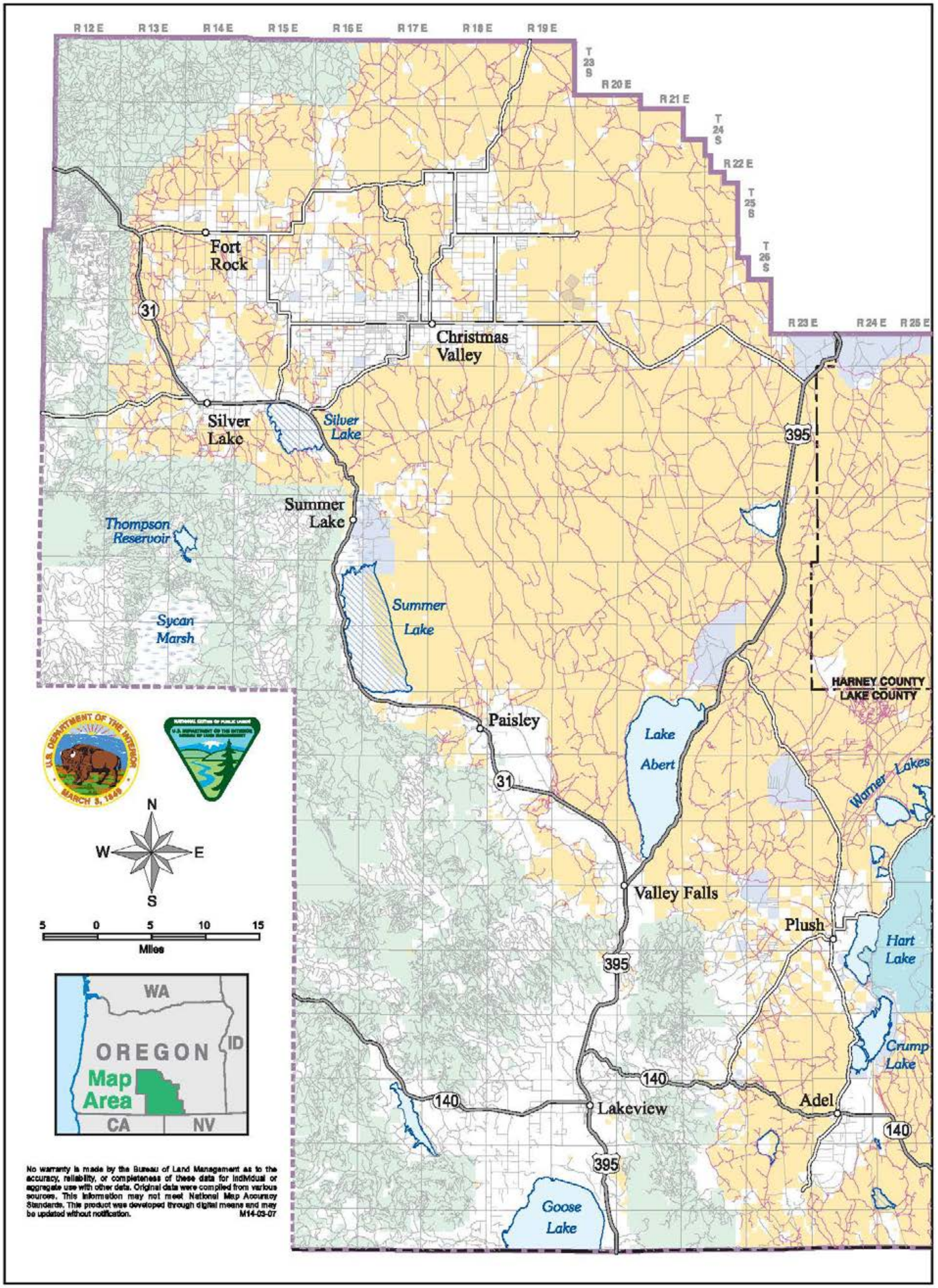
The susceptibility of plant communities to infestation by invasive plants is influenced by many factors, including community structure, proximity to currently infested areas, and the biological traits of the invading species. In general, vegetation types with frequent gaps in plant cover, such as rangelands, woodlands, and dry forests, are more susceptible to invasive plant establishment, than vegetation types with relatively closed plant cover.

The Lakeview Resource Area has over 30 invasive plant species occupying over 44,000 acres in approximately 2,700 separate documented locations (Treatment Category 1, Table E-1, *Documented Invasive Plant Sites*). These sites are primarily located along roads, in riparian areas, wetlands, recreations sites, range water development sites, and previously disturbed areas. The individual sites range from a few plants to sites as large as 5,000 and 10,000 acres (perennial pepperweed in the Warner Valley Basin). Invasive annual grasses (including cheatgrass) occupy hundreds of thousands of additional acres. Existing sites are spreading at the edges, and by seed and other propagules to new sites creating satellite populations. The current spread rate for noxious weeds is estimated to be about 12 percent annually (Treatment Category 2)(USDI 2010a:133 & 594).[35] Most invasive plant spread is along roads (see Figure 3-2) and riparian areas (see Figure 3-3), as well as by wind, water, and animals, and by humans through vehicles and foot traffic.

A major pathway of invasive plant spread is the water that moves across the Warner Basin, where invasive plants spread from landowner to landowner through irrigation water systems. These water systems first push water across agriculture fields in the southern portion of the basin. Many (if not all) of these fields contain invasive plant species such as perennial pepperweed, hoary cress, and Canada thistle. Once the water is pushed through the agriculture lands, it is diverted north into dikes and canals to Crump Lake. The water in Crump Lake is then pushed through the Warner Narrows that connect to Hart Lake. Water from Hart Lake is pumped into the Warner

[35] The 2010 Oregon FEIS examined a variety of sources, see pp. 594-5, and concluded the spread rate for noxious weeds in Oregon was about 12 percent. The sources for that estimate, and the nature of the infestations at Lakeview, indicate that this is a reasonable estimate for noxious weeds on the Lakeview Resource Area as well. Invasive annual grasses like cheatgrass, however, are well established and are thus likely spreading more rapidly (see Invasion Lag Curve, USDI 2010a:132), but a lack of effective controls has made careful mapping of these grasses a low priority on the Resource Area until recently. Although some of the 44,090 Treatment Category 1 acres are invasive annual grasses, the (likely conservative) 12 percent spread rate is used for calculations in this section for simplicity (see *Effects by Alternative* below). Since available herbicides and other control methods have been essentially constant for 30 years, the 12 percent spread rate is assumed to apply to the No Action Alternative.

Figure 3-2. Road-Based Spread of Invasive Plants



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Bureau of Land Management
Integrated Invasive Plant Management Environmental Assessment
Lakeview Resource Area
2014

Figure 3-2. Road-Based Spread of Invasive Plants

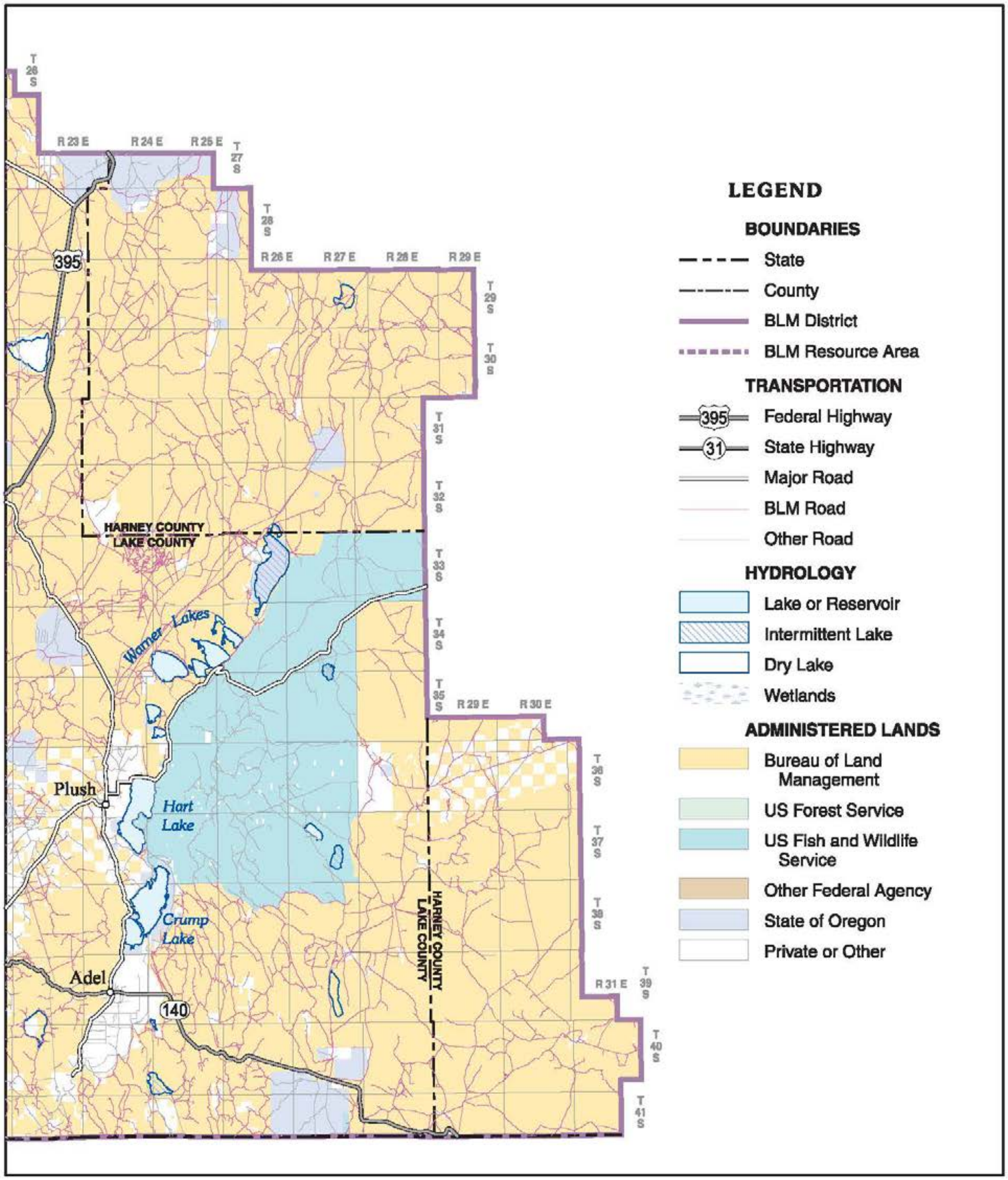
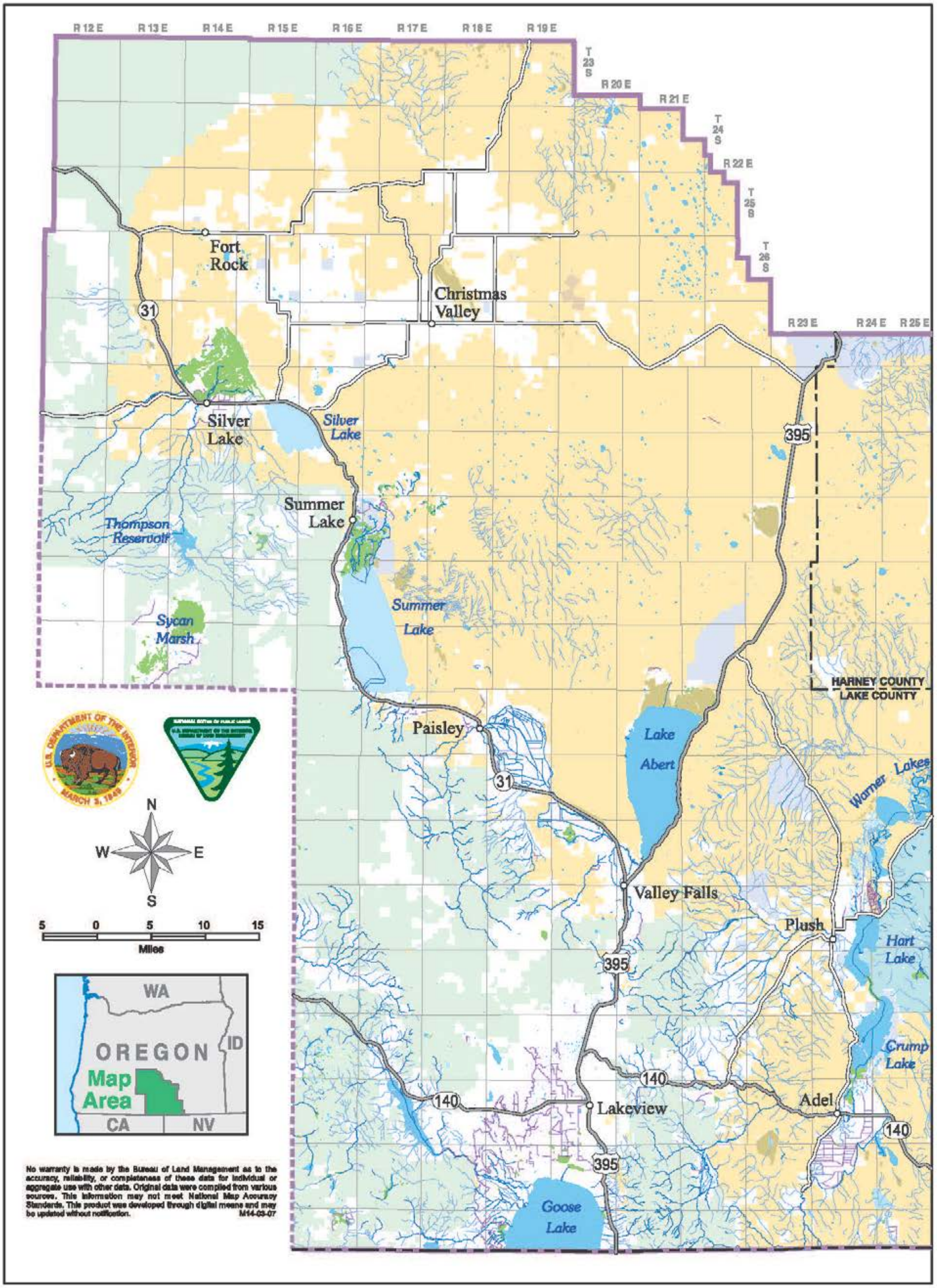
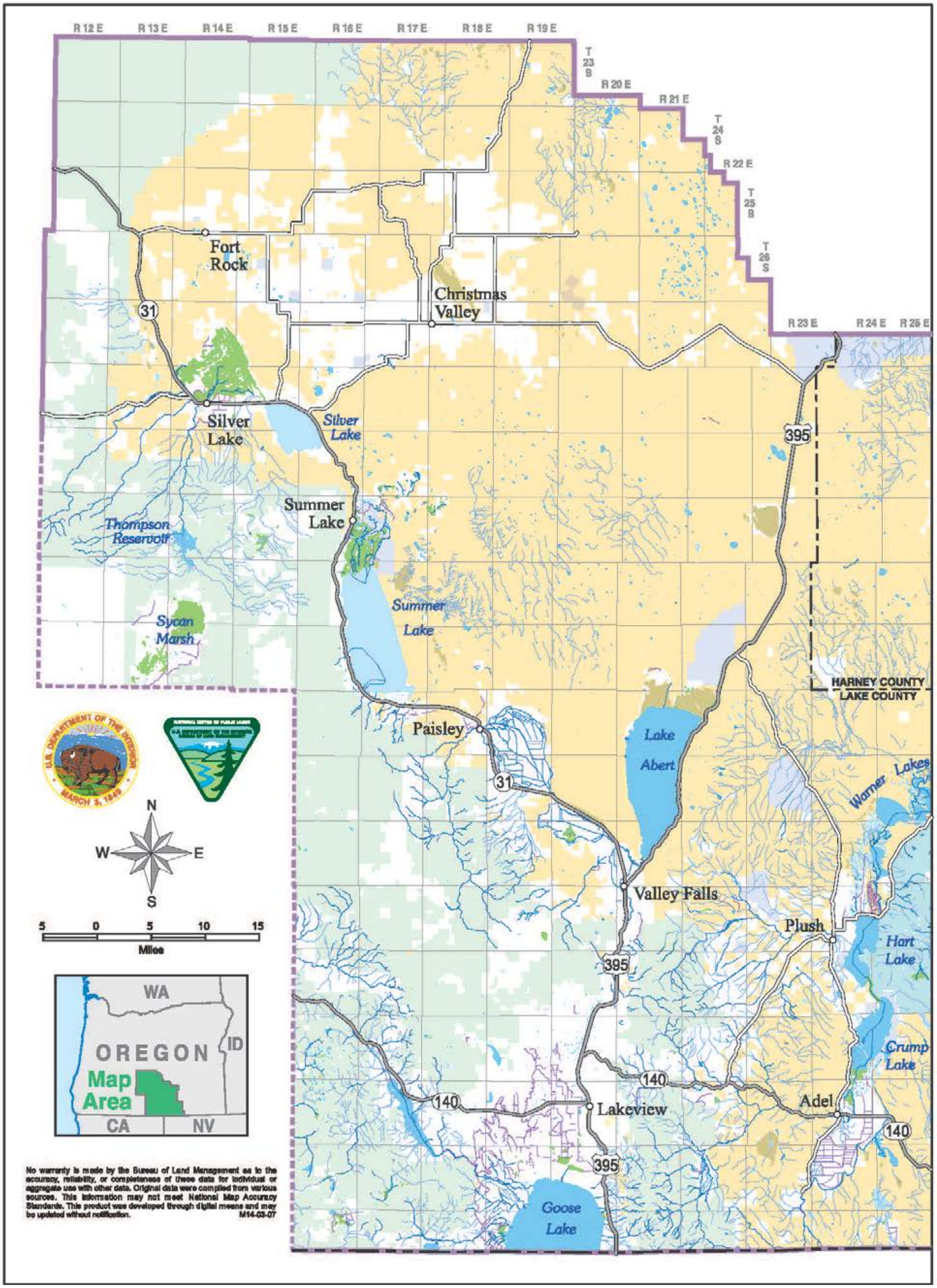


Figure 3-3. Water-Based Spread of Invasive Plants

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Fort Rock
Christmas Valley
31
Silver Lake
Silver Lake
395
Summer Lake
Thompson Reservoir
Summer Lake
Sycan Marsh
HARNEY COUNTY
LAKE COUNTY
Paisley
Lake Abert
31
Warner Lakes
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5
0
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10
15
Miles
Valley Falls
Plush
Hart Lake
395
WA
OREGON
ID
Map Area
CA
NV
Crump Lake
140
Adel
140
Lakeview
140
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Goose Lake
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Wetlands and across many agriculture lands in the northern portion of the Basin. This movement of water leaves the Warner Wetlands with a very well distributed seed bank every season.

Roads are another spread pathway. However, satellite infestations are often found along roads when just a single plant has appeared, and thus can usually be controlled through manual methods. The most common noxious weed found across the Resource Area is Mediterranean sage.[36] This species can be easily managed through hand digging if sites are found before the plant goes to seed. If the plant goes to seed and produces thousands of seeds, the following year would likely require more aggressive controls to keep the site contained.

Invasive plants, such as yellow starthistle and Dyer's woad, are entering the Resource Area from neighboring states, counties, and other Resource Areas. When the 2004 *Lakeview Resource Integrated Noxious Weed Management Program EA* was prepared, the Resource Area had approximately 900 known noxious weed sites. Now there are approximately 2,700 sites documented in the BLM's National Invasive Species Information Management System (NISIMS) database for the Resource Area. New sites are found within the Resource Area every time an invasive plant survey is performed.[37] Usually these sites contain species that are already present within the Resource Area. Invasive plants have the ability to spread great distances on off-road and other vehicles, on camping and other recreation equipment, on livestock, in hay and other feed crops, on construction equipment, on the wind, on animals (including within feces), as intentionally moved plants, or inadvertently within the soils of other transplanted vegetation (USDI 1996a). Infestations begin mostly on disturbed sites such as along roads and trails, firebreaks or burned areas, wildlife or livestock concentration areas, and recreation sites. Linear disturbances such as roads and fences can serve as corridors for invasive plant spread (USDI 2010a:132). Mediterranean sage is often found along fences because it has the ability to break off from the root crown and tumble across the rangelands; it can blow miles away from the original site.

When new invasive plants are found that have not formerly existed within the Resource Area, they are considered "new invaders" (Treatment Category 3). New invaders move into Oregon every year. Many of the new invaders would often reside within the Resource Area on non-BLM lands before they spread onto the BLM-administered lands. For example, summer pheasant eye has been invading the Goose Lake watershed for ten years, but has yet to be detected on BLM-administered lands. There are also many sites with Russian olive on the private lands scattered across the Resource Area that have just started to spread onto BLM-administered lands. The Resource Area is involved with the Lake County Cooperative Weed Management Area (CWMA), a cooperative group that assists with managing invasive plants adjacent to the BLM-administered lands and helps coordinate projects across jurisdictional boundaries. These groups help educate the public about new invasive plants that are invading the Resource Area and surrounding areas.

Control efforts are most effective if they identify and eradicate the infestation while it is still in the introduction phase. Control efforts in this phase can prevent future infestations on tens to hundreds of times more acres (Radke and Davis 2000:25). The Lakeview Resource staff performs detailed field surveys of the Resource Area (with the goal of covering the majority of it every three to five years) to detect as many populations in the introduction (or early establishment) phase as possible. The Lakeview staff is always looking for species that are in neighboring areas that have not invaded the Resource Area; the Resource Area is currently surveying for African rue, purple loosestrife, and leafy spurge.

There are many undocumented infestations of invasive annual grasses for which there are no effective controls available under the current program. Estimates from the BLM Ecological Site Inventory (ESI) showed the Resource Area having more than 300,000 acres where cheatgrass is recorded as the dominant understory grass. Additional

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[36] Perennial pepperweed and Medusahead rye are documented on more acres (see Table 2-1, Summary of Documented Invasive Plant Sites), but Mediterranean sage sites are more numerous and widespread.

[37] In addition to invasive plant spread, new sites are also found because more of the Resource Area is being inventoried annually than in previous years. The Resource Area also expects to find additional sites as the survey plant list expands from noxious weeds to include other invasive plants.

tens of thousands of acres of invasive annual grasses are located within recently burned areas where the ESI is outdated. However, these grasses appear to be present throughout the Resource Area, where they range from low density to monocultures. Where densities are high, there is an increase in the frequency and severity of rangeland wildfires, which in turn damages sagebrush and other native habitats, and promotes further spread of invasive annuals (Whisenant 1990, Miller and Tausch 2001, Pellant et al. 2004, Chambers et al. 2007). Currently there are few post-fire annual grass preventative measures taking place (Treatment Category 4) because there is no herbicide selective to these grasses available for use for emergency fire stabilization programs. Even with aggressive post fire seeding efforts, rehabilitation is often unsuccessful due to competition from invasive annual grasses that begin growing sooner than the seeded species.

Environmental Consequences

Effects of Treatment Methods on Invasive Plants

Non-Herbicide Treatments

Manual methods (such as pulling, digging, and grubbing weeds) can be used to control some invasive plants, particularly if the population is relatively small. Grubbing is often used when a single invasive plant is found. These techniques can be extremely target-specific, minimizing damage to adjacent desirable plants, but they can be labor and time intensive. The Lakeview Resource Area uses manual control for many small biennial or annual species such as musk thistle, Scotch thistle, and Mediterranean sage. Treatments must typically be administered several times annually to prevent the invasive plant from re-establishing. In the process, laborers may trample vegetation and disturb soil, providing isolated but nevertheless prime conditions for re-invasion by the same or other invasive plants. Manual techniques can be effective for small infestations and/or where a large pool of labor is available. They can be used in combination with other techniques; for example, when shrubs are pulled and cut, re-sprouts and seedlings can be treated with herbicides or fire several weeks or months later (Tu et al. 2001, USDI 2010a:73).

Mechanical methods include weed whackers, chainsaws, and mowing, including flail mowing and boom mowers. Some of these methods (e.g., chainsaws and weed whackers) can be more target-specific than others; all methods share some of the drawbacks that manual methods do (e.g. need of repeat treatment, disturbed vegetation and soil disturbance can promote invasive plants, disturbance to non-target species, etc.). Weed whacker methods are common in recreation sites, as the area would not need to be closed for re-entry intervals as they would with herbicide application (the Highway Well and Hart Bar Day Use Areas are generally treated mechanically). Mowing is often used at communication, storage, and administrative sites (such as the Lakeview Interagency Fire Center, and guard stations) to prevent invasive plants from becoming a fire hazard. When using mechanical and manual methods, all equipment and clothing is normally cleaned and inspected before being moved off-site. This lessens, but does not eliminate, the possibility of spreading invasive plants to the next worksite (USDI 2010a:74). The District-maintained *Weed Prevention Schedule* guides the Resource Area staff on how to prevent invasive plant spread (see Appendix F).

Targeted livestock grazing can reduce invasive plant abundance at a particular site. However, grazing will rarely, if ever, eradicate invasive plants. Grazing animals may be particularly useful in areas with limited access, severe slopes, or where herbicides cannot be applied (e.g., near water). Cattle are currently the only animals that have been used for targeted livestock grazing within the Lakeview Resource Area, as sheep and goats have the ability to carry diseases that can be transmitted to the local bighorn sheep herds[38]. Animals are brought into an infested area at a time when they would be most likely to damage the invasive plants without causing unacceptable damage to desirable species or other elements of the environment. For example, livestock grazing of cheatgrass

[38] Sheep and goats would only be used for targeted livestock grazing within and directly adjacent to Allotments 700, 701, 702, 703, 704 and 713 (the area south and west of Silver Lake next to the Fremont-Winema Forest) in order to reduce the risk of contact between Big Horned Sheep and domestic goats and sheep.

could occur prior to emergence of native grasses so the native grasses can take advantage of the reduced cheatgrass competition. Several of the grazing allotments (such as the Paisley Flat allotment) are routinely grazed in the early spring when cheatgrass is palatable, to prevent the cheatgrass from flowering and setting seed. Targeted grazing can be extremely effective on some annual and biennial species. However, it usually does not kill the plants, just suppresses growth, spread, and reproduction. It can be used together with seeding[39] to restore native habitats. As with many other treatments, targeted livestock grazing can be most effective when used in combination with other treatments (USDI 2010a:75). In limited areas[40], sheep and goats can be used to selectively graze shrub, forb, and woody invasive plants. Targeted grazing using cattle may happen throughout the district, including on 41,712 acres of exclosures[41], to assist in controlling some invasive species such as Canada thistle and spotted knapweed. This is a treatment that could be used in exclosures. A Standard Operating Procedure requires targeted grazing occur prior to weed seed set or, if seed set has occurred, not moving the animals to uninfested areas for a period of seven days.

Biological control agents are host specific organisms (mostly insects but can be nematodes, mites, or pathogens) that target noxious weeds and reduce their reproduction and vigor. Fourteen biological control agents are currently active on eleven different noxious weeds[42] in the Lakeview Resource Area. Dozens of releases have been made on several of these species[43] in the resource Area in the past 25 years. Biological control agents typically help keep the plant in balance when they occur in the original native community from where the invasive plant originated. Absence of these natural community controls is often what allows an invasive plant to spread and become invasive in its new habitat. Most of the species used for biological control are host-specific and are not known to attack non-target species. Biological controls will seldom remove an invasive plant entirely, but can dampen its reproduction, spread and extent, and keep it in some sense of balance compared to other plants in that community. Biological controls are usually acquired from the same alien ecosystems as the target invasive plant originated, and so are vigorously tested by the Federal Animal and Plant Health Inspection Service to ensure that they are not likely to become pests themselves. The Oregon Department of Agriculture's Noxious Weed Control Program coordinates releases and monitors populations. Since the biological control agents are not successful unless there are enough weeds for them to feed upon, typically only large sites are targeted. Once large populations become unmanageable, other methods of control are not always economical or physically possible. The most successful biological controls on the Lakeview Resource Area are *Phrydicuchus tau*, which targets Mediterranean sage, and the Canada thistle biological control *Urophora cardui*. *Phrydicuchus tau* has been used to control Mediterranean sage since the 1970s within the Resource Area. Canada thistle biological controls have been introduced within the Warner Wetlands and in large infestations in spring enclosures. Within the Resource Area, there is a nursery collection site used to spread biological controls across the State.

The most effective prescribed fires for invasive plant control are typically those administered just before flower or seed set, or at the young seedling/sapling stage. Like other treatments, timing is critical and is dependent on characteristics of the invasive plant, desirable plants, soil moisture, and environmental conditions. Other treatment methods are often used in conjunction with fire, including the use of herbicides and/or seeding. In some cases, prescribed fires can unexpectedly promote invasive plants, particularly when their seeds are adapted to fire or re-sprout vigorously. Most successful invasive plant control efforts using burning include native plant seeding and the restoration of natural fire regimes. The Resource Area uses prescribed fire to burn off the thatch layers of Medusahead rye prior to herbicide application.

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[39] Where the hoof action improves seed/soil contact and germination.

[40] Sheep and goats would only be used for targeted livestock grazing within and directly adjacent to Allotments 700, 701, 702, 703, 704 and 713 (the area south and west of Silver Lake next to the Fremont-Winema Forest) in order to reduce the risk of contact between Big Horned Sheep and domestic goats and sheep. This is a treatment that could be used in exclosures assist in controlling some invasive species such as Canada thistle and spotted knapweed.

[41] This does not include about 3,164 acres of existing exclosures in occupied Warner Sucker habitat.

[42] Mediterranean sage; Canada, bull, Scotch, and Russian thistle; yellow starthistle; diffuse and spotted knapweed, St. John's wort; and, Dalmatian and yellow toadflax.

[43] An unsuccessful release was also made on field bindweed.

Herbicide Treatments

2,4-D (common to both alternatives) is effective on a wide range of broadleaf weeds while protecting most grasses. While having additional herbicides available can allow for more target specific control, having one herbicide that controls a vast range of vegetation could reduce operator error that can occur while mixing and applying herbicides. In addition, adding a small amount of 2,4-D to a tank mix can improve the effectiveness of the other herbicides and reduce the likelihood of a population developing resistance. Since there have only been four herbicides available and herbicide resistance has been a concern, 2,4-D has been used as a tank mix with both picloram and dicamba. A combination of 2,4-D and dicamba has been used to suppress the perennial pepperweed infestations in the Warner Wetlands for the past fifteen years.

Fluridone (Proposed Action) is an aquatic herbicide that requires prolonged plant contact, so it can only be used on aquatic plants in still water. There are currently no invasive aquatic plants on the Resource Area that would be controlled with this herbicide, but it could be used in the future if such a species invades. Treatments in water are normally conducted by the ODA.

Hexazinone (Proposed Action) would be used occasionally to treat annual grasses near roads. It could also be used to treat new invaders to the Resource Area, and common targets could include broadleaf plants, brush, and trees. It provides excellent control on African rue, a bushy invasive perennial (not known in the Resource Area, but known in neighboring counties) that is toxic to people and livestock.

Glyphosate (common to both alternatives) is being used on broadleaf invasive plants and woody species and has been used to treat Medusahead rye on the Resource Area. However, it is a non-selective herbicide and can harm desirable plants, so use has been limited to areas where this is an acceptable treatment. Glyphosate and 2,4-D have been the only two aquatic herbicides available to the Resource Area for the past 30 years, and their use would decrease if more aquatic herbicides became available.

Imazapyr (Proposed Action) is an ALS-inhibitor[44] that is effective against brushy and woody species such as saltcedar and Russian olive. It is also used to treat African rue, Japanese knotweed, and leafy spurge. Imazapyr applications may be used for the control of aquatic invasive plants in and around standing and flowing water.

Imazapic (Proposed Action), an ALS-inhibitor, is especially effective against the invasive annual grasses such as cheatgrass and Medusahead rye. It is selective for these grasses at low rates, leaving the perennial herbaceous species critical for restoration. The Resource Area does not currently have an effective method of selectively treating these fire-prone invasive annual grasses.

Like imazapic, *sulfometuron methyl* (Proposed Action), an ALS-inhibitor, is effective against cheatgrass and Medusahead rye. It has a shorter half-life than imazapic, which speeds restoration efforts. In addition, sulfometuron methyl is effective on mustards, but can harm desirable forb species.

Dicamba (common to both alternatives) has been used extensively on thistles and in combination with 2,4-D on mustards (including perennial pepperweed) and knapweeds. Use would drop under the Proposed Action, and chlorsulfuron and metsulfuron methyl would be used for many of these treatments. However, dicamba provides good control right up to seed set, which extends the treatment window.

Diflufenzopyr + Dicamba (Proposed Action) would be used for many of the same species as dicamba. It can be used in a mixture with picloram, triclopyr, and clopyralid, allowing for a reduced rate of these chemicals.

[44] Chlorsulfuron, metsulfuron methyl, and sulfometuron methyl (sulfonylureas) and imazapic and imazapyr (imidazolinones) work by inhibiting the activity of ALS, which is necessary for plant growth. These five herbicides are effective at very low dosages (half ounce to a few ounces per acre). A predominant problem with ALS-inhibiting herbicides is that they can quickly confer resistance to weed populations, particularly where they are used extensively as the primary weed control method in cropping systems.

Chlorsulfuron (Proposed Action) is an ALS-inhibitor that is effective on grasses and broadleaf plants such as whitetop, perennial pepperweed, Mediterranean sage, and thistles. It is often mixed with 2,4-D to reduce the likelihood of developing plant resistance and to produce more immediately visible results. It can also be used on toadflax and knapweeds.

Metsulfuron methyl (Proposed Action) has similar targets and effects as chlorsulfuron, but can cause more harm to desired meadow grasses. It could be used on perennial pepperweed, whitetop and other mustards.

Picloram (common to both alternatives) has been used on rush skeletonweed, knapweeds, toadflax, and thistles, and provides good residual control. Use would decrease under the Proposed Action, and clopyralid, which is more selective, would likely be used instead.

Clopyralid (Proposed Action) would target many of the same species as picloram, but is more selective. It is effective on knapweeds and Canada thistle, while minimizing risk to surrounding desirable brush, grass, and trees.

Triclopyr (Proposed Action) is effective on woody plants, and would be used on saltcedar, Russian olive, brooms, and other shrubs. Triclopyr BEE, the ester formulation, is more effective at smaller doses, but is more toxic to fish.

Effects by Alternative

No Action Alternative

Continued use of 2,4-D, dicamba, glyphosate, and picloram along with non-herbicide method to control only State, Federal, or county-listed noxious weeds will continue to slow the spread of many noxious weeds within Resource Area. However, certain noxious weeds and most of the other invasive plants would continue to spread. For example, perennial pepperweed cannot be eradicated under this alternative; treatments for this species only reduce the vigor or delay seed development, thus slowing the spread. The invasive annual grasses (including the noxious weed Medusahead rye) cannot be effectively treated under this alternative because there is no herbicide available that is selective to these grasses. Treatments under this alternative are estimated to effectively control small populations about 60 percent of the time (USDI 2010a:136),[45] and at the current 12 percent annual spread rate, the 44,090 acres of documented sites (see Table 2-1, *Summary of Documented Invasive Plant Sites*) would be expected to spread to approximately 215,000 acres in 15 years ($44{,}090 \times 1.12^{14}$). Cooperative partners within the Resource Area (such as Lake County CWMA) find projects with the BLM to be difficult because many of the herbicides they routinely use are not available for use on BLM-administered lands.

Herbicide resistance is the evolved capacity of a susceptible invasive plant population to withstand an herbicide application and complete its lifecycle. Because some sites (such as perennial pepperweed in the Warner Wetlands ACEC) have been sprayed annually with the same herbicide to suppress noxious weeds with low likelihood of eradication, a concern is that plant populations could become herbicide resistant. Most herbicide resistant plants are in agriculture settings; however, resistance has been documented in vegetation management settings and regulatory invasive plant programs. Resistance can result from repeated use of the same herbicides, or several herbicides with the same site of action.

Proposed Action

The wider range of herbicides from which to choose would increase the effectiveness of the average treatment to an estimated 80 percent (USDI 2010a:136). Although some levels of retreatment would still take place, the additional herbicides would substantially improve the chances the invasive plant would be controlled with fewer

[45] Primarily because the currently available treatment methods (including four herbicides) do not kill or effectively control certain species, like perennial pepperweed.

retreatments (USDI 2010a:135-136). With additional herbicides available, this alternative could effectively control all of the types of noxious weed species known to be within the Resource Area, as well as provide the control of cheatgrass and other invasive annual grasses needed for habitat protection and large-scale rehabilitation projects. Non-herbicide methods could be more focused where they are effective, or used in conjunction with herbicides; thus, treatments under this alternative could be more focused where they are most effective. Using spread calculations developed for Alternative 3 in the 2010 Oregon FEIS, (the alternative nearly identical to the Proposed Action in this EA), the 44,090 acres of documented sites (Treatment Category 1) are predicted to spread to 147,000 acres over 15 years, or 68,000 acres less than under the No Action Alternative (USDI 2010a:596, Table A7-4). The annual spread rate is estimated to decrease to seven percent over that same period (ibid).

The more selective herbicides chlorsulfuron and metsulfuron methyl could be used to effectively control the perennial pepperweed in the Warner Wetlands that the BLM has been trying to manage for 15 years (see Table 2-7, *Treatment Key, Proposed Action*). The Warner Wetlands are designated as an ACEC for the quality waterfowl habitat. The Warner Wetlands is also habitat for Special Status plant species, Seaside heliotrope *(Heliotropium curvassicum* L. var. *obovatum* DC.) and Verrucose sea-purslane (*Sesuvium verrucosum* Raf*).* The control of invasive plants will allow Special Status plants to continue to occupy the salty banks of the Warner Lakes.

The addition of imazapic and sulfometuron methyl would give the Resource Area the ability to control the invasive annual grass species Medusahead rye before it becomes widespread across the native rangelands. This species has been invading the Resource Area for the last decade, and many attempts with the currently available control methods have been unsuccessful. The largest invasion of Medusahead rye is in the Red Knoll ACEC, where it threatens active Greater Sage-Grouse leks.

With the addition of the herbicides imazapyr and triclopyr, species such as Russian olive could be controlled. Clopyralid could be used to manage the 250-acre musk thistle site at the Juniper Mountain RNA, in addition to controlling other species such as Mediterranean sage (see Table 2-7-*Treatment Key, Proposed Action*). These more effective herbicides would allow the Lakeview Resource Area to develop containment boundaries around many of the large infestations to prevent or slow their spreading. The Resource Area would also have the ability to better manage species currently unknown on the Resource Area but with the potential to invade. For example, if African rue appeared on the Resource Area, it could be managed with hexazinone. The additional herbicides would allow control of invasive aquatic plants as well. Elodea, hydrilla, and watermilfoil have become more common across Oregon, but have not been found on the Resource Area. If detected in still waters, fluridone could be used to manage such invasive plants.

Imazapic would be used as a pre-emergent to prevent invasive annual grass species as part of post-fire emergency stabilization after large catastrophic fires (Treatment Category 4). This herbicide application would be incorporated with seeding and other emergency stabilization efforts. Greater Sage-Grouse habitat protection and restoration would also use imazapic to reduce the invasive annual grass populations in Primary Priority Management Area (Treatment Category 5). The U.S. Fish and Wildlife Service identified invasive plants, especially annual grasses, as a threat to sagebrush/forb plant communities in their *12-Month Finding for Petitions to List the Greater Sage-Grouse (Centrocercus urophasianus) as Threatened or Endangered* (75 Federal Register 13910, March 23, 2010). Treatments would help provide and protect successful nesting and reproduction habitat.

Containing existing infestations and preventing them from spreading would be the highest priority for most of the invasive annual grasses. The second priority would be restoring areas dominated by annual grass species (Category 6) to native or more favorable species, which would create a more invasive plant resistant (and fire resistant) landscape. Cattle can be used to suppress seed production before invasive annual grasses flower, but more intensive restoration efforts could consist of a several step plan, including removing the grasses with fire, herbicide application, and seeding. Fire (to burn off thick duff layers to allow herbicide/soil contact) is only used on very dense infestations, and is not often used for annual grass control efforts at Lakeview because of the sensitive period for performing the burn and the need to retain any remaining native vegetation. All of these methods and treatments would help rehabilitate currently infested areas and would decrease the rate of spread over time.

Having additional herbicides would help prevent herbicide resistance by adding chemicals that control the plants through different mechanisms (sites) of action. Herbicide resistance is the inherited ability of a plant to survive an herbicide application to which the original populations were susceptible. Naturally resistant plants occur within a population in extremely small numbers (somewhere between 1 in 100,000 to more than 1 in 1,000,000). They differ slightly in genetic makeup from the original populations, but they remain reproductively compatible with them. The repeated use of one herbicide, or of herbicides that kill the plants the same way (same mechanism or site of action), allows these few plants to survive and reproduce. The number of resistant plants then increases in the population until the herbicide no longer effectively controls it. The additional herbicides available under this alternative would permit more effective rotation of herbicides (see Table 3-4), that when coupled with integrated invasive plant management, would help prevent the development of herbicide resistance. Many of the ALS-inhibitors (such as chlorsulfuron and metsulfuron methyl) recommend tank-mix partners and/or sequential herbicide application that have different mechanisms of action.

Table 3-4. Guide for Herbicide Rotation[1]

ALS Inhibitors	Imidazolinones	Imazapic	None	None
	Imidazolinones	Imazapyr	None	None
	Sulfonylureas	Chlorsulfuron	Prickly lettuce Kochia Russian thistle Italian ryegrass Mayweed Chamomile Small-seed false flax	Idaho, Oregon, Washington Idaho, Oregon, Washington Idaho, Oregon, Washington Oregon Idaho, Washington Oregon
	Sulfonylureas	Metsulfuron methyl	Prickly lettuce Kochia Russian thistle Small-seed false flax	Idaho, Oregon Oregon Oregon Oregon
	Sulfonylureas	Sulfometuron methyl	None	None
Synthetic auxins	Phenoxy acetic acids	2,4-D	Prickly lettuce	Washington
	Benzoic acids	Dicamba	Kochia Prickly lettuce	Idaho Washington
	Pyridines	Clopyralid	None	None
	Pyridines	Picloram	Yellow Starthistle	Washington
	Pyridines	Triclopyr	None	None
ESPS synthase inhibitors	Glycines	Glyphosate	Italian ryegrass	Oregon

To avoid selecting for herbicide-resistant weeds, rotate to a different group every year if possible. Avoid using herbicides from the same group more than once every three years.

1. Adapted from *Herbicide-resistant Weeds and Their Management* (University of Idaho 2011)

Cumulative Effects

No Action Alternative

Other things would continue to affect the spread or control of invasive plants, and the 12 percent spread calculation above is made in the presence of all of these factors. Ongoing habitat restoration, prescribed burns, juniper cutting, mining (including the transport of gravel pit materials to other locations on the Resource Area), and fuel break mowing (Table 3-3) all have the potential to inadvertently introduce invasive plants (from equipment, shoes and clothing), and facilitate establishment when soil and vegetation are disturbed. Non-BLM management activities move invasive plants as well, perhaps particularly utility personnel maintaining long stretches of power lines and other rights-of-way that has been previously disturbed and is thus more likely to be infested. In addition, livestock, wild horses, and wildlife can introduce weed seeds from their coats and feces. Hoof action by large herbivores like cattle and wild horses can contribute to weed establishment by exposing bare soil and increasing the contact between seed and soil, and by selectively removing plants that are more palatable (which reduces completion for invasive plants). Similarly, and as discussed elsewhere in this section, invasive plant propagules would continue to arrive via a wide variety of transport mechanisms including wind, water, vehicles, and recreation equipment including contaminated ATVs.

Conversely, invasive plant spread is reduced not just by treatments described in the Alternatives, but also by the prevention and education measures described early in Chapter 2. The Lakeview District has a weed prevention schedule (see Appendix F) that prescribes prevention measures for various programs and activities. Additionally, risk assessments are done on proposed projects and prevention measures prescribed (BLM Manual 9015). The risk assessment considers the likelihood and consequences of invasive plant introduction and spread, and would result in project modification and/or monitoring if the risk is moderate or high. The American public is becoming more aware about the spread of invasive plants and the damage they cause. Many people understand, for example, the implications of cheatgrass to native ecosystems in the western U.S. Invasive plant spread is also reduced by the control actions of neighboring landowners by reducing the amount of seed or propagules that can be moved onto BLM lands. That effect is multiplied by cooperative relationships that control invasive plants across ownerships. Control actions on adjacent federal lands including those on the Fremont National Forest (with their new control plan and additional herbicides) and the Hart Mountain National Antelope Refuge (which is currently revising their management plan) further reduce the likelihood of introduction and spread to BLM lands, just as control efforts on BLM benefit adjacent lands.

Proposed Action

Cumulative effects under the Proposed Action with regard to invasive plants are generally influenced by the same off-site forces and agency policies as the No Action Alternative. The increased number of herbicides and other treatment methods expected to be used under this alternative, and the expanded number of plants herbicides may be used on, would improve BLM's effectiveness at controlling invasive plant spread as described in this section. Those herbicides would also have a synergistic effect as their availability facilitates more effective cooperative control projects, which in turn, would reduce the number of invasive plants entering the Resource Area from neighboring lands. In addition, completion of EAs for similar proposals on other Oregon BLM Districts would be expected to reduce, comparatively, the amount of invasive plants available to be transported into the Resource Area. The spread rate of invasive plants is expected to decrease to seven percent as more effective control measures become available.

Native Vegetation

Issues

- How would the alternatives affect native plant communities?

Affected Environment

Of the nearly 3.2 million acres in the Resource Area, approximately 91 percent supports shrub dominated plant communities. Approximately seven percent of the land base supports tree dominated forest and woodlands, while less than two percent is water influenced riparian and wetland vegetation. The following discussion, adapted from the *Lakeview Resource Management Plan*, breaks down these categories into plant communities (see Table 3-5).

Table 3-5. Plant Communities on BLM Lands within the Lakeview Resource Area[1]

Plant Community	Acres	Description
Shrub Steppe/Sagebrush Steppe[2]		
Big sagebrush shrub/grassland	1,709,758	Most common vegetative cover in southeastern Oregon; can occur with other shrubs and various grasses and forbs. Forms a mosaic with other plant communities.
Low and black sagebrush shrub/grassland	402,110	Common throughout eastern Oregon, generally on shallow soils. Usually has sparse shrub, grass, and forb cover that is usually insufficient to carry fire. Often in a mosaic with big sagebrush types.
Salt desert scrub/grassland	261,019	Common in alkaline playa or dry lake basins of Great Basin. Prominent around Lake Abert, Summer, Alkali, and Warner Lakes. Consists of salt-tolerant shrubs, grasses with few forbs.
Modified grassland	249,140[3]	Extensive grasslands and shrub grasslands of southeastern Oregon that have been planted with crested wheatgrass, typically after a fire; some areas are dominated by invasive annual grasses, primarily cheatgrass.
Lava flow, sand dune, playa, bare rock	130,057	Expanses of barren lava fields and aeolian sands with occasional isolated patches of big and low sagebrush.
Miscellaneous shrub/grassland	70,476	Usually consist of mountain mahogany, bitterbrush, and snowberry communities with a bunchgrass understory; they are often on steep slopes or in association with western juniper.
Silver sagebrush shrub/grassland	27,161	Usually found in moist playas or on semi-alkaline flats and valley bottom lands.
Mountain big sagebrush/grassland	8,064	Occur at higher elevations on plateaus and rocky flats. Shrubs tend to be denser, grasses and forbs abundant.
Forests and Woodlands/Eastern Forest[2]		
Western juniper woodland	215,052	Areas of open-canopy woodland with western juniper as primary tree species; understory vegetation often includes sagebrush species, bunchgrasses, and forbs.
Ponderosa pine forest	14,076	Widespread forest type in eastern Oregon; usually found in the foothills margin bordering the mixed conifer forest on the national forests; widely spaced, pines dominate diverse shrub and forb layers.
Quaking aspen	2,063	Widely scattered throughout the coniferous forest and sagebrush grasslands of eastern Oregon. Typically in isolated pockets with denser grasses and forbs.
Mixed conifer forest	1,255	A close-canopied, upper montane forest type that includes several plant communities dominated by pine and fir species and a variety of understory shrubs, grasses, and forbs.
Riparian and Wetland Vegetation/Eastside Riparian[2]		
Riparian and wetlands	40,676	Highly productive and valuable; the variety of shrubs, grasses, and forbs present depends on the degree and duration of wetness and shade.

1. Adapted from Table 2-1, USDI 2003a.
2. Lakeview Resource Management Plan Plant Community/2010 Oregon FEIS Biome (USDI 2003a:2-2 & USDI 2010a:123).
3. According to best available data, 2001. Invasive annual grass-dominated communities continue to spread, particularly following wildfires.

Plant Communities

Big sagebrush shrub/grassland: Big sagebrush shrubland is the most common vegetative cover type in southeastern Oregon. Approximately 54 percent of plant communities mapped on BLM-administered lands in the Resource Area are dominated by one of three subspecies of big sagebrush: Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), mountain big sagebrush (*A. tridentata* ssp. *vaseyana*), or basin big sagebrush *(A. tridentata* ssp*. tridentata*). These communities occur as a mosaic with other shrub-steppe communities over much of the foothills and valley floors. Native grasses range from rare to abundant, depending on site history and soil/water relationships. Native perennial bunchgrasses include bluebunch wheatgrass (*Pseudoroegneria spicata*), Sandberg's bluegrass (*Poa secunda*), Idaho fescue (*Festuca idahoensis*), Great Basin wildrye (*Leymus cinereus*), junegrass (*Koeleria macrantha*), needle-and-thread grass (*Achnatherum hymenoides*), Thurber's needlegrass (*Achnatherum thurberianum*), western needlegrass (*Achnatherum occidentale*), and, in more disturbed areas, bottlebrush squirreltail (*Elymus elymoides*). Introduced grasses are primarily annual cheatgrass (*Bromus tectorum*) and perennial crested wheatgrass (*Agropyron cristatum*).

Low and Black sagebrush/grassland: Low sagebrush (*Artemisia arbuscula*) communities are found throughout eastern Oregon, generally on areas with shallow, clayey soils of basalt origin. Approximately 13 percent of plant communities mapped on BLM-administered lands in the Resource Area are dominated by low sagebrush and it is often the only shrub in the stand; Sandberg's bluegrass is the most common grass. Other associated grasses are bluebunch wheatgrass, Idaho fescue, and bottlebrush squirreltail. Low sagebrush is usually the dominant vegetation in shallow soil and soils with an impervious layer that excludes the formation of big sagebrush and other shrub types. The sites have extensive areas of exposed rock and often do not have enough vegetation to support wildland fires. These areas are often rich in forbs. Black sagebrush (*Artemisia nova*) communities are similar to low sagebrush in shrub height, soil depth (shallow), dominant grass, and sparse vegetation that typically cannot carry a fire. Approximately 0.1 percent of plant communities mapped on BLM-administered lands in the Resource Area are dominated by black sagebrush.

Salt desert scrub/grassland (alkaline plant communities): This plant community occurs in the alkaline playa lake basins of the northern Great Basin. Approximately 8 percent of plant communities mapped on BLM-administered lands in the Resource Area are dominated by salt desert scrub. It is especially prominent around Lake Abert, Summer Lake, Alkali Lake, and the Warner Lakes. These are low to tall shrub communities comprised of dispersed alkali-tolerant vegetation. Salt desert scrub is a "catchall" term that describes several different environments more common in Nevada. On the most saline, seasonally flooded sites, black greasewood is dominant, and winterfat is usually associated with droughty soils with high carbonate content on alluvial fans and toeslopes. Sites with better drainage support a variety of shrubs and several salt tolerant plants, such as shadscale, hopsage, budsage, rabbitbrush, and grasses such as saltgrass, bottlebrush squirreltail, and basin wildrye. Salt desert scrub is surrounded by big sagebrush or sagebrush steppe cover types. The most extensive areas are always associated with the large, ephemeral lakes of the region. However, there are numerous small pockets of this cover type scattered throughout southeastern Oregon (Anderson 1998, Kagan and Caicco 1996).

Modified grassland (crested wheatgrass and cheatgrass): Extensive grasslands in southeastern Oregon that formerly were composed of native perennial bunchgrasses have today been planted with crested wheatgrass (a bunchgrass) and/or been infested by invasive annual grasses such as cheatgrass, Medusahead rye, and North African grass. Forbs commonly found in this community include yarrow, milkvetch, arrowleaf balsamroot, spreading phlox, salsify, and mullein. The ecological integrity of such sites is low, especially over large areas, because there are few mosaics of other plant communities, little diversity of wild animal species that use these communities, and disruption of corridors for animal movement.

Vegetated lava land/sand dunes (vegetated): There are large expanses of sparsely vegetated lava fields with occasional isolated patches of tall shrub communities where Wyoming and basin big sagebrush predominate and low shrub communities may also occur. These include barren recent lava flows with no vegetation, lava flows with big sagebrush inclusions, and flows that have recently been colonized by vegetation. Bluebunch wheatgrass, Sandberg's bluegrass, needlegrass, Idaho fescue, and junegrass occur in soil pockets in these flows. However, bare lava characterizes large areas of this type. While big sagebrush is the principal dominant plant, low sagebrush is also common at certain sites. The two rabbitbrushes are also associates. Other shrubs found are currants, bitterbrush, and desert-sweet. The vegetated sand dunes have a variety of grasses, especially Indian ricegrass, creeping wildrye, and basin wildrye, while only a few shrubs survive on the dune systems.

Miscellaneous shrub/native perennial grassland: Approximately 2 percent of plant communities mapped on BLM-administered lands in the Resource Area are dominated by miscellaneous shrubs. Mountain mahogany shrubland is found on the steep, rocky slopes and mountain ridges in southeastern Oregon. It usually appears as a minor component within the old-growth western juniper woodland types or within the sagebrush steppe. This cover type is commonly encountered but generally exists as units too small to be mapped. This widely dispersed tall shrub community grows in rock talus, rock outcrops, and in the soil pockets within the rocky slopes along with big sagebrush. It can be the dominant overstory vegetation with occasional western juniper and low sagebrush or bitterbrush, several buckwheats, and some grasses (bluebunch wheatgrass, Sandberg's bluegrasses, Idaho fescue, and western and Thurber's needlegrasses).

Bitterbrush communities are found in a medium-tall shrubland steppe with bunchgrass or cheatgrass understory. Bitterbrush can be dominant or co-dominant with big sagebrush. Idaho fescue is the characteristic native bunchgrass, with bluebunch wheatgrass co-dominant at lower elevations, while western needlegrass is dominant at higher elevations and where soils are sandier (Anderson 1998). Rabbitbrush species are common associates. Basin big sagebrush and mountain big sagebrush grow as co-dominants in some areas. Juniper and ponderosa pine are occasionally found as isolated individuals in this plant community.

Snowberry communities are found on steep slopes between alpine habitats and riparian or sagebrush steppe. They are usually in areas with some soil development, north facing, on very steep slopes, and can be in a mosaic with quaking aspen groves. Thurber's needlegrass, bluebunch wheatgrass, Idaho fescue, and Sandberg's bluegrass are found as understory. Many forbs grow in the area with snowberry, as do mountain mahogany, quaking aspen, and mountain big sagebrush. Juniper can be found with these shrubs at lower elevations.

<u>Unvegetated ground</u>: These areas can be wetland playas that are seasonally wet and dry, bare rock areas, open water, recent burns, barren lava fields or sand dunes, and areas where no data is available.

<u>Silver sagebrush/grassland</u>: The silver sagebrush (*Artemisia cana*) community is usually found in playas, which are moist, semi-alkaline flats or valley bottomlands. Approximately 0.9 percent of plant communities mapped on BLM-administered lands in the Resource Area are dominated by silver sagebrush. Some of the playas are quite extensive. Silver sagebrush occurs in playas because it tolerates the alkalinity and standing water. This shrub community is moderately- to widely-spaced. It grows in areas that have been deflated (eroded by wind) and subsequently partially filled with sediment. Although rhizomatous species such as creeping wildrye (*Elymus triticoides*), milkvetch (*Astragalus*), and cress (several mustard species) occasionally occur, the understory can be dominated by widely-spaced bunchgrasses, such as Sandberg's bluegrass, mat muhly (*Muhlenbergia richardsonis*), and alkali grass (*Sporobolus airoides*). Silver sagebrush is the dominant and characteristic shrub of this community; however, green rabbitbrush (*Ericameria teretifolia*) is a common associate.

Mountain big sagebrush/grassland: Mountain big sagebrush communities occur on plateaus, mountain toeslopes, and stony flats with minimal soil development at high elevations in the High Desert Province. Approximately 0.25 percent of plant communities mapped on BLM-administered lands in the Resource Area are dominated by mountain big sagebrush. This medium-to-medium-tall shrubland varies with widely spaced to dense shrubs that occur on deep-soiled to stony flats, ridges, and mountain slopes, and usually in cool, moist areas with some snow. In this community, Idaho fescue is the most common and diagnostic grass. Mountain big sagebrush is the dominant shrub, but low sagebrush can occur in some places. Other shrubs that can occur are chokecherry, serviceberry, snowberry, bitterbrush, and buckthorn. Occasionally, mountain big sagebrush grows in snowbank areas or other moist sites within this community. Few trees occur in this community, but quaking aspen and mountain mahogany may be present. This is a forb-rich community where Indian paintbrush, potentilla, geum, lupines, and buckwheat species are abundant.

<u>Western Juniper Woodlands</u>: Areas of open-canopy woodland with western juniper as primary tree species; understory vegetation often includes sagebrush species, bunchgrasses, and forbs. Relict old growth juniper is primarily confined to rocky surfaces or ridges, or pumice sands with sparse vegetation and infrequent fires. Juniper has also expanded its historic range into sagebrush habitats, riparian areas and the lower edges of Ponderosa pine forests.

<u>Ponderosa Pine Forests</u> are a widespread forest type in eastern Oregon. On the Resource Area, it is usually found in the foothills margin bordering the mixed conifer forest on the National Forest. It is widely spaced, and pines dominate the diverse shrub and forb layers. Most of this community is in small remote tracts.

Aspen Groves are widely scattered throughout the coniferous forest and sagebrush grasslands of eastern Oregon. They are typically in isolated pockets with denser grasses and forbs.

Mixed Conifer Forest are a close-canopied, upper montane forest type that includes several plant communities dominated by pine and fir species and a variety of understory shrubs, grasses, and forbs.

Treatments Planned Relating to the Issues

No Action Alternative

Manual, biological controls, and targeted livestock grazing would continue to be used to control invasive plants on about 1,500 acres per year (see Table C-4, *Estimated Treatment Acres, by Alternative and Category* in Appendix C). Only noxious weeds would be treated with the four available herbicides. According to estimates calculated from the treatments described on Table 2-5 (see Table C-4, *Estimated Treatment Acres, by Alternative and Category* in Appendix C), 2,4-D would be the most used herbicide, followed by dicamba, glyphosate, and picloram. Medusahead rye, an annual grass, would be treated where selective treatments of non-selective glyphosate leave enough native or desirable plants to revegetate the site, when seeding would follow herbicide application, or when containment or fuel break objectives outweigh the need to retain other existing vegetation. In all, about 38,000 of the Treatment Category 1 acres would be treated over the next 10 to 15 years.[46]

Most herbicide applications would be spot spraying to directly target the noxious weeds. Broadcast applications would be limited to sites where selective herbicides (2,4-D, dicamba, and picloram) are used on broadleaf plants, or non-selective glyphosate would be used on expanses (monocultures) of noxious weeds. Invasive plants not listed as noxious weeds, like cheatgrass, would not be controlled with herbicides.

Proposed Action

The 44,090 acres of Category 1 invasive plants, as well as Categories 2 and 3 would be treated over the next 10 to 15 years with the full range of methods shown on Table 2-7, *Treatment Key, Proposed Action*. Annual treatment levels in this treatment category would be similar to the No Action Alternative, but the use of the four No Action herbicides would decrease because other herbicides would be available. Non-herbicide methods would be used on an estimated 700 Category 1, 2, and 3 acres per year (see Table C-4, *Estimated Treatment Acres, by Alternative and Category,* in Appendix C).

In addition to documented sites, and estimated 200,000 to 300,000 acres of cheatgrass, Medusahead rye, north Africa grass, and lesser priority invasive annual grasses, wild oats, ripgut, red, soft, and poverty bromes would benefit from control and/or rehabilitation treatments. Up to 20,000 acres of these invasive annual grasses could be treated in Categories 4, 5 and 6 annually, mostly with imazapic but sometimes accompanied with pre-burning to expose the soil, and/or post-treatment seeding of native or other desirable plants.

Category 3 treatments for new invasive plant species are unknown, but likely to be fewer than 10 acres per year.

[46] The remaining 6,000 acres of Category 1 are infested with invasive plants for which no effective treatment is available under this alternative.

Standard Operating Procedures and Mitigation Measures Relevant to Effects

The potential for adverse effects to native and other desirable vegetation is minimized for both alternatives by existing Standard Operating Procedures and Mitigation Measures (see Appendix A). These include, but are not limited to:

- Consider site characteristics, environmental conditions, and application equipment in order to minimize damage to non-target vegetation.
- Select the herbicide that is least damaging to the environment while providing the desired results.
- Apply the least amount of herbicide needed to achieve the desired result.
- Avoid accidental direct spray and spill conditions to minimize risks to resources.
- Comply with herbicide-free buffer zones to ensure that drift will not affect crops or nearby residents/ landowners.
- Take precautions to minimize drift by not applying herbicides when winds exceed >10 mph (>6 mph for aerial applications), or a serious rainfall event is imminent.
- Use drift reduction agents, as appropriate, to reduce the drift hazard to non-target species.
- Consider surrounding land use before assigning aerial spraying as a treatment method and avoid aerial spraying near agricultural or densely populated areas.
- Refer to the herbicide label when planning revegetation to ensure that subsequent vegetation would not be injured following application of the herbicide.
- Minimize the use of sulfometuron methyl in watersheds with downgradient ponds and streams if potential impacts to aquatic plants are identified. (MM)
- Limit the aerial application of chlorsulfuron and metsulfuron methyl to areas with difficult land access, where no other means of application are possible. (MM)

Environmental Consequences

Effects of Treatment Methods on Native Vegetation

Non-Herbicide Treatments

Manual and other non-herbicide treatments can have less risk to non-target plants and provide varying levels of control primarily for small infestations of annual and biennially forbs, when compared to herbicide use. However, non-herbicide treatments have their own adverse environmental effects. The extent to which non-herbicide treatment methods directly affect non-target plants varies by the amount and method of treatment as well as the treatment timing, site conditions, and relative abundance of plants present. Minimizing impacts to native and other desirable plants allows them to recapture the site more quickly and reduces the need for additional invasive plant treatments.

Manual treatments tend to be selective and result in minimal damage to non-target plants including minor trampling, breakage and occasional mortality to individuals, as well as light soil disturbance that could increase the germination of any seeds present. Manual treatments are labor intensive and usually only practical on small areas.

Mechanical treatments involving chainsaws or similar hand operated equipment can be focused on target plants, and thus have similar effects as manual treatment. Mechanical treatments like mowing are typically non-selective, and remove or damage target and non-target plants alike. Mechanical treatments have limited use for noxious weed control unless coupled with other treatments. Machinery can leave parts of the plant, disturb vegetation and soil, and spread seeds.

Prescribed Fire may be used as a pretreatment for herbicide treatments in invasive annual grasses. It is normally used for invasive plant control only on heavily infested sites, because fire can be non-selective, removing both desirable and invasive plants. Prescribed fire can be most effective if followed by herbicide treatments to control germinating or young plants. Seeding with native or other desirable species is often necessary. Native species adapted to fire or seasonally senescent may remain, and the selection of imazapic herbicide is designed to minimize damage to these remaining native plants, where possible. Possible adverse effects to native vegetation include injury, mortality, nutrient flush or loss of nutrients, reduced shading, and potential increases of invasive plants.

Targeted grazing can effectively reduce the vigor and seed production of invasive plants, but is not likely to supply long-term control. Multiple treatments from targeted grazing may increase risks to native vegetation by reducing vigor and invasive plant seed production of non-target species, and the ground disturbance can increase the opportunity for seed germination. Alternately, disturbance from directed grazing could provide positive benefits by preparing a seedbed for seeding competitive native species.

Seeding or Planting is used to restore native vegetation or introduce desirable vegetation following invasive plant treatments when the existing plants are not expected to fully occupy the site. Additionally, seeding is used following wildfire to stabilize the soil and provide competition for invasive plants. The effect of these treatments varies from simply supplementing the existing vegetation to overwhelming it (although this is rare). Typically, a rangeland drill is used to seed, with only minor damage to existing plants. Successful re-vegetation using seed can be particularly difficult in sagebrush steppe due to arid and semiarid conditions, and sometimes minimal seedbed preparation to maintain existing native vegetation. Native seed collected on site protects the genetic integrity of local alleles. Seed from other locations could alter locally evolved adaptations; however, non-native seed may be used in emergency stabilization treatments (Treatment Category 4), primarily to protect the soil resource and subsequent site potential, if native seed is not available.

Biological controls employ host-specific insects, pathogens, and disease that evolved with the target noxious weed. These organisms are self-perpetuating and those that feed only on the target host are available for release. Currently available biological control agents do not attack native vegetation. They benefit native and other desirable plants by reducing the abundance and reproductive capacity of host noxious weeds, ideally reducing vigor, abundance, and density within a plant community. The effects are difficult to quantify as multiple factors such as weather patterns, climate, predators, and host availability affect biological control agent survival and impact to target noxious weeds. The use of biological controls is not expected to substantially differ between the alternatives.

Herbicide Treatments

Herbicides have the potential to harm non-target plants. Some damage to non-target plant species from herbicide application is probable despite cautious planning and implementation. Herbicide impacts to non-target plants depend on (but are not limited to) the herbicide used, its selectivity, application rate, concentration, relative toxicity to the plants in the treatment area, likelihood of exposure, timing and method of application, environmental conditions during application, and plant stage of growth. Herbicide treatments affect non-target plants through direct application, overspray, off-site movement, and, potentially, accidental spills. Potential impacts include mortality, reduced productivity, and abnormal growth. Risk to off-site plants from spray drift is greater under scenarios with application from greater heights (i.e., aerial application) or when air temperature or movement is high. Risk to off-site plants from surface runoff and movement through soil (leaching) is less likely; it is influenced by precipitation rate and timing, soil type, and application area.

However, measures taken to limit exposure such as selective application methods (e.g., spot applications, wiping and hand directed spraying), maximum and typical application rates (that are often less than the maximum allowed on the label (Tables 2-4 and 2-6, *Herbicide Information*)), droplet size and drift reduction agents, and application restrictions based on environmental conditions (wind speed, precipitation, temperature, etc.), all reduce the off-target movement of herbicides. Standard Operating Procedures and Mitigation Measures (Appendix A) are designed to minimize risk to non-target plants including crops.

Certain plants or groups of plants are more susceptible to specific herbicides (see Tables 2-4 and 2-6, *Herbicide Information*), and collateral damage to non-target plants would depend upon their susceptibility to a particular herbicide. For example, 2,4-D, dicamba and picloram are selective and target broadleaf plants , so damage to perennial grasses would not be expected during normal use. The following sections summarize the Ecological Risk Assessments (Appendix D, *Herbicide Risk Tables*) concerning the potential effects to non-target plants, by herbicide.

Herbicide treatments to control invasive plants would not affect plant communities to the extent that one community changes to another, although infestation of sagebrush communities by invasive annual grasses have caused conversions to grassland. Treatment effects to plant communities would typically relate to improvements in condition. Selective broadleaf herbicide applied aerially would have the most effect on forbs.

BLM-Evaluated Herbicides[47]

Chlorsulfuron (Proposed Action) selectively controls pre-emergent and early post-emergent broadleaf plants (see Table 2-6, *Herbicide Information, Proposed Action*). It is effective at very low dosages (half ounce to a few ounces per acre). Because of its high potency and longevity, chlorsulfuron can pose a particular risk to non-target plants. Off-site movement of even small concentrations of these herbicides can result in extensive damage to surrounding plants, and damage to non-target plants may result at concentrations lower than those reportedly required to kill target invasive plants (Fletcher et al. 1996). It poses a high risk to non-target terrestrial forbs from direct spray at typical and maximum rates, a moderate risk to non-target terrestrial forbs from offsite drift at typical and maximum rates, and no risk to terrestrial plant from runoff or wind erosion. Chlorsulfuron would be used most often to control perennial mustards that are most abundant in the Salt Desert Scrub. Forbs are not common in Salt Desert Scrub and impact to forbs is likely although those are expected to be less than the benefit of removing invasive plants. In 2013, control of perennial pepperweed resulted in increases of a sensitive forb.

Diflufenzopyr (Proposed Action) would be used only in combination with dicamba and would be used to selectively control broadleaf forbs, such as knapweeds. Diflufenzopyr + dicamba pose a high risk to terrestrial forbs at the maximum rate and a moderate risk at the typical rate. It poses no risk to forbs from offsite drift, surface runoff, or wind erosion. Diflufenzopyr + dicamba would be used mainly along roads and in disturbed areas as an alternative to dicamba. Diflufenzopyr acts by disrupting the delicate auxin balance needed for plant growth. It is selective for annual broadleaf plants and can suppress perennials. Although diflufenzopyr is a weak herbicide, it can reduce the amount of herbicide needed from 1-2 pounds per acre of dicamba alone to .26-.35 pounds per acre of diflufenzopyr + dicamba. Diflufenzopyr would affect all plant communities by reducing the amount of herbicides applied to control invasive broadleaf plants, which would be expected to increase the vigor of perennial grasses and forbs.

Fluridone (Proposed Action) is a non-selective, slow-acting herbicide that could be used in low concentrations to control submerged and emergent invasive vegetation in ponds or reservoirs, lakes and canals where long-term contact with the target plants can be maintained (not flowing waters). When used on aquatic invasive plants, any native plants present would be controlled as well. Terrestrial plants would not be treated with fluridone: hence, none of the described plant communities would be affected. (There are currently no known aquatic invasive plants on the Lakeview Resource Area.)

Imazapic (Proposed Action) would be primarily used to control pre-emergent invasive annual grasses when native plants are dormant in fall. At the low rates (typically 6 oz. per acre), used to select for invasive annual grasses, imazapic poses a low risk to other terrestrial plants. At the maximum rate, imazapic poses a moderate risk to non-target terrestrial forbs and some grasses. Terrestrial plants are not at risk from off-site drift, surface runoff or

[47] Risk levels (no, low, moderate, high) used in these sections are defined in Appendix D, Herbicide Risk Tables.

wind erosion of imazapic. When used to control invasive annual grasses, imazapic did not affect perennial forb cover. However, it reduced the cover of native annual forbs, and Sandberg's bluegrass (*Poa secunda*) for at least three years post-treatment (Pyke et al. 2014). Susceptibility of native perennial plants as adults or seedlings is unknown for many species and soil types; thus, there is some uncertainty about the retention of native perennials when this herbicide is used as a selective herbicide for annual grasses, and about the success of revegetation efforts immediately following herbicide applications. Native annual plants, if they emerge at the same time as invasive annual grasses, may be susceptible and harmed by imazapic applications (Pyke 2011). Imazapic applied to reduce cheatgrass fuel continuity has been successful and has not reduced some perennial grasses (Shinn and Thill 2004, Miller 2006, Davison and Smith 2007). Imazapic used at low rates (typically 6 oz. per acre) would reduce invasive annual grass cover and fire risk in the Sagebrush Steppe and the Forest and Woodland communities.

Sulfometuron methyl (Proposed Action) is non-selective and is not available for use on rangelands. It is registered for use on rights-of-ways, forests and woodlands, and recreation sites. There would be low risk to sagebrush steppe plants at maximum application rates on those sites. Sulfometuron methyl would not be applied in winds, as drift could cause extensive damage to vegetation at a substantial distance from the application site. Sulfometuron methyl would be used in terrestrial settings to control dense stands of invasive annual grass species. During applications of sulfometuron methyl, a drift prevention agent would be used, and the current registration does not permit it to be applied through aerial application.

Forest Service-Evaluated Herbicides

2,4-D: (common to both alternatives) is a selective herbicide that kills broadleaf plants, but not grasses. It has a long history of use and is relatively inexpensive. Direct spraying of non-target plant species is the highest potential for damage due to 2,4-D application. Drift could damage non-target species close to the application site (much less than 100 feet) although some species such as grapes (not a crop in Lake County) are more susceptible. One study determined that 2,4-D could affect three species of ectomycorrhizal fungi in laboratory experiments (Estok et al. 1989). 2,4-D poses a high risk at typical and maximum rates from direct spraying or drift to broadleaf forbs and shrubs, although there is no risk to grasses and other tolerant plants. Risk to susceptible plants from offsite drift from broadcast treatments is low, although drift from aerial applications was not evaluated. Risk scenarios indicate that there is no risk to susceptible plants from offsite drift associated with hand directed foliar applications or surface runoff. Plant communities would benefit by 2,4-D reducing invasive broadleaf plants, which is expected to increase vigor of perennial grasses, forbs, and shrubs. 2,4-D is also used to prevent herbicide resistance when mixed with herbicides with other mechanisms of action.

Clopyralid (Proposed Action) is selective for broadleaf plants and poses a high risk to forbs and shrubs from direct spray at typical and maximum rates. Offsite drift risk from broadcast applications to susceptible plants is low at the typical rate and moderate at the maximum rate. Drift from aerial applications of clopyralid pose a moderate risk at the typical rate and a high risk at the maximum rate. There is no risk for even susceptible plants from runoff. Clopyralid would be used to effectively control thistle and knapweed infestations. Clopyralid is more selective and less persistent than picloram. Clopyralid is relatively non-toxic to aquatic plants; however, accidental spills may result in temporary growth inhibition of aquatic plants. As with picloram, clopyralid has little effect on grasses and members of the mustard family. Overall effects to non-target plants from normal application of clopyralid are likely to be limited to susceptible plant species in or very near the treatment area.

Dicamba (common to both alternatives) is a selective, systemic herbicide that can affect some annual, biennial, or perennial broadleaf and woody species. Dicamba poses a high risk to non-target terrestrial forbs from direct spray and drift scenarios; a moderate risk to terrestrial forbs from off-site drift and no risk from surface runoff or wind erosion (although wind erosion may cause impacts in arid regions)(SERA 2004g). The greatest risks to aquatic plants are associated with runoff, but are highly site-specific. Drift may cause damage to susceptible species at distances less than 100 feet from the application site. Vaporized or volatilized dicamba can affect non-target plants. Vaporization does affect vegetation, but much more study in air concentration-duration relationships needs to be done to quantify the level of effects. Vaporization potential is dependent on atmospheric stability and temperature. Dicamba vapor has been known to drift for several miles following application at high temperatures (Cox 1994).

Glyphosate (common to both alternatives) is a non-selective, systemic herbicide that can damage all groups or families of non-target plants to varying degrees, most commonly from off-site drift. Plants highly susceptible to glyphosate can be damaged by drift up to 100 feet from the application site if applied at the maximum rate. Species that are more tolerant are likely to be damaged at distances up to 25 feet (SERA 2003a). Non-target species are not likely to be affected by runoff or absorption from soil or wind erosion. Glyphosate strongly adsorbs to soil particles, which prevents it from being taken up from the soil by plant roots (Tu et al. 2001, SERA 2003a). Field studies conducted using glyphosate found no effects to plant diversity in an 11-year study on site preparation using herbicides, though the structural composition and perennial species' presence were changed (Miller et al. 1999). Glyphosate was found to inhibit growth of three types of ectomycorrhizal fungi associated with conifer roots at concentrations of 1,000 parts per million in laboratory experiments (Estok et al. 1989). Houston et al. (1998) documented that responses of below-ground fungal community structure (richness, diversity, composition) were similar in untreated and treated (with glyphosate and triclopyr) stands, and although total fungal abundance was not changed, isolation frequencies (the abundance measure used) in organic soil of two fungal species decreased when samples were collected two years after herbicide treatments. Glyphosate poses a high risk to grasses, forbs, shrubs, and trees from direct spray scenarios at typical and maximum rates. Some plants are tolerant of glyphosate, and these are at low to moderate risk from direct spray at typical and maximum rates respectively. The risk from offsite drift for susceptible plants is high for aerial applications, moderate for low boom and low to moderate for hand directed foliar applications (SERA 2011a). Glyphosate is the only herbicide effective on grasses in the No Action Alternative. However, because it is non-selective, it would only be used in spot treatments or where monocultures of noxious weed were present (see *Treatments Planned Relating to the Issues* section above).

Hexazinone (Proposed Action) controls grasses and broadleaf and woody plants, both pre- and post- emergent. Risks to plants were not evaluated for direct spray, surface runoff, or erosion scenarios; however, risk from offsite drift is low for susceptible plants, with no risk to tolerant plants. Hexazinone has differential toxicity to plants and is effective against woody species. It is primarily absorbed through the roots of the plant. Impacts from hexazinone are limited as the estimate of proposed use is about 20 acres per year and Mitigation Measures limit where it can be applied.

Imazapyr (Proposed Action) is non-selective, posing a high risk to susceptible plants and a low risk to tolerant plants in direct spray scenarios (SERA 2011b). Currently, projected use would be on fewer than ten acres per year (see Table C-4, *Estimated Treatment Acres, by Alternative and Category,* in Appendix C) to control Russian olive, salt cedar, and reed canary grass, and it could be used as a backup choice on other invasive plants if herbicide resistance develops. Effects would be limited to the immediate application area.

Metsulfuron methyl (Proposed Action) is selective for broadleaf and woody plants (see Table 2-6, *Herbicide Information, Proposed Action*) and poses a high risk from direct spray to susceptible plants at the typical and maximum rate, and a low to moderate risk to tolerant plants at the typical and maximum rate respectively. Risk from offsite drift from broadcast spraying is low to moderate for susceptible plants from ground applications and moderate to high for aerial applications for typical and maximum rates respectively. Metsulfuron methyl would be used under the Proposed Action to manage perennial pepperweed and hoary cress in dry areas of the Warner Wetlands ACEC.

Picloram (common to both alternatives) poses very substantial risks to non-target (broadleaf and woody) plants (EPA 1995). Picloram is highly soluble in water, resistant to biotic and abiotic degradation processes, and mobile under both laboratory and field conditions. The EPA Fact Sheet for picloram states that there is a high potential to leach to groundwater in coarse textured soils with low organic material. Plant damage could occur from drift, runoff, and off-site where contaminated ground water is used for irrigation or is discharged into surface water (EPA 1995). However, the contribution from irrigation is considered inconsequential relative to off-site drift and runoff (SERA 2003b). Picloram is a restricted-use herbicide and can only be purchased and applied by licensed applicators. Additional requirements on the label prevent the use of this herbicide on coarse textured soils, above fractured bedrock and within no-spray buffers surrounding waterbodies. Because picloram persists in soil, non-target plant roots can take up picloram (Tu et al. 2001), which could affect re-vegetation efforts. Additionally, animals can pass sufficient quantities of picloram in urine from treated sites in to damage susceptible non-target plants (primarily legumes, such as alfalfa) for up to one year (Lym et al. 1998) According to the Risk Assessment (Appendix D, *Herbicide Risk Tables*), picloram poses a high risk to susceptible plants from direct spray scenarios, and a low to moderate risk for tolerant plants at typical and maximum rates respectively. Offsite drift poses a high risk to susceptible plant from ground and aerial applications. The risk from offsite drift from hand directed backpack spraying is moderate for susceptible plants. Risk from surface runoff is low at the typical rate and moderate at the maximum rate for susceptible plants, legumes in particular (SERA 2011c). Picloram would be used to control species such as Russian knapweed and Musk thistle in terrestrial areas.

Triclopyr (Proposed Action) is a selective systemic herbicide used on broadleaf and woody species. Susceptible species could be impacted by drift from 100 feet (typical rate) to 1000 feet (maximum rate) (SERA 2003c). Two forms of triclopyr could be used with differing degrees of effects. Triclopyr BEE (butoxyethyl ester) is more toxic to plants than triclopyr TEA (triethylamine salt). The triclopyr BEE form is more apt to damage plants from runoff than other forms (SERA 2003c). Direct spray scenarios indicate a high risk for susceptible plants and a low risk for tolerant plants at the maximum rate. Risk from offsite drift is low to moderate for susceptible plants at the typical and maximum rates respectively (SERA 2011d). Either formulation may be proposed for use on woody species in an upland environment but may be used in wetlands and riparian areas that go dry for part of the year. It may also be used for spot treatment of Canada thistle at low application rates, and for perennial pepperweed in the Warner Wetlands. Only the aquatic form may be used over water.

Both forms of triclopyr have been found to decrease the relative long-term abundance and diversity of lichens and bryophytes. Newmaster et al. (1999) stated that drift from triclopyr could affect the sustainability of populations of lichens and bryophytes, where these ingredients reduced abundance. Typical application rates in aerial spraying were found to reduce abundance by 75 percent, variable by species. Colonists and drought-tolerant species were more resistant than the mesophytic forest species, which means that aerial applications of triclopyr could essentially push back the successional stage on non-vascular communities. Triclopyr BEE was found to inhibit growth of three types of ectomycorrhizal fungi associated with conifer roots at concentrations of 1,000 parts per million in laboratory experiments (Estok et al. 1989). Busse et al. (2003) found no inhibition of ectomycorrhizal formation in a laboratory experiment using this active ingredient. Newmaster et al. (1999) reported that moss and lichen abundance and richness were not or nearly not affected at six months, one year, or two years after treatment except when very high rates of triclopyr were used.

Except as noted above, few studies were found on the impact of herbicides to fungi. In studies using rates similar to amounts proposed for use on BLM-administered lands, fungi seem relatively unaffected by herbicides (Busse et al. 2003, Houston et al. 1998).

Effects of Invasive Plants on Native Vegetation

Native plant communities have been invaded by nearly 30 noxious weed species and more than a dozen other invasive plants that compete with the native species for light, moisture, and space. An estimated ten percent of the BLM-administered lands in the Resource Area are infested with at least one species of invasive plant (including cheatgrass). Some plant communities have been transformed from shrub dominated to grass dominated communities because of invasion by annual grasses, often following wildfire.

The susceptibility of plant communities to impact from invasive plants is directly associated with the site characteristics, disturbances or stresses, the biological traits of the invader (Davis et al. 2000), and the introduction of seed or other propagules. Most of the plant communities of the Resource Area are at a high risk of invasion due to their open canopies, wide spacing between plants, and presence of invasive plants, including those that can establish in the extreme soil condition of the salt desert scrub and silver sagebrush plant communities.

Invasive plants directly affect native and other desirable plants by competing with them for space, light, and moisture. Invasive plants often capture resources so successfully they reduce the vigor of existing natives and in many cases, eliminate them. In the short term, the most obviously affected are the understory herbaceous plants -forbs and grasses. When invasive annual grasses form a continuous thatch layer, which burns more readily, and increases fire frequency, sagebrush and other woody plants that are not adapted to frequent fire would be removed from the site for decades. Reduction of the abundance and vigor of native plants, adversely affects the condition of the plant community and when dominant species are reduced, the plant community as a whole. Once a threshold is exceeded, permanent loss of historical plant associations and the organisms that depend on them occurs (USDI 2010a:598). The impact of invasive plants can be permanent when economic and environmental factors limit the ability of a managing agency to restore the ecosystem to a healthy state (NAS 2002). The fewer invasive plants present, the more likely it is that restoration is feasible.

Invasive plants can adversely influence succession and alter historic disturbance regimes. For example, one of the greatest threats to big sagebrush plant communities is the invasion of cheatgrass, which has modified big sagebrush sites throughout the Great Basin by providing a fine-textured early-maturing fuel that increases the frequency and season of wildfires. Adverse impacts include increased fire risk, reduced biodiversity and forage for livestock and wildlife, degraded water quality, reduced recreational and aesthetic values, and significant economic losses. Historically, wildfire frequency was estimated at 60 to 100 years in the sagebrush/bunchgrass vegetation type (Whisenant 1990), and virtually absent from the salt desert shrub type (Billings 1994). Fire intervals have decreased to as little as five years in all of these vegetation types since the invasion of cheatgrass, red brome (*Bromus rubens* L.), and other invasive plants (Whisenant 1990). In lower elevation sagebrush habitat, fire return intervals have decreased dramatically (from 50 to 100, to less than 10 years) due to invasion by annual grasses, causing loss of perennial bunchgrasses and shrubs. Subsequent loss of sagebrush can result in a conversion of shrubland to grassland (Crawford et al. 2004) that is difficult or impossible to reverse.

The International Union for the Conservation of Nature ranks invasive species as one of the top ten threats to currently Threatened species (IUCN 2008). Many invasive plants modify invaded sites so that the site becomes inhospitable to the original plant community. For example, knapweeds and starthistles are known to increase sheet erosion and produce chemicals that prevent other species from germinating (Boersma et al. 2006).

Native ecosystems adjacent to BLM-administered lands may also suffer when invasive plants spread from BLM-administered lands. Adjacent landowners may control these plants with less environmentally friendly methods or products, or by using more herbicides to combat invading plants than would be needed if all ownerships were participating. Adverse effects may occur near property lines, and landscape-scale values such as watershed or wildlife values may be degraded by the need to compensate for poor control of BLM invasive plants, particularly where the BLM-administered lands are in a checkerboard pattern with private lands. In addition, native and other desirable plants including crops on adjacent lands can suffer irreparable damage when uncontrolled invasive plants from BLM-administered lands move across property lines (USDI 2010a:149).

Effects by Alternative

No Action Alternative

The risk of adverse effects to native and desirable plants would be similar to those that have occurred in the past 10 years. Risks to native plants include trampling (by foot or vehicle), herbicide overspray, and continued spread of invasive plants that compete with natives. Although the herbicide discussions above indicate the potential for adverse effects to non-target plants from some herbicides under some conditions, Standard Operating

Procedures and Mitigation Measures minimize this risk to the point where any risk is exceeded by the adverse effect of an additional 68,000 acres of infestation at 15 years when compared to the Proposed Action.[48]

The availability of four herbicides for use only on noxious weeds increases the likelihood that some noxious weeds would become resistant to those herbicide and available controls would no longer be effective, eventually leading to an increasing rate of spread. Additionally, some noxious weeds, such as perennial pepperweed are suppressed (but not killed) with current herbicides, limiting their density and reproduction, but not eliminating the infestations. Perennial pepperweed has the potential to form dense stands that displace desirable vegetation and wildlife and it deposits salts on the soil surface, inhibiting the germination and growth of native plants sensitive to salts (DiTomaso et al. 2013). Given enough time, perennial pepperweed can convert Riparian sites to Salt Desert Scrub.

The degree to which these effects apply to the alternatives is primarily a function of, and directly proportional to, the number of acres that would become infested under each alternative. Under the No Action Alternative noxious weeds are projected to spread at the rate of 12 percent annually (see *Invasive Plants* section earlier in this chapter), with cheatgrass likely spreading faster. At 12 percent projected under the no action, the 44,090 acres of documented sites (Category 1) would spread to an estimated 215,000 acres in 15 years. Additionally, the more than three hundred thousand acres infested with cheatgrass would continue to spread essentially unchecked under this alternative. This increases the likelihood of transforming important sagebrush steppe plant communities into less diverse grasslands.

Proposed Action

Under this alternative, use of the four herbicides available in the No Action Alternative would decrease and herbicides generally less toxic to various classes of plants would be used. The use of picloram would decrease by 63 percent, primarily in favor of clopyralid. The use of 2,4-D would decrease 30 percent (see Table C-4, *Estimated Treatment Acres, by Alternative and Category* in Appendix C). Having more herbicides provides more opportunity to select one less likely to damage adjacent desirable plants, further reducing the likelihood of adverse effects described above for each herbicide. Noxious weed spread is projected to decrease by 68,000 acres in 15 years under this alternative compared to the No Action Alternative, and the annual spread rate is predicted to decrease to seven percent (see *Invasive Plant* section earlier in this chapter). With more target-effective herbicides, plants like perennial pepperweed and cheatgrass would be controlled, populations reduced, and restoration actions would have more potential for success.

Up to 20,000 acres of invasive annual grasses would be controlled annually (Treatment Categories 4-6), facilitating rehabilitation of cheatgrass-infested sites and preventing further displacement of native vegetation by invasive plants in those areas. These treatments would reduce the rate of spread and improve the likelihood of successful re-vegetation following fire. This would preserve more native vegetation and plant communities. Potentially one-half or more of the projected herbicide use under this alternative would be imazapic, to which most native perennial bunch grasses are tolerant.

Adjacent private landowner values and uses would benefit from improved invasive plant control on BLM-administered lands because invasive plant spread onto non-BLM-administered lands would be reduced if overall invasive plant spread on BLM-administered lands were reduced. In addition, the additional herbicides would make cooperative, cross-boundary treatments more feasible and effective for both other landowners and BLM managers, which could have an effect of reduced herbicide use on lands adjacent to BLM-administered lands. The Fremont-Winema National Forest has recently added more effective herbicides to their integrated invasive plant

[48] See *Invasive Plants* section earlier in this Chapter. The 44,090 acres of currently documented invasive plant sites, Treatment Category 1, are estimated to be spreading at 12 percent, to 215,000 acres in 15 years. The improved effectiveness of the Proposed Action is projected to reduce this total by 68,000 acres. These estimates are based on noxious weed spread and do not include the hundreds of thousands of acres currently infested with cheatgrass.

management plan, and the additional herbicides allowed on BLM-administered lands would allow for more effective interagency projects.

Cumulative Effects

Common to Both Alternatives

Managing vegetation is an integral part of BLM land management in the Resource Area. In the past, present, and reasonably foreseeable future, there have been and would continue to be projects and activities within the Resource Area that cause impacts to native plants and their habitats. Planned and ongoing actions include juniper cutting and/ or burning, fuel break mowing, mining, and livestock grazing. Noxious weed control, as described under the No Action Alternative is also an ongoing activity.

Current and planned juniper treatments on 51,800 acres often include cutting, burning, or both. Cutting reduces soil moisture use by juniper making it available for other plants. Burning removes existing above ground biomass in the burned area followed by seed germination and regrowth of plants existing on the site. Juniper treatments are designed to improve rangeland health in Sagebrush Steppe, Eastern Forests, and Riparian Areas; these treatments typically cause short-term negative impacts to vegetation that would be counteracted by long-term increased vigor of understory plants.

Livestock grazing has occurred on most of the Resource Area for decades and has resulted in changes in plant communities, especially in the sagebrush steppe and riparian areas. Grazing has a direct effect on herbaceous plants through selective cropping of palatable plants, some trampling and deposition of urine and feces, and soil compaction.

Fuel brake mowing on 1,305 acres has little direct effect on native plant communities, as roadside areas are already disturbed and native plant communities in those corridors altered. Where these prevent unnatural fire frequency, native plant communities primarily in the Sagebrush Steppe benefit by more normal fire occurrence.

Mining and use of locatable, salable, and leasable materials causes visible widespread and chronic vegetation disturbance in some areas, and typically removes soil A horizons so re-vegetation is slow or non-existent.

Invasive plant management would contribute to cumulative effects on non-target plants (native and desirable non-native) in the project area. Effects would generally occur in areas where past activities have created ground disturbance and reduced native plant cover. The cumulative effects of invasive plant treatments on non-target plants would generally be minor and occur within treated areas or within short distances of treated areas (less than 100 feet). Mitigation Measures reduce the potential for offsite impacts to non-target plants during herbicide application. Over time, treatments would contribute to the protection and restoration of native plant communities, as invasive plants are controlled or eliminated. Overall, the alternatives would help reduce the negative impacts of invasive plants on native and desirable vegetation on the Resource Area with the proposed action benefiting native plants the most.

Special Status Plants

Issues

- How would the alternatives affect Special Status plant species?

Affected Environment

Species designated as Special Status by the BLM include 1) those Federally Listed or proposed for listing as Endangered or Threatened under the *Endangered Species Act*, and 2) species designated by the State Director as Bureau Sensitive and requiring special management consideration to promote their conservation and reduce the likelihood and need for future listing under the *Endangered Species Act*. These are managed under provisions of the BLM's Special Status Species Program (USDI 2008c). None of the Special Status plant species on the Lakeview Resource Area are listed under the Endangered Species Act as Threatened or Endangered. BLM management activities must be conducted to minimize or eliminate threats affecting the status of the species or to improve the condition of the species' habitat by ensuring that activities are carried out in a way that does not lead to a need to list the species under the *Endangered Species Act*. Potentially habitat-disturbing projects require pre-project clearances for Special Status plants. Clearances can include proposed project review for potential habitat and/or project site surveys.

The Final Oregon/Washington State Director Special Status Species List, December 1, 2011 lists 27 documented and 22 suspected Special Status plant species located on the Resource Area. BLM has mapped 7,373 acres of documented Special Status plant species populations throughout the Resource Area. None of the Special Status plant species that are documented or suspected for the Resource Area are Federally Listed under the *Endangered Species Act* as Threatened or Endangered. A complete list of the Special Status plant species documented or suspected on the Resource Area is provided in Table 3-6.

Table 3-6. Special Status Plants, Lakeview Resource Area

Species Code	Scientific Name	Common Name	Life Cycle	Documented or Suspected	Acres
AGCU	*Agastache cusickii*	Cusick's giant-hyssop	Perennial	Documented	18
ALGEG	*Allium geyeri var. geyeri*	Geyer's onion	Perennial	Documented	28
ASTE4	*Astragalus tegetarioides*	bastard kentrophyta	Perennial	Documented	117
BOCR	*Botrychium crenulatum*	crenulate moonwort	Perennial	Documented	1
CADI4	*Carex diandra*	lesser panicled sedge	Perennial	Documented	48
CHXA	*Chaenactis xantiana*	desert chaenactis	Biennial	Documented	1
CYNI3	*Cymopterus nivalis*	snowline spring-parsley	Perennial	Documented	380
ELBR5	*Elatine brachysperma*	short seeded waterwort	Annual	Documented	26
ELBO	*Eleocharis bolanderi*	bolander's spikerush	Perennial	Documented	1
ERCR10	*Eriogonum crosbyae*	crosby's buckwheat	Perennial	Documented	177
ERCU3	*Eriogonum cusickii*	cusick's buckwheat	Perennial	Documented	117
ERPR9	*Eriogonum prociduum*	prostrate buckwheat	Perennial	Documented	531
GASEW	*Galium serpenticum var. warnerense*	Warner Mountain bedstraw	Perennial	Documented	56
GRHE	*Gratiola heterosepala*	Boggs Lake hedge-hyssop	Annual	Documented	3
HECU3	*Heliotropium curassavicum var. obovatum*	salt heliotrope	Annual, short lived perennial	Documented	2479
HYLE	*Hymenoxys cooperi var. canescens*	Cooper's goldflower	Biennial, short lived perennial	Documented	313
IVRHR	*Ivesia rhypara var. rhypara*	grimy ivesia	Perennial	Documented	1
IVRHS	*Ivesia rhypara var. shellyi*	Shelly's ivesia	Perennial	Documented	418
MIEV	*Mimulus evanescens*	disappearing monkeyflower	Annual	Documented	9
MILA4	*Mimulus latidens*	broad-toothed monkeyflower	Annual	Documented	7
PHIN3	*Phacelia inundata*	playa phacelia	Annual	Documented	806
PLSA3	*Plagiobothrys salsus*	desert allocarya	Annual	Documented	95
PLOR3	*Pleuropogon oregonus*	Oregon semaphoregrass	Perennial	Documented	107
POFL17	*Pogogyne floribunda*	profuse-flowereed mesa mint	Annual	Documented	1
ROCO3	*Rorippa columbiae*	columbia cress	Perennial	Documented	218

Species Code	Scientific Name	Common Name	Life Cycle	Documented or Suspected	Acres
SEVE2	*Sesuvium verrucosum*	verrucose sea-purslane	Annual, short lived perennial	Documented	1134
SYLO	*Symphoricarpos longiflorus*	long-flowered snowberry	Perennial	Documented	281
ASGEG	*Astragalus geyeri var. geyeri*	Geyer's milk-vetch	Perennial	Suspected	
BOPU2	*Botrychium pumicola*	pumice grape-fern	Perennial	Suspected	
CACA13	*Carex capitata*	capitate sedge	Perennial	Suspected	
CALAA	*Carex lasiocarpa var. americana*	slender sedge	Perennial	Suspected	
CASU7	*Carex subnigricans*	dark alpine sedge	Perennial	Suspected	
CAVE5	*Carex vernacula*	native sedge	Perennial	Suspected	
CACH15	*Castilleja chlorotica*	green-tinged paintbrush	Perennial	Suspected	
CHFE	*Cheilanthes feei*	Fee's lip-fern	Perennial	Suspected	
ERUMG	*Eriogonum umbellatum var. glaberrimum*	green buckwheat	Perennial	Suspected	
IVSH	*Ivesia shockleyi*	Shockley's ivesia	Perennial	Suspected	
LIAR6	*Lipocarpha aristulata*	aristulate lipocarpha	Annual	Suspected	
LUNE	*Lupinus nevadensis*	Nevada lupine	Perennial	Suspected	
MASO	*Malacothrix sonchoides*	lyrate malacothrix	Perennial	Suspected	
MITR3	*Mimulus tricolor*	three-colored monkey-flower	Annual	Suspected	
PEGL10	*Penstemon glaucinus*	blue-leaved penstemon	Perennial	Suspected	
RORA	*Rotala ramosior*	lowland toothcup	Annual	Suspected	
SAWO	*Salix wolfii*	Wolf's willow	Perennial	Suspected	
SCSU10	*Schoenoplectus subterminalis*	water clubrush	Perennial	Suspected	
TESA	*Texosporium sancti-jacobi*	lichen	Perennial	Suspected	
THBR	*Thelypodium brachycarpum*	short-podded thelypody	Biennial, short lived perennial	Suspected	
TOMU70	*Tortula mucronifolia*	moss	Perennial	Suspected	
TRLE	*Trifolium leibergii*	leiberg's clover	Perennial	Suspected	

Treatments Planned Relating to the Issues

No Action Alternative

Treatment Categories 1, 2, and 3 would be treated under this alternative. Currently, 73 acres of Special Status plant populations are occupied by a documented invasive plant site. *Sesuvium verrucosum* (sea purslane) and *Heliotropium curassavicum* var. *obovatum* (seaside heliotrope) populations within the Warner Wetlands comprise 49 and 22 acres, respectively. The remaining acreage is comprised of one acre of *Pleuropogon oregonus*, one acre of *Hymenoxys cooperi* var. *canescens,* and less than one acre of *Astragalus tegetarioides.* An additional 1,289 acres of Special Status plant populations occur within 900’ of mapped invasive plant sites. This distance represents the maximum distance analyzed in the herbicide Risk Assessments based on the likelihood of offsite drift from herbicide spraying. The planned treatments with the greatest potential to affect Special Status plant populations are applications of 2,4-D, dicamba, and glyphosate for perennial pepperweed control in the Warner Wetlands.

It is possible additional Special Status plant habitat is present in treatment areas, however, because treatment areas are most often composed of road corridors and disturbed areas like recreation sites, and burned areas, it is not likely large amounts of additional Special Status plant habitat are present.

Monitoring of Special Status plant populations includes the identification of invasive plant occurrences within the population. Treatment of new infestations detected during these monitoring efforts (Treatment Categories 2 and 3) are, like existing documented sites, a high priority to maintain the ecological integrity of the community. It is likely that these treatments would be limited to manual controls under this alternative because populations would be small and the four available herbicides are not particularly selective.

Proposed Action

Except for the invasive annual grasses, treatment levels for Treatment Category 1, 2, and 3 sites would be about the same as for No-Action, but as many as 14 different herbicides would be used instead of just four. Additionally, control treatments would be conducted on invasive annual grasses (mostly Treatment Categories 4-6). The full extent of invasive annual grasses in Special Status plant populations is unknown, but numerous Special Status plant monitoring reports note their presence within the population (USDI 2005c, 2007h, 2012f). Seven acres of an *Eriogonum prociduum* population occur within an area mapped as a cheatgrass community in the ESI database. Treatments within these areas would generally be done with imazapic.

Monitoring of Special Status plant populations includes the identification of invasive plant occurrences within the population. Treatments of invasive plants detected during these monitoring efforts would fall under Category 2 and 3 and are a high priority to maintain the ecological integrity of the Special Status plant community. Under this alternative, these treatments would usually be either manual or chemical controls. When the soil disturbance associated with manual control poses a risk to the Special Status plant community, or when non-herbicide treatments cannot control a particular species because of its scope or physiology, an appropriate chemical control method could be used. The diversity of herbicides available under this alternative may make it possible to use a selective herbicide that poses a lower risk to the Special Status plant.

Standard Operating Procedures and Mitigation Measures Relevant to Effects

The potential for adverse herbicide-related effects on Special Status plants is minimized for both alternatives by existing Standard Operating Procedures and Mitigation Measures (see Appendix A). These include but are not limited to:

- Refer to the herbicide label when planning revegetation to ensure that subsequent vegetation would not be injured following application of the herbicide.
- Provide clearances for Special Status species before treating an area as required by Special Status Species Program policy. Consider effects to Special Status species when designing herbicide treatment programs.
- Use a selective herbicide and a wick or backpack sprayer to minimize risks to Special Status plants.
- Avoid treating vegetation during time-sensitive periods (e.g., sensitive life stages) for Special Status species in area to be treated.
- When necessary to protect Special Status plant species, implement all conservation measures for plants presented in the Vegetation Treatments on Bureau of Land Management Lands in 17 Western States Programmatic Biological Assessment (see Appendix A, *Project Design Features, Standard Operating Procedures, Mitigation Measures, Conservation Measures, Prevention Measures, and Best Management Practices*). (MM)

For this last one, the exact conservation measures adopted would depend on the method of treatment, the Special Status plant species, and the environmental conditions of the site. These decisions would be made during preparation of the Annual Treatment Plan (see Chapter 2, *Planning/Annual Treatment Plans* for more information).

Environmental Consequences

Effects of Treatment Methods to Special Status Plants

Non-Herbicide Treatments

Common to Both Alternatives

Manual/Mechanical: Control of invasive plants using manual or mechanical methods could directly affect non-target plants. Direct negative effects could include mortality of individuals, reduced vigor due to trampling or removal of above ground parts, and reduced seed production. These effects would be minor with manual control and mechanical control using weed whackers. However, there would be less ability to target individual plants with mowing, resulting in more effects to Special Status plants in the treated area. Therefore, mowing is not recommended as a method within Special Status plant populations.

Biological Control: Biological control agents are rigorously tested for host specificity and approved by APHIS prior to release in the United States. The agents proposed for release meet the host-specificity requirements of Forest Service's Treatment Restoration Standard 14 (USDA 2005b).[49] There is a slight risk that an approved agent could attack a closely related non-target plant species. However, no close relationships have been identified between the target Invasive plants and the Special Status plants of the Resource Area.

Prescribed Fire: The application of prescribed fire has the potential to harm Special Status plant populations that are not ecologically adapted to fire. Prescribed fire is generally used in monocultures of invasive annual grasses. Pre-project clearance requirements would minimize such effects.

Targeted Grazing: Directed grazing could affect Special Status plants through herbivory or trampling of individual plants. This method would not be used within Special Status populations due to the non-selective nature of grazing and potential for reduced vigor from trampling.

Herbicide Treatments

Common to Both Alternatives

Special Status species are at risk from herbicides because their populations may be limited in geographic scope, and thus damage to individuals may have population implications. Pre-project clearances and protection of occupied or assumed occupied habitats as required by Special Status Species Program direction should prevent most or all adverse effects. The vast majority of treatments can be designed to reduce or eliminate adverse effects to these species; however, adverse effects could occur under any alternative for some treatment methods on some individuals. Some projects would have short-term adverse effects to individual plants in order to gain long-term benefits for the species. For example, habitat improvement projects or the reduction of competition from invasive plants may injure individual plants. In most cases, effects to individuals would be mitigated by Standard Operating Procedures, Mitigation Measures, and Conservation Measures from the PEIS Biological Assessment (e.g., no-herbicide buffers, timing of treatments, use of selective herbicides, exclosures, spot treatments that avoid Special Status plants, or avoiding or prohibiting aerial applications. See Appendix A, *Project Design Features, Standard Operating Procedures, Mitigation Measures, Conservation Measures, Prevention Measures, and Best Management Practices*). In addition, site-specific project design considerations made part of the Annual Treatment Plan would minimize risks to non-target plants. Design considerations include the abundance and distribution of target versus non-target plant species, stage of growth (phenology) of plants, and

[49] Treatment Restoration Standard 14 reads: Use only APHIS and State-approved biological control agents. Agents demonstrated to have direct negative impacts on non-target organisms would not be released.

the size of the treatment area, as well as physical features like soil moisture, timing of precipitation, air temperature, wind speed, and other factors.

Some damage to non-target plant species from herbicide application is probable despite cautious planning and implementation. Herbicide impacts to non-target plants depend on (but are not limited to) the herbicide used, its selectivity, application rate, concentration, relative toxicity to the plants in the treatment area, likelihood of exposure, timing and method of application, environmental conditions during application, and plant stage of growth. Herbicide treatments may affect non-target plants through direct application, overspray, off-site movement, and/or accidental spills. Potential impacts include mortality, reduced productivity, and abnormal growth. Risk to off-site plants from spray drift is greater under scenarios with application from greater heights (i.e., aerial application) or when air temperature or movement is high. Risk to off-site plants from surface runoff and movement through soil (leaching) is influenced by precipitation rate and timing, soil type, and application area. Measures taken to limit exposure, such as selective application methods (e.g., spot spraying, or wiping), typical application rates-that are less than the maximum allowed on the label, drift reduction agents, and application restrictions based on environmental conditions (wind, precipitation, temperature, etc.), reduce the off-target movement of herbicides. Standard Operating Procedures and Mitigation Measures (Appendix A) are designed to minimize risk to non-target species including Special Status plants. In general, plants in the sunflower, legume, and mustard families tend to be more susceptible to broadleaf herbicides. Therefore, there may be increased risk from these herbicide treatments for Special Status plant species such as Cooper's goldflower, desert chaenactis, and lyrate malacothrix of the sunflower family; Nevada lupine, Leiberg's clover, and Geyer's milk-vetch in the legume family; and, Columbia cress and short-podded thelypody of the mustard family.

No Action Alternative

Under this alternative, 2,4-D, dicamba, glyphosate, and picloram are available for treatment of noxious weeds. The Forest Service Risk Assessment ratings and discussions for *susceptible plants* (Appendix D, *Herbicide Risk Tables*) are assumed to represent Special Status plants. All four herbicides present a high risk of damage to Special Status plants under direct spray scenarios. Picloram presents a high risk and the remaining three herbicides pose zero risk of damage to Special Status plants under surface run-off scenarios. 2,4-D presents low to zero risk for off-site drift scenarios depending on the method of application. Depending on the method of application, glyphosate, picloram, and dicamba present high to zero risk of damage to Special Status plants for off-site drift scenarios.

Proposed Action

In addition to the four herbicides available under the No Action Alternative, ten additional herbicides would be used for vegetation treatments under this alternative. These include triclopyr, sulfometuron methyl, metsulfuron methyl, imazapyr, imazapic, hexazinone, fluridone, diflufenzopyr + dicamba, clopyralid, and chlorsulfuron. With the exception of hexazinone, fluridone, and imazapic, these herbicides present a high risk of damage to Special Status plants through direct spray scenarios. The additional herbicides include more species-specific chemicals (so those less likely to damage nearby non-target plants can more often be used), allow for a reduction in the total amount of herbicides applied (Table 3-2), and include an herbicide, imazapic, that presents low to medium risk to Special Status plants under direct spray scenarios (Table D-3).

Fluridone targets aquatic plants; none of the Special Status plants in the Lakeview Resource Area are aquatics, so there is unlikely to be an adverse effect on Special Status plants from this herbicide if it is used in the future.

Use of hexazinone is proposed for areas where invasive annual grasses have formed monocultures. Mitigation measures preclude the use of this herbicide within 300 ft. to ½ mile of Special Status plant populations.

ALS-Inhibitors: Chlorsulfuron, metsulfuron methyl, and sulfometuron methyl (sulfonylureas) and imazapic and imazapyr (imidazolinones) work by inhibiting the activity of ALS, which is necessary for plant growth. These five herbicides are effective at very low dosages (half ounce to a few ounces per acre). The ALS-inhibiting herbicides are highly active, and extremely low concentrations could injure Special Status plants. Because of their high potency and longevity, these herbicides can pose a particular risk to non-target plants. Off-site movement of even small concentrations of these herbicides can result in extensive damage to surrounding plants, and damage to non-target plants may result at concentrations lower than those reportedly required to kill target invasive plants (Fletcher et al. 1996). Chlorsulfuron may cause severe reduction in seed production of some non-target crops if they are exposed at critical stages of development (Fletcher et al. 1993). Rare or susceptible annual plants in particular may suffer if they are unable to produce seed due to exposure to chlorsulfuron. Metsulfuron methyl is known to be harmful to commercial onion crops of the lily family, so other plants in that family, like Geyer's onion, may be more readily affected by this herbicide. Imazapic presents low to medium risk for direct spray scenarios depending on application rate. The planned treatments utilizing imazapic that are likely to affect Special Status plants, target the invasive annual grasses. The benefits of reducing invasive annual grasses within special status populations are expected to exceed any negative impacts to perennial Special Status plant populations. Mitigation measures including those requiring buffers and doing treatments when non-target plants are dormant would reduce the likelihood of adverse effects to Special Status plants and populations.

Synthetic Auxins: As with picloram, clopyralid has little effect on grasses and members of the mustard family. Overall effects to non-target plants from normal application of clopyralid are likely to be limited to susceptible plant species in or very near the treatment area. These chemicals would be useful for managing invasive plants within or nearby the populations of Oregon semaphore grass and Columbia yellowcress, a grass and mustard respectively.

The Risk Assessments show that triclopyr presents a high to low risk of damage to Special Status plants through offsite drift depending upon the application method. Mitigation measures include restricting its use within up to ½ mile of Special Status plant populations depending on formulation and method of application.

Effects of Invasive Plants on Special Status Plants

Common to Both Alternatives

Researchers have ranked invasion from alien species as the second largest threat to endangered species in the United States (Wilcove et al. 1998). Rare species generally display narrow ecological amplitudes, keeping them geographically restricted and unable to compete over a wide range of site conditions. Although effects vary depending on species, invasive plants have the potential to disrupt plant communities through modification of nutrient cycles and disturbance regimes, resource competition, changes in habitat structure and effects on regeneration of native plants (Grodon 1998). Although the protection of sites occupied by Special Status species is a priority for BLM invasive plant control efforts, success of those efforts would vary depending upon the likelihood of those sites being invaded and whether effective invasive plant control tools are available.

Currently, 73 acres of Special Status plant populations are occupied by an existing documented invasive plant site. There are 1,748 acres within the Warner Wetlands occupied by *Sesuvium verrucosum* (sea purslane) and *Heliotropium curassavicum* var. *obovatum* (seaside heliotrope). In this area, infestations of *Lepidium latifolium* (perennial pepperweed) occupy 49 acres of sea purslane and 22 acres of seaside heliotrope. One acre of a six-acre *Pleuropogon oregonus* (Oregon semaphore grass) population is infested with Canada thistle and Mediterranean sage. One acre of a 238-acre *Hymenoxys cooperi* var. *canescens* (Cooper's goldflower) population is infested with bull thistle. Less than one acre of a 99-acre *Astragalus tegetarioides* population is infested with whitetop.

No Action Alternative

Under current management, the rate of spread is estimated at 12 percent from existing documented noxious weed sites (see *Invasive Plants* section earlier in this Chapter). The effect of this spread would be most apparent in the Warner Wetlands populations of *Sesuvium verrucosum* and *Heliotropium curassavicum*. Additionally, the spread of noxious weeds would continue to encroach on Special Status plant populations that have previously been unaffected by invasive plant infestations.

Areas infested with invasive annual grasses are not being controlled due to the lack of selective treatment methods available. Currently seven acres of an *Eriogonum prociduum* population occur within an area mapped as a cheatgrass community in the ESI database. Monitoring data of the population confirms the presence of cheatgrass at the site and lists it as a threat to population viability. Without control efforts, cheatgrass is expected to continue its spread throughout this population as well as elevating the risk of wildfire in this community.

The Resource Area does not have an accurate map of the total extent of invasive annual grasses, but it is reasonable to expect their presence on tens of thousands of acres of recently (1968-2012) burned habitat within the Resource Area. It is unknown exactly how many acres of Special Status plant populations are affected by invasive annual grasses. Currently 469 acres of Special Status plants occur within previously burned areas of the Resource Area. These are primarily 255 acres of *Ivesia rhypara* var. *shellyi, and* the remaining 214 acres include populations of *Symphoricarpos longiflorus, Astragalus tegetarioides, Eriogonum prociduum,* and *Rorippa columbiae*. Cheatgrass is listed on the BLM monitoring reports for all these populations. The density of cheatgrass is not reported, but is likely to increase if disturbances occur within these populations.

Proposed Action

Effects of invasive plants would be similar to the No Action Alternative except the noxious weed rate of spread and future infested acres are predicted to be reduced about 40 percent when compared to the No Action Alternative (see *Invasive Plants* section earlier in this Chapter). This reduced spread lowers the acreage of Special Status plant habitat that would be affected each year and reduces the risk of new invasive plant introductions into previously un-infested Special Status plant populations.

The ability to treat invasive annual grasses has the potential to reduce competition with Special Status plants and reduce the risk of wildfire in Special Status plant habitat. The herbicides available under this alternative would make cooperative projects with adjacent landowners more feasible, resulting in better protection for Special Status plant communities both on and off BLM-administered lands.

Cumulative Effects

Common to Both Alternatives

Invasive plants have altered habitat and compete with Special Status plants for limited resources. Under both alternatives, the control of invasive plants and restoration of invasive grass dominated areas would benefit Special Status plant species and their associated habitat. Controlling invasive plants that occur outside of Special Status plant populations would limit the need for treatment activities within these populations, because if left unchecked, invasive plants could spread into these populations.

The reasonably foreseeable actions included in Table 3-3 typically require project level botanical clearances to avoid negative impacts to Special Status plants. Where conflicts are identified, projects are modified or mitigation is implemented to insure the long-term viability of Special Status plant populations. For example, grazing exclosures have been established around Special Status plant populations where declines due to livestock use were identified. Mining activities are subject to similar analysis and mitigation measures, but prospecting can cause effects similar to those from ATVs and cattle.

Increases in abundance of cheatgrass following juniper removal have been documented (Bates 2000) and effective control measures are necessary to limit the spread of cheatgrass and other invasive plants into treated areas. Weed management activities occurring in conjunction with the juniper removal projects would reduce the negative effects to Special Status plants.

Soil Resources

Issues

- How would the alternatives affect microbiotic soil crusts?
- Are there soils/conditions where particular herbicides included in the alternatives could be transported off site?
- What is the fate of herbicides in soils?

Affected Environment

The landscape throughout the Resource Area is dominated by basins, tablelands, and mountains. In the semi-arid to arid environment across the region, soil processes such as accumulation of organic matter, clay formation, and nutrient cycling proceed slowly (USDI 2003b:38). Accordingly, soil development and characteristics are primarily influenced by site position on the landscape. Natural or geologic erosion rates on the steep land types proceed too fast to develop distinct, deep soil horizons. Soils in basins may have drainage limitations and accumulation of salts. Many of the fine-textured soils of the alluvial flats and upland plateaus are highly susceptible to wind erosion. Differences in topography, elevation, and internal drainage are reflected in the diversity of soil types, development, and productivity throughout the region (USDA 2012).

Soils in the Resource Area are classified by the Natural Resources Conservation Service (NRCS) as Andisols, Aridisols, Entisols, Inceptisols, Mollisols, and Vertisols (see Figure 3-4 and Table 3-7)(USDA 1999b, 2012b). These are soil orders, or groupings of soils at the broadest level of classification. Soils categorized within a given order would differ substantially with regards to soil properties and characteristics. Nonetheless, soils within each order are very heterogeneous with respect to the presence or absence of diagnostic horizons (layers) or features that reflect soil forming processes (USDA 1999a).

Table 3-7. Soil Orders, Clay and Sand Content, Percent of Resource Area by Order

Soil Order	Average Percent Clay	Average Percent Sand	Acres on Resource Area	Percent of Resource Area by Soil Order Acres
Andisols	16.9	78.3	15,280	<1%
Aridisols	18.2	46.4	2,650,727	83%
Entisols	18.5	66.8	233,505	7%
Inceptisols	21.7	23.8	15,150	<1%
Mollisols	21.0	44.2	143,169	4%
Vertisols	34.1	18.6	52,609	2%

A majority of the soils in the Resource Area (approximately 83 percent) are Aridisols. The very dry Aridisol soils are extensive throughout the northern and eastern half of the Resource Area, and cover the greatest area at 2.6 million acres of BLM-administered lands. Aridisols are characterized by a lack of water and/or accumulation of salts, and contain less organic matter (humus) than Mollisols. Aridisols are typically light colored mineral soils with pH ranges from neutral to strongly alkaline. Due to the low organic matter accumulation in Aridisols, their ability to filter, store, and process herbicides is limited to the mineral soil properties of the upper soil layers.

Aridisols are also highly susceptible to wind erosion if they become barren, as they have extremely high average (78 percent) sand content. Elsewhere, these soils exhibit moderate to low susceptibility to wind erosion if protected by vegetation. As with Mollisols, a clay layer may be present in some Aridisol soils. The clay layer indicates a much wetter climatic regime sometime in the past when these soils were formed. Clay layers provide a good binding and degradation mechanism to herbicides; however, they are found lower in the soil profile on these soil orders.

Mollisols occur on the Resource Area, but are most widespread on neighboring Fremont National Forest lands. The dark, base-rich, surface horizons of Mollisols are particularly high in organic matter. The high organic content tends to bind herbicides and provide for degradation by soil organisms.

In some Mollisol soils, a clay layer is present, indicating sufficient moisture was present at some period to cause clay movement and accumulation. The average percentage of clay in this order is comparable to Aridisols. Clay content (see Table 3-7, *Soil Orders and Clay Content*) influences not only permeability rates, but also the movement and fate of herbicides through the soil profile.

If unprotected by vegetation, woody debris or other barriers, Mollisols are also prone to wind erosion. Wind erosion remains a persistent concern in the central portion of the Resource Area, specifically in the Fort Rock and Christmas Valley areas. Within the Resource Area, BLM-administered lands along Abert Rim, east of Valley Falls, and a narrow sliver of land from Plush to Adel contain Mollisols most susceptible to wind erosion. As the climate becomes increasingly drier to the north and east, the semi-arid Mollisol soils grade into Aridisols.

Andisols are volcanic-derived soils that are found in the northwest quadrant of the Resource Area. Andisols display high infiltration and permeability rates. They have some of the highest erosion rates for wind erosion and are the most likely to lose soil from disturbed surfaces during local wind events.

Other soil orders present in the Resource Area include the geologically young, undeveloped to minimally developed Entisols and Inceptisols. These soils are found primarily on alluvial flats and low lake terraces, shorelines, and floodplains. Inceptisols and Entisols in the Guano Valley, north of Hart Lake, and east of Summer Lake are highly susceptible to wind erosion, as are the Andisols and Aridisols throughout the northern part of the Resource Area. This may be due to the higher average percent of silt that composes most of these soils. There are also some areas of Vertisols that are very heavily clay-laden. That may help bind herbicides but also has cracking and movement problems that may make herbicide application difficult.

The data within the NRCS's Soil Survey Geographic database, or county soil surveys, was used to refine the Wind Erosion Groups 1 and 2 (see Figure 3-5), soil properties such as average percentages for sand, silt, clay, and organic matter contents, along with any soil limitation interpretations. These soil parameters are the most informative for the determination of soil effects from soil disturbance, applications of chemicals, or use by machinery or animals, and are thus carried forward in the following analysis. About 850 different soil map units make up the nearly 7900 polygons within the combined NRCS's Soil Survey Geographic database. A listing or a summary table would not provide more clarity for most purposes here. If more information is needed for purposes other than this analysis, it is suggested that the NRCS Web Soil Survey site is likely the single best source of soil data in the nation. It can be accessed at http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm

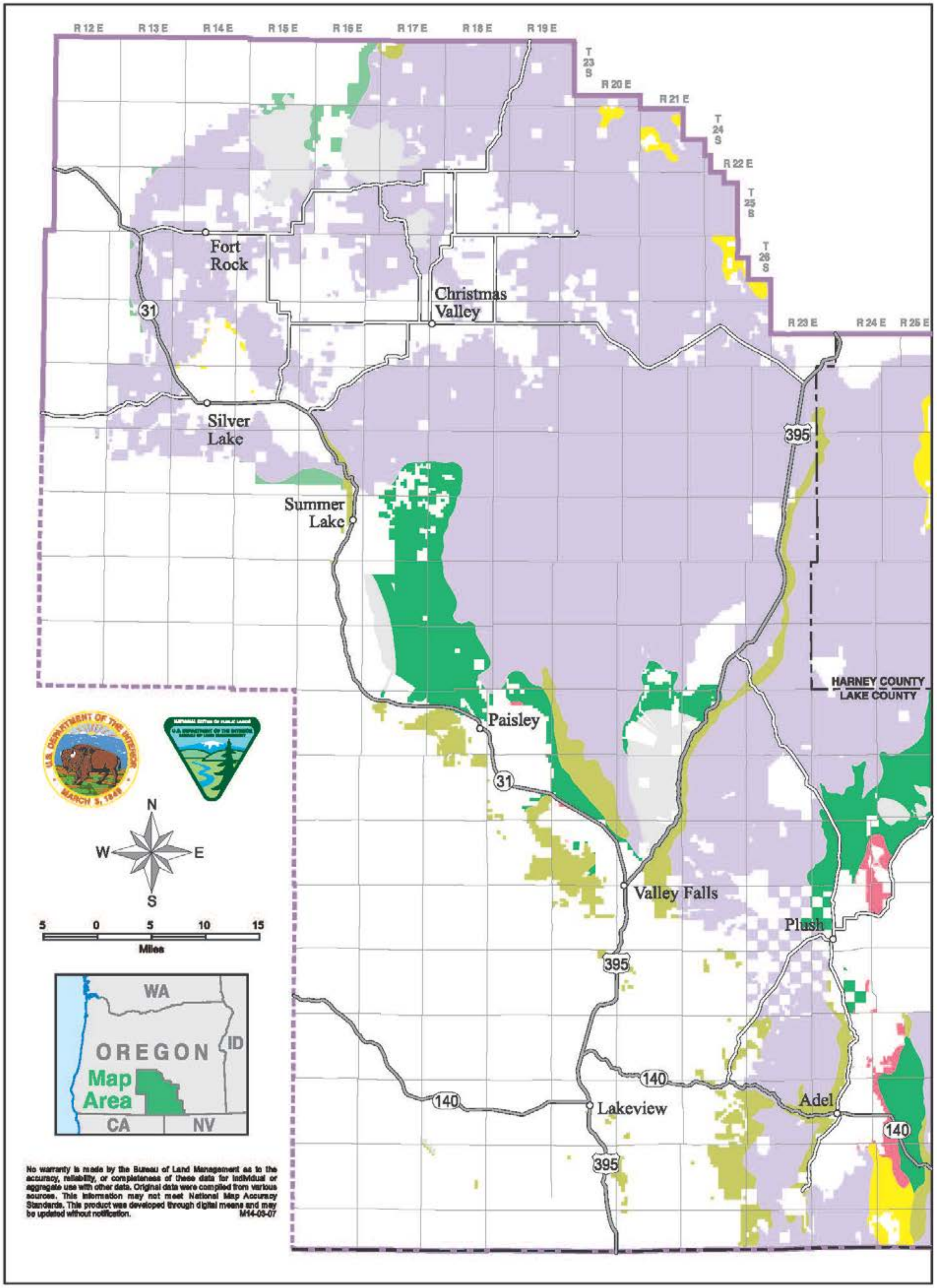
Soils and Invasive Plants

Invasive plant populations are located on all soil types previously described. It is well established that some invasive plants favor particular environments or specific soil types to germinate, grow, and reproduce (USDA 2014). For example, Medusahead rye appears more commonly on shrink-swell clay soils, Canada thistle favors deep moist soils, and whitetop prefers soils with neutral to alkaline pH and disturbed sites including excessively grazed areas. Other species such as cheatgrass prefer a wide range of well-drained soil textures, but are not well adapted to saline, sodic, or poorly drained soil conditions (USDA 2014). Documented and observed invasive plant sites on the Resource Area tend to support these data.

Biological Soil Crusts

Biological crusts are a combination of bacteria, algae, mosses, and lichens. They have a complex distribution as each individual component may have different abilities to colonize and utilize a particular soil area. Distribution is a function of seven factors that interrelate with one another: elevation, soils and topography, disturbance, timing

Figure 3-4. Soil Orders



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Bureau of Land Management
Integrated Invasive Plant Management Environmental Assessment
Lakeview Resource Area
2014

Figure 3-4. Soil Orders

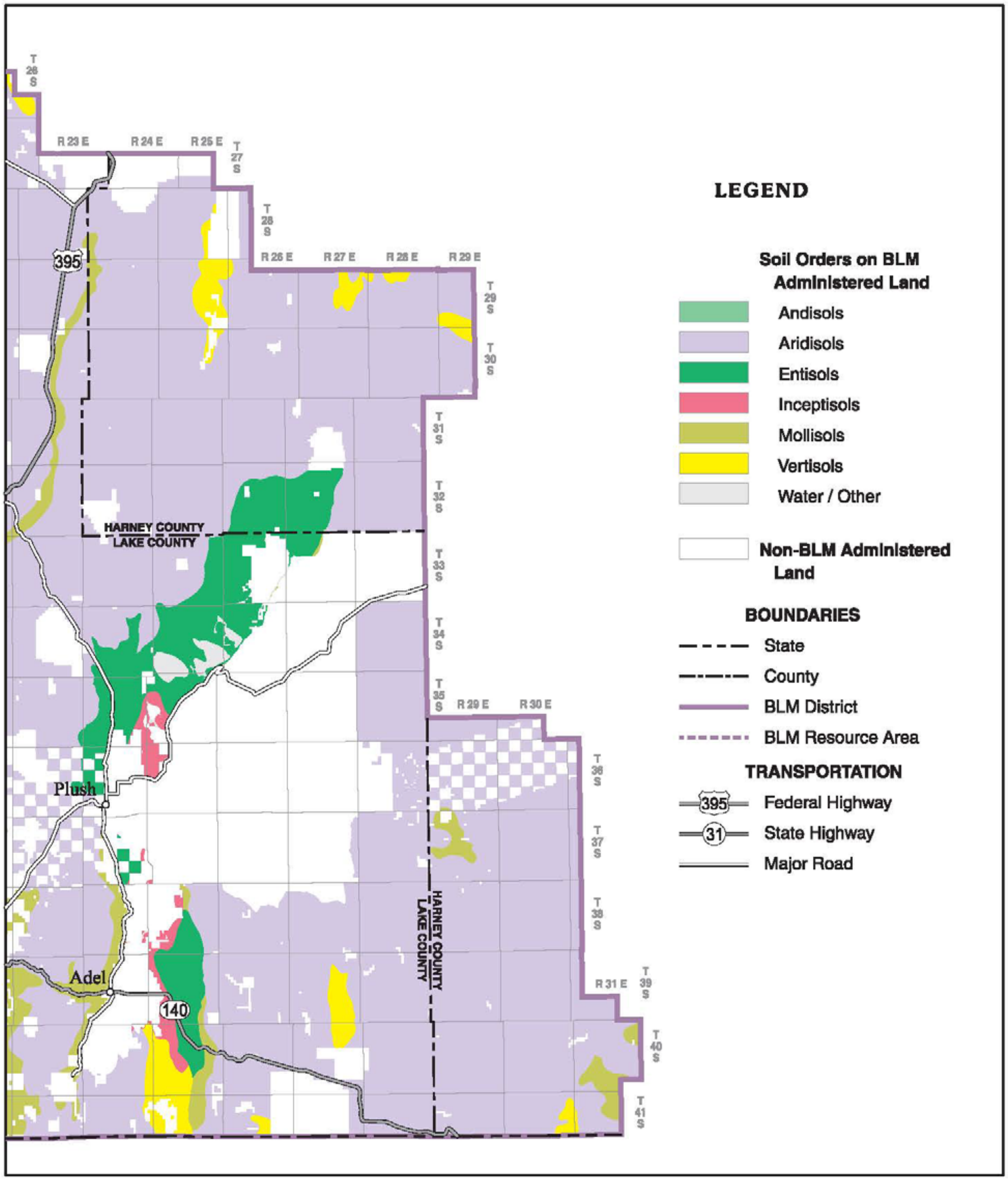


Figure 3-5. Soil Wind Erosion Groups

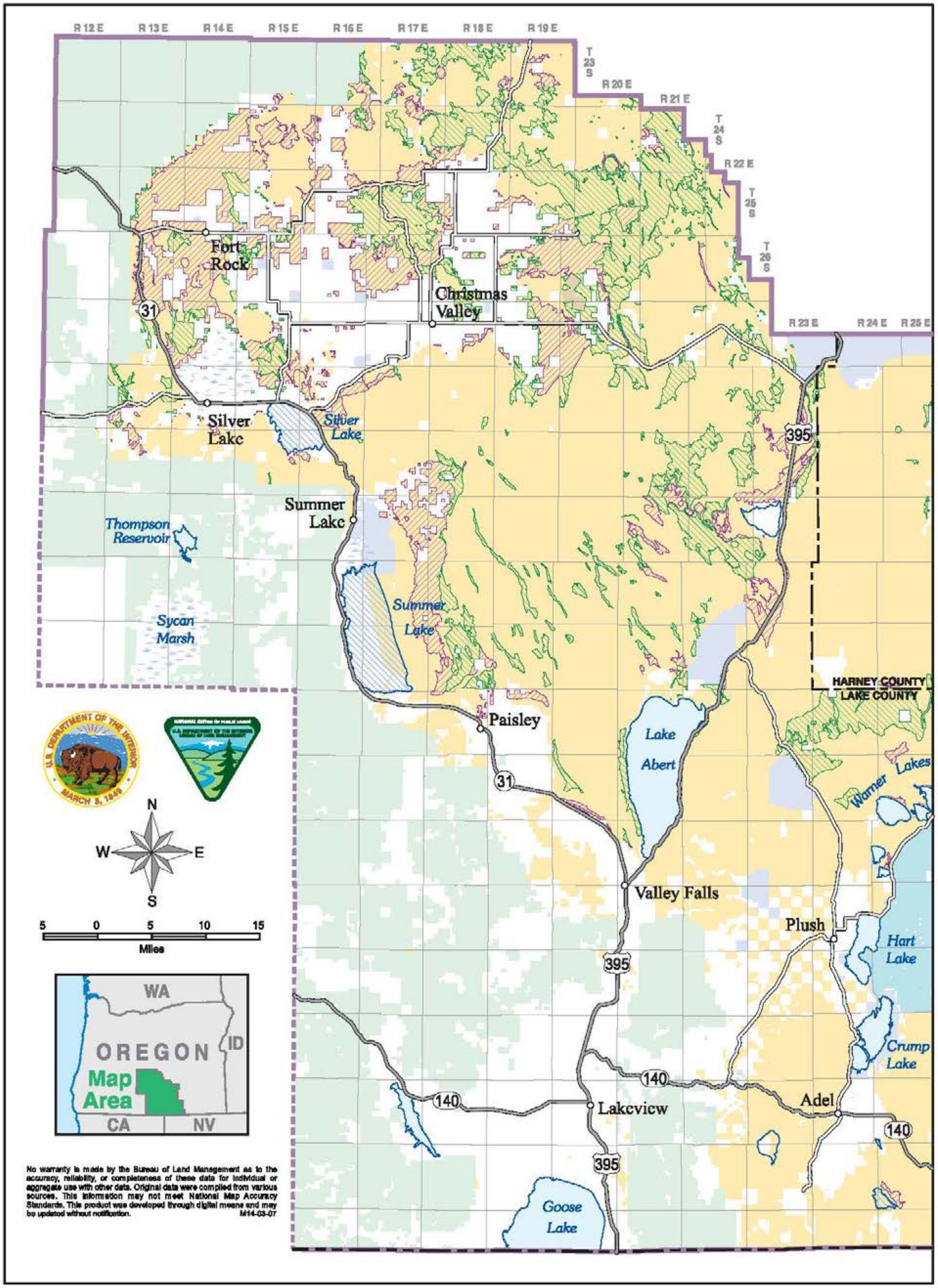
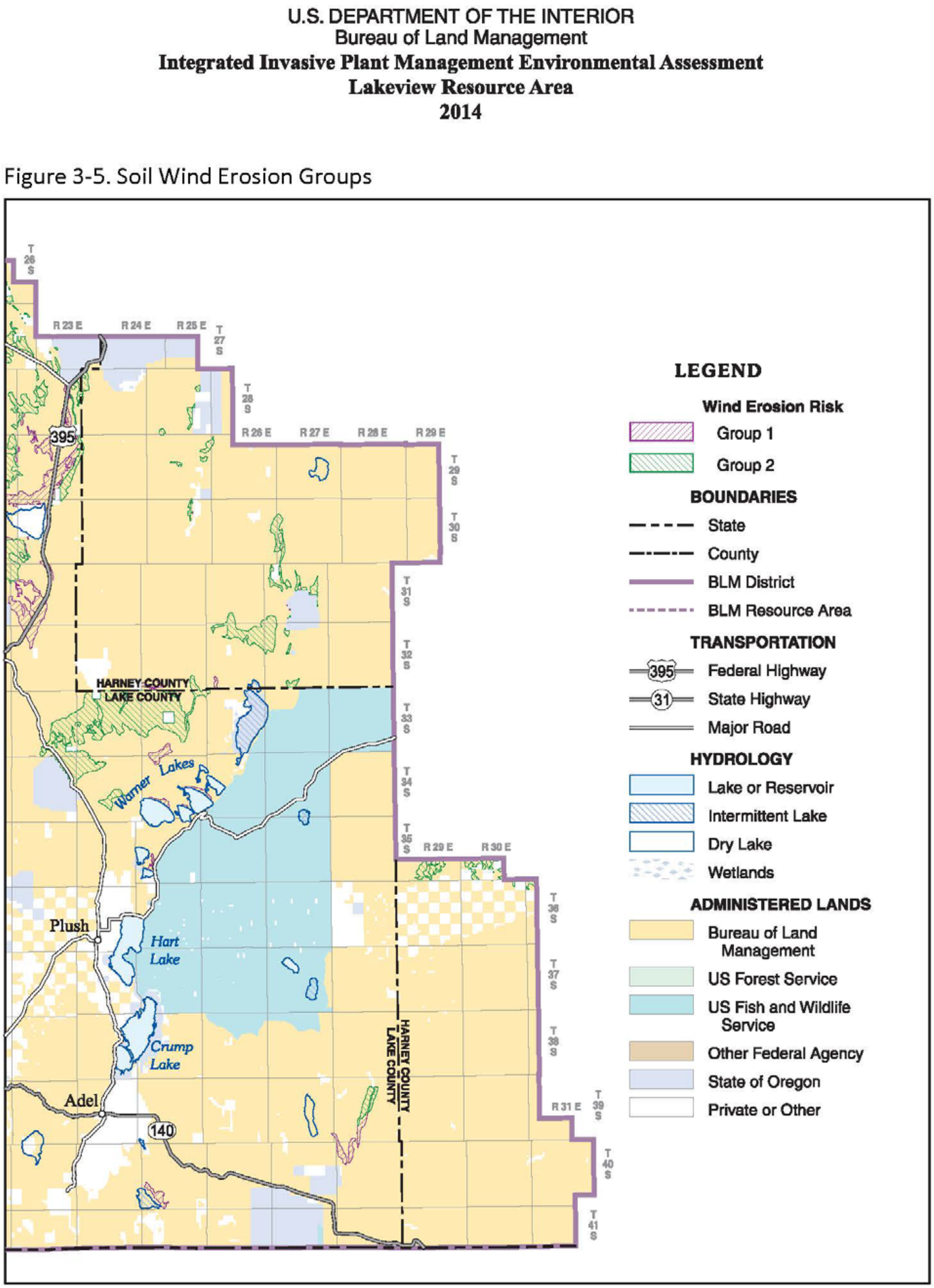


Figure 3-5. Soil Wind Erosion Groups



of precipitation, vascular plant community structure, ecological condition, and microhabitats (USDI 2001b). Total crust cover is high when elevation is low (below 3,000 ft.). Some increase in distribution occurs as elevation increase but point vascular plant cover precludes their growth; biological soil crust distribution is highest when vascular plant cover is low. Crust cover is also highest when soil depth is shallow and soil texture is fine. Stable or embedded rocks near or at the soil surface can increase the percent crust cover by perching water and armoring the surface from physical disturbances (USDI 2001b:18).

Biological soil crusts are identified throughout the Resource Area. Also known as cryptogamic, cryptobiotic, microbiotic, or microphytic soil crusts, they are found on Aridisols, Mollisols, and Inceptisols. They do not appear on Entisol soils, as these soils tend to be too sandy, wet, or unstable for crust development. The most critical physical factor for biological soil crust establishment is the presence of fine-textured surface soils such as silts, silt loams, and non-shrink/swell clays (USDI 2001b). Other factors that determine biological soil crust presence and development include, but are not limited to dominant shrub type, herbaceous plant density and form, annual precipitation, historical fire return, and current ecological condition. The Resource Area is dominated by plant communities that have a high potential for biological soil crust cover. However, sites where vegetation structure has been modified due to introduction of invasive plants would have reduced potential for biological crusts (USDI 2003b:38). The actual extent of biological soil crusts in the Resource Area is not mapped.

Biological soil crusts contribute to soil stabilization by reducing wind and water erosion of soil surfaces. Biological soil crusts play an important part in ecosystem processes, such as carbon and nitrogen fixation, soil-water evaporation, seed germination time, and seedling growth rates. In addition to holding soil in place and restricting the amount of erosion, biological soil crusts also influence the type of material eroded from the soil. Laboratory studies showed that water erosion resulted in the erosion of mainly fine soil particles (silt and clay) from a sparsely covered crust surface, while the extensively covered surface lost only coarse sand Since most soil nutrients are bound onto the silts and clays, the loss of these fine particles represents a reduction in soil fertility and hence, productivity. Wind erosion would be expected to have similar erosional effects (USDI 2001b).

Treatments Planned Relating to the Issues

Soil Crusts – Virtually all treatments in Treatment Categories 1 – 3 are ground based, being either spot spray from backpacks, or spot and boom sprays from ATVs or on-road vehicles. Many of these applications would be made from roads and other disturbed surfaces, but some ATV and foot traffic would be in areas with soil crusts.

Wind Erosion - The Proposed Action proposes tens of thousands of acres of applications per year of herbicides that are either long-lived in the soil or are effective at very low doses (ounces per acre). Mostly targeting cheatgrass, some of these applications would fall in the 17 percent of the Resource Area with soils unusually susceptible to wind erosion.

Fate of Herbicides in Soils – The herbicides addressed in both alternatives have various longevity and solubility in soils. Use of some of the longest-lived, most soluble is expected to decrease between the No Action Alternative and the Proposed Action.

Standard Operating Procedures and Mitigation Measures Relevant to Effects

The potential for adverse herbicide-related effects to soils is minimized for both alternatives by existing Standard Operating Procedures and Mitigation Measures (see Appendix A). These include, but are not limited to:

Mechanical and Manual Methods

- Minimize disturbance to biological soil crusts (e.g., by timing treatments when crusts are moist).
- Reinoculate biological crust organisms to aid in their recovery, if possible.

Chemical

- Minimize use of herbicides that have high soil mobility, particularly in areas where soil properties increase the potential for mobility.
- To avoid the loss of finer-sized soil particles and avoid having herbicide-treated soils blown or washed off-site, avoid exposing large areas of wind-erosion group 1 or 2 soils (see Figure 3-5, *Soil Wind Erosion Groups*) when a combination of dry soil and seasonal winds are expected. Mitigation measures could include the use of selective herbicides to retain some vegetation on site; reseeding so cover is present before the windy season affects dry soils; staggering treatment of strips until stubble regrows enough to provide an acceptable filter strip; rescheduling treatments away from the windy season; or, other measures to prevent wind erosion on these soil groups (Oregon FEIS MM).

Environmental Consequences

Effects of Treatment Methods to Soil Resources

Effects are described in terms of the intensity, spatial, and temporal scales of the impacts. Spatial boundaries define areas or sites that may be affected by the proposed management actions. For the Resource Area, "local effects" refers to individual treatment sites where soil crusts are directly disturbed or soil processes are impacted. Watershed effects would affect sixth field watersheds. Effects that would influence fifth field watershed scales or larger are considered widespread effects.

How long a management action would affect the soil resource is the duration of effects. If short-term, the effects are anticipated to occur within five years of project implementation. Long-term effects would occur beyond five years of project implementation. The intensity of management action impacts may vary within treatment areas due to reoccurring treatments in the same areas. If manual pulling of the same area occurs on the same site for several years in a row, the soil resources will be disturbed each time. If herbicides are applied to an area aerially and no retreatment is needed, the impacts on the soil resources are greatly reduced, as recovery is not interrupted.

The magnitude of effects ranges from negligible to moderate. "Negligible effects" on soil processes (i.e. organic matter degradation, infiltration or nutrient cycling) would be at or below the level of detection, whereby "moderate effects" would be readily apparent such as biological soil crust breakage, result in changes of soil character, and would likely require some or few mitigating measures to offset adverse effects. "Major effects" on soil processes or biological soil crusts would be readily apparent, long-term, and would substantially change the character of the soils over a large area. Extensive mitigating measures to offset adverse effects would be needed, and their success could not be guaranteed.

Non-Herbicide Treatments

<u>*Manual*</u>

Manual methods such as pulling or digging to control weeds have negligible effects on soil resources. Manually digging and pulling weeds are expected to result in localized short-term ground disturbance primarily due to foot traffic and tool use. Effects of manual invasive plant treatments are more likely to be realized on biological soil crust communities. Pulling and digging weeds can result in trampling and dislodging sensitive biological soil crusts, particularly when the crusts are dry. To reduce disturbance and potential damage to biological soil crusts, Standard Operating Procedures require mechanical and manual treatments to minimize disturbances to biological soil crusts (e.g., by timing treatments when crusts are moist).

Mechanical

Mechanical control methods, including the use of weed whackers, chainsaws, and mowers, would be expected to result in negligible to moderate localized short-term effects to soil resources. Ground disturbance would be due primarily to foot traffic or the use of off-highway vehicles to transport equipment or workers. With respect to biological soil crusts, mechanical methods involving the use of heavy equipment, such as blading and rangeland seed drilling, have the potential to cause moderate localized short-term impacts because of track or wheeled equipment needed to pull or push the equipment. Blading may initially disturb crust presence, but in the long-term, it would improve local biological soil crust habitat by reducing invasive plant cover.

Targeted grazing

Many studies and established programs show that grazing weeds at a specific time, duration, and intensity can effectively reduce their abundance (Davison et al. 2005). Impacts to soils and biological soil crusts by targeted grazing would vary by season of use, length of grazing period, and number of grazing animals. Crusts on all soil types are least vulnerable to disturbance when soils are frozen or snow covered. Biological crusts on sandy soils are less susceptible to disturbance when moist or wet; on clay soils, when crusts are dry (USDI 2001b).

Prolonged grazing on wet fine-textured soils can cause soil compaction, shearing, and post-holing. If extensive, changes in soil functions and site hydrology can occur. Dry-season grazing would avoid potential damage to these soils. However, grazing turnout in early spring is the most ideal for sites containing biological soil crusts. Biological soil crusts are the most resistant to disturbance under moist springtime conditions.

Biological Control

The introduction of beneficial microorganisms and biological control agents can affect soil properties, biota, and soil processes. Many biological control species will increase nitrogen inputs into the soil and interact with other soil biota. Improved soil aggregation and heightened carbon accumulation can also occur. The utilization of biological control nematodes may result in greater nutrient release within the root-soil interface, but can interact with other organisms (e.g. reduce mycorrhizal populations) (FAO 2014).

Prescribed Fire

Low-intensity prescribed burns have minimal effects on soil properties due to reduced heating in the upper most layers. Typically, broadcast burns have a slight short-term positive effect of increasing available nutrients to vegetation, with a slight negative effect three to five years post burning, due to decreases in nitrogen. Soil productivity is expected to improve due to the positive flush of post-treatment nutrients.

Prescribed burns will incur similar effects on biological soil crusts. Johansen et al. (1993) observed that biological soil crusts structural matrix was left intact following low-intensity fire, indicating that a lightly burned crust still functions to maintain soil stability against erosive forces for both vascular plants and biological soil crusts during the recovery period. A recent study explored the effects of a controlled burn on crusts at a site in the foothills of the Onaqui Mountains in Utah. The results indicate that low-intensity fire has few long-term adverse effects. The recovery of soil crusts in a good rain year after a light fire was fairly quick (FSB 2009).

Herbicide Treatments

Persistence is the length of time an herbicide remains in the soil. It is measured in half-life, or the length of time in days that half of the initial concentration of herbicide remains in the soil. One quarter of the initial application would remain at the end of the next half-life cycle. Persistence depends upon the amount of herbicide applied to the soil, the amount taken up by roots, off-site movement, and how fast a chemical breaks down or degrades. Degradation rates vary by soil texture and characteristics, as well as precipitation and temperature. Herbicides can be degraded by soil organisms, chemical reactions, or by sunlight (USDA 2011).

The ability of an herbicide to bind to soil particles is affected by soil adsorption affinity. Also known as K_{oc} values, soil adsorption values are strong indicators of herbicide mobility within the soil profile. Herbicides with high K_{oc} values bind strongly to soil particles, which may limit leaching and off-site movement. The NRCS model that calculated leaching potential for basic soil properties was used in the FEIS 2010 analysis. The Pesticide Adsorbed Runoff Potential indicates the tendency of a pesticide to move in surface runoff in the solution phase. The chemicals proposed for use in this EA range from low to high (see Table 3-8).

Table 3-8. Fate of Herbicides in Soil

Herbicide	Soil Half-life (days)	Soil Adsorption (K_{oc})[1]	Fate in Environment (Persistence Rating[2] based on half-life)	SPISP II[3] Ratings (potential)		
				PLP[4] (Leaching)	SRP[5] (Solution Runoff)	PARP[6] (Adsorbed Particle Runoff)
2,4-D	10	20 m/g (acid/salt) 100 mL/g (ester)	Rapid microbial degradation 1-4 weeks (Not Persistent)	Intermediate	Inter mediate	Inter mediate
Chlorsulfuron	40	40 mL/g	Relatively rapid degradation by microbial and chemical actions, trace amounts have extreme bioactivity (Moderately Persistent)	High	High	Inter mediate
Clopyralid	40	6 mL/g, ranges to 60 mL/g	Biodegradation, photo degradation, and hydrolysis are the primary mechanisms that remove diflufenzopyr from soil (Non-Persistent)	High	Intermediate	Low
Dicamba	14	2 mL/g	Mobile in soil but is easily degraded by microbes (Non-Persistent)	High	Intermediate	Low
Diflufenzopyr	2 to 14	18 to 156 mL/g (aver. 87)	Biodegradation, photo degradation, and hydrolysis are the primary mechanisms that remove diflufenzopyr from soil (Non-Persistent)	Not Rated	Intermediate	Not Rated
Fluridone	21	1,000 mL/g	Fluridone adsorption to soil increases with clay content, organic matter content, cation exchange capacity, surface area, and decreasing pH (Non-Persistent)	Not Rated	Not Rated	Not Rated
Glyphosate	47	24,000 mL/g	Tightly adsorbed to soil and rapidly degraded by microbes, thus no soil activity (Moderately Persistent)	Very Low	Intermediate	Low
Hexazinone	90	54 mL/g	Soil organic matter content does not affect adsorption. Relatively low affinity for soil particles and dissolves in soil water. Bio-degradation is an importation fate (Moderate to Persistent)	Not Rated	Not Rated	Not Rated
Imazapic	120 to 140	137 mL/g	Most imazapic is lost through bio-degradation. Sorption to soil increases with decreasing pH and increasing organic matter and clay content. (Persistent)	Intermediate	Intermediate	Low
Imazapyr	25 to 141	100 mL/g	Adsorption is affected by aluminum and iron in soil more than by clay and organic matter, subject to microbial degradation except in cool temperatures (Moderate to Persistent)	High	High	Intermediate
Metsulfuron methyl	30	35 mL/g	Hydrolysis and microbial degradation, with the latter being the only major pathway in alkaline soils (Non-Persistent)	High	High	Intermediate
Picloram	20-300	16 mL/g	Very slow microbial degradation and some photo-decomposition. Picloram is persistent for a year or more (Moderate to Persistent)	High	High	Intermediate
Sulfometuron methyl	20	78 mL/g	Relatively rapid microbial and chemical degradation. However trace amounts can be significant due to extreme bioactivity (Non-Persistent)	Intermediate	High	Low
Triclopyr	46	20 mL/g (salt) 780 mL/g (ester)	Degradation occurs primarily through microbial metabolism, but photolysis and hydrolysis can be important. As plants die, release of triclopyr to the soil can occur and it can then be taken up by other plants. (Moderately Persistent)	High	High	Intermediate

1. K_{oc}: Soil organic carbon sorption coefficient of an active ingredient in mL/g. For a given chemical, the greater the K_{oc} value, the less soluble the chemical is in water and the higher affinity the chemical has for soil organic carbon. For most chemicals, a higher affinity for soil organic carbon (greater K_{oc}) results in less mobility in soil

2. Persistence based on half-life - non persistent: less than 30 days; moderately persistent: 30 to 100 days; and persistent: greater than 100 days (defined by Extoxnet Pesticides http://extoxnet.orst.edu/pips/ghindex.html)
3. SPISP II = Soil Pesticide Interaction Screening Procedure version II
4. PLP - Pesticide Leaching Potential indicates the tendency of a pesticide to move in solution with water and leach below the root zone. A low rating indicates minimal movement and no need for mitigation.
5. SRP - Pesticide Solution Runoff Potential indicates the tendency of a pesticide to move in surface runoff in the solution phase. A high rating indicates the greatest potential for pesticide loss in solution runoff.
6. PARP - Pesticide Adsorbed Runoff Potential indicates the tendency of a pesticide to move in surface runoff attached to soil particles. A low rating indicates minimal potential for pesticide movement adsorbed to sediment, and no mitigation is required.

Numerous additional factors that affect the fate of herbicides include soil physical, chemical, and biological properties. Soil pH, texture (amount of sand, silt, and clay), percentage of organic matter, depth to restrictive layer, presence of a water table, and soil temperature and moisture regimes contribute to herbicide fate and transport. Site characteristics that factor into the analysis include physical elements that can influence the susceptibility of exposed soil surfaces to wind erosion and runoff potential.

The soil types on the Lakeview Resource Area exhibit a wide range of the characteristics described above. Analysis of the fate, transport, and effects of specific herbicides are limited by soil properties and function at the site level. Project planning considers site-specific soil characteristics in determining appropriate herbicide formulations, size of buffers if needed, application methods, and timing, as described below.

For this analysis, the NRCS soil survey information that is most useful for determining effects of chemical application on soil resources consolidate to four of the factors listed above. The amount of organic matter in the top 6 inches of the soil controls the ability of soil to capture herbicides: less than 1 percent was considered a severe limitation and soils between 1 and 2.5 percent levels were considered cautionary. Soils with 2.5 to 3 percent may tie up soil-applied herbicides prior to the being delivered to the plant (USDI 2010a:176), thus soils greater than 2.5 percent organic matter were considered a binding mechanism for herbicides (see Figure 3-6).

Soils that have greater than 20 percent average clay contents (see Figure 3-7) are considered by the NRCS to be in a sandy clay, silty clay, or just clay loam texture classification class. Thus, these soils may have sufficient levels of clay to adsorb and thus retain herbicides within the soil profile or surface. The average percentage of sand within the soil is also important from an infiltration and water routing perspective. For this analysis, those soils with a percentage of sand greater than 50 percent (see Figure 3-8) were used as a screening mechanism to determine when soils may have a greater potential to infiltrate into the soil profile. Where that may occur, some herbicides (like picloram) could connect with ground water if water tables are near the surface.

Soils in groups 1 or 2 (see Figure 3-5, *Soil Wind Erosion Groups*) for wind erosion risk are most likely to demonstrate a blowing condition and potentially transport herbicides attached to soil particles (USDI 2010a:179). This could affect roughly 540,500 acres, the bulk of which are in the northern half of the Resource Area with an additional concentration northeast of Hart Lake and the town of Plush.

2,4-D (common to both alternatives) is non-persistent and degrades rapidly. It has a 10 day half-life in moist soils and its fate is pH- and temperature- dependent. Degradation is slower in acidic soils and in cold or dry soils. 2,4-D is registered for use on all land types.

Chlorsulfuron (Proposed Action) has high soil mobility (low soil adsorption), a 40 day half-life, and is moderately persistent in soil. Degradation is affected by soil pH (high pH translates to slower herbicide degradation) and has potential longevity on alkaline soils. It is registered for use on all land types except forest and riparian, and has a label advisory for wind erosion. Many of the alluvial flats and low lake terraces in the Warner Valley, Chewaucan River Valley, east of Summer Lake, and northeast of Lake Abert contain saline-sodic soils that could exhibit potential longevity of this herbicide.

Clopyralid (Proposed Action) is moderately persistent and has a 40 day half-life. Its rapid degradation reduces the potential for leaching or runoff. It has high solubility and very high soil mobility. Clopyralid is registered for use on all land types but riparian. It is persistent in plants, and if killed plants are put in contact with other plants, e.g. as mulch, the residual herbicide can kill other plants.

Dicamba (common to both alternatives): is highly soluble. It has high soil mobility, but is non-persistent. It has a 14 day half-life and slowly breaks down in sunlight. It is easily degraded by microbes. It may contaminate groundwater and it is registered for use on all land types except forest and riparian.

Figure 3-6. Soil Organic Matter Content

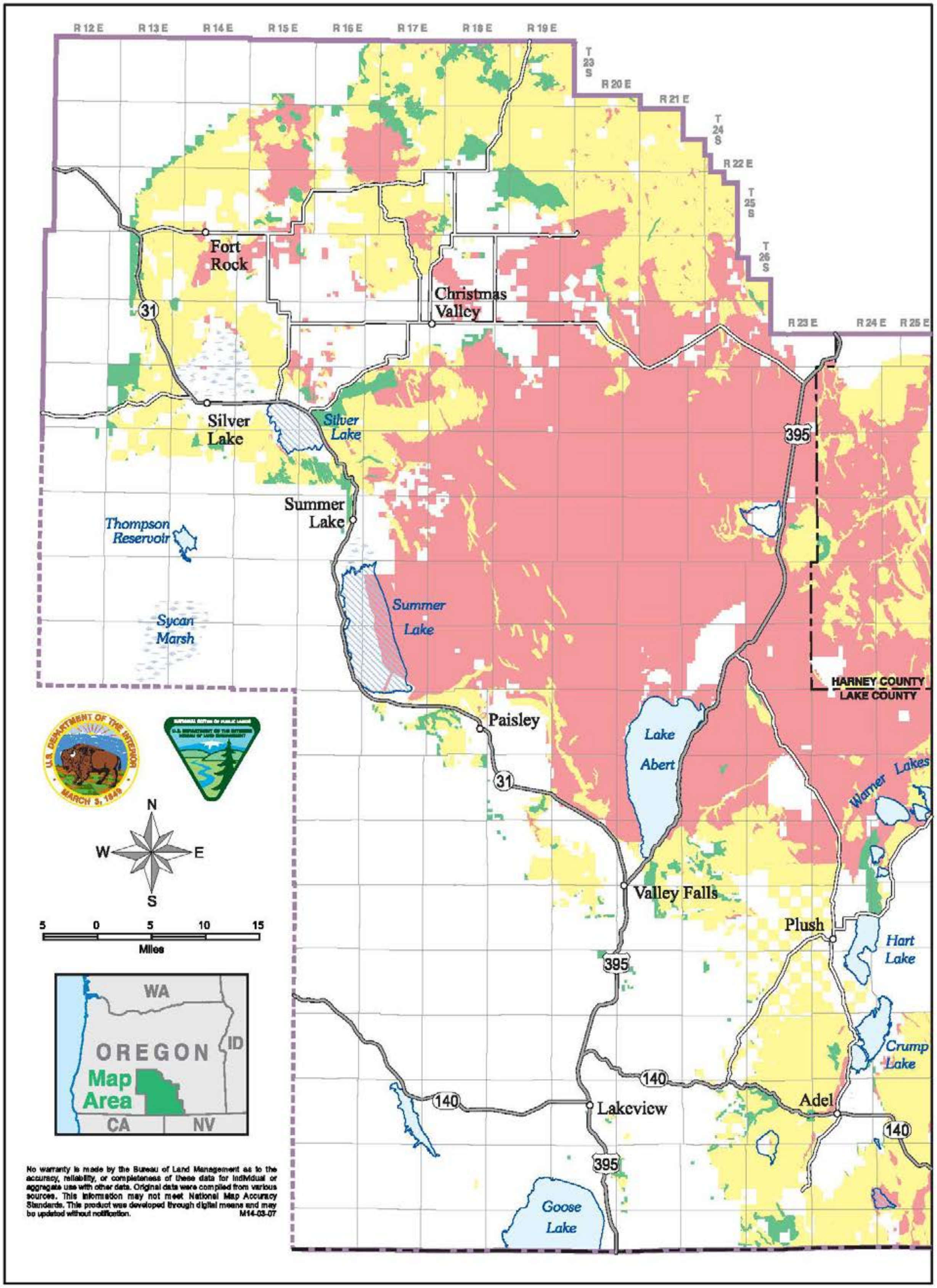


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Figure 3-6. Soil Organic Matter Content

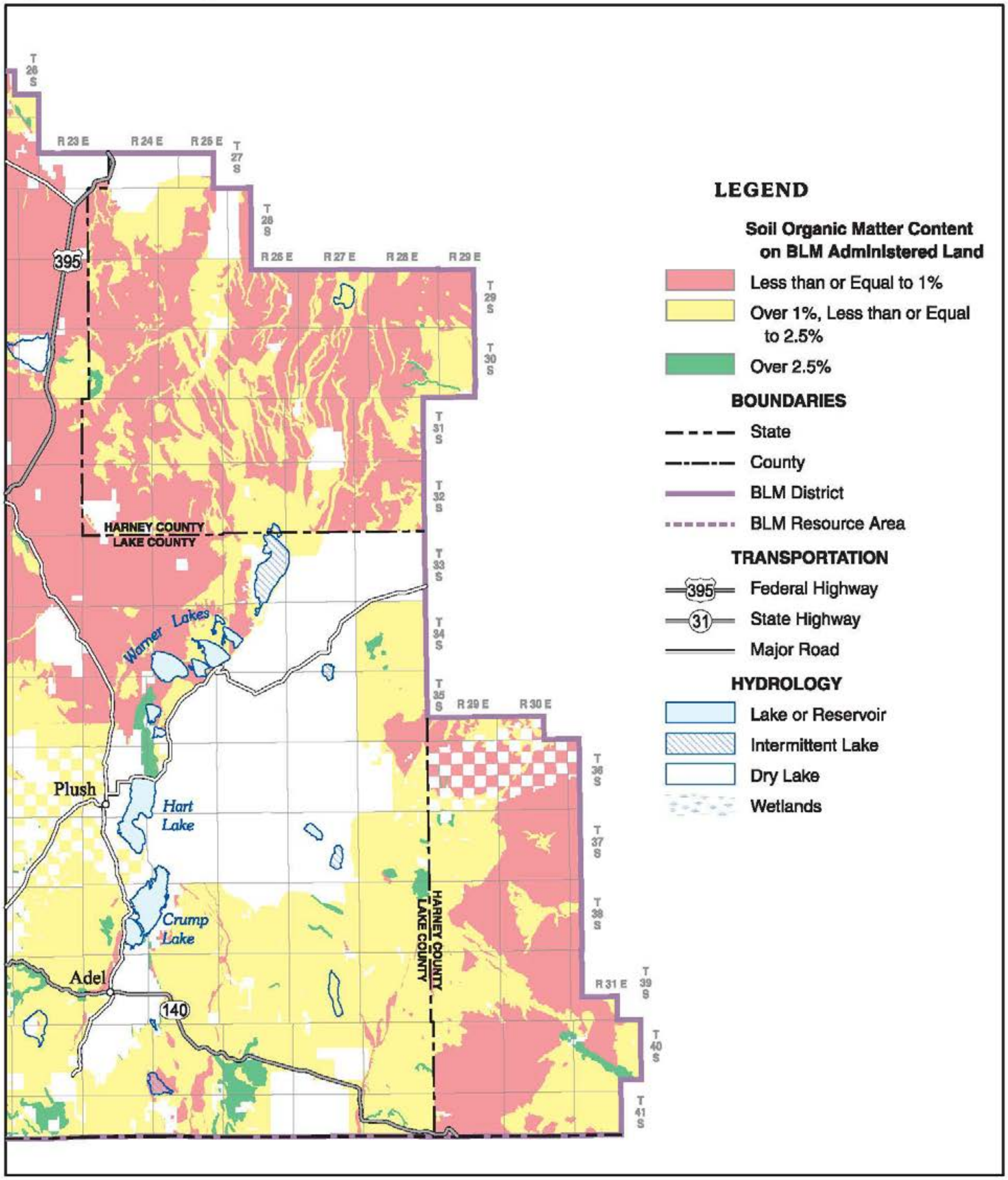

Figure 3-7. Soils with Average Clay Contents Greater than 20%

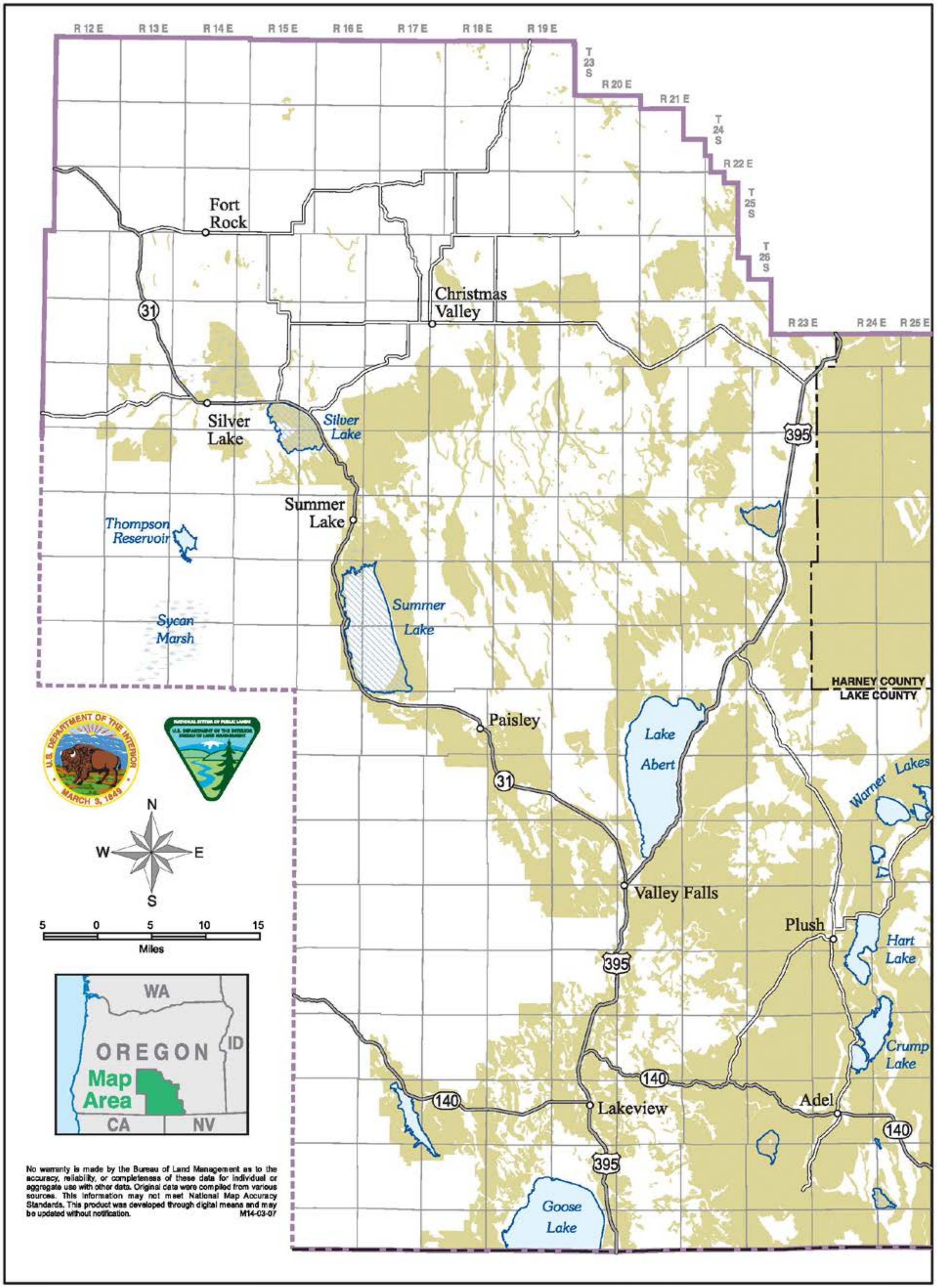

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Figure 3-7. Soils with Average Clay Contents Greater than 20%

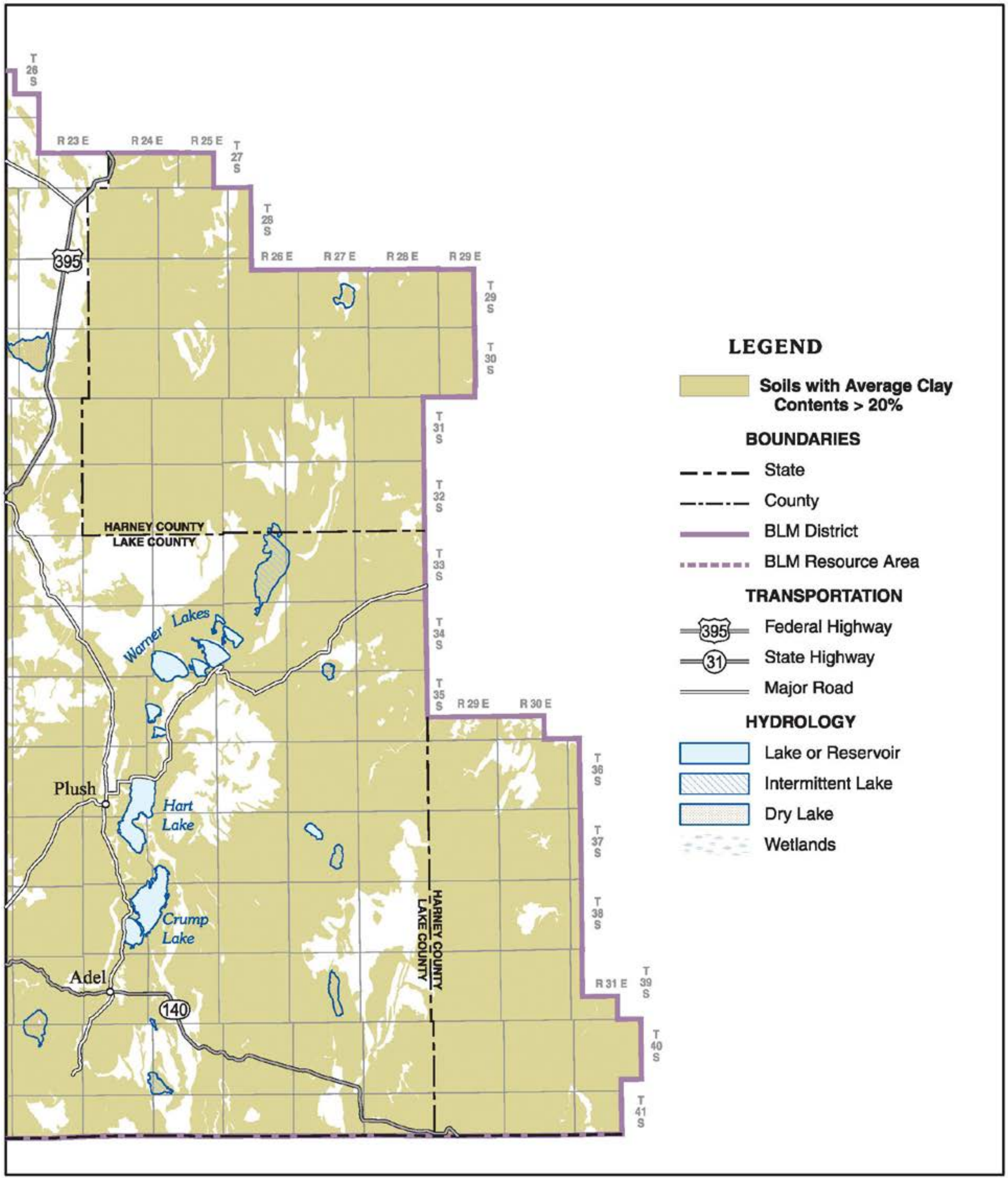

Figure 3-8. Soils with Average Sand Contents Greater than 50%

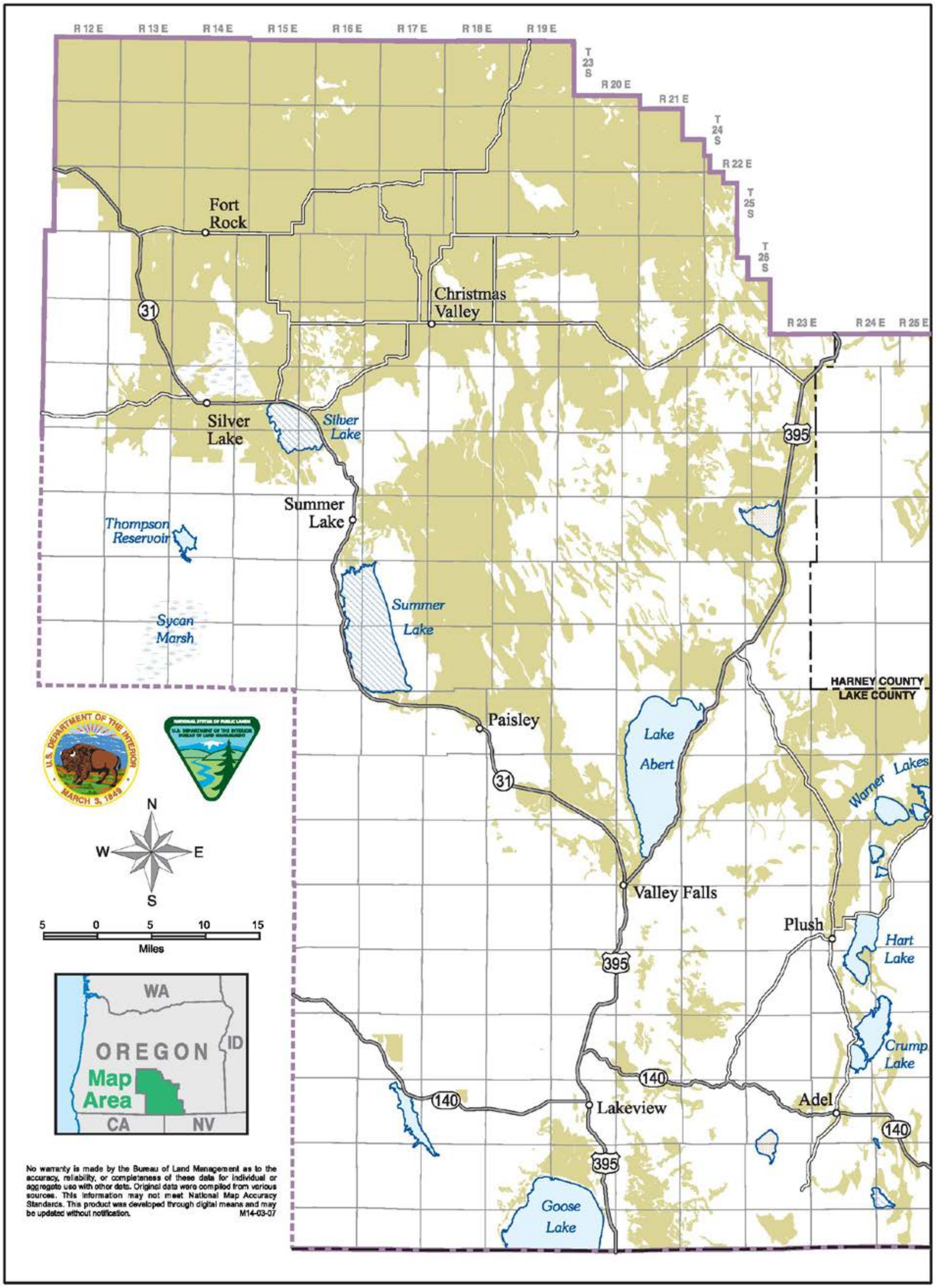

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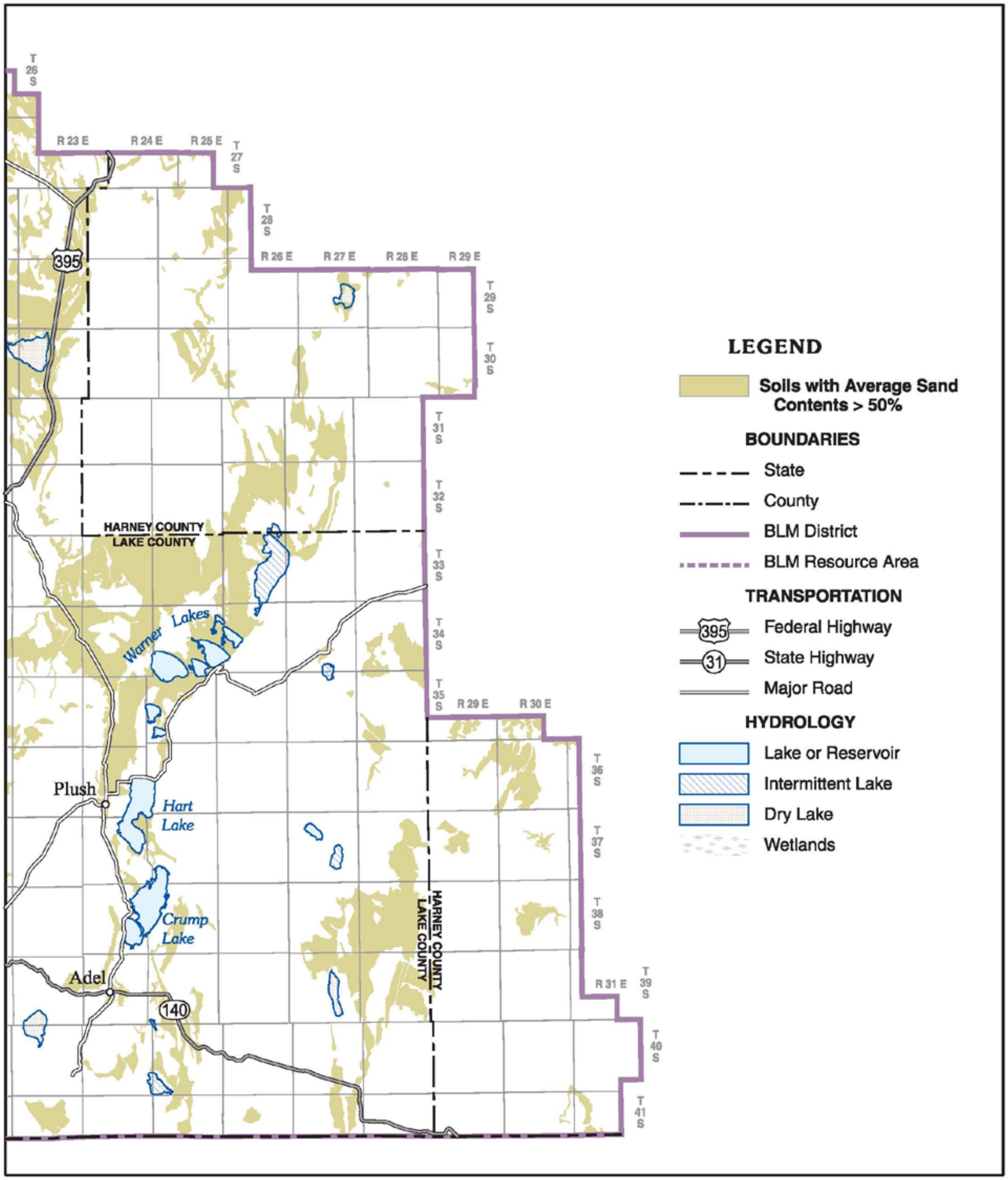
Figure 3-8. Soils With Average Sand Contents Greater than 50%



Diflufenzopyr: (Proposed Action) is non-persistent and has a 2-14 day half-life. It is soluble in neutral to alkaline soils and surface runoff is possible. It is registered for use on all land types except forest and riparian. Due to high solubility and soil mobility, it is not recommended for use where off-site transport could occur (e.g., sloped ground, soils with high water tables).

Fluridone (Proposed Action) is a non-persistent aquatic herbicide and has a 21 day half-life. Its adsorption increases with clay content, organic matter and decreasing pH.

Imazapic (Proposed Action) has very high soil solubility, is persistent, and has a 120-140 day half-life. It does not move laterally with surface water. Its adsorption to soil increases with decreasing pH and increasing organic matter and clay content. It is registered for use on all land types but riparian.

Sulfometuron methyl (Proposed Action) is non-persistent and has a 20 day half-life. It has high soil mobility and may move readily through coarse textured soils. It is registered for use on all land types but range and riparian. Sulfometuron methyl has a label advisory for wind erosion. Application may be challenging in areas of high wind erosion potential throughout the Resource Area, specifically in the Fort Rock and Christmas Lake Valleys. These areas, along with lands along Abert Rim and numerous smaller locations scattered throughout the Resource Area have high susceptibility to wind erosion. Furthermore, Fort Rock Valley and east of Summer Lake are dominated by coarse textured sandy soils, prone to herbicide movement through the soil profile.

Glyphosate (common to both alternatives) is moderately persistent and has a 47 day half-life. It has low soil mobility –it binds tightly to soil particles. Binding increases with increasing clay and/or organic matter, and binding decreases with an increase in pH (Gimsing et al. 2004). Glyphosate is degraded by microbes and is not soil active. It is registered for use on all land types.

Hexazinone (Proposed Action) is moderately persistent to persistent, with a 90 day half-life. It is highly soluble and has low affinity for soil particles. It bio-degradates and is registered for use on all land types.

Imazapyr (Proposed Action) is moderately persistent to persistent, with a 25 -141 day half-life. It binds strongly to organic soil but does not bind tightly to alkaline soils with low organic matter. It can be released from plants into soil, where it remains active and can kill non-target plants. There are conflicting studies regarding runoff. It is registered for use on all land types. Imazapyr has a wind advisory for wind erosion. Application may be challenging in areas of high wind erosion potential, specifically in the Fort Rock and Christmas Lake Valleys. These areas, along with lands along Abert Rim and numerous smaller locations scattered throughout the Resource Area have high susceptibility to wind erosion. Many of the alluvial flats and low lake terraces in the Warner Valley, Chewaucan River Valley, east of Summer Lake, and northeast of Lake Abert contain saline-sodic soils that could exhibit potential longevity of this herbicide.

Metsulfuron methyl (Proposed Action) is non-persistent and has a 30 day half-life. Microbial degradation is the only pathway in alkaline soils, with degradation rates affected by soil temperature, moisture content, and soil pH. Metsulfuron methyl degrades faster in acidic soils and soils with higher moisture and temperature. In alkaline soils, adsorption is very low and leaching potential high is high, which results in increased persistence in alkaline soils. It is registered for use on all land types but riparian. Many of the alluvial flats and low lake terraces in the Warner Valley, Chewaucan River Valley, east of Summer Lake, and northeast of Lake Abert contain saline-sodic soils that could exhibit potential longevity of this herbicide.

Picloram (common to both alternatives): is moderately persistent to persistent. It has a 20-300 day half-life and very slow microbial degradation. It adsorbs to clay and organic matter, but if little of each are present then it has very low adsorption and is easily moved by water (very high soil mobility). It degrades slowly under alkaline fine textured low organic matter soils, but degrades more rapidly under anaerobic conditions and at low application rates. It is persistent in plants, and if killed plants are put in contact with other plants, e.g. as mulch, the residual herbicide can kill other plants. It is registered for use on all land types but riparian. Application may be challenging in areas of high wind erosion potential throughout the Resource Area, specifically in the Fort Rock and Christmas

Lake Valleys. These areas, along with lands along Abert Rim and numerous smaller locations scattered throughout the Resource Area have high susceptibility to wind erosion. Infiltration into high water tables is a risk on soils with sand content greater than 45 percent, such as those in the northwestern corner of the Resource Area, east of Summer Lake, north of Lake Abert, north of Hart Lake down to the State line. Many of the alluvial flats and low lake terraces in the Warner Valley, Chewaucan River Valley, east of Summer Lake, and northeast of Lake Abert contain saline-sodic soils that could exhibit potential longevity of this herbicide.

Triclopyr (Proposed Action) is moderately persistent. It has a 46 day half-life and degrades readily in sunlight, where warm moist soils with high organic matter support highest rates of microbial degradation. It is persistent in plants, and if killed plants are put in contact with other plants, e.g. as mulch, the residual herbicide can kill other plants. It is registered for use on all land types.

Effects by Alternative

Common to Both Alternatives

Microbiotic soil crusts: The effects to microbiotic crusts are largely confined to the breakage and disturbance of the actual crusts caused by manual methods or the expected disturbance that is incurred while applying chemicals to the treatment areas. This is due to the limited information regarding actual direct effects of herbicide application on biological soil crusts.

Studies of direct impacts of herbicides (glyphosate or 2,4-D) on microbiotic soil crusts by Youtie et al. (1999) and Metting (1981) have demonstrated in laboratory settings that there is a wide range from positive, neutral or negative effects. However, the authors provided caution stating that the results were not conclusive and extrapolating this information to the field may not yield that same response.

For both alternatives, the application of herbicides does not change the fate of microbiotic soil crusts on the soil. The Proposed Action does not contain herbicides found to affect these crusts more than the No Action Alternative. Given the prediction that having a wider suite of herbicides would reduce the need to retreat similar locations, the mechanical disruption affects outlined below may be more widespread in the No Action Alternative.

The stated risk to this issue is the disruption and degradation of the microbiotic soil crusts. Using the definitions found at the beginning of the Effects of Treatment Methods to Soil Resources the intensity may vary from extremely low (aerial application using aircraft) to moderate (multiple treatments of the same ground with OHV sprayers). The acreage is small (perhaps 5,000 acres per year for Treatment Categories 1-3, and up to 20,000 acres per year for Categories 4-6 (this latter mostly aerial), compared to the total Resource Area (roughly 3.2 million acres). The spatial extent could encompass portions of sixth field watersheds and be either scattered or conjoined. The treatment affects would be short and longer term depending on retreatment frequency and methods. Those areas where multiple applications of herbicides are required over three or five years may have two very different effects. The first is short term, when herbicides are directly applied to microbiotic crusts. However, the second effect, the potential destruction and displacement of those same crusts, would require decades to rebuild if reoccurring vehicle tread traffic breaks up the crust and recovery cannot occur. Therefore, the magnitude of the impact may be negligible at the Resource Area level and moderate at the local level.

The potential of herbicides to be transported off-site: Some herbicides attach to soil particles and could be moved by wind or water; the process is known as saltation (NSERL 2014). Only herbicides with residual properties that remain active once they come in contact with the soil become a concern in this situation. Picloram is the only herbicide with this property in both alternatives.

There are several conditions needed to have saltation events. More than half of the soil surface cover has to be removed to expose the soil to the influence of wind (such as might occur with a burn or broadcast herbicides). The soil would have to be subject to wind velocities necessary to move soil particles. Generally, winds of greater than 30 mph have been used when modeling this process in an agriculture setting (Hagen 1991). In addition, the soil would have to be dry.

Herbicides that bind to soil particles or have persistent longevity in the soil would be those most likely to affect other non-target areas through this process. Chlorsulfuron, glyphosate, imazapic, imazapyr, and picloram fit one criteria or the other. The 540,452 acres in Wind Erosion Groups 1 and 2 mostly located in the northern half of the Resource Area would be most prone to the effects of wind erosion (see Figure 3-5, *Soil Wind Erosion Groups*). When these areas are overlaid with the existing documented invasive plant sites (Treatment Category 1), the recent burns and ESI cheatgrass areas (Treatment Category 6), it is apparent a moderate percentage (approximately one quarter of the Resource Area acres) of these land areas may undergo displacement or erosion of the treated soil if saltation conditions align. Those herbicides that have a persistent or moderately persistent half-life would be the ones of particular concern about being transported off-site (off-site is considered from the point of application but may still be within a treatment area).

<u>*The fate of herbicides in soils*</u>: Herbicide half-life and persistence in the soil determines the duration of effects (see Table 3-8, *Fate of Herbicides in Soil*). The length of time most of the proposed herbicides remain active in the soil is within the first growing season, and thirty to 100 days is considered moderately persistent. The degradation of the applied chemicals occurs through several mechanisms in the soil; these include attachment to soil particles or organic matter, processing and degradation by microbes, and degradation by sunlight.

Herbicides in soil are broken down into other compounds, most of which are non-toxic. This occurs at the surface of the soil, with volatilization and photolysis, evaporation into the air, and under the influence of sunlight. In the soil, microorganisms (bacteria, fungi, or algae) and macroorganisms (nematodes, earthworms, and processors of organic matter) break down herbicides. They can also be broken down by water (hydrolysis), or they are moved through the soil under the influence of gravity (leaching) (USDI 2010a:179)

For both alternatives, the fate of the herbicides in the soil is the same. One alternative does not contain longer-term duration herbicides than the other. The inclusion of picloram in both alternatives makes the longest duration of chemicals is similar but the amount of picloram in the proposed alternative is roughly a third of the no action, see Table C-4. Therefore reducing this effect across the action area. There is no stated risk to this issue: the intensity is extremely low, as the acreage is small compared to the total Resource Area; the spatial extent is local as the processing occurs in a very small area of the soil; and, the duration is short term. Therefore, the magnitude of the impact would be negligible at the Resource Area level and negligible at the local level.

No Action Alternative

<u>*Microbiotic Soil Crusts*</u>: This alternative would primarily treat documented invasive plant sites and their spread, which are often along roads or disturbed areas, or in wetter areas such as riparian areas and the Warner Wetlands ACEC. These areas may already have undergone disturbance to the biological soil crust and in these areas it is expected that if disturbance continues, crusts will stay in early-successional stages (i.e., cyanobacteria only) (USDI 2001b: 21). Given that recent funding limits treatments to less than 5,000 of the Resource Area's 3.2 million acres of land annually, the impacts to biological soil crusts would be extremely low in intensity, local for spatial extent, and short-term in temporal scales. Therefore, the magnitude of the impact would be negligible at the Resource Area level and negligible at the local or watershed level.

<u>*The potential of herbicides to be transported off-site*</u>: Glyphosate and picloram attach to soil particles or are long lived in soil. These both have a persistence rating of moderately persistent to persistent. The half-life for glyphosate is 47 days and picloram is 20-300 days. The ability of the soil to hold on to the attached herbicide is noted by its K_{oc} number. For most chemicals, a higher affinity for soil organic carbon (greater K_{oc}) results in less mobility in soil. Glyphosate has an extremely high (24,000 mL/g) value compared to 16 mL/g for picloram and 20

to 100 ml/g for the two forms of 2,4-D (see Table 3-8, *Fate of Herbicides in Soil*). In those treatment areas where picloram or picloram + 2,4-D are used, herbicide transport can be expected to occur if the above-mentioned environmental conditions are met. Approximately 11 percent of the acres in Treatment Category 1 would meet this condition.

The potential for soil transport of herbicides is reduced by an Oregon FEIS Mitigation Measure designed to avoid the loss of finer-sized soil particles and avoid having herbicide-treated soils blown or washed off-site is necessary. This mitigation measure says to avoid exposing large areas of wind-erosion group 1 or 2 soils (see Figure 3-5, *Soil Wind Erosion Groups*) when a combination of dry soil and seasonal winds are expected. This can be achieved by using selective herbicides to retain some vegetation on site; reseeding so cover is present before the windy season affects dry soils; staggering treatment of strips until stubble regrows enough to provide an acceptable filter strip; rescheduling treatments away from the windy season; or, other measures determined to be appropriate during preparation of the Annual Treatment Plan (see *Background/Planning/Annual Treatment Plan* section in Chapter 2)

The impact for this alternative would be extremely low in intensity (0.1 percent of the Resource Area), watershed wide for spatial extent (17 percent of the Resource Area), but short-term in temporal scales. Therefore, the magnitude of the impact would be negligible at the Resource Area level and moderate at the local level.

Proposed Action

<u>*Microbiotic Soil Crusts*</u>: This alternative adds an additional component of up to 20,000 acres of invasive annual grasses per year in Categories 4, 5, and 6, treated mostly with imazapic. The majority of these acres would not result in extensive disturbance to biological soil crust as access to the treatment areas would be primarily along established roads and applications would generally occur by aircraft. Some ground disturbance can be expected to occur in areas where it has not been previously disturbed, and where off-highway vehicles are used for application. These areas may later need retreatment. The repeated use of the same access points or OHV trails would reduce the likelihood that recovery of soil crusts will occur, thus the impact may increase due to retreatments.

The overall treatment level of up to 25,000 acres per year would be less than one percent (0.7 percent) of the total resource land base; the magnitude of the impact would be negligible at the Resource Area level but may reach moderate at the local level especially where reoccurring treatments take place over subsequent years.

<u>*The potential of herbicides to be transported off-site*</u>: Chlorsulfuron, glyphosate, imazapic, imazapyr, picloram, and triclopyr either have the tendency to bond to soil particles or are persistent in the soil. The K_{oc} of glyphosate is rated high; thus, it will keep herbicides bound and not release them later if transported. Chlorsulfuron, imazapic, imazapyr, picloram and triclopyr could attach to soil and either translocate later with water, or come in to contact with non-target vegetation. It is estimated that 44 percent of the Treatment Category 1 acres treated would be treated with one of these herbicides (Table C-4 in Appendix 4). The bulk of this increase is due to the additional acres of imazapic treatments. The proposed use of picloram is decreased to 37 percent of the No Action Alternative levels but additional herbicides with lower half lives and higher K_{oc} would replace that use. The additional use of new herbicides elevates the potential for off-site impact by four times the No Action, but may reduce the actual occurrence of transport off-site due to the shorter exposure time compared to picloram. As with the No Action Alternative, the potential for soil transport of herbicides is reduced by the Oregon FEIS Mitigation Measure designed to avoid the loss of finer-sized soil particles and avoid having herbicide-treated soils blown or washed off-site.

The additional (up to) 20,000 acres per year of invasive annual grasses expected to be treated under this alternative would all be treated with herbicides, particularly imazapic, tending to bind to soils and create off-site risk from soil movement.

A total level of up to 25,000 acres in a single year (Categories 1-6) would be less than one percent (0.7 percent) of the total Resource Area land base. The actual level of transport within the treated areas depends on meeting environmental conditions that cannot be known at this time. The magnitude of the impact would be negligible at the Resource Area level but may approach moderate at the local level.

Cumulative Effects

Common to Both Alternatives

The actual soil disturbance from invasive plant control under either alternative is negligible alongside grazing on 2.9 million acres of the Resource Area, juniper restoration, prescribed burning, mining, and other Resource Area activities (Table 3-3). Prescribed fires associated with invasive annual grass rehabilitation treatments, if they occur, have the highest potential for soil loss of any of the control activities proposed, but the potential of those treatments to reduce wildfire intensity and frequency likely more than make up for such effects. The improved protection of native ecosystems would make up for any increased soil risk occurring from implementation of the Proposed Action, when compared to the No Action Alternative.

Water Resources

Issues

- How would the alternatives affect surface water quality including sediment, temperature, dissolved oxygen, and chemical contamination?
- How would the alternatives affect the safety of drinking, irrigation, or stock water?
- How would the alternatives affect 303(d)-listed streams? Are the alternatives consistent with the *Clean Water Act*?
- How would the alternatives affect bioaccumulation of herbicides in hydrologic systems including groundwater and streams?
- How would the alternatives affect stream channel stability and structural complexity?
- How would the alternatives affect water supply (yield), infiltration, runoff, and other hydrologic processes?

Affected Environment

Hydrologic regions, subregions, basins, and sub-basins are delineated based on protocol defined by the United States Geological Survey. This system delineates a hierarchy of geographical regions and their subparts, such as sub-region, basin, sub-basin, watershed, and sub-watershed. Each hydrologic unit is referred to as a field and given a two-digit numeric identifier. The code, called a hydrologic unit code, is a unique numeric identifier.

The Lakeview Resource Area is comprised primarily of four sub-basins (or fourth field hydrologic units): Summer Lake, Lake Abert, Warner Lakes, and Guano. These sub-basins are part of the larger Oregon Closed Basins Sub-region and the Pacific Northwest Region. The topographies of these large areas direct surface and some shallow subsurface water to streams, lakes, reservoirs, or playas. These are internally drained sub-basins and do not have an outflow like traditional watersheds. The Goose Lake sub-basin, prominent in the southern part of Lake County and including the city of Lakeview, contains scattered BLM sections and parcels totaling less than 10,000 acres. The Goose Lake sub-basin drains to the Sacramento River.

There are two main types of watersheds in the Resource Area. One is the traditional watershed, which has considerable slope and a network of stream channels that start as ephemeral in the headwaters and gradually are fed more water down slope, transitioning to intermittent, and finally perennial. These watersheds have streams that can support a variety of aquatic species. The other type is the closed basin. These are desert areas where the precipitation infiltrates locally and mainly supports the vegetation on site. Some water does move over land and subsurface to large playas or wetlands on valley bottoms. Of the little precipitation received, more is used on-site than is delivered downslope.

Sub-basins

The Summer Lake Sub-basin is more than 2.5 million acres in size. It is bounded by forested mountains on the western edge and desert hills to the north, east, and south. There are 19 10thfield watersheds in the sub-basin. Major waterbodies include Summer Lake, Silver Lake, Thompson Reservoir, Ana Reservoir, Duncan Reservoir, ZX Reservoir, and Detention Reservoir. Alkali Lake and North Alkali Lake are low-lying areas seasonally inundated with water. Paulina Marsh is a large wetland that drains into Silver Lake. The lakes in the area are large and shallow, so the shorelines change dramatically with seasonal filling and drying cycles.

The Lake Abert Sub-basin is about 650,000 acres in size. It is bounded by Abert Rim to the east, forested mountains to the west and south, and desert hills to the north. The major water body is Lake Abert, a large, shallow, saline lake. There are six 10thfield watersheds in the sub-basin. The Chewaucan River is the largest stream flowing into the lake and has upper and lower marshes associated with it. The Lake Abert Sub-basin contains internally drained basins and many seasonally flowing streams.

The Warner Lakes Sub-basin is more than one million acres in size. It is bounded by Hart Mountain to the east, Abert Rim and Warner Mountains to the west, desert hills to the north, and forested mountains to the south. There are eight 10thfield watersheds in the sub-basin. It has many lakes, which form an interconnected chain parallel to the Hart Mountain uplifted fault block. These are Crump, Hart, Anderson, Swamp, Flagstaff, Upper Campbell, Campbell, Turpin, Stone Corral, and Bluejoint Lakes. These lakes are associated with extensive wetlands. The major perennial streams flow from the Warner Mountains.

Guano Sub-basin is almost two million acres in size. It is bounded by Hart Mountain on the west and desert hills on the north, east, and south. There are 11 10thfield watersheds in the sub-basin. It has many seasonal lakes and wetlands. The sub-basin has perennial, intermittent, and ephemeral streams, but is dominated by streams that flow only seasonally. Guano Creek is the main intermittent stream that drains from Hart Mountain.

Streams

The streams in the Resource Area originate in the higher elevation hills and mountains, mostly in the adjacent Fremont National Forest. They then flow to the lower elevation valleys, lakes, wetlands, and playas. Most surface runoff is from snowmelt or rainfall at the higher elevations, producing peak discharges in the spring. Year-to-year variability in precipitation influences stream flow both in quantity and in duration. Water scarcity has led to increased water storage, water diversions, and groundwater withdrawal associated with irrigation. These projects have significantly altered natural flow regimes, which has changed habitat conditions, channel stability, and timing of sediment and organic material transport. Throughout the Resource Area, stream flows have been altered by management activities, such as water impoundments, water withdrawal, road construction, and agricultural activities.

The Summer Lake Sub-basin includes Ana River and the small streams, which flow off Winter Rim into Summer Lake. The Ana River is a spring-fed system, which is captured in a reservoir and then flows to Summer Lake. Buck, Bridge, and Silver Creeks are the main streams which flow into the Paulina Marsh and then into Silver Lake. There are many intermittent streams and ephemeral drainages where the water infiltrates into the soil or evaporates. The intermittent streams have surface flows for some of the year or flows which move underground for a portion of the stream. They are in contact with the water table and either receive water from the groundwater system to surface flow or lose surface water to the groundwater. Ephemeral drainages are channels in which surface water flows immediately after snowmelt or rainfall and are always above the water table.

In the Lake Abert Sub-basin, the Chewaucan River is the main stream system. It has many headwater tributaries in the forested mountains. It flows through the Chewaucan Marsh in the valley bottom and supplies most of the water to Lake Abert. There are many intermittent and ephemeral drainages that dry up seasonally.

The major streams in the Warner Lakes Sub-basin flow from the Warner Mountains. These include Twelvemile, Twentymile, Deep, and Honey Creeks. Most of the surface water would flow into the Warner Lakes and Wetlands but is diverted for irrigation. There are many intermittent and ephemeral drainages that dry up seasonally.

In the Guano Sub-basin, Guano Creek is the major stream. It is intermittent, as are most of the other streams. There are many ephemeral streams, which have surface water in the channel only after snowmelt or rainfall. There are perennial springs that flow for a short length before moving underground.

Surface Water Quality

In the State of Oregon, the Environmental Protection Agency (EPA) has delegated authority to implement the *Federal Water Pollution Control Act* of 1972 and amendments (*Clean Water Act* of 1977) to the Oregon Department of Environmental Quality (ODEQ). Federal land management agencies are designated by the State to assist in *Clean Water Act* implementation on public lands. As a designated management agency, the BLM must:

1. implement and enforce natural resource management programs for the protection of water quality on Federal lands under its jurisdiction;
2. protect and maintain water quality where it meets or exceeds applicable State and Tribal water standards;
3. monitor activities to assure that they meet standards and report the results to the State of Oregon; and,
4. meet periodically to recertify water quality best management practices.

Best management practices are methods, measures, or practices to prevent or reduce water pollution, including but not limited to structural and nonstructural controls, operations, and maintenance procedures. Best management practices are applied as needed to projects. Best management practices for all resource activities are included in Appendix D of the *Lakeview Resource Management Plan*. Those specific to invasive plant management are included in Appendix A, *Project Design Features, Standard Operating Procedures, Mitigation Measures, Conservation Measures, Prevention Measures, and Best Management Practices*, of this EA.

Water quality, as defined by the *Clean Water Act*, includes all the physical, biological, and chemical characteristics that affect existing and designated beneficial uses. The State of Oregon is required to identify which beneficial uses a water body currently supports or could support in the future. The primary beneficial uses of surface water are domestic water supply, salmonid and other resident fish habitat, irrigation, livestock watering, wildlife and hunting, fishing, water contact recreation, and aesthetic quality. Most streams on the Resource Area support one or more of these State-designated beneficial uses. Elevated summer temperatures are the primary water quality problem identified by the State for some streams on the Resource Area. While some streams have been monitored and violate the State standard for the resident fish and aquatic life water temperature numeric criteria, it is unknown if the natural temperature potential would meet the criteria.

Causes of stream degradation are removal of riparian vegetation and destabilization of stream banks. The land use most commonly associated with these problems in the Resource Area is grazing. Other land uses associated with degraded streams include roads, trails, water withdrawal, reservoir storage and release, altered physical characteristics of the stream, and wetlands alteration.

The State of Oregon has established beneficial uses for the surface and groundwater within the Resource Area and water quality standards, which protect these uses. These uses are shown in Tables 3-9 and 3-11. The current water quality standards can be found at the ODEQ web site (URL: http://www.oregon.gov/DEQ/Pages/index.aspx).

Table 3-9. Designated Beneficial Uses, Goose and Summer Lakes Basin[1]

Beneficial Uses	Goose Lake	Freshwater Lakes & Reservoirs	Highly Alkaline & Saline Lakes	Freshwater Streams
Private Domestic Water Supply[2]		√		√
Industrial Water Supply		√	√	√
Irrigation		√		√
Livestock Watering	√	√		√
Fish and Aquatic Life[3]	√	√	√	√
Wildlife & Hunting	√	√	√	√
Fishing	√	√	√	√
Boating	√	√	√	√
Water Contact Recreation	√	√	√	√
Aesthetic Quality	√	√	√	√
Hydro Power				
Commercial Navigation & Transportation				

(ODEQ 2010)
1. Includes Summer, Abert, Warner, and Goose Lake Sub-basins
2. With adequate pretreatment (filtration & disinfection) and natural quality to meet drinking water standards.
3. See also Table 3-10 for fish use designation for this basin.

Table 3-10. Beneficial Use Designations – Fish Uses, Goose, and Summer Lakes Basin

Geographic Extent of Use	Redband or Lahontan Cutthroat Trout (<20˚ C)	Cool Water Species (No Salmonid Use, >20˚ C)
Summer Lake Sub-basin		
Ft. Rock sub-basin[1]: Silver Creek, Buck Creek and Bridge Creek	√	
Ft. Rock sub-basin[1]: All other streams		√
Alkali Lake sub-basin[1]		√
All other Summer Lake streams	√	
All other Goose and Summer Lakes basin streams within Oregon	√	
All other Highly Alkaline & Saline Lakes in this basin		√

1. 5th field HUC sub-basins

Table 3-11. Designated Beneficial Uses for Malheur Lakes Basin (Includes Guano Sub-Basin)

Beneficial Uses	Natural Lakes	All Rivers & Tributaries
Private Domestic Water Supply[1]		√
Industrial Water Supply		√
Irrigation	√	√
Livestock Watering	√	√
Fish and Aquatic Life[2]	√	√
Wildlife & Hunting	√	√
Fishing	√	√
Boating	√	√
Water Contact Recreation	√	√
Aesthetic Quality	√	√
Hydro Power		
Commercial Navigation & Transportation		

1. with adequate pretreatment (filtration & disinfection) and natural quality to meet drinking water standards.
2. See also Table 3-12 for fish use designation for Guano sub-basin.

Table 3-12. Beneficial Use Designations – Fish Uses for Guano Sub-basin

Geographic Extent of Use	Redband or Hybrid Trout (<20˚ C)	Cool Water Species (No Salmonid Use, >20˚ C)
Guano Sub-basin	√	

Water Quality Impaired Stream Reaches

The State of Oregon is required by section 303(d) of the *Clean Water Act* to identify waters that are water quality impaired. This list is updated biannually and the State is required to develop a total maximum daily load allocation for each pollutant of concern. Table 3-13 lists the stream reaches in the Resource Area that have been identified by the ODEQ as being water quality limited. U.S. Forest Service and BLM's *Protocol for Addressing Clean Water Act Section 303(d)-Listed Waters* (USDA and USDI 1999) was issued to provide the agencies with a consistent approach to addressing water quality limited water bodies on Federal lands. This guidance was developed in collaboration with the EPA, ODEQ, and the Washington Department of Ecology. The protocol uses a three-pronged approach to address water quality problems on Federal lands: a set of goals, a seven-component strategy, and a decision framework.

Table 3-13. 2010 State of Oregon 303(d)-Listed Waterbodies on the Lakeview Resource Area

Sub-basin	Water body	State Record ID[1]	Parameters
Summer Lake	Silver Creek	12731	Temperature
Lake Abert	Chewaucan River	12697; 700	Temperature; Biological Criteria
Lake Abert	Willow Creek	681	Temperature
Warner Lakes	Camas Creek	12686	Temperature
Warner Lakes	Deep Creek	12672	Temperature
Warner Lakes	Drake Creek	12683	Temperature
Warner Lakes	Fifteenmile Creek	659; 8358; 24434	Temperature; Silver; Thallium
Warner Lakes	Honey Creek	12674; 14521	Temperature; pH
Warner Lakes	Horse Creek	12678	Temperature
Warner Lakes	Parsnip Creek	12684	Temperature
Warner Lakes	Snyder Creek	12687	Temperature
Warner Lakes	Twelvemile Creek	12679; 12680; 8359; 14538; 14556	Temperature; Silver; Arsenic; Thallium
Warner Lakes	Twentymile Creek	12673; 8361; 8348; 14498; 11853; 14515	Temperature; Silver; Arsenic; Dissolved Oxygen; Thallium

1. The State Record ID is a unique combination of water body location, pollutant parameter, and season; designated by Oregon DEQ.

The BLM uses this protocol to fulfill the agency's *Clean Water Act* responsibilities and provide assurance that management activities in 303(d)-listed waterbodies would contribute to the maintenance of good water quality or restoration of poor water quality. This assurance is provided by documenting and implementing sufficiently stringent management measures during the planning and NEPA process and by developing and implementing water quality restoration plans. The management prescriptions in a water quality restoration plan are drawn from Federal standards, guidelines, and best management practices. The prescriptions in a water quality restoration plan apply only to Federal lands.

Groundwater

Groundwater is particularly valuable in the Resource Area because of the limited surface water. Regional groundwater gradients and aquifer systems have not been extensively studied. Groundwater data are limited and are based on isolated studies and well logs.

Groundwater occurs as both confined and unconfined aquifer systems. Most unconfined aquifers are located in stream valleys or associated with Pleistocene lakebeds that contain recent alluvial material, although some may exist as perched aquifers. Alluvial aquifers vary greatly in size and yield. These aquifers are important as transient storage systems to move groundwater to or from streams and the deeper confined aquifers. Some perched aquifers occur between the top of ridges and bottom of valleys and can usually be identified by the occurrence of springs above the valley bottoms.

Little is known of the real extent or depth of deep, confined bedrock aquifer systems. The EPA has not identified any sole-source aquifers in the Resource Area. Groundwater is used for irrigation, domestic use, and livestock use. There is some groundwater influenced by geothermal heat sources, and the springs have hot, mineralized water. These types of springs have vegetation and microbial and algal fauna that are adapted to hot, mineralized water.

Springs and seeps occur in areas where water from aquifers reaches the surface. Some springs begin in stream channels. Others flow into small ponds or marshy areas that drain into channels. Still others flow into lakes or reservoirs. Some springs and seeps form their own channels that reach flowing streams, but most lose their surface flow to evaporation or recharge the alluvial fill.

Springs have been disturbed by management activities, such as livestock or wild horse grazing and watering, recreation use, and road construction. This affects the amount of water available.

Community Drinking Water

Community water systems treat and distribute water from the source, primarily underground aquifers, and deliver it to consumers (see Table 3-14). Towns, small communities, and private farm and ranch residences mainly use groundwater as their source of drinking water.

Table 3-14. Community water systems identified by the EPA

Sub-basin	Community water system	Filtered	Population served
Summer Lake	Christmas Valley Domestic Water System	Yes	400
Summer Lake	Silver Lake Ranger Station (U.S. Forest Service)	Yes	60
Summer Lake	City of Paisley	Yes	315

Water Rights and Uses

Demands on water resources have increased in Oregon over the past few decades. Although most early water rights were established for irrigation and mining, today's demand includes municipal water supplies, commercial and industrial supplies, and maintenance of adequate stream flows for fish, recreation, and water quality.

There are over 900 existing water storage impoundments, pipeline systems, groundwater wells, and irrigation diversions on public lands within the Resource Area that have State-approved water rights. The availability of water in much of the area is limited and may hamper additional developments that are water dependent. Future development for rangeland projects for wildlife, recreation, and livestock would require a State of Oregon water right before project implementation could occur.

The information presented in Table 3-15 (USDI 2003c) is a summary developed by the EPA on the 1990 United States Geological Survey water use for thermoelectric power, mining, livestock (stock and animal specialties), irrigation, hydroelectric power, wastewater treatment, and reservoir evaporation. This data is no longer available at the web site. More current data (2005) and more information is available at http://www.usgs.gov.. This more recent data is organized by county, and shows that Lake County total water use averaged 516.42 million gallons per day in 2005.

Table 3-15. 1990 Water Use by Category and Sub-Basin

Category	Summer Lake	Lake Abert	Warner Lakes	Guano
Total withdrawals				
Groundwater (mgal./d[1])	82.78	2.62	1.59	5.68
Surface water (mgal./d[1])	77.90	166.81	201.24	55.98
Total	160.68	169.43	202.83	61.66
Total population served by sub-basin	1,320	480	360	40
Number of public supply facilities	3	0	0	0

1. mgal./d = one million gallons per day.

Treatments Planned Relating to the Issues

Most of the treatments described for each alternative in Chapter 2 have the potential to affect the water-related issues described for this analysis. Approximately 6.75 percent of the riparian vegetation on the Resource Area (including the Warner Wetlands) is infested with documented invasive plants (Treatment Category 1); the riparian areas have a disproportionate share of the invasive plants on the Resource Area. This is because the area is so hospitable to plants, and people, animals, and water move the seeds and other propagules around. Upland treatments also have the potential to affect the water resource when wind, drift, or overland or subsurface water flow move unbound herbicides downslope. Because of the importance of limited riparian areas on the Lakeview Resource Area, these areas are also high priority for control treatments. There are about 113 miles of perennial streams on the Resource Area being tracked on the Resource Area for proper functioning condition. If the 6.75 percent infested applies to this portion of the riparian habitat, invasive plant treatments would be conducted along 7 to 8 miles of these streams for Treatment Category 1, and unknown additional miles for Category 2 and 3.

The Proposed Action envisions up to 20,000 additional acres treated per year, much of it likely aerially applied, to rehabilitate sites infested with, or burned and in danger of becoming infested with, invasive annual grasses. These treatments would generally be in larger units laid out away from streams, although aerial applications would have a higher likelihood of drift than most treatments under the No Action Alternative. Some of this may be pre-burned, temporarily exposing large areas of soil to wind and overland flow of ash and soil, and potentially, soil-bound pre-emergent herbicides. In the case of Treatment Category 4, post-wildfire emergency stabilization, treatments would have the objective of watershed protection as well as preventing soil movement and infestation by annual grasses.

Standard Operating Procedures and Mitigation Measures Relevant to Effects

The potential for adverse herbicide-related effects to water resources is minimized for both alternatives by existing Standard Operating Procedures and Mitigation Measures (see Appendix A). These include, but are not limited to:

- Site-specific analyses for roadside treatments should specifically consider that drainage ditches and structures lead to streams and that normal buffer distances, herbicide selection, and treatment method selection may need to be changed accordingly, particularly where those ditches are connected to streams with Federally Listed or other Special Status species. (Oregon FEIS MM)
- Closely monitor timing and intensity of biological control with domestic animals.
- Use appropriate herbicide-free buffer zones for herbicides not labeled for aquatic use based on Risk Assessment guidance, with minimum widths from water of 100 feet for aerial, 25 feet for vehicle, and 10 feet for hand spray applications.
- Maintain buffers between treatment areas and water bodies. Buffer widths should be developed based on herbicide and site-specific conditions to minimize impacts to water bodies.
- Review hydrogeologic maps of proposed treatment areas[50]. Note depths to groundwater and areas of shallow groundwater and areas of surface water and groundwater interaction. Minimize treating areas with high risk for groundwater contamination.

[50] These areas would be identified during the yearly preparation of annual treatment plans.

Project Design Features Adopted for this Analysis

Fire Use
- Any treatments near perennial streams or major water bodies will be coordinated with an interdisciplinary team to minimize negative impacts to water resources.
- A vegetated buffer between treatment areas and water bodies will be maintained in accordance with direction from an interdisciplinary team.

Targeted Grazing
- All targeted grazing will be included on the Annual (invasive plant) Treatment Plan for discussion by the interdisciplinary team.
- Targeted grazing within the riparian zone along fish-bearing streams will be managed under specific standards, and will generally include stubble height and/or streambank alteration. Grazing standards will be applied on a site specific basis and will depend on the livestock type, stream condition, and stream sensitivity to grazing. Stream sensitivity to grazing will be based on Rosgen channel type (Rosgen 1994) and corresponding sensitivity to grazing (Rosgen 1996). In general, stubble heights of 4-10" on native plants will be used, because on highly sensitive stream channel types these stubble heights should be maintained along the green line to rebuild banks and minimize hoof shear (Clary and Webster 1989, Elmore and Kovalchik, 1991, Archer pers. comm. 2014). Streambank alteration standards will generally be set at 15-25% based on recommendations from the Pacfish-Infish monitoring team (Archer pers. comm. 2014) and the National Riparian Service Team (Wyman pers. comm. 2014). These standards will be used by permittees and BLM personnel to determine when livestock need to be moved to ensure thresholds are not exceeded.

Herbicide Use
- Herbicide treatments will be minimized at locations that pose a high risk for groundwater contamination, i.e., areas with shallow groundwater and areas with groundwater-surface water interaction. High risk locations will be identified during preparation of the Annual Treatment Plans.
- The aquatic buffers specified in the 2013 *U.S. Fish and Wildlife Service Biological Opinion for Fish Habitat Restoration Activities Affecting ESA-listed Animal and Plant Species and their Designated Critical Habitat found in Oregon, Washington and parts of California, Idaho and Nevada, submitted by the U.S. Forest Service, Bureau of Land Management, and Bureau of Indian Affairs* (ARBO II) (see Table 3-16) will be applied to water bodies with Federally Listed fish (see Figure 3-9) until formal Endangered Species Act Section 7 consultation with the U.S. Fish and Wildlife Service results in different buffers (see footnotes 1 and 2 in Table 3-16) and a new Decision Record is signed. These same buffers will also be applied to water bodies containing other Special Status fish.
- Hexazinone may not be applied where there is a potential to enter streams via direct application or drift as determined by an interdisciplinary team.

Table 3-16. No-application buffer widths in feet for herbicide application, by stream types and application methods, for streams with Federally Listed and other Special Status species (ARBO II)

Herbicide	Perennial Streams and Wetlands, and Intermittent Streams and Roadside Ditches with flowing or standing water present			Dry Intermittent Streams, Dry Intermittent Wetlands, Dry Roadside Ditches		
	Broadcast Spraying	Spot Spraying	Hand Selective	Broadcast Spraying	Spot Spraying	Hand Selective
Labeled for Aquatic Use						
Aquatic Glyphosate	100	waterline	waterline	50	0	0
Aquatic Imazapyr	100	waterline	waterline	50[1]	0	0
Aquatic Triclopyr TEA	Not Allowed	15	waterline	Not Allowed	0	0
aquatic 2,4-D (amine)	100	waterline	waterline	50[1]	0	0

Herbicide	Perennial Streams and Wetlands, and Intermittent Streams and Roadside Ditches with flowing or standing water present			Dry Intermittent Streams, Dry Intermittent Wetlands, Dry Roadside Ditches		
	Broadcast Spraying	Spot Spraying	Hand Selective	Broadcast Spraying	Spot Spraying	Hand Selective
Low Risk to Aquatic Organisms						
Dicamba	100	15	15	50	0	0
Dicamba + diflufenzopyr	100	15	15	50	0	0
Imazapic	100	15	bankfull elevation	50[1,2]	0	0
Clopyralid	100	15	bankfull elevation	50[1]	0	0
Metsulfuron methyl	100	15	bankfull elevation	50[1]	0	0
Moderate Risk to Aquatic Organisms						
Imazapyr	100	50	bankfull elevation	50	15	bankfull elevation
Sulfometuron methyl	100	50	5	50	15	bankfull elevation
Chlorsulfuron	100	50	bankfull elevation	50[1]	15[1]	bankfull elevation[1]
High Risk to Aquatic Organisms						
Triclopyr BEE	Not Allowed	150	150	Not Allowed	150	150
Picloram	100	50	50	100	50	50
2,4-D (ester)	100	50	50	100	50	50
Hexazinone	Not Allowed	Not addressed in ARBO II[3]		Not Allowed	Not addressed in ARBO II[3]	

1. Following completion of formal consultation with FWS, and a subsequent Decision Record, these herbicides would be allowed to be used with 0 buffers for broadcast (including aerial), spot spraying, and hand selective applications within the Warner Basin to control perennial pepperweed, hoary cress, and Canada thistle within dry intermittent wetland areas. All herbicides will be applied within their labeled restrictions.
2. Following completion of formal consultation with FWS, and a subsequent Decision Record, imazapic will be used to control annual grass species in dry intermittent streams with a 0 buffer when no water is present.
3. Do not apply hexazinone where there is a potential to enter streams via direct application or drift as determined by an interdisciplinary team (Resource Area Project Design Feature). Hexazinone treatments are expected to be included in the Annual Treatment Plan and be subject to interdisciplinary review.

Environmental Consequences

Effects of Treatment Methods on Water Resources

Herbicides Used for both Aquatic and Terrestrial Vegetation Control

2,4-D (common to both alternatives): Some salt forms of 2,4-D are registered for use in aquatic systems. Aquatic forms of 2,4-D have been used for decades across the Resource Area to suppress species such as Canada thistle in riparian areas. Currently no submerged plants are being managed on the Resource Area, therefore no forms of 2,4-D are being applied directly to water. 2,4-D is a known groundwater contaminant although potential for leaching into groundwater is moderate by its being bound to organic matter and its short half-life. In terrestrial applications, most formulations of 2,4-D do not bind tightly with soils, and therefore have a moderate potential to leach into the soil column and to move off site in surface or subsurface water flows (Johnson et al. 1995 cited in Tu et al. 2001). In a study on groundwater in small shallow aquifers in Canadian prairies, 2,4-D was detected in 7 percent of 27 samples (Wood and Anthony 1997).

Fluridone (Proposed Action): Currently the Resource Area has no proposed aquatic plant application planned; however, if invasive aquatic plants were detected, fluridone could be applied to ponds, lakes, canals, and reservoirs. Fluridone has limited use in flowing water because it works through contact maintained over several weeks. Water quality is not degraded when fluridone is used at a concentration of less than 20 ppb, and there are no label restrictions against swimming, fishing, or drinking treated water (Washington Department of Ecology 2002). Whole-lake treatments using fluridone are possible because the herbicide does not cause a rapid plant kill, which would otherwise result in oxygen-depleted water and reduced water quality.

Figure 3-9. Critical and Occupied Habitat for Federally Listed Fish

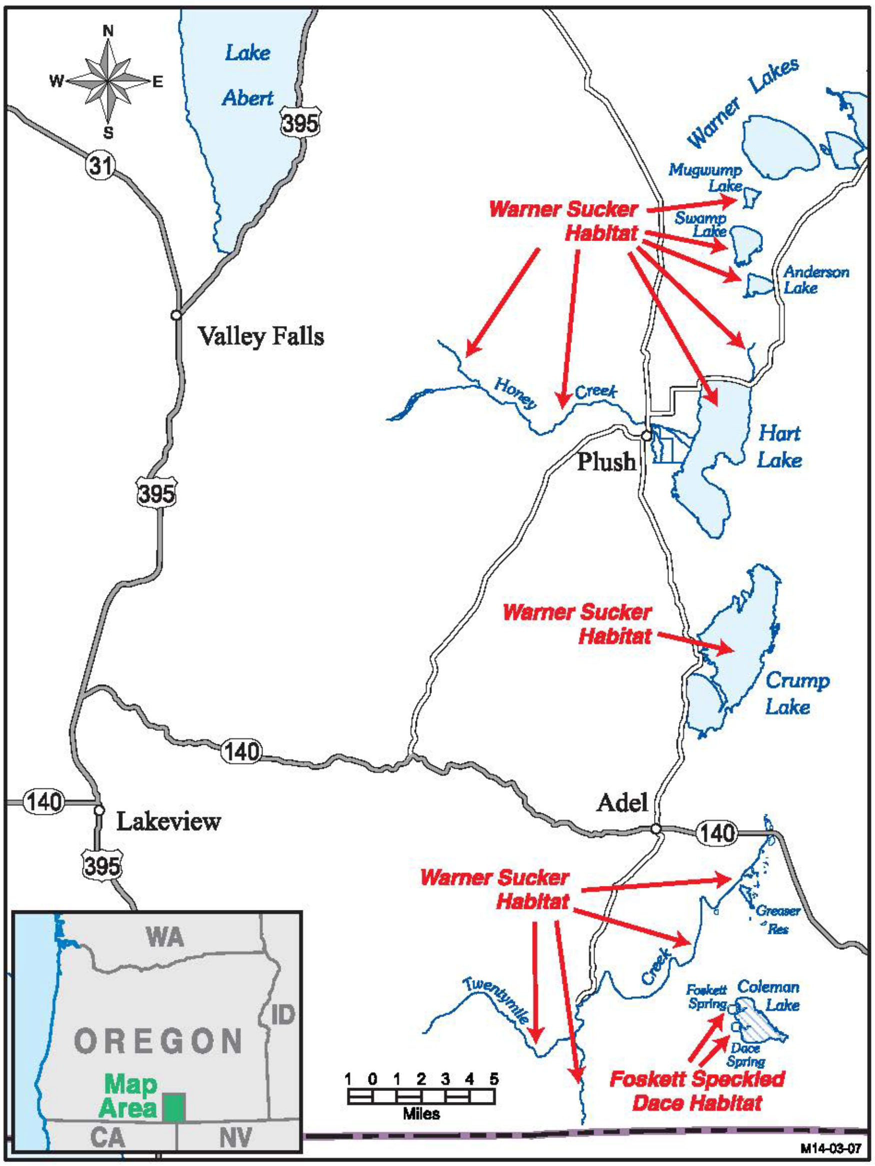


Photo degradation in aquatic systems is an important loss pathway for fluridone (British Crop Protection Council and The Royal Society of Chemistry 1994). Fluridone is stable to hydrolysis, volatilizes slowly from water, and adsorbs to suspended solids and sediments (EPA 1986, Tomlin 1994, ENSR 2005g). Fluridone has low potential to leach to groundwater and is not known to contaminate groundwater. It does have high potential to be transported in surface runoff.

Glyphosate (common to both alternatives) is registered for aquatic use and would be applied to wetland vegetation. Strong adsorption to soil particles and organic matter slows microbial degradation, allowing glyphosate to persist in aquatic environments in bottom sediments (half-life of 12 days to 10 weeks) (Goldsborough and Brown 1993, Extension Toxicology Network 1996a, all cited in Tu et al. 2001).

While glyphosate is very water soluble it is unlikely to enter waters through surface runoff or subsurface flow because it binds strongly to soils, except when the soil itself is washed away by runoff; even then, it remains bound to soil particles and generally unavailable (Rueppel et al. 1977, Malik et al. 1989, all cited in Tu et al. 2001). Studies that are more recent found solution-phase glyphosate in 36 percent of 154 stream samples, while its degradation product, aminomethylphosphonic acid, was detected in 69 percent of the samples.

Glyphosate may stimulate algal growth at low concentration; Austin et al. (1991) have suggested that this could contribute to eutrophication of waterways. However, the study has more implications in streams flowing through agricultural and urban areas where glyphosate is shown to be relatively common, although additional phosphates from those same areas might mask the effect. The amount of glyphosate expected to reach streams from BLM terrestrial applications would be expected to have no noticeable effect on eutrophication.

Some non-aquatic glyphosate formulations contain polyethoxylated tallow amine (POEA) surfactant, which is substantially more toxic to aquatic species than glyphosate or other surfactants that may be used with glyphosate. In the Risk Assessment, the toxicity of glyphosate is characterized with and without the use of POEA surfactant (SERA 2011a)(see Appendix D, *Herbicide Risk Tables*).

Imazapyr (Proposed Action) is registered for use in aquatic systems to control emergent, floating, and/or riparian and wetland plants. Imazapyr is water soluble and potentially mobile (SERA 2011b). Imazapyr is rapidly degraded by sunlight in aquatic solutions, with a half-life of approximately 2 days that decreases with increasing pH (Mallipudi et al. 1991, Mangels 1991, all cited in Tu et al. 2001). Imazapyr does not appear to degrade in anaerobic systems, such as wetland soil or lake or pond sentiments, and will bind strongly to peat (American Cyanamid 1986).

In their literature review of imazapyr, Tu et al. (2001) found no reports of imazapyr contamination in water, despite its potential for mobility. It is not known to be a groundwater contaminant. Battaglin et al. (2000) stated that little is known about its occurrence, fate, or transport in surface water or groundwater. In one study, imazapyr (from terrestrial applications) was detected in 4 percent of the 133 samples taken from streams, but was not detected in reservoirs or groundwater.

Triclopyr (Proposed Action): The two forms of triclopyr, TEA and BEE, behave very differently in water. Both forms are used to control woody riparian vegetation. However, only the TEA form of triclopyr is registered for use for selective control of floating, immersed, and submersed aquatic plants. Both forms readily degrade to the acid form, which is the active form in plants. No adverse effects on water quality were observed following triclopyr TEA applications in two studies of whole-pond applications in closed systems (no water exchange; Petty et al. 2001). The Risk Assessment shows a scenario of accidental spill at the maximum application rate poses a low risk to susceptible fish (SERA 2011d).

Triclopyr TEA is soluble in water and photodegrades in several hours with adequate sunlight. The rate of degradation in water is generally dependent on water temperature, pH, and sediment content.

The BEE form (terrestrial use only, not registered for aquatic application) is not water-soluble and can partition into organic materials and be transported to sediments, where it is persistent. Alternatively, bound ester forms can degrade through hydrolysis or photolysis to triclopyr acid (Smith 1976 cited in Tu et al. 2001), which will diffuse into the water column and continue to degrade (Tu et al. 2001).

Herbicides Used for Terrestrial Vegetation Control

Chlorsulfuron (Proposed Action) is persistent and mobile in some soils. In aquatic environments, the environmental fate of chlorsulfuron is related to pH and temperature. Hydrolysis rates are fastest in acidic waters and slower in more alkaline systems (Sarmah and Sabadie 2002). As hydrolysis rates drop, biodegradation becomes the mechanism affecting the breakdown of chlorsulfuron. Aquatic dissipation half-lives from 24 days to more than 365 days have been reported (ENSR 2005c), with a shorter time reported for flooded soil (47 to 86 days) than anaerobic aquatic systems (109 to 263 days; SERA 2004a). Chlorsulfuron is not known to be a groundwater contaminant, but has a high potential to leach into the groundwater.

Clopyralid (Proposed Action) does not appear to bind tightly to soil and will leach under favorable conditions. However, leaching and subsequent contamination of groundwater appear to be minimal (SERA 2004b), which is consistent with a short-term monitoring study of clopyralid in surface water after an aerial application (Rice et al.

1997a cited in SERA 2004b). Clopyralid is not known to be a common groundwater contaminant, and no major off-site movement has been documented. Clopyralid does not bind with suspended particles in water; biodegradation in aquatic sediments is the main pathway for dissipation. The average half-life of clopyralid in water has been measured at 9 and 22 days (Dow AgroSciences 1998).

Dicamba (common to both alternatives): Because dicamba is mobile in soil, terrestrial application of this herbicide can result in groundwater and surface water contamination. Biodegradation is the major mechanism for dicamba degradation in water. Dicamba is a known groundwater contaminant, and has a high potential to leach into groundwater. The EPA has set health advisory concentration levels for dicamba (e.g., 300 µg/L for 1-day exposures), but has not set maximum concentration limits for potable water. A regional study of pesticides in shallow groundwater in Delaware, Maryland, and Virginia detected dicamba in groundwater at low concentrations, generally less than 3 µg/L (ppb) (Koterba et al. 1993).

Diflufenzopyr (Proposed Action) appears to be soluble, with transportation from surface runoff following application, particularly when diflufenzopyr is applied on soils with neutral to alkaline pH. However, based upon proposed uses, fate characteristics, and model predictions, the EPA does not expect diflufenzopyr to occur in drinking water in significant quantities (EPA 1999). Diflufenzopyr is not a known groundwater contaminant. Biodegradation, photolysis, and hydrolysis are important mechanisms in removing diflufenzopyr from aquatic systems. Its half-life is less than 1 month, with hydrolysis and photolysis rates higher in acidic environments. The aquatic dissipation half-life for diflufenzopyr is 25 to 26 days in aerobic and 20 days in anaerobic conditions. Diflufenzopyr's expected half-life in small ponds is estimated at 24 days. These factors suggest that diflufenzopyr would be removed from an aquatic environment relatively rapidly if contamination occurred (EPA 1999).

Hexazinone (Proposed Action) and its degradates persist, are highly mobile, and are readily washed into surface waters. Hexazinone has been identified as a groundwater contaminant in seven states. The EPA requires a groundwater advisory on all product labels stating that hexazinone must not be used on permeable soils. In areas where irrigation water is contaminated with hexazinone or where groundwater discharges to surface water, hexazinone residues in water could pose a threat to plants.

In surface water, hexazinone resists photo degradation (Neary et al. 1983 cited in Tu et al. 2001). Hexazinone does not bind strongly to particulates or sediments. The main method of degradation is by microorganisms in soils. The average half-life of hexazinone in soils and water is 90 days (Tu et al. 2001). Hexazinone has been detected in streams near terrestrial application sites up to 30 days after treatment, and reported in runoff up to 6 months post-treatment in a forestry dissipation study (Neary and Michael 1996, Michael et al. 1999). Neary et al. (1984, 1993, all cited in Tu et al. 2001) concluded that hexazinone was diluted in the mainstream flow to very low concentrations in forested watersheds.

Imazapic (Proposed Action): In aquatic systems, imazapic rapidly photodegrades with a half-life of one to two days (Tu et al. 2001). Since aerobic biodegradation occurs in soils, aerobic biodegradation is likely important in aquatic systems. Aquatic dissipation half-lives have been reported from 30 days (water column) to 6.7 years in anaerobic sediments (SERA 2004c). Little is known about the occurrence, fate, or transport of imazapic in surface water or groundwater (Battaglin et al. 2000). However, according to the herbicide label for Plateau, in which imazapic is the active ingredient, it is believed to be a groundwater contaminant (BASF 2008).

Metsulfuron methyl (Proposed Action) is stable to hydrolysis at neutral and alkaline pH and has a half-life of three weeks in acidic systems (Extoxnet 1996b). The persistence of metsulfuron methyl (initial concentration 10 µg/L) was investigated using in situ enclosures in a woodland/boreal forest lake, and the half-life was estimated at approximately 29 days (Thompson et al. 1992). Metsulfuron methyl is not known to be a groundwater contaminant, although it has a high potential to leach into the groundwater.

Picloram (common to both alternatives) can move off site through surface or subsurface runoff, and has been detected in the groundwater of 11 states (Howard 1991). Picloram does not bind strongly with soil particles and is not degraded rapidly in the environment (Tu et al. 2001). Concentrations in runoff have been reported to be great enough to damage crops, and could cause damage to certain submerged aquatic plants (Forsyth et al. 1997 cited in Tu et al. 2001). Picloram may degrade through photolysis, especially in non-turbid and moving water. Woodburn et al. (1989, cited in Tu et al. 2001) found that the half-life of picloram in water was 2 to 3 days but the EPA reported it stable to hydrolysis and unlikely to degrade in ground water, even over several years (EPA 1995). Maximum picloram runoff generally occurs following the first significant rainfall, after which runoff concentrations drop to levels that persist up to two years post-application (Scifres et al. 1971, Johnsen 1980, Mayeux et al. 1984, Michael et al. 1989, all cited in Tu et al. 2001).

Sulfometuron methyl (Proposed Action) degrades quickly by hydrolysis in acidic water, but is stable in neutral water. Biodegradation and photolysis are major loss pathways in aquatic systems, where hydrolysis rates generally are slow. Aquatic dissipation half-lives are estimated at 1 to 3 days to 2 months in aerobic systems, and several months in anaerobic sediments (Extoxnet 1996a). Sulfometuron methyl is not known to be a groundwater contaminant. In one surface water study, sulfometuron methyl was detected in 2 percent of 133 samples taken from streams.

Effects by Alternative

Common to Both Alternatives

Effects of Riparian and Aquatic Treatments: Restoring native vegetation would improve riparian stability where invasive plants like Canada thistle have colonized along stream channels and out-competed native species. However, invasive plant removal by mechanical, manual, or other means could exacerbate stream instability as well as remove stream shading; these effects could last until the native vegetation replaced the treated vegetation and planting would be used as needed to shorten this time. Treatments would not be inconsistent with 303(d) restoration plans. Where invasive plant control would remove plants significantly contributing to bank stability or stream shading, particularly along 303(d)-listed stream reaches, control would be delayed or phased as necessary while aggressive restoration efforts are undertaken. BLM policy requires restoration plans to account for these effects, and prescribes mulching, seeding, and planting as needed to re-vegetate riparian and other treated areas (USDI 2008a). Speeding restoration of such management-exposed stream banks with willow planting or other measures is a common BLM practice.

Targeted grazing is not a common weed treatment technique on the resource area in wet, riparian and/or fishbearing areas and its use, if any, is expected to be minimal. The limited extent of the treatment, coupled with the project design features adopted for this analysis will result in any effects to water, riparian and/or fish and fish habitat being at a negligible level in the short-term. Effects to aquatic resources are expected to be beneficial in the long-term as native riparian vegetation is re-established.

With the exception of potential increases in turbidity or temperature in the short term as discussed elsewhere in this section, none of the treatments under either alternative is expected to adversely affect the safety of drinking, irrigation, or stock water.

Standard Operating Procedures require that areas with shallow groundwater and areas of groundwater-surface water interaction be identified to reduce impacts to groundwater from the application of herbicides. These areas would be identified during preparation of the Annual Treatment Plans.

Effects of Upland Treatments: Buffers are effective at reducing the movement of herbicide to streams (Berg 2004, Dent and Robben 2000, Rashin and Graber 1993). The potential for impacts from herbicide drift is reduced by Standard Operating Procedures and Mitigation Measures requiring buffers between treatment areas and water bodies. The buffers described in Table 3-16 (*No-application buffer widths in feet for herbicide application, by stream types and application methods, for streams with Federally Listed species (ARBO II))* apply to Warner Sucker and Foskett Dace occupied and critical habitat (see *Project Design Features Adopted for the Analysis* earlier in this section) and are based on herbicide properties. These are adapted from ARBO II (USDI 2013b). They will apply until and unless consultation for this EA provides different buffers.

Roads often parallel streams or have stream crossings, so roads can act as extensions of stream networks. A simulation of roadside maintenance spraying near Estacada, Oregon revealed low but measurable herbicide concentrations months after treatment (Wood 2001). Since vehicles spread invasive plants, a high percentage of invasive plant treatments are along roadsides. Under conditions of roadside ditch flow, herbicides used in these areas could conceivably reach streams even when buffers to the actual stream are applied. Existing Standard Operating Procedures such as stream buffers reduce potential impacts to water quality from herbicide applications, and an Oregon FEIS Mitigation Measure requires analyses for roadside treatments to specifically consider that drainage ditches and structures lead to streams and that normal buffer distances, herbicide selection, and treatment method selection may need to be changed accordingly, particularly where those ditches are connected to streams with Federally Listed or other Special Status species. The number of acres treated along roadsides annually (Treatment Category 1-3) is expected to be about the same for both alternatives.

No Action Alternative

The four herbicides used under this alternative include three known groundwater contaminants: picloram, dicamba and 2,4-D. Picloram is a high-risk herbicide for aquatic resources but is preferred in many situations because it is a selective herbicide that represses reestablishment of target plants.

Some of the invasive plants found in Oregon are not effectively controlled by the four herbicides available. For example, the four herbicides are ineffective at treating perennial pepperweed and other perennial weeds that have been documented to be expanding in riparian areas throughout the Resource Area.

While glyphosate is available to treat emergent species such as knotweeds and yellow flag iris (documented on Klamath Falls Resource Area but not on the Lakeview Resource Area yet), no herbicides are available to treat submerged plants such as Eurasian watermilfoils and hydrilla (not on the Lakeview Resource Area at this time). Noxious weeds are expected to continue to spread at approximately 12 percent per year under this alternative, and the 44,090 acres of documented invasive plant sites (see Table 2-1, *Summary of Documented Invasive Plant Sites*) would be expected to spread to 215,000 acres over 15 years at this rate.

Riparian areas are extremely valuable to the ecosystem and must be protected from invasion by noxious weeds. Invasive weed species, such as purple loosestrife, can be extremely competitive in a riparian setting. They can crowd out valuable native species, forming a solid stand of weeds. Studies have shown that weeds often do not stabilize soils as well as native bunch grasses, which can lead to soil erosion in the riparian area and loss of the stream channel function (Sheley 1994).

Proposed Action

This alternative would use herbicides on additional acres, but use of the four herbicides presently available would go down, as other herbicides would be used instead. For example, clopyralid (low risk to aquatic ecosystems) can frequently be substituted for the use of picloram. In particular, imazapic, chlorsulfuron, metsulfuron methyl, clopyralid, and sulfometuron methyl would be the herbicides most likely to replace the four currently being used. More acres would be treated annually under the Proposed Action, but almost all of the increase can be attributed to imazapic, which would generally be used in upland areas, away from streams, thereby minimizing any impacts to water resources.

Three of the additional herbicides in this alternative would be available to treat aquatic emergent or submergent plants (if they invade the Resource Area) giving this alternative greater potential to treat invasive aquatic plant species than the No Action Alternative. The increased efficacy of this alternative is expected to result in 68,000 fewer acres infested in 15 years and a decrease in noxious weed spread rate to seven percent. The fewer acres infested than under the Proposed Action translates to fewer degraded stream banks, riparian areas, and watersheds.

Effects of Riparian and Aquatic Treatments: Imazapyr has an aquatic formulation that is frequently used to control weeds in and adjacent to aquatic environments. Aquatic formulations of triclopyr would be used to control broadleaf species in riparian areas. Removing invasive riparian and aquatic plants can result in improved water quality where blooms of invasive plants lead to low dissolved oxygen, and where invasive plants within riparian areas have led to increased erosion and sedimentation. Monitoring data for emergent treatments show that the amount of herbicide entering water from treatments is generally below levels of concern (LOC) for potentially exposed aquatic organisms.

Fluridone is an aquatic herbicide available to control submerged aquatics including Eurasian watermilfoils and hydrilla. This herbicide can only be used in still waters such as ponds and lakes. There are not any areas currently proposed for treatment with fluridone on the Resource Area, although if invasive submerged aquatic plants are found in the future, they would be a high priority for treatment. In Washington, fluridone is considered effective at controlling Eurasian watermilfoil without affecting drinking water quality or recreation (Washington Department. of Ecology 2002). Fluridone is slow acting, and is used at low concentrations on both submergent and emergent plants. As the plants die off slowly, there is not a large concentration of decaying organic matter added to the water at one time, and so it is less likely to deoxygenate the water than other aquatic herbicides.

No measurable effects to sediment, temperature, or dissolved oxygen are expected from herbicide treatments in riparian areas given the treatments planned and the limited extent of current infestations. Some level of chemical contamination may occur with the Proposed Action but the application rates and protection measures in place are expected to generally result in herbicide levels below LOCs for aquatic organisms.

There is low risk to drinking, irrigation, or stock water from treatment with imazapyr, glyphosate, triclopyr, or fluridone even in the case of accidental spills. 2,4-D is considered moderate risk for drinking water under accidental spill scenarios (see *Human Health and Safety* section in this Chapter).

None of the parameters in Table 3-13 (*2010 State of Oregon 303(d)-Listed Waterbodies on the Lakeview Resource Area*) that lead to 303(d) listings on the Resource Area would be measurably affected by the implementation of the Proposed Action. The Proposed Action is consistent with *Clean Water Act* as Standard Operating Procedures, Mitigation Measures, and other measures are designed to keep non-aquatic herbicides from getting into waters. For aquatic herbicides used to control invasive plants in and near water, the benefits of controlling invasive plants before major adverse effects to aquatic habitat, water quality and amount, infiltration, and runoff occur, outweighs the risk of using herbicides not shown to pose a risk to aquatic or riparian systems.

Effects of Upland Treatments: Overall herbicide exposure would be increased under this alternative compared to the No Action Alternative because more acres would be treated, but the total pounds would be lower, especially for those herbicides of highest concern to water quality.

This alternative would potentially add several thousands of acres of prescribed fire in invasive annual grass-degraded rangelands not expected to occur under the No Action Alternative, increasing the potential for storms to deliver sediments to streams. These treatments are in a dryer part of Oregon where many stream channels run seasonally, so few perennial streams are likely to be adversely affected by treatments. Where perennial streams are affected, those effects would normally be negligible and temporary; long-term effects would be positive as vegetation provides riparian shading and reduces runoff and erosion.

Local and temporary increases in stream flows could occur in areas where large acreages of a monoculture such as cheatgrass or Medusahead rye, would be treated with herbicides or prescribed fire. This would typically last one season or until native vegetation became reestablished.

Hexazinone is persistent and mobile. It has been reported in runoff up to six months post treatment (Tu et al. 2001[51]). Hexazinone is considered a high risk for groundwater contamination. Hexazinone is generally proposed for use along upland roadways, and would not be used in road drainage ditches or in any areas directly connected hydrologically to waterways.

Under the Proposed Action, Standard Operating Procedures, Mitigation Measures, and other measures are designed to keep non-aquatic herbicides from getting into waters.

[51] Where roadside maintenance treatments were simulated west of the Cascades.

Riparian and Wetlands

Issues

- How would the alternatives affect the health and function of riparian and wetland areas?
- How would the alternatives affect riparian/wetland dependent species and their diversity?
- What is the likelihood of long-term alterations to riparian vegetation; would herbicide use result in loss of riparian and wetland function?

Affected Environment

Riparian Vegetation—Lotic Systems[52]

Riparian vegetation is dependent on the stream channel type, duration of water availability, soil type and depth, climate, and management history. Sedges, rushes, and in some cases willow and alder, dominate streams with deeper soils and longer-lasting water. Boulder-dominated streams have pockets of vegetation that may be dominated by grass and shrubs. As water availability decreases, herbaceous vegetation shifts from sedges to grasses. The grasses change from wetland obligates (plants that occur usually in wetlands under natural conditions) to wetland facultative (plants that usually occur in wetlands but occasionally are found in non-wetlands). Lower elevation sites often have alder and dogwood along with willow as the predominant woody vegetation. Higher sites are dominated by willow. There are several species of willow in the Resource Area, some more dependent on moisture than others. For example, Scouler's willow can survive dry, upland sites, while sandbar willow requires wet conditions. The presence of these species can assist in determination of stream-site condition as it relates to site potential. Canyon-confined streams in lower reaches often have ponderosa pine as a dominant structural feature. Juniper has invaded many riparian sites and quaking aspen stands and has replaced more desirable riparian species.

Included in these plant communities are the willow floodplain riparian areas, where tall shrub communities with dense willow cover are occasionally interspersed with wetlands, sedge meadows, or moist, forb-rich grassland. This community occurs in broad valley floors as well as in narrow riparian canyons along rivers and streams. Many rivers usually have some cottonwood, willow, rose, snowberry, red-osier dogwood, and some pine and *Prunus* species. Alder is rare on the BLM portion of the Resource Area. At one time, cottonwood was probably more prevalent; at present, it does not occur widely in Lake County (Anderson 1998). Stinging nettle is present in most areas.

The role vegetation plays in stream condition (bank stability, sediment capture, flood-flow attenuation, and source of woody debris, etc.) depends on channel type. Channel types E3-6, C3-6, and G3-6[53] (Rosgen 1996) depend on vegetation to control stream function. The type of vegetation is also critical. Larger sedges have more extensive soil-holding ability than grasses like Kentucky bluegrass. Large woody debris such as tree trunks or boulders may supply the bank-forming structure on streams (other than the vegetation-dependent ones).

Structure and type of vegetation is critical to wildlife and fish habitat, even when it does not control stream morphology, condition, or function. Hardwoods, such as quaking aspen, some taller willows, and cottonwood, supply vertical structure for neotropical birds. As the trees age and decay, cavity nesters make use of them. Vegetation also supplies shade to the stream and helps to cool the water. Leaves from hardwoods supply nutrients to the riparian and aquatic system. In some areas, these leaves can be the driving force as a food source for aquatic macro-invertebrates, which in turn become a food source for fish.

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[52] Flowing water, such as rivers and streams.
[53] Generally low gradient pool/riffle streams in stream-deposited gravels and silts and other loosely consolidated materials.

Cottonwood deserves special consideration when managing riparian vegetation. Many cottonwood stands have declined in the area. Remnant stands can be found that have little or no regeneration, while some stands can be identified only by the remaining dead and down trees. Cottonwood trees need flood events so that a silt bed is developed for the seeds to establish. Normal water levels do not present the conditions needed for seedling establishment. After establishment, the seedlings must be protected from grazing for a period in order to survive.

Riparian vegetation communities are more diverse than the surrounding upland areas, and thus support a wider variety of wildlife species. This is especially true when considering the amount of habitat edge that exists between the riparian and upland vegetation types.

The habitat islands provided by springs are of special significance, because they often provide the only habitat diversity in uniform desert systems.

Wetlands Vegetation—Lentic Systems[54]

The large number of closed basins that typify the High Desert Province include dry lakebeds, lakebeds that are inundated infrequently and for short periods, perpetual lakes that fluctuate in size over time, and wetlands and marshes that are reasonably perpetual. Vegetation on these bottomlands varies according to the frequency, depth, and duration of inundation. Probably the most significant and valuable wetlands in the High Desert Province, from a total ecosystem viewpoint, are those associated with isolated springs and streams scattered over the arid landscape. The variety of shrubs, grasses, and forbs present depends on the degree and duration of wetness and shade at each location (USDI 2003a:2-9).

Hard stem bulrush-cattail marshes form open to dense, nearly monotypic (solitary) stands of bulrush where standing water is found throughout much of the growing season. Patches of cattail, burreed, and several species of *Scirpus* are the most important graminoids. *Carex* species occur in and around this habitat type, along with *Eleocharis* and *Juncus* species. In some areas, spike rush forms a monotypic community along wetland channels.

Sedge montane meadows and wetlands are scattered throughout the area with tall sedge meadows and wetlands, with dense, rhizomatous, or tufted sedges dominating the meadows. Usually these areas are low in forb production. Tufted hairgrass is the most common grass, occurring at the drier margins. The forbs often present are *Potentilla*, *Geum*, *Lupinus*, and *Lomatium* species and occasionally blue camas and *Perideridium* species. *Salix* species dominate streams that run though these meadows.

Tufted hairgrass montane meadows and valley prairie occur on a few sites in the Resource Area. These tall montane meadow grasslands with dense, tufted grasses range from forb-rich to grass-sedge dominated areas. Occasionally, willows, silver sagebrush, and black greasewood can be found. Tufted hairgrass is usually the dominant species. In some areas, Nevada bluegrass or Cusick's bluegrass are entirely dominant. *Carex* and *Juncus* species are codominant in wetter margins.

Proper Functioning Condition

In 1991, in response to growing concern over the integrity of ecological processes in many riparian and wetland areas, the BLM Director approved the "Riparian-Wetland Initiative for the 1990s" (USDI 1991c), establishing national goals and objectives for managing riparian/wetland resources on BLM-administered land. The initiative's goals were to restore and maintain existing riparian/wetland areas so that 75 percent or more were in proper functioning condition by 1997 and to provide the widest variety of habitat diversity for wildlife, fish, and watershed protection. Subsequently, the BLM established a definition for proper functioning condition and a methodology for its assessment (USDI 1993). The BLM has adopted proper functioning condition assessment as a

[54] Standing waters such as lakes, ponds, and some wetlands.

standard for evaluating riparian areas and would use it to supplement existing stream channel and riparian evaluations and assessments.

The functioning condition of riparian and wetland areas is a result of the interaction of geology, soil, water, and vegetation (USDI 1993). Proper functioning condition can be defined separately for lotic and lentic waters.

In 1996 and 1997, a team of specialists inventoried 113 miles of stream on the Resource Area using the *Process for Assessing Proper Functioning Condition* (USDI 1993) and found that over 99% of lentic riparian areas and over 75% of lotic riparian areas were at Proper Functioning Condition.

A re-survey of streams not at proper functioning condition in 1996 and 1997, as well as a subset of those at proper functioning condition at that time, is currently underway and generally showing improving conditions across Resource Area. In instances where this is not the case, or where recovery rates are unacceptably slow, new management recommendations or projects that would benefit stream and riparian conditions result.

A riparian score card system has recently (2010) been developed that assesses the current interaction of soils, vegetation, and stream channel. These cards are being used to compare current conditions to potential conditions for riparian sites. This information will be used in the future to describe desired range of conditions on each site.

Treatments Planned Relating to the Issues

Most of the treatments described for each alternative in Chapter 2 have the potential to affect the riparian and wetlands-related issues described for this analysis. Approximately 6.75 percent of the riparian vegetation on the Resource Area (including the Warner Wetlands) is infested with documented invasive plants (Treatment Category 1); the riparian areas have a disproportionate share of the invasive plants on the Resource Area. This is because the area is so hospitable to plants, and people, animals, and water move the seeds and other propagules around. Upland treatments also have the potential to affect the water resource when wind, drift, or overland or subsurface water flow move unbound herbicides downslope. Because of the importance of limited riparian areas on the Lakeview Resource Area, these areas are also high priority for control treatments.

The Proposed Action envisions up to 20,000 additional acres treated per year, much of it likely aerially applied, to rehabilitate sites infested with, or burned and in danger of becoming infested with, invasive annual grasses. These treatments would generally be in larger units laid out away from riparian areas and wetlands, although aerial applications would have a higher relative likelihood of drift than most treatments under the No Action Alternative.

Standard Operating Procedures and Mitigation Measures Relevant to Effects

The potential for adverse herbicide-related effects to water resources is minimized for both alternatives by existing Standard Operating Procedures and Mitigation Measures (see Appendix A). These include, but are not limited to:

- Use a selective herbicide and a wick or backpack sprayer.
- Use appropriate herbicide-free buffer zones for herbicides not labeled for aquatic use based on risk assessment guidance, with minimum widths from water of 100 feet for aerial, 25 feet for vehicle, and 10 feet for hand spray applications.
- See mitigation for Water Resources and Vegetation. (MM)

Environmental Consequences

Effects of Herbicides on Riparian and Wetland Areas

Fate of Herbicides in Wetlands and Riparian Areas

Herbicide drift, runoff, soil erosion, or ground water leaching could affect wetlands and riparian areas. The risk would be related to the amount, selectivity, persistence of the herbicide, application methods, timing of the application in relation to climatic conditions, and the plant species present. Accidental spills or unintended applications to wetlands and riparian areas would be the greatest risk and have the most impact. All herbicides dissipate in wetlands and riparian areas by water transport, chemical or biological degradation, and adsorption and immobilization in soils. Herbicides applied upland and adjacent to wetlands but moving into the wetland may experience increased persistence and degradation times compared to those expected in the upland area. Soil and water properties in wetlands or riparian areas differ from upland areas and thus the capacity to adsorb, transport, and transform herbicides may be affected. Soil temperatures, amount of organic matter and degree of saturation may change duration and storage of herbicides. Soil pH and level of oxygen present in a soil may increase or decrease degradation of herbicides. Generally, anaerobic degradation processes are much slower than the degradation processes in well-drained soils where oxygen is present (see Table 3-17).

Table 3-17. Herbicide Half-Life in Anaerobic Soils

Herbicide	**Half-life in Anaerobic Soil** (days)
2,4-D	333
Chlorsulfuron	109-263
Clopyralid	>1000
Dicamba	Not Determined
Diflufenzopyr	20
Fluridone	4-270
Glyphosate	12-70
Hexazinone	30-180
Imazapic	>1000
Imazapyr	>500
Metsulfuron methyl	338
Picloram	>500
Sulfometuron methyl	60
Triclopyr TEA	<1

Herbicides Used for Both Aquatic and Terrestrial Vegetation Control

Five herbicides proposed for use by the Proposed Action are registered for aquatic use by the EPA and approved for such use by the BLM nationally: 2,4- D (salt forms, not esters), fluridone, glyphosate, imazapyr, and triclopyr. Cautions for each herbicide vary in the aquatic environment.

2,4-D: (common to both alternatives) The principle hazard is unintended spraying or drift to non-target plants; spot treatments applied according to the labeled rate do not substantially affect native aquatic vegetation or significantly change species' diversity (USDA 2005a, Washington Department of Ecology 2002). In aerobic riparian soils that have a high content of organic material, an active microbial community, high pH values, and high temperatures, toxic effects are limited because of rapid degradation of 2,4-D. 2,4-D may inhibit shoot and/or root growth of macrophytes in aquatic systems (Roshon et al. 1999). 2,4-D would only be used for spot spraying of invasive plants such as Canada thistle in wet riparian areas.

Fluridone (Proposed Action) is a non-selective, slow-acting herbicide used in low concentrations to control submerged and emergent vegetation in ponds or reservoirs, lakes and canals where long-term contact with the target plants can be maintained to achieve control (not flowing waters). It photo-degrades, volatilizes slowly from water, and adsorbs to suspended solids and sediments.

Glyphosate (common to both alternatives) would be used along shorelines and banks to control grasses (reed canary grass), herbaceous plants and some broadleaf trees and shrubs, and is approved for emergent aquatic vegetation in wetlands and estuaries. It may move into surface water with eroded soil particles (although it is unlikely it will dislodge from the particles and become active) where it rapidly dissipates from surface water by biodegradation and adsorption. Freshwater aquatic macrophytes and algae are reported to be susceptible to low amounts (20 mg/l concentrations). For many years, glyphosate has been the most appropriate herbicide to use to control invasive plants in riparian areas.

__Imazapyr__ (Proposed Action) is approved for wetlands, and riparian areas. Used on Russian olive, reed canarygrass and many other invasive plants, it may also remove non-target vegetation. Residual soil contamination with imazapyr could be prolonged in some areas, possibly resulting in substantial inhibition of plant growth (SERA 2004d). Imazapyr is not likely to degrade in anaerobic soils or sediments, and has been shown to strongly bind to peat (American Cyanamid 1986, SERA 2004d).

__Triclopyr__ (Proposed Action) generally controls woody species in an upland environment but can be used in wetlands and riparian areas that go dry for part of the year. It can also be used for spot treatment of Canada thistle at low application rates, and perennial pepperweed in riparian areas, as it does not damage native grasses and sedges. Only the TEA (acid) form is approved for selective control of submersed aquatic vegetation. Triclopyr BEE (ester form) is hazardous to aquatic life forms in maximum concentrations or spill situations where runoff to open water may occur. Triclopyr could be used to manage perennial pepperweed and Canada thistle near water in the Warner Wetlands.

Herbicides Used For Terrestrial Vegetation Control

Other herbicides may be used on or near intermittent streams during the dry season, or would be used to control vegetation outside of riparian areas using buffer widths applicable to the herbicide being used. However, non-target wetland and riparian areas could be exposed to herbicides through a variety of routes, including accidental spills or direct spray, local spray drift from adjacent target areas, surface water runoff, and soil erosion (Karthikeyan et al. 2003). Risks to wetland and riparian non-target species would depend on a number of factors, including the amount, selectivity, and persistence of the herbicide used; the application method used; the timing of the application; and the plant species present. Risks to wetlands and riparian areas from surface runoff would be influenced by precipitation rates, soil types, and proximity to the application area. Some herbicides (e.g., sulfometuron methyl) that adsorb readily onto clay soil particles could be carried off site in runoff situations, increasing their risk of affecting vegetation in wetlands and riparian areas.

Unintentional applications can have severe negative impacts on wetland and riparian systems. In particular, accidental spills near wetland and riparian areas could be particularly damaging to wetland and riparian vegetation. Spray drift can also degrade water quality in wetland and riparian areas and could damage non-target vegetation.

__Chlorsulfuron__ (Proposed Action) is effective at low concentrations and is prone to leaching. Hydrolysis rates are the fastest in acidic waters and are slower as the pH rises (Sarmah and Sabadie 2002). When hydrolysis rates drop, biodegradation becomes the primary loss mechanism. Strek (1998a, b) studied the dissipation of chlorsulfuron in an anaerobic sediment/water system; biodegradation progressed much more slowly than in aerobic soil systems, with a half-life greater than 365 days. Chlorsulfuron would be used under the Proposed Action to effectively manage the thousands of acres of perennial pepperweed infesting the Warner Wetlands. Chlorsulfuron would not be applied to areas with standing or moving water, but would be applied to dry areas of the wetlands, often in tank mixes of 2,4-D.

__Clopyralid__ (Proposed Action) is relatively non-toxic to aquatic plants. Overall, effects to non-target wetland and riparian vegetation from normal application of clopyralid are likely to be limited to susceptible plant species in or very near the treatment area, and could be avoided by maintaining an adequate buffer between the treatment area and wetland and riparian areas (SERA 2004b). Clopyralid is not likely to affect aquatic plants via off-site drift or surface runoff pathways unless spilled. Clopyralid would replace many of the picloram applications across the Resource Area under the Proposed Action. Clopyralid would be an effective treatment for the thistle and knapweed infestations throughout the Resource Area.

__Dicamba__ (common to both alternatives) direct spray and drift scenarios pose a moderate to high risk to susceptible terrestrial plants. Susceptible aquatic algae are at high risk from an accidental spill scenario and from direct exposure at maximum rates. Tolerant algae are at low risk from accidental spill at maximum rate. In water, biodegradation is the major mechanism for dicamba degradation. Dicamba is mobile in soils and is therefore likely to reach surface water and groundwater. The rates of dicamba degradation were generally more rapid in the surface than in the subsurface soil microcosms. The study indicated that some riparian wetland soils possess limited potential to degrade dicamba (Pavel et al. 1999). For the past ten years, dicamba mixed with 2,4-D has been the most effective treatment to manage perennial pepperweed and hoary cress. The addition of the new herbicides would reduce the amount of dicamba used by almost 90 percent across the Resource Area.

Diflufenzopyr (Proposed Action) is not approved for the treatment of aquatic plants, but poses a low risk to riparian species and aquatic plants via off-site drift. This herbicide would only be used with dicamba and would be used to control species such as knapweeds. This formulation would be used mainly along roads and in disturbed areas.

Hexazinone (Proposed Action) exposure poses a moderate to high risk for aquatic plants from acute and chronic exposures at both the typical and maximum application rates. Aquatic algal species are also susceptible to hexazinone exposure. It is also likely that aquatic macrophytes are susceptible, based on the effects of hexazinone on algae and terrestrial plants (SERA 1997). Hexazinone would be used to control small amounts of annual grass species along roads and in disturbed areas away from riparian areas.

Imazapic (Proposed Action) risk to aquatic plants from accidental spills of imazapic is moderate to high at the maximum application rate and low to moderate at the typical application rate (there is no acute risk to aquatic plants in standing water at the typical application rate). Aquatic plants are generally not at risk from off-site drift of imazapic, except when applied aerially at the maximum application rate with a buffer of 100 feet or less. Imazapic rapidly degrades through photodegradation in aquatic systems (SERA 2004c). The most common use of imazapic on the Resource Area would be to control winter annual grass species such as Medusahead rye and cheat grass. The typical rate of application for these species is 6 ounces per acre, which is half of the maximum rate of application.

Metsulfuron methyl (Proposed Action) poses a low risk to aquatic macrophytes from acute exposure at upper exposure limits (SERA 2004e). Metsulfuron methyl is stable to hydrolysis at neutral and alkaline pH. Larsen and Aamand (2001) evaluated biodegradation of metsulfuron methyl (25 µg/L) under anaerobic and aerobic conditions in sandy sediments; the herbicide did not biodegrade under any of these conditions. Metsulfuron methyl would be used under the Proposed Action to manage perennial pepperweed and hoary cress in dry areas of the Warner Wetlands ACEC.

Picloram (common to both alternatives) toxicity to aquatic plants varies substantially among different species. There is low risk to susceptible aquatic macrophytes from acute exposure to picloram at the maximum application rate. Because picloram does not bind strongly to soil particles and is not rapidly degraded in the environment, it has a high potential for being transported to wetland and riparian areas. Picloram would be used to control species such as Russian knapweed and Musk thistle in terrestrial areas.

Sulfometuron methyl (Proposed Action) poses a high risk to aquatic plants from accidental direct spray and spills, and a high risk to susceptible and aquatic plants from drift. It poses a low risk to terrestrial plants from drift. Aquatic plants in standing water are typically at low to moderate risk for adverse effects from surface runoff scenarios. Sulfometuron methyl would not be applied during high winds, as drift could cause extensive damage to vegetation at a substantial distance from the application site. Sulfometuron methyl would be used in terrestrial settings to control dense stands of winter annual grass species. During applications of sulfometuron methyl, a drift prevention agent would be used. It would not be applied through aerial application.

Effects of Invasive Plants on Riparian and Wetlands

For terrestrial weeds, the various levels of invasive plant control predicted to be achieved by each alternative would variously reduce or limit invasive plant -induced changes to wetland and riparian vegetation, soil water content, and erosion in wetlands and riparian areas adjacent to streams. Removing species like Medusahead rye and spotted knapweed upslope would allow native species to recolonize the near stream-bank or uplands. Native wetland and riparian species are adapted to the unique relationship of inundation of plants or soil by water for various portions of the year and respond well or survive such inundations. The native plant community would be better preserved, and the fauna that depends on it would benefit proportionately. (Adverse direct effects to wildlife species are discussed in the *Wildlife* section in this Chapter.)

Aquatic invasive plants can overwhelm water systems and displace native plants, removing habitat for native plant and animal species. Fish kills occur due to removal of too much oxygen from the water. Oxygen depletion occurs when plants die and decompose. Photosynthetic production of oxygen ceases, and the bacteria, which break down the plant material, use oxygen in their own respiration. Fish kills in summer are frequently caused by die-offs of algae blooms. Fish kills in winter occur when snow accumulates on ice cover. Light is blocked thus preventing photosynthesis by any living plants or algae. Decomposition of plants that died in the fall causes further oxygen depletion. Fish kills also can be caused by insecticide runoff, ammonia runoff from feedlots, and diseases. Aquatic invasive plants can also:

- interfere with or prohibit recreational activities such as swimming, fishing, and boating.
- detract from the aesthetic appeal of a body of water.
- stunt or interfere with a balanced fish population.
- produce quiet water areas that are ideal for mosquito breeding.
- certain algae can give water bad tastes and odors.
- impede water flow in drainage ditches, irrigation canals, and culverts, causing water to back up.
- deposition of weeds, sediment, and debris, can bodies of water to fill in (http://www.uky.edu/Ag/PAT/cat5/cat5.htm).

Effects by Alternative

No Action Alternative

Of the four herbicides available under this alternative, most riparian and wetland treatments would be done using aquatic formulations of 2,4-D or glyphosate. 2,4-D has moderate to high risks of negatively affecting non-target vegetation, and up to moderate risks for some scenarios for water quality, fish, and wildlife habitats. Glyphosate has moderate risks under several of the same Ecological Risk Assessment exposure scenarios (see respective resource sections in this Chapter). The rapid decay of these herbicides particularly in wetland soils that have high organic matter, high pH, and slow or no water movement during application, limits the impacts to root tips and aquatic life forms that are found in this environment (Voth et al. 2006).

Targeted grazing is not a common weed treatment technique on the Resource Area in wet, riparian and/or fishbearing areas and its use is expected to be minimal. Targeted livestock grazing is used occasionally in the 5,150[55] acres of riparian exclosures to control some invasive species. The limited extent of the treatment, coupled with the project design features adopted for this analysis will result in any effects to water, riparian and/or fish and fish habitat being at a negligible level in the short-term. Effects to aquatic resources are expected to be beneficial in the long-term as native riparian vegetation is re-established. Effects from manual and mechanical treatments could occur, but at an immeasurable, negligible level given the limited magnitude of the treatments.

Control methods including the four herbicides available under this alternative would effectively control 25 of the 35 invasive plants documented on the Resource Area (see Table 2-1, *Summary of Documented Invasive Plant Sites,* and Oregon FEIS Table A9-2), with the remaining 10 including perennial pepperweed and other riparian invasive plants. Noxious weeds would be expected to continue spreading at about 12 percent per year, and infest 215,000 acres on the Resource Area in 15 years. Since wetlands and riparian areas provide favorable invasive plant habitat, it is expected they would become similarly infested.

[55] This does not include about 3,164 acres of exclosure in occupied Warner Sucker habitat.

Proposed Action

The additional ten herbicides available under this alternative would permit substitution of lower risk (to aquatic organisms and resources) herbicides that would be effective at lower rates. 2,4-D and glyphosate projected annual acres would decrease by more than half when compared to the No Action Alternative, while the replacement herbicides trigger very few moderate risks for fish or wildlife, and only one high (fluridone at maximum rates creates a high risk to Special Status aquatic invertebrates in the direct spray to pond scenario). Moderate risks are limited to fluridone at the maximum application rate for fishponds, and hexazinone at typical and maximum rates for several categories of wildlife. Projected use of these two herbicides is expected to average less than 15 acres per year (see Table C-4, *Estimated Treatment Acres, by Alternative and Category*, in Appendix C), with all hexazinone use expected to be outside of riparian areas.

Effects of non-herbicide treatments would be about that same as described under the No Action Alternative with the possible exception of the effects of prescribed fire for invasive plant control. Any additional acres for such treatment would mostly be outside of riparian areas. Burning could release ash and other nutrients that could blow or be washed to nearby water, but the amount of material released from burning invasive annual grasses would not be expected to noticeably affect riparian area function.

All 35 of the invasive plants documented on the Resource Area (see Table 2-1, *Summary of Documented Invasive Plant Sites*) could be effectively controlled with the tools and herbicides that would be available under this alternative. Further, the projected reduction of the noxious weed spread rate to seven percent is expected to reduce the 15-year spread of these sites by 68,000 acres when compared to the No Action Alternative.

Fish and Other Aquatic Resources

Issues

- How would sediment or chemical deposition from the alternatives affect fish, including Special Status fish?
- How would the alternatives affect fish habitat, including water quality, aquatic and riparian vegetation, and habitat complexity?

Affected Environment

Fisheries habitat includes perennial and intermittent streams, springs, lakes, and reservoirs that support fish through at least a portion of the year.

The condition of fisheries habitat is related to hydrologic conditions of the upland and riparian areas associated with, or contributing to, a specific stream or water body, and to stream channel characteristics. Riparian vegetation reduces solar radiation by providing shade and thereby moderates water temperatures, adds structure to the banks to reduce erosion, provides overhead cover for fish, and provides organic material, which is a food source for macroinvertebrates. Intact vegetated floodplains dissipate stream energy, store water for later release, and provide rearing areas for juvenile fish. Water quality parameters (especially factors such as temperature, sediment, and dissolved oxygen) are also important components of fish habitat.

Habitat quality varies by stream reach, with canyons generally being in better condition due to inaccessibility to livestock and rock armoring. In these reaches, pool quality and quantity are usually good, and channel condition is not dependent on vegetation. On less confined, deep-soil reaches, vegetation plays more of a role controlling habitat conditions that vary depending on past and present management. Generally, the condition of these sites has improved in the Resource Area over the last 20 years because of livestock management and exclusion. Some sites were degraded to the point that many years would be required for the streams to improve to desired condition. Large wood, while not meeting standards in the 1995 "Inland Native Fish Strategy" (USDA 1996), is usually not a factor in determining function of the streams. Most sites on BLM-administered land naturally do not have an adequate source of large wood to meet the Inland Native Fish Strategy standards (USDA 1996).

Several nonnative fish have been introduced into the Resource Area. Currently, outside of some small reservoirs in the Resource Area, the Oregon Department of Fish and Wildlife (ODFW) stock hatchery trout only in Ana River.

As noted in the *Water Resources* section, ICBEMP rated the aquatic integrity of the sub-basins throughout the project area. An aquatic system that exhibits high integrity has a mosaic of well-connected, high-quality water and habitats that support a diverse assemblage of native and desired nonnative species, the full expression of potential life histories, dispersal mechanisms, and the genetic diversity necessary for long-term persistence and adaptation in a variable environment. Sub-basins exhibiting the greatest level of these characteristics were rated high, and those exhibiting the least were rated low. The Guano Sub-basin was rated as having moderate aquatic integrity, while the other three sub-basins in the Resource Area, Warner Lakes, Lake Abert, and Summer Lake, were rated as having low aquatic integrity. Sub-basins with low aquatic integrity may support populations of key salmonids or have other important aquatic values (that is, Threatened or Endangered species, narrow endemics, and introduced or hatchery-supported sport fisheries). In general, however, these watersheds are strongly fragmented by extensive habitat loss or disruption throughout the component watersheds, and most notably through disruption of the mainstem corridor. Although important and unique aquatic resources exist, they are usually localized (USDA and USDI 1996).

Species and Habitat

Species designated as Special Status by the BLM include 1) those Federally Listed or proposed for listing as Endangered or Threatened under the Endangered Species Act, and 2) species designated by the State Director as Bureau Sensitive and requiring special management consideration to promote their conservation and reduce the likelihood and need for future listing under the Endangered Species Act. These are managed under provisions of the BLM's Special Status Species Program (USDI 2008c). BLM policy objectives are: 1) to conserve and or recover Federally Listed species and the ecosystems on which they depend so that Endangered Species Act protections are no longer needed for these species, and 2) to initiate proactive conservation measures that reduce or eliminate threats to other Special Status species to minimize the likelihood of and need for listing of these species under the Endangered Species Act. BLM management activities must be conducted to minimize or eliminate threats affecting the status of the species or to improve the condition of the species' habitat by ensuring that activities are carried out in a way that does not lead to a need to list the species under the Endangered Species Act.

Redband Trout (Sensitive)

There are no anadromous salmonids (such as salmon and steelhead that return from saltwater to spawn) in the Resource Area. Redband Trout, a relative of rainbow trout, is the native trout. These trout occur in nearly all perennial streams (consisting of approximately 60 miles on BLM-administered land) of the Warner Lakes, Goose, Lake Abert, and Summer Lake Sub-basins. These sub-basins make up four of six separate desert basin populations of interior native Redband Trout (Behnke 1992).

Redband Trout evolved in Pleistocene lakes and moved into mid- to high-elevation streams that did not have water outlets to the ocean as the climate became drier and warmer in portions of Oregon, Nevada, and Utah. Redband Trout are generally more tolerant of higher temperatures than are planted rainbow trout. The introduction of hatchery-raised rainbow trout as early as 1925 may have altered many of the unique characteristics of the native Redband. Brook trout have competed for limited resources with Redband. However, brook trout are known to occur only on the upper reaches of streams on private and Fremont National Forest lands; they have only occasionally been found in the lower Chewaucan River on BLM-administered lands in the Resource Area.

In September 1997, a petition to list the Great Basin Redband Trout as Threatened was filed. This petition included the four subpopulations in the Resource Area. After considering all available information and analyzing public comment, the U.S. Fish and Wildlife Service determined that listing the species was not warranted (USDI 2000b). The BLM will pursue activities to improve conditions for Redband Trout to help prevent the need to list the species.

Other Trout

Neither rainbow nor brook trout are native to the Great Basin. Brook trout, which evolved east of the Rocky Mountains, were introduced for sport fisheries. Hatchery rainbow may have come from coastal streams. Neither the extent of the loss of genetic purity nor the locations of the most pure strains of Redband are known. Stocked rainbow trout are less able to survive the high temperatures and low oxygen levels of the local streams. Stocking any type of trout on BLM land has been discontinued except for the stocking done by Oregon Department of Fish and Wildlife in Sid Luce, Big Rock, Lucky, Sunstone, Sherlock, Spaulding, Duncan, Squaw Lake, Priday, Mud Lake, and MC Reservoirs. In most of these reservoirs, spawning habitat is lacking and natural reproduction does not occur.

Cutthroat trout occur in the Resource Area only in Guano Creek. They were introduced in 1957. The early introductions were from Lahontain stock, but subsequent introductions from other stocks have altered the Lahontain genetic pattern of these fish. Guano Creek is intermittent; that is, it flows only in response to rain or snowmelt. Therefore, the trout are found only during spring runoff and in the longer lasting pools on the Shirk Ranch. They survive in the perennial reaches of the stream on Hart Mountain Refuge and in Jacobs Reservoir.

Warner Sucker (Federally Listed Threatened)

Warner suckers (*Catostomus warnerensis*) are endemic to the Warner Valley and were Federally Listed as a Threatened species in 1985. There are 43 miles of designated critical habitat in the Resource Area, including 13.5 miles of designated habitat on BLM-administered lands.

Biological evaluations (see *Glossary*) on the effects of grazing on Warner suckers were completed in 1994 by the BLM. On those pastures with “may affect” or “likely to adversely affect” determinations from the evaluations, consultation between the BLM and U.S. Fish and Wildlife Service, in compliance with section 7 of the *Endangered Species Act*, has been completed. Where noncompliance with the terms and conditions of the biological opinion has occurred or changes were made to the actions proposed in the original consultation, the consultation process has been reinitiated. Biological evaluations and re-initiation of the consultation are completed as needed on all Federal actions taken by the BLM in the Warner Watershed south of Bluejoint Lake. Besides the grazing program, consultations have been completed on several fence construction projects, noxious weed control (USDI 1996c), road construction, waterhole maintenance, prescribed fire, commercial recreation permits, a wetland management plan, and a combination pump station and fish screen project.

A recovery plan for the Warner sucker was approved in 1998 (USDI 1998). It included descriptions, life histories, distribution, reason for decline, current conservation efforts, and recovery strategy of the species. Most importantly, it lists what actions must be completed to remove the species from the Endangered Species List. Many of the actions required to remove the species from listing, such as screening and providing passage over irrigation diversions, are needed on private lands and have been started. The BLM has worked on determining the population status of the species, one of the primary steps in ` establishing the self-sustaining metapopulation requirements of the plan. BLM has also worked to identify existing habitats, assess their quality, and improve habitats by managing and excluding livestock.

Foskett Speckled Dace (Federally Listed Threatened)

The Foskett speckled dace (*Rhinichthys osculus* ssp.), listed as Threatened in 1985, occurs in a spring on BLM-administered land in Coleman Valley. The BLM acquired this land in an exchange with the private landowner and has maintained livestock exclusion on the spring area. A habitat creation project was completed in 2009 and fish were moved into the habitat in 2010, in order to establish fish in an adjacent spring (Dace Spring), as recommended in the recovery plan (USDI 1998). Reproduction has been documented at Dace Spring and preliminary data collected in 2014 shows increasing population numbers, although the data is not complete. Work, as outlined in the recovery plan (USDI 1998), was completed in 2012-2014 to enhance the existing dace habitat through the promotion of open water habitat at Foskett Spring, including prescribed fire and hand excavation of pool habitat. Population estimates increased from less than 2000 fish in 2012 to over 13,000 in 2013. 2014 population data is not yet complete.

Hutton Tui Chub (Federally Listed Threatened)

The Hutton tui chub (*Gila bicolor*) was Federally Listed as Threatened in 1985 and inhabits a privately owned spring along the shore of Alkali Lake. The landowner has excluded grazing from the spring and has restricted public access to the spring in an effort to protect the chub habitat. BLM management actions around the spring are not likely to affect this species but are evaluated to assure no adverse effect. This species is also covered by a recovery plan (USDI 1998).

Other Aquatic Species

Amphibians and aquatic invertebrates are integral components of the fish community. One amphibian, the Columbia spotted frog, is a candidate for Federal Listing.

Other fish of concern, because of limited habitat and range, include Sheldon tui chub (*Gila bicolor* spp.) in the Guano Basin, Summer Basin tui chub (*Gila bicolor* spp.) in the Summer Lake Basin and Oregon Lakes, and XL tui chub (*Gila bicolor* spp.) in the Chewaucan Basin.

ODFW no longer routinely stocks warm water fish species, but largemouth bass, black crappie, white crappie, and brown bullhead have become established from previous introductions in the Warner Lakes and some smaller reservoirs. Anglers illegally introduced these species in other reservoirs in the Resource Area.

<u>Cowhead tui chub</u> (*Gila bicolor vaccaceps*): Occur in a limited range in northern California on a tributary of Twelvemile Creek. This species was proposed for listing, but the listing was postponed because of the development of a conservation agreement between the U.S. Fish and Wildlife Service and the private landowners that manage the chub habitat. Because the Resource Area is downstream from this species' habitat, management actions by the Lakeview BLM will have no effect on this species. Management actions proposed in adjacent areas that are consistent with the Standard Operating Procedures and Mitigation Measures should have no adverse effect to the species.

<u>Columbia spotted frogs</u> (*Rana lutiventris*): A Federal candidate species known to occur in four locations in the Warner Basin. It is suspected these frogs occur in other locations but none have been located. This species may be considered for Federal listing in the future.

<u>Spring snails</u> (*Pristinicola* sp., *Pyrgulopsis* sp. and others): Occur in several springs scattered around the Resource Area. They tend to be endemic to the spring in which they occur. Some species have been described (i.e., XL and Abert), but many others have yet to be identified as unique.

Habitat Management

Habitat Connectivity, Strongholds, and Refugia

The watersheds that supply the majority of water to the Warner Valley are identified as refugia and strongholds for Warner suckers and Redband Trout. Deep, Twelvemile, Twentymile, and Honey Creek Watersheds all contain a considerable amount of BLM-administered lands and streams that provide habitat to significant fish species, including Warner suckers and Redband Trout. The perennial waters of the Twelvemile, Twentymile (except Horse and Fifteenmile Creeks), and Honey Creek Watersheds provide habitat for Warner suckers. All of the perennial reaches of Twelvemile and Twentymile Creeks in Oregon have been identified as critical habitat for Warner suckers. These sucker-bearing streams, along with Horse Creek, Fifteenmile Creek and the perennial streams of the Deep Creek Watershed provide habitat for Redband Trout.

The major factor limiting fish habitat is a lack of connectivity to the Warner Lakes. Deep and Twentymile Creeks have had substantial modifications and diversion that limit upstream movement to the upper reaches of the stream. Due to a natural falls on Deep Creek, only 2.3 miles of stream between Adel and the falls is affected by the connectivity concern. There are two major obstacles on Twentymile and three on Deep Creek. Honey Creek has the most direct connection between the stream and the Warner Lakes; however, there are several diversions that need to be modified to reestablish connectivity. All of these diversions are privately operated and all but one are on private land. The BLM has acted as a partner facilitating passage and screening programs to restore connectivity on the Warner Valley Watersheds, but the ultimate responsibility for work lies with the private owner. Culvert passage is not an issue in the Resource Area.

Past Activities

Many past activities have affected the habitat conditions for fish in the area. Road construction has altered the ability of many streams to access their full floodplain or has constricted their floodplain and has straightened or constricted many channels, resulting in channel incision. Logging and associated road construction has removed overstory cover on many watersheds, changing peak and base flows downstream. Grazing has removed bank-stabilizing vegetation and affected banks directly. Water withdrawal since the turn of the century has affected the ability of fish to thrive in many streams. Irrigation water withdrawn from the major streams in the area reduces summer flows and raises water temperature. Channeling streams to better control the spread of water and removing of willows to create irrigated pasture and hay fields have resulted in channel incision and loss of habitat. Diversions often block upstream movement of trout from the lower reaches of streams and lakes to upper spawning areas. The inability of fish to move from Hart Lake into Honey Creek and from Crump Lake into Twentymile Creek is an example of this problem.

Active riparian management in the Resource Area has been initiated on nearly all perennial and many intermittent streams. Some exclosures have been successful at controlling grazing use, while in others, grazing still occurs when livestock occasionally find their way through the exclosure fences. With the initiation of consultation with U.S. Fish and Wildlife Service under section 7 of the *Endangered Species Act*, more extensive efforts in locating unauthorized grazing use and construction of additional fencing has made most of the exclosures in the Warner Basin more effective. The Resource Area is generally implementing grazing management to improve riparian conditions, with particular emphasis on those pastures that contain perennial streams. When grazing occurs as directed by the BLM, management on these pastures has been successful in improving habitat conditions.

Aquatic habitat surveys using the *Alaskan Aquatic Resource Information Management System* were completed in 1996 and 1997 on all of the perennial fish-bearing streams on the Resource Area. The Fremont National Forest completed many surveys on forestlands during these years as well. While some of the data collected from these surveys has yet to be analyzed, analysis of the data used in the *Deep Creek Watershed Analysis* (USDA and USDI 1998) indicated that stream temperature was the major limiting factor on the watershed's streams, resulting in a generally poor overall rating on most stream reaches. Temperatures greater than the State standard are the result of several factors, including water withdrawal, loss of streamside vegetation, channel widening, and lower summer flows. Stream channel entrenchment has prevented water storage in floodplain soils, thereby reducing water storage that would promote longer-duration stream flow and reduced or eliminated interflow between cool/cold underground waters in the riparian area (floodplain) and surface stream flow. Even under pristine conditions, it is unlikely State standards for temperature could be achieved on BLM stream reaches. However, most other elements (pools per mile, large wood per mile, pools per mile greater than 2.6-feet deep, unstable banks, proper functioning condition rating, and sediment rating) were good to fair with some poor ratings.

Proper Functioning Condition assessments, stream surveys, and photo monitoring (all on file at Lakeview BLM), and field reconnaissance generally indicate improving trends in fish habitat and riparian conditions throughout the Resource Area. Photos points established in the 1970's–1990's that were retaken in 2005-2010 show increases in native riparian vegetation, including willows, sedges and rushes, as well as stream channel narrowing and deepening, and increases in stream bank stability.

While most stream conditions provide adequate habitat for suckers and trout, there are opportunities to enhance some habitat components. Deep pools may be created and stream width-to-depth ratios may be reduced with structural controls. Other projects could be implemented that would improve cover and forage areas. Management actions, including continued grazing control and active restoration projects, could be initiated to improve temperature conditions by channel narrowing and overstory vegetation establishment.

Treatments Planned Relating to the Issues

Most of the treatments described for each alternative in Chapter 2 have the potential to affect the fish and other aquatic resource-related issues described for this analysis. Approximately 6.75 percent of the riparian vegetation on the Resource Area (including the Warner Wetlands) is infested with documented invasive plants (Treatment Category 1); the riparian areas have a disproportionate share of the invasive plants on the Resource Area. This is because the area is so hospitable to plants, and people, animals, and water move the seeds and other propagules around. Upland treatments also have the potential to affect fish habitat when wind, drift, or overland or subsurface water flow move unbound herbicides downslope. Because of the importance of limited riparian areas on the Lakeview Resource Area for fish habitat protection and function, these areas are also high priority for control treatments. There are nearly 100 miles of fish-bearing perennial streams on the Resource Area. If the 6.75 percent infested riparian area applies to these miles, invasive plant treatments would be conducted along 6 to 7 miles of these streams for Treatment Category 1, and unknown additional miles for Category 2 and 3, potentially affecting fish.

The Proposed Action envisions up to 20,000 additional acres treated per year, much of it likely aerially applied, to rehabilitate sites infested with, or burned and in danger of becoming infested with, invasive annual grasses. These treatments would generally be in larger units laid out away from streams, although aerial applications would have a higher likelihood of drift than most treatments under the No Action Alternative. Some of this may be pre-burned, temporarily exposing large areas of soil to wind and overland flow of ash and soil, and potentially, soil-bound pre-emergent herbicides. In the case of Treatment Category 4, post-wildfire emergency stabilization, treatments would have the objective of watershed protection as well as preventing soil movement and infestation by annual grasses.

Standard Operating Procedures and Mitigation Measures Relevant to Effects

The potential for adverse herbicide-related effects on fish and other aquatic resources is minimized for both alternatives by existing Standard Operating Procedures and Mitigation Measures (see Appendix A). These include but are not limited to:

Fire Use
- Maintain vegetated buffers near fish-bearing streams to minimize soil erosion and soil runoff into streams.

Mechanical
- Maintain adequate vegetated buffer between treatment area and water body to reduce the potential for sediments and other pollutants to enter the water body.

Chemical
- Use appropriate buffer zones based on label and Risk Assessment guidance.
- Use appropriate application equipment/method near water bodies if the potential for off-site drift exists.
- Limit the use of terrestrial herbicides in watersheds with characteristics suitable for potential surface runoff that have fish-bearing streams during periods when fish are in life stages most sensitive to the herbicide(s) used. (MM)
- Establish appropriate herbicide-specific buffer zones for water bodies, habitats, or fish or other aquatic species of interest (see Tables A-3 and A-4 (*Buffer Distances to Minimize Risk*) in Appendix A, *Project Design Features, Standard Operating Procedures, Mitigation Measures, Conservation Measures, Prevention Measures, and Best Management Practices Standard Operating Procedures and Mitigation Measures*, and recommendations in individual ERAs). (MM)
- Consider the proximity of application areas to salmonid habitat and the possible effects of herbicides on riparian and aquatic vegetation. Maintain appropriate buffer zones around salmonid-bearing streams. (MM)
- Use of adjuvants with limited toxicity and low volumes is recommended for applications near aquatic habitats. (Oregon FEIS MM)

Environmental Consequences

Effects of Treatment Methods to Fish and Other Aquatic Resources

Herbicide Treatments

Stehr et al. (2009) studied developmental toxicity in zebrafish (*Danio rerio*), which involved conducting rapid and sensitive phenotypic screens for potential developmental defects resulting from exposure to six herbicides (picloram, clopyralid, imazapic, glyphosate, imazapyr, and triclopyr) and several technical formulations. Available evidence indicates that zebrafish embryos are reasonable and appropriate surrogates for embryos of other fish, including salmonids. The absence of detectable toxicity in zebrafish screens is unlikely to represent a false negative in terms of toxicity to early developmental stages of Threatened or Endangered salmonids. Their results indicate that low levels of noxious weed control herbicides are unlikely to be toxic to the embryos of Federally Listed fish. Those findings do not necessarily extend to other life stages or other physiological processes (e.g., smoltification, disease susceptibility, behavior, etc.) (USDI 2013b:249).

Standard Operating Procedures and Mitigation Measures including limitations on the herbicides, adjuvants, carriers, handling procedures, application methods, drift minimization measures, and riparian buffers greatly reduce the likelihood that significant amounts of herbicide would be transported to aquatic habitats, although some herbicides are still likely to enter streams through aerial drift, in association with eroded sediment in runoff, and dissolved in runoff, including runoff from intermittent streams and ditches. No adverse effects to tolerant fish are anticipated (see Appendix D, *Herbicide Risk Tables*). This conclusion tentatively applies to susceptible[56] (including Federally Listed) fish as well, pending completion of the Biological Assessment.

[56] From the Risk Assessments, fish susceptible species include coldwater fish, such as trout, salmon, and Federally Listed species. Fish tolerant species include warm water fish, such as fathead minnows. See Risk Table D-7 in Appendix D.

The indirect effects or long-term consequences of invasive plant control would depend on the long-term progression of climatic factors and the success of follow-up management actions to exclude invasive plants from the action area, provide early detection and rapid response before such species establish a secure position in the plant community, eradicate incipient populations, and control existing populations.

BLM-Evaluated Herbicides

Chlorsulfuron (Proposed Action) is a selective, ALS-inhibitor herbicide. It is not registered for use in aquatic systems. Chlorsulfuron's physical and chemical properties suggest that it is highly soluble in water, and is likely to remain dissolved in water and runoff from soils into water bodies. In addition, this herbicide has a long half-life in ponds, but is not likely to bio concentrate in aquatic wildlife. However, none of the evaluated scenarios, including accidental direct spray and spill of chlorsulfuron, poses any risk to fish in streams and ponds.

Diflufenzopyr (Proposed Action) is a selective, systematic post-emergence herbicide active ingredient. It is not registered for use in aquatic environments. The physical and chemical properties of diflufenzopyr suggest that this herbicide would be removed from an aquatic environment relatively rapidly following contamination and would not appreciably bio concentrate in fish tissue. The Ecological Risk Assessment shows that diflufenzopyr does not pose a risk to fish under any of the Risk Assessment scenarios.

Fluridone: (Proposed Action) is a slow-acting, broad-spectrum aquatic herbicide that can be used selectively for management of aquatic species, including water-thyme and Eurasian watermilfoil. As fluridone is relatively non-persistent, it is not expected to affect water quality for a substantial period of time (Muir et al. 1980).

Fluridone has little tendency to bioaccumulate in fish (Washington Department of Health 2000). An accidental spill of fluridone poses moderate risk to fish. Direct spray of fluridone over a pond at the maximum application rate poses a low risk to fish. Accidental direct spray of fluridone over a stream (aquatic herbicides are not typically applied to streams) at the maximum application rate poses no or low risk to fish. Because fluridone is an aquatic herbicide, off-site drift and surface runoff scenarios were not evaluated.

Imazapic (Proposed Action), an ALS-inhibitor, is a selective, systemic herbicide. It would not be used for treatment of aquatic vegetation, but could be used in riparian areas. Leafy spurge and the perennial mustards would be target species.

The average half-life for imazapic in a pond is 30 days, and this herbicide has little tendency to bioaccumulate in fish (Barker et al. 1998). According to the manufacturer's label, imazapic has a high runoff potential from soils for several months or more after application. Accidental direct spray and spill scenarios generally pose no risk to fish when imazapic is applied at either the typical or maximum application rate. Risk Assessments show fish are not at risk from off-site drift or surface runoff of imazapic.

Diflufenzopyr + Dicamba (Proposed Action) is a selective, systematic herbicide, with low residence times in water bodies and a low bio concentration potential (National Library of Medicine 2002). Diflufenzopyr + dicamba application does not pose a risk to fish under any application scenario (also see toxicity studies under dicamba and diflufenzopyr).

Sulfometuron methyl (Proposed Action), an ALS-inhibitor, is a broad-spectrum, pre- and post-emergent herbicide. It is not approved for use in aquatic systems, but could be used to treat perennial pepperweed, hoary cress, and other weeds associated with riparian systems if the application was made far enough from water to ensure that the active ingredient did not get into the water. Sulfometuron methyl has a relatively low residence time in aquatic systems, and bioaccumulation in aquatic organisms has not been detected (Extoxnet 1996a). According to

Ecological Risk Assessments, there would be no risks to fish associated with the use of sulfometuron methyl under any of the evaluated scenarios.

Forest Service-Evaluated Herbicides

The effects of herbicides on salmonids were fully described by National Marine Fisheries Service (NMFS) in recent biological opinions with the U.S. Environmental Protection Agency (EPA) and U.S. Forest Service (NMFS 2010, NMFS 2011a, NMFS 2011b, NMFS 2012) and in SERA reports. For the 2007 Aquatic Restoration Biological Opinion (ARBO),[57] the Agencies evaluated the risk of adverse effects to Federally Listed salmonids and their habitat in terms of hazard quotient values (NMFS 2008).

Hazard quotients evaluations are summarized below for the herbicides used in the 2007 ARBO (chlorsulfuron, clopyralid, glyphosate, imazapyr, metsulfuron methyl, and sulfometuron methyl). Hazard quotients were calculated by dividing the expected environmental concentration by the effects threshold concentration. Adverse effect threshold concentrations are 1/20th (for Federally Listed aquatic species) or 1/10th (all other species) of LC_{50} values, or no observable adverse effect concentrations, whichever concentration was lower. The water contamination rate values are categorized by herbicide, annual rainfall level, and soil type. Variation of herbicide delivery to streams among soil types (clay, loam, and sand) is displayed as low and high water contamination rate values. All water contamination rate values are from Ecological Risk Assessments conducted by SERA. Given that there are hazard quotient values > 1, adverse effects are likely to occur. Hazard quotient values were calculated for fish, aquatic invertebrates, algae, and aquatic macrophytes.

For dicamba, diflufenzopyr + dicamba, imazapic, picloram, triclopyr, and 2,4-D, which were added to list, ARBO II (USDI 2013b) referred to the National Marine Fisheries Services' opinions, SERA reports, various other literature sources, and the 2013 BA (USDA et al. 2013) to characterize risk to Federally Listed fish species. Those conclusions are included in the information below.

2,4-D: (common to both alternatives) Drift and runoff are the most likely pathways of deposition of 2,4-D into aquatic habitats (EPA 2009b) and it is detected frequently in freshwater habitats within the four western states where Federally Listed Pacific salmonids are distributed. 2,4-D acid, salts, and esters are toxic to aquatic animals, with esters having greater toxicity than 2,4-D acid and salts. 2,4-D amine fits into the "moderate" risk group. Given their long residency period and use of freshwater, estuarine, and near shore areas, juveniles and migrating adults have a high probability of exposure to herbicides that are applied near their habitats. The risk of adverse effects to fish and their habitats was evaluated in terms of hazard quotient values and no observable effect concentration levels. Over the range of 2,4-D acid/salt application rates used in U.S. Forest Service programs (0.5-4 lb. acid equivalent/acre), adverse effects on fish, amphibians, and aquatic invertebrates are likely only in the event of an accidental spill. With regard to 2,4-D esters, however, adverse effects on aquatic animals (e.g., fish, invertebrates, amphibians) are plausible in association with runoff (all application rates) and would be expected in direct spray to water and in cases of relatively large accidental spills (USDA 2006b). NMFS (2011a) determined that 2,4-D BEE posed a medium risk to fish. 2,4-D amine is labeled for aquatic use and 2,4-D ester is characterized as high risk to all Federally Listed fish due to the [narrow] proposed no-spray buffers (USDI 2013b).

Clopyralid (Proposed Action) is a selective herbicide most effectively used post-emergence for the control of broadleaf weeds. It is not registered for aquatic vegetation treatment, but can be used in riparian areas if the application does not affect standing water. Clopyralid is used to treat teasel, common cocklebur, and several species of thistles and knapweeds that could be found in riparian areas.

[57] Biological Opinion and Letter of Concurrence USDA Forest Service, USDI Bureau of Land Management and the Coquille Indian Tribe for Programmatic Aquatic Habitat Restoration Activities in Oregon and Washington That Affect ESA-listed Fish, Wildlife, and Plant Species and their Critical Habitats (USDI 2007e).

Application of clopyralid under the modeled scenario did not result in any hazard quotient exceedances for any of the species groups. Clopyralid applications were determined not likely to adversely affect Federally Listed salmonids or their habitat because hazard quotient values are less than one (USDI 2013b).

Dicamba (common to both alternatives) is a growth regulator selective herbicide that controls many broadleaf plants, but generally would not harm grasses. Its soil activity is very short. Like 2,4-D, it also is available as both an amine and ester formulation. Drift from dicamba applications is common, especially from the ester formulation (DiTomaso et al. 2006). The Washington State Department of Agriculture has added dicamba to its list of Pesticides of Concern because it is being increasing detected in most of the streams sampled in Washington (Sargeant et al. 2013).

The risk characterization for aquatic animals is extremely limited by the available toxicity data. Another very substantial limitation in the risk characterization is that no information is available on the chronic toxicity of dicamba to aquatic animals and the available acute toxicity data do not permit reasonable estimates of toxicity values for chronic toxicity. Acute toxicity studies in fish indicate that dicamba is relatively non-toxic, although salmonids appear to be more sensitive than other freshwater fish to the acute toxicity of dicamba (SERA 2004c). However, the EPA concluded that dicamba compounds with currently registered uses will have "no effect" on Federally Listed fish and their critical habitat, and therefore consultation with the National Marine Fisheries Service is not necessary (EPA 2003). Therefore, dicamba likely fits into the “low” risk group.

Glyphosate (common to both alternatives) is a non-selective systemic aquatic herbicide. It can be applied as a broadcast, spot, stem injection, or wipe application, and is effective in controlling purple loosestrife, cattail, and in some situations, saltcedar. In general, glyphosate is immobile in soil, being readily adsorbed by soil particles and subject to microbial degradation (Norris et al. 1991). This immobility reduces the potential for glyphosate to enter water bodies during runoff.

Based on bioassays, technical grade glyphosate is classified as non-toxic to practically non-toxic in freshwater fishes (EPA 1993). Some formulations are more toxic to fish than technical grade glyphosate. At the typical application rate, the less toxic formulation of glyphosate poses little risk to fish, except under accidental spill scenarios, for which there is a low to moderate risk to fish. At the typical application rate, the more toxic (non-aquatic) formulation of glyphosate poses a high risk to fish under accidental spill scenarios, and a low risk under routine acute exposure scenarios (moderate risk to susceptible fish species). At the maximum application rate, the less toxic formulation of glyphosate poses a low risk to fish under acute exposure scenarios. Accidental spills for the maximum application rate pose moderate to high risk to fish. At this same application rate, the more toxic formulation of glyphosate poses a high risk to fish under accidental spill scenarios, and moderate risk to fish under acute exposure scenarios. Based on these data, the EPA classified glyphosate formulation as moderately toxic to practically non-toxic to freshwater fishes (SERA 2003a).

Glyphosate hazard quotient exceedances occurred for fish and algae only at rainfall rates of 150 inches per year (over 15 times the approximately nine inches per year on average Resource Area receives), and no hazard quotient exceedances occurred for aquatic invertebrates or aquatic macrophytes.

Hexazinone: (Proposed Action) According to Ecological Risk Assessments, there is a low risk to fish in ponds or streams only for accidental spill scenarios.

Bioassays on the active ingredient hexazinone and commercial formulations that include hexazinone indicate that commercial formulations are substantially less toxic than the active ingredient alone, even when exposures are normalized for hexazinone levels (Wan et al. 1988).

Imazapyr (Proposed Action) is an ALS-inhibiting herbicide used in the control of a variety of grasses, broadleaf weeds, vines, brush species, and aquatic vegetation. It is effective in the control of saltcedar, which dominates many riparian systems in the West. Imazapyr is relatively non-toxic to fish (SERA 2011b). Imazapyr poses a low risk to susceptible fish only for the accidental spill scenario at the maximum application rate. Tolerant fish were not modeled.

ARBO II reported that no hazard quotient exceedances occurred for imazapyr for fish or aquatic invertebrates. Hazard quotient exceedances occurred for algae and aquatic macrophytes at a rainfall rate of 150 inches per year on low permeability clay soils (USDI 2013b).

Algae and macrophytes provide food for aquatic macroinvertebrates, particularly those in the scraper feeding guild (Boulton 1993). These macroinvertebrates in turn provide food for rearing juvenile salmonids. However, the small amount of imazapyr that could reach the water from applications planned for the Resource Area should not result in measureable effects.

Metsulfuron methyl (Proposed Action) is a selective ALS-inhibiting herbicide used pre- and post-emergence in the control of many annual and perennial weeds and woody plants. It is not registered for use in aquatic situations, but can be applied in riparian areas if the herbicide does not come into contact with water (SERA 2004e). Overall, metsulfuron methyl appears to have a very low potential to cause any adverse effects in aquatic animals. According to the Ecological Risk Assessments, metsulfuron methyl poses almost no risk to fish in streams and ponds under accidental, acute, and chronic exposure scenarios involving application of typical and maximum rates (although an accidental spill at the maximum application rate poses a low risk to susceptible fish species).

Values from 96-hour LC_{50} values for acute toxicity in bluegill sunfish and rainbow trout ranged from approximately 150 mg/L to 1,000 mg/L for both species (SERA 2004e). In rainbow trout, signs of sub-lethal toxicity include erratic swimming behavior, lethargy, and color change at concentrations around 100 mg/L, with a no observable effects concentration of 10 mg/L (SERA 2004e). One investigation did not observe any effects on rainbow trout hatching, larval survival, or larval growth over a 90-day exposure period, at a no observable effects concentration of up to 4.5 mg/L (Kreamer 1996 cited in SERA 2004e). The no observable effects concentration of 10 mg/L for sub-lethal effects in rainbow trout is approximately 100 times more susceptible than bluegill sunfish that has a no observable effects concentration of 1,000 mg/L.

No hazard quotient exceedances occurred for metsulfuron for fish, aquatic invertebrates, or algae. The hazard quotient exceedances for aquatic macrophytes occurred at the maximum application rate on clay soils at rainfall rates of 50 and 150 inches per year. Applications at Lakeview would not be exposed to such conditions.

Picloram (common to both alternatives) acts as a plant growth regulator. It would not be used to control aquatic vegetation. The acute and chronic toxicity of picloram has been assayed in various species of fish. According to the Ecological Risk Assessments, risk to susceptible fish is moderate for accidental spill scenarios at the typical or the maximum application rate, and low for tolerant fish at the maximum rate. Under acute and chronic exposure scenarios, picloram poses no risk to fish (SERA 2011c).

Based on expected concentrations of picloram in surface water, all central estimates of the hazard quotients are below the level of concern for fish, aquatic invertebrates, and aquatic plants. No risk characterization for aquatic-phase amphibians can be developed because no directly useful data are available. Upper bound hazard quotients exceed the level of concern for longer-term exposures in susceptible species of fish (hazard quotient =3) and peak exposures in susceptible species of algae (hazard quotient =8). It does not seem likely that either of these hazard quotients would be associated with overt or readily observable effects in either fish or algal populations. In the event of an accidental spill, substantial mortality would be likely in susceptible species of fish (SERA 2011a).

Triclopyr (Proposed Action) is a selective, systemic herbicide used on broadleaf and woody species, including woody species found in riparian and aquatic areas, such as saltcedar, willows, and purple loosestrife. Commercial formulations of triclopyr may contain the acid form (TEA) or the BEE form.

With the exception of aquatic plants, substantial risks to nontarget species (including humans) associated with the contamination of surface water are low, relative to risks associated with contaminated vegetation.

Applications of triclopyr BEE in excess of about 1.5 to 3 lbs. acid equivalent/acre could be associated with acute effects in susceptible species of fish or invertebrates, in cases of substantial drift or off-site transport of triclopyr via runoff (SERA 2011c). Stehr et al. (2009) observed no developmental effects at nominal concentrations of 10 mg/L or less for purified triclopyr alone or for the TEA formulations Garlon 3A and Renovate. However, the developmental toxicity of other triclopyr-containing herbicides, especially formulations based on BEE (e.g., Garlon 4), rewash were not determined. NMFS (2011a) determined that triclopyr BEE (esters) posed a medium risk to fish. However, given the uses, fate, and toxicity of triclopyr BEE, the National Marine Fisheries Service did not expect mortality to be a common occurrence. Triclopyr acid (TEA) posed a low risk only to susceptible fish under the accidental spill scenario at the maximum rate.

Adjuvants, Degradates, and Inert Ingredients

Adjuvants: The BLM reviewed toxicity data for adjuvants, such as surfactants and anti-foam agents, to assess risks to fish. In addition, the Groundwater Loading Effects of Agricultural Management Systems (GLEAMS) model was used to evaluate the risks associated with polyoxyethylenamine (POEA), a surfactant found in some glyphosate formulations that is more toxic to fish than glyphosate itself. This adjuvant is of greatest concern in terms of potential effects to fish. Using the GLEAMS model, the BLM predicted the portion of an adjuvant that would potentially reach an adjacent water body via surface runoff.

Based on GLEAMS modeling for POEA, risks to aquatic organisms were not predicted for the majority of pond and stream scenarios involving exposure to this adjuvant. However, risks were predicted (using the most conservative acute Endangered species level of concern) for applications at a distance of 0 feet from the water body. This scenario, which essentially assumes a direct application to the water body with no dilution or drift, is highly conservative and highly unlikely under BLM application practices. Risks to Federally Listed and other Special Status aquatic organisms in streams and ponds were also predicted for aerial applications of POEA at the maximum rate at a distance of 100 feet from the water body. However, it is unlikely that the BLM would apply glyphosate formulations containing POEA in an area known to contain Special Status aquatic species. Because of a lack of physical chemical property information, POEA was not modeled for leaching properties and runoff to water bodies. Therefore, there is some uncertainty associated with risk to fish from this exposure.

Some sources (Muller 1980, Lewis 1991, Dorn et al. 1997, Wong et al. 1997) generally suggest that the acute toxicity of surfactant and anti-foam agents to aquatic life ranges from 1 to 10 mg/L, and that chronic toxicity ranges as low as 0.1 mg/L. This evaluation indicates that, for herbicides with high application rates, adjuvants have the potential to cause acute, and potentially chronic, risk to aquatic species. More specific modeling and toxicity data would be necessary to define the level of uncertainty. Use of adjuvants with limited toxicity and low volumes near aquatic habitats would mitigate this risk. Wherever aquatic herbicides are required, adjuvants approved by ARBO II (for Federally Listed species habitats) should be considered for use. These adjuvants are identified on the list of BLM-approved adjuvants included in Appendix C, Table C-3, *Adjuvants Approved for Use on BLM-administered Lands*.

Degradates: Degradates may be more or less mobile and more or less toxic in the environment than their source herbicides (Battaglin et al. 2003). Differences in environmental behavior (e.g., mobility) and toxicity between parent herbicides and degradates makes prediction of potential impacts challenging. For example, a less toxic, but more mobile, bioaccumulative or persistent degradate may have a greater adverse impact due to residual concentrations in the environment. The BLM conducted a detailed analysis of degradates for herbicides proposed for use under the herbicide treatment program. Several databases, including EPA's ECOTOX database (EPA 2009a), were searched, and relevant aquatic toxicity data for degradates were identified and considered in the Ecological Risk Assessments (see Appendix D, *Herbicide Risk Tables*).

In most cases, predicted risks to fish from degradates would likely be less than risks from the active ingredients imazapyr and metsulfuron methyl predicted in Ecological Risk Assessments. For some degradates associated with 2,4-D, fluridone, and triclopyr, selected aquatic species may be more susceptible to the degradate than to the active ingredient. These findings should be considered in the context of herbicide use practices, the concentration of degradate relative to the parent compound, the process of degradate production, and the body of available toxicity data. For instance, in most cases, the increased toxicity of the degradate may be offset by the fact that only a minute amount of the degradate is produced, which would likely disperse rapidly in an active aquatic system.

Other Ingredients: Relatively little toxicity information was found on inert ingredients during preparation of the BLM Ecological Risk Assessments. A few acute studies on aquatic or terrestrial species were reported. No chronic data, no cumulative effects data, and almost no indirect effects data (food chain species) were found for the inerts in ten herbicides examined. However, some of the inerts, particularly the EPA List 3 compounds (inert ingredients of unknown toxicity) and unlisted compounds, may potentially be moderately to highly toxic to aquatic species (based on information in Material Safety Data Sheets or published data)(USDI 2010a:229).

Based on GLEAMS modeling of a generalized inert compound in a “base case” watershed, concentrations of inert ingredients exceeded concentrations of herbicide active ingredients under all stream and pond scenarios. In general, greater exposure concentrations of inerts occurred under higher application rates, exceeding 1 mg/L for the maximum pond application scenario. These results suggest that inerts associated with the application of herbicides may contribute to acute toxicity to fish if they reach the aquatic environment. However, given the lack of specific inert toxicity data, this statement may overestimate their potential toxicity. It is assumed that toxic inerts would not represent a substantial percentage of the herbicide, and that minimal impacts to the environment would result from these inert ingredients. Standard Operating Procedures and Mitigation Measures should make adverse effects to fish negligible (USDI 2010a:229).

Non-Herbicide Treatments

Manual and Mechanical

Certain manual and mechanical treatments within riparian areas that disturb soil, such as grubbing and pulling, carried out over a large area, may lead to increased erosion and stream sedimentation. Resultant sedimentation may adversely affect fish by covering eggs or spawning gravels, reducing prey availability, or directly harming fish gills, reducing stream carrying capacity for fish. However, the risk of harm to aquatic ecosystems due to fine sediment production from manual treatment or use of motorized hand tools is low, and short-term, resulting in effects likely to be localized and minor. However, depending on the scale of treatment, pulling significant numbers of large plants or treating large riparian areas with motorized hand tools may moderately increase the risk to fish. Cut vegetation not in danger of contributing invasive plant seeds or sprouting matter to the site (including any cut non-target vegetation) left on the treatment site can reduce the potential for erosion and subsequent sediment delivery to streams or other water bodies.

The risk of harm to fish from use of wheeled or tracked machinery would vary, depending on the extent of treatment area and proximity to aquatic environments; vehicle tracks can compact soils and divert waters. Fish are temporarily affected when water is affected by turbidity, sedimentation, and local increases in surface water runoff. However, all wheeled equipment (including off-highway vehicles containing spray mix and other herbicide application equipment) would normally be kept well away from riparian areas to minimize aquatic effects and the risk of water-affecting spills. Some kinds of equipment, such as walking brush-cutters, are designed to minimize ground disturbance.

Power-tool use near water can potentially cause water contamination with minor amounts of chainsaw oil or minor fuel spill. An oil skim on water, while highly unlikely, can deplete oxygen levels and cause fish kills. This effect is more likely for fish living in ponds than for fish living in rivers or streams, since the flow of water in streams would move and disperse small amounts of oil.

Targeted Grazing

Targeted grazing is not a common weed treatment technique on the resource area in wet, riparian and/or fishbearing areas and its use is expected to be minimal. Targeted livestock grazing is used occasionally in the 5,150[58] acres of riparian exclosures to control some invasive species. The limited extent of the treatment, coupled with the project design features adopted for this analysis will result in any effects to water, riparian and/or fish and fish habitat being at a negligible level in the short-term. Effects to aquatic resources are expected to be beneficial in the long-term as native riparian vegetation is re-established.

Prescribed Fire for Invasive Plant Control

The risk of harm to fish from prescribed fire for invasive plant control depends on fire intensity, timing, and landform, among other factors. Prescribed burning has the potential to bare large areas of soil, and thus increase both surface erosion and sedimentation of streams. Heavy runoff from burned areas can increase water pH, indirectly affecting aquatic biota. Site-specific implementation of Standard Operating Procedures would help prevent this method from being used where significant adverse stream effects would occur.

Biological Controls and Seeding/Planting

No adverse effects to fish are anticipated from either of these non-herbicide processes.

Effects of Invasive Plants on Fish and Other Aquatic Resources

Riparian systems are being invaded by invasive plants, which are generally detrimental to native aquatic species. Potential adverse effects to aquatic species are also described in part under the *Water Resources* and *Wetlands and Riparian Areas* sections in this Chapter. Invasive plants are generally less efficient at holding soil in place, and cause water-quality problems. Whenever the water quality of a fish-bearing stream is affected, so are fish. Specifically, fish are affected by turbidity, sedimentation, loss of large organic debris, loss of shading (and associated temperature increases), and exposure to hazardous substances. Erosion increases turbidity and sedimentation that can reduce fish feeding success. Severe cases of sedimentation can keep fry (early-stage fish) from emerging, or fill in or reduce the deeper pools preferred by fish, especially trout.

In riparian areas, invasive plants (e.g. Canada thistle, perennial pepperweed, etc.) often support fewer native insects than native plant species, which could affect food availability for insectivorous fish species, such as salmonids. The replacement of native riparian plant species with invasive plants may adversely affect stream morphology (including shading and instream habitat characteristics), bank erosion, and flow levels. Invasive plants break down the complex natural vegetative physical structure and interfere with natural processes.

Problematic invasive plants that could be treated by the BLM using herbicides include water-thyme and Eurasian watermilfoils (although not currently documented on the Resource Area), which are found in ponds, lakes, and streams; and perennial pepperweed, knapweed, and thistles, which are found in riparian habitats. These species displace native vegetation and decrease species' diversity. Dense concentrations of aquatic plants can reduce light penetration and lower the concentration of dissolved oxygen in the water and can upset the balance of the fish community by providing too much cover for small fish (Payne and Copes 1986). Many invasive riparian plants form monocultures that crowd out more desirable native plant species.

[58] This does not include about 3,164 acres of exclosure in occupied Warner Sucker habitat.

Effects by Alternative

No Action Alternative

Herbicide Effects

Based on Forest Service Ecological Risk Assessments, chronic (long-term) and acute (short-term) exposures modeled for all herbicides in this alternative except acute exposure for glyphosate did not exceed the no observed effects concentration for any fish. For glyphosate, the Ecological Risk Assessment modeling predicted low to moderate risks from acute exposures at typical and maximum application rates. It is unlikely that the use of herbicides proposed in this alternative would cause fish kills at the concentrations likely to occur in water, even for Federally Listed fish. Mortality to fish is also not expected or likely from operational use, because buffers and other Standard Operating Procedures, degradation, adsorption, and other factors reduce the amount of herbicide that could enter a water body. In rare circumstances, high concentrations of herbicides could wash into streams from rainfalls shortly after herbicide application along road ditches or other surfaces that rapidly generate overland flows, or because of an accidental spill. In such instances, localized fish kills are plausible in small tributary streams or small enclosed water bodies where contaminated flows would not be readily diluted. Dicamba presents a risk (low) only for susceptible fish under the accidental spill scenario at the maximum rate.

Invasive Plant Spread

Noxious weeds would be expected to continue spreading at about 12 percent per year on the Resource Area, with the 44,090 acres of documented sites (Treatment Category 1) spreading to an estimated 215,000 acres in 15 years (see *Invasive Plants* section in this Chapter). A disproportionate amount of Lakeview's invasive plants are in riparian areas, and spread would continue to be fastest (in terms of acres) in these areas. In addition, the inability to treat other non-noxious invasive plants with herbicides increases the likelihood additional plants would become well established before they are declared noxious weeds. The spread of invasive plant populations at current rates would continue to cause damage to native plant communities, including riparian communities, which directly or indirectly provide habitat for fish.

Proposed Action

Herbicide Effects

Based on Ecological Risk Assessments, chronic (long-term) and acute (short-term) exposures modeled for chlorsulfuron, clopyralid, fluridone, hexazinone, imazapic, metsulfuron methyl, and sulfometuron methyl (seven of the herbicides added by this alternative to the four discussed in the No Action Alternative) did not exceed the no observed effects concentration for any fish. Two herbicides in this alternative and not included in No Action Alternative, imazapyr and triclopyr, were found to have high risk under certain scenarios. Imazapyr was found to have high risk for susceptible (cold-water) fish in an accidental spill scenario at the maximum exposure. Modeling for triclopyr found a high risk to susceptible (cold-water) fish in the accidental spill scenario at both the typical and maximum application rates, and a high risk for susceptible (cold-water) fish in the acute exposure scenario.

Based on the results of the Ecological Risk Assessments, it is unlikely the fish species would be harmed by herbicide use proposed in this alternative.

As this alternative proposes to treat more acres than the No Action Alternative, it could potentially result in greater exposure to fish. However, much of this increase would occur in upland areas, generally away from streams. Also, the BLM's ability to use up to ten additional herbicides would reduce risks to fish when compared to the No Action Alternative. For example, fluridone shows no risks to fish at typical application rates, and triclopyr and imazapyr pose relatively little risk to fish. The use of glyphosate is predicted to decrease 70 percent under this alternative (see Table C-4, *Estimated Treatment Acres, by Alternative and Category*).

Imazapic, chlorsulfuron, clopyralid, and metsulfuron methyl would provide benefits greater than those under the No Action Alternative would. These herbicides could be used to control biennial thistles, annual and perennial mustards, knapweeds, starthistle, and cheatgrass. These invasive plant species degrade riparian and upland habitats and can contribute to shortened fire cycles, followed by soil erosion and sedimentation (see *Invasive Plants* and *Soils Resources* sections in this Chapter).

Under accidental direct spray, spill, and off-site drift scenarios modeled in the Ecological Risk Assessment, imazapic presents a very low or no risks to fish, similar to chlorsulfuron, and sulfometuron methyl but lower than the risks associated with other herbicides currently being used.

Ecological Risk Assessments for chlorsulfuron, imazapic, and sulfometuron methyl predict no risk to fish from direct spray, off-site drift, surface runoff, or accidental spill to a pond. For the surface runoff scenarios, risks to fish were not predicted for chlorsulfuron, fluridone, imazapic, and sulfometuron methyl. Glyphosate and triclopyr do present risk to fish under some application scenarios. Each of the four currently available and ten additional herbicides that would be available under this alternative has different properties (e.g., mode of action), different suggested uses, and is most effective/least risky in different scenarios. This suggests that the more herbicides available for use, the more opportunities there would be to select one or more during project-level design that would present the least risk to fish while accomplishing the specific invasive plant control objective.

Fluridone is an aquatic herbicide that would be available under this alternative to control submerged aquatics including Eurasian watermilfoils and hydrilla if they were to be found on the Resource Area in the future. The fluridone Ecological Risk Assessment predicts no risk to fish from direct spray in a pond (fluridone is not used in streams). However, the Ecological Risk Assessment predicts risk to fish may occur when fluridone is spilled directly into a pond. Fluridone is slow acting and is used at low concentrations on both submergent and emergent plants. As the plants die off slowly, there is not a large concentration of decaying organic matter added to the water at one time so it is less likely to deoxygenate the water and kill fish than other aquatic herbicides.

Should an aquatic invasive plant invade the Resource Area in the future, it is very unlikely that implementation of aquatic vegetation control under this alternative would result in a fish-kill. Fish have avoidance mechanisms and are mobile allowing them to move to other parts of a lake or stream in order to avoid adverse conditions. However, under certain circumstances such as an accidental spill in an enclosed water body or small fish-bearing stream, fish-kills could occur.

Invasive Plant Spread

Under this alternative, the noxious weed spread rate is projected to be reduced to 7 percent per year over the course of 15 years, and noxious weeds are projected to infest 68,000 fewer acres of Resource Area lands in 15 years than under the No Action Alternative (see *Invasive Plants* section in this Chapter). Although the Proposed Action would prevent more invasive plant infestations, their continued spread would continue to damage native plant communities, including riparian communities that directly or indirectly provide habitat for fish. This continued, albeit reduced, spread would have harmful effects on fish.

Cumulative Effects for Water Resources, Riparian and Wetlands, and Fish and Other Aquatic Resources

As noted above, causes of stream degradation are removal of riparian vegetation and destabilization of stream banks. The land use most commonly associated with these problems in the Resource Area is grazing. Other land uses associated with degraded streams include roads, trails, water withdrawal, reservoir storage and release, altered physical characteristics of the stream, mining, and wetlands alteration. Springs have also been disturbed by management activities, such as livestock or wild horse grazing and watering, recreation use, and road construction. This affects the amount of water available. Juniper reduction projects (see Table 3-3) benefit water-related resources in the mid and long-term by removing these unnaturally populous, high water-using trees. Consultation documents for the Warner Sucker list other activities (besides grazing) of several fence construction projects, noxious weed control (USDI 1996c), road construction, waterhole maintenance, prescribed fire, commercial recreation permits, a wetland management plan, and a combination pump station and fish screen project, that could all potentially affect water and fish.

Herbicide use also occurs on other Federal, State, and County lands, private forestry lands, rangeland, agricultural land, utility corridors, and road rights-of-way. The use of herbicides by BLM is usually a small amount of the total use in any large watershed given the mixed ownerships. More than have of the Warner Sucker habitat, for example, is on non-BLM lands.

In 2000, the Oregon Department of Forestry completed a study of aerial pesticide applications, indicating that water resources, aquatic organisms, and riparian management areas were being adequately protected under current rules (which are less strenuous than the Standard Operating Procedures associated with this EA) (Dent and Robben 2000).

In addition, many of the proposed new herbicides pose fewer risks to riparian resources, wetlands, humans, fish, and wildlife than those available under the No Action Alternative. For example, the use of picloram, a particularly soluble, long-lived herbicide is estimated to decrease 63 percent under the Proposed Action. The contribution to downstream effects is minimized with Standard Operating Procedure implementation such as required buffer widths and limits on application methods. No adverse cumulative effects are expected.

Wildlife

Issues

- How would large-scale treatments affect smaller resident species and publicly important species such as mule deer, elk, pronghorn antelope, and bighorn sheep?
- How would treatment disturbances (noise, presence of humans) and the timing of that disturbance affect migratory bird nesting and migration, as well as Special Status wildlife species?
- How would the alternatives affect Greater Sage-Grouse?
- How would the alternatives affect habitat quality (forage and cover availability/quality/quantity over the short/long term)?

Affected Environment

Numerous species of wildlife occur within the Resource Area. Only priority species or taxa and their associated habitats will be discussed. These animals are recognized as being of particular interest to the public and are generally the emphasis for management. A subset of the priority taxa and their associated habitats will be highlighted to provide background information and specific management opportunities relative to them.

A listing of priority animal taxa was developed using the following species ranking criteria: Federal Endangered, Federal Threatened, proposed Threatened, proposed Endangered, BLM Special Status, species of high public interest, and U.S. Fish and Wildlife species of concern. The last category includes game animals, raptors, and species proposed for listing.

Birds

Bald Eagle
The BLM manages the bald eagle as a Special Status species, and it is protected by the *Migratory Bird Treaty Act* of 1918, the *Lacey Act* of 1900, and the *Bald and Golden Eagle Protection Act* of 1940 (USDI 1940).

Inventories of nesting bald eagles in the Resource Area have been conducted annually since 1979 by the Oregon Cooperative Wildlife Research unit and the Oregon Eagle Foundation in cooperation with BLM and U.S. Forest Service wildlife biologists. The surveys over the years have only found three bald eagle nests on BLM-administered lands; however, at least six bald eagle nesting pairs use BLM-administered lands for foraging.

Inventories of wintering bald eagles, foraging areas, and communal night roosts have been conducted in Lake County by BLM, U.S. Forest Service, and Oregon Eagle Foundation biologists. Bald eagles forage in the winter on BLM, U.S. Forest Service, and private lands throughout much of Lake County.

Nesting and wintering bald eagle habitat is affected by human disturbance. Activities such as urban and recreational development, timber harvesting, mineral exploration and extraction, and all other forms of human activity adversely affect the breeding, wintering, and foraging areas of bald eagles by both the immediate action and cumulative long-term effects (USDI 1986c).

Golden Eagle
The golden eagle is a species of high public interest and is given consideration when planning resource activities. The golden eagle is not Federally Listed; however, it is a BLM Special Status species and is protected under the *Migratory Bird Treaty Act* and the *Bald and Golden Eagle Protection Act*.

No systematic inventories have been completed for golden eagles in the Resource Area, but known nesting sites have been monitored at higher frequencies within the last 5 years. The BLM does not know all the golden eagle nest sites in the Resource Area, but the majority of the best habitats have been surveyed for nest sites.

The major impacts to golden eagles or their habitat are disturbance near the nest during the nesting season because of mining and blasting operations, and modification or destruction of the nest site itself.

Peregrine Falcon
The BLM manages the peregrine falcon as a Special Status species, and it is still protected by the *Migratory Bird Treaty Act* of 1918 (USDI 1918), the *Lacey Act* of 1900, and the *Bald and Golden Eagle Protection Act* of 1940. The peregrine falcon was Federally Listed under the *Endangered Species Act* as an Endangered species throughout its range and as a State Endangered species under the *Oregon Endangered Species Act* (Oregon Revised Statutes 1987). The peregrine falcon was delisted in 1999 after reaching the recovery goals set forth in the 1982 *Pacific Coast Recovery Plan for the American Peregrine Falcon*.

Inventories conducted by the Wilderness Research Institute, revealed no active peregrine nests on BLM-administered lands in the Resource Area. It was determined that there was some suitable habitat along Fish Creek Rim, between Plush and Adel, Oregon, where researchers concentrated their search. Peregrines have historically nested along Fish Creek Rim prior to 1948, but no nesting has been observed since.

There are two hack sites where young peregrines hatched in captivity were reintroduced into the wild in Lake County. One site is in the Warner Valley and one in the Summer Lake Basin. Approximately 15–20 peregrines were successfully reintroduced into the wild through cooperative efforts of the BLM, U.S. Forest Service, U.S. Fish and Wildlife Service, Oregon Department of Fish and Wildlife, and the Peregrine Fund. Many of the released birds have been observed in the Warner Valley, Summer Lake Basin, and Abert Lake area since the reintroductions, and one pair has been observed successfully nesting on Winter Rim on U.S. Forest Service-administered lands.

Peregrine falcon habitat and populations are negatively affected by disturbance from development activities such as mining and decorative stone collection, chemicals in the environment, and harassment from human activities. Development activities, such as road construction, and disturbance by recreational activities such as rock climbing, can render nest sites unusable. Invasive plant treatments close to nest sites during critical nesting/rearing periods could adversely affect peregrines. Development projects, such as draining wetlands directly adjacent to peregrine nest sites, can adversely affect the habitat and availability of prey species such as waterfowl and shorebirds; this directly influences the suitability of an area for peregrine occupancy and reproductive success.

Other Raptors

There are many other raptors of high public interest in the Resource Area. These include, but are not limited to, northern pygmy owl, osprey, northern harrier, sharp-shinned hawk, Cooper's hawk, northern goshawk, Swainson's hawk, red-tailed hawk, ferruginous hawk, rough-legged hawk, American kestrel, merlin, prairie falcon, barn owl, great horned owl, western burrowing owl, long-eared owl, short-eared owl, and turkey vulture. Some of these species are provided special management as BLM Special Status species, and three of these—the western burrowing owl, northern goshawk, and ferruginous hawk—are U.S. Fish and Wildlife Service species of concern and protected under the *Migratory Bird Treaty Act* of 1918.

The major impacts to this group include disturbance or damage to nests and nesting structures as well as disturbances near the nest site during nesting seasons, which vary by species, but most nesting activity generally occurs between February 1 and August 31.

Greater Sage-Grouse

On March 5, 2010, after thoroughly analyzing the best scientific and commercial information available, the U.S. Fish and Wildlife Service concluded that the Greater Sage-Grouse warrants protection under the *Endangered Species Act* through the Service's 12-month finding (USDI 2010d). However, the Service has determined that proposing the species for protection is precluded by the need to take action on other species facing more immediate and severe extinction threats. As a result, the Greater Sage-Grouse will be added to the list of species that are candidates for *Endangered Species Act* protection. The Service will review the status of the Greater Sage-Grouse annually, as they do all candidate species, to determine whether it warrants more immediate attention.

The Western Association of Fish and Wildlife Agency has published conservation assessment for Greater Sage-Grouse rouse and sagebrush habitats in 2004 (Connelly et al. 2004). In 2011, a comprehensive summary of current science related to Greater Sage-Grouse and their habitats was published by the Cooper Ornithological Society (Knick and Connelly 2011). This document is commonly known as the Greater Sage-Grouse monograph. The *Oregon Greater Sage-Grouse Conservation Assessment and Strategy* was created in 2005 and adopted by the Oregon Fish and Wildlife Commission in April 2011 (ODFW 2011). The Oregon BLM initiated a Resource Management Plan Amendment in an effort to incorporate Greater Sage-Grouse conservation measures into its Resource Management Plans in eastern Oregon (USDI 2013a). This process is currently under way and is expected to be completed later this year. In the interim, until these Greater Sage-Grouse plans can be completed, the BLM follows the *Greater Sage-Grouse Interim Management Policies and Procedures* (USDI 2012a). Oregon BLM is committed to the conservation of Greater Sage-Grouse and its habitats through all of the plans, policies, and procedures listed above. Greater Sage-Grouse populations have exhibited long-term declines throughout their range (Connelly et al. 2004). Even in states where the species is considered secure, long-term population declines have averaged 30 percent (Crawford and Lutz 1985). In Lake County, Greater Sage-Grouse depend on sagebrush/grassland communities (Gregg et al. 1994). Greater Sage-Grouse populations in Lake County have fluctuated considerably since 1980; however, average populations estimates are roughly somewhere around 9,000 birds within the Resource Area (ODFW 2011).

Greater Sage-Grouse are most frequently found in sagebrush-covered flatlands or gently rolling hills. Greater Sage-Grouse populations that are migratory may travel great distances seasonally. There are three general habitat types that Greater Sage-Grouse use throughout the year: breeding habitat, brood-rearing habitat, and wintering habitat.

Lek sites are Greater Sage-Grouse strutting and mating grounds. The sites are usually small open areas, from 0.01 acre to 10 acres, with low sparse sagebrush or areas denuded of vegetation. Grassy swales, natural and irrigated meadows where grass has been removed, burned areas, cultivated fields adjacent to sagebrush-grass rangelands, and dry lakebeds are often used as leks. Most active leks have been included in the BLM's Preliminary Priority Management Areas (see Figure 2-XX).

Optimum Greater Sage-Grouse nesting habitat consists of the following characteristics: sagebrush stands containing plants 16 to 32 inches in height with a canopy cover that ranges from 15 percent to 25 percent and an herbaceous understory of at least 15 percent cover that is at least 7 inches tall (Gregg et al. 1994). It is recommended that these conditions should be found on 80 percent of the breeding habitat for any given population of Greater Sage-Grouse (Connelly et al. 2004).

Early brood rearing generally occurs relatively close to nest sites, where chick diets include forbs and invertebrates (Gregg and Crawford 2009). Insects, especially ants and beetles, are an important component of early brood-rearing habitat. Brood habitats that provide a wide diversity of plant species tend to provide an equivalent diversity of insects, which are important chick foods (Gregg and Crawford 2009). As fall progresses toward winter, Greater Sage-Grouse start to move toward their winter ranges, and their diet shifts to primarily sagebrush leaves and buds (Connelly et al. 2004).

The greatest negative impact on Greater Sage-Grouse is the destruction or adverse modification of their habitat, including invasion by invasive plants and wildfire. During the past 40 years, many sagebrush-covered valleys and foothill ranges have been sprayed, plowed, chained, burned, disked, or cut in an attempt to convert these ranges to grasslands. Eradication of large tracts of sagebrush has occurred in Lake County but has been slowed and almost stopped over the last 30 years.

Invasive annual grasses are threatening Greater Sage-Grouse by outcompeting the native forbs and native grasses needed to provide food and shelter for the species. The Preferred Alternative in the *Oregon Sub-Region Greater Sage-Grouse Final Resource Management Plan Amendment and Environmental Impact Statement* is expected to suggest reducing invasive annual grasses in Preliminary Priority Management Areas to less than five percent cover. Currently, the annual grasses have invaded many of the known leks across the Resource Area. For example, a large monoculture of Medusahead rye at Red Knoll impacts two leks (USDI 2005b). The Resource Area has begun to survey many other Preliminary Priority Management Areas and has found small, scattered, controllable patches of annual grasses beginning to invade. The areas that have small controllable invasive annual grasses populations are a high priority for treatment (Treatment Category 5). There is currently no effective controls available for these populations.

<u>*Neotropical Migrant Bird Species*</u>

Numerous neotropical migrant bird species are found in the Resource Area, although no systematic nesting inventories have been conducted. Birds of Conservation Concern (USDI 2008d) that have been documented on the Resource Area include the willow flycatcher, white-headed woodpecker, Lewis' woodpecker, Williamson's sapsucker, pinyon jay, loggerhead shrike, green-tailed towhee, Brewer's sparrow, sage sparrow, black-chinned sparrow, and the sage thrasher. Neotropical migrant bird species are protected and managed under the *Migratory Bird Treaty Act* and the *Neotropical Migratory Bird Conservation Act* of 2000.

Mammals

<u>*Bats*</u>

There are four species of bats on the Oregon BLM Special Status species list. These are the Townsend's big-eared bat, pallid bat, spotted bat and the fringed myotis. These species occurs in a wide variety of habitat types. Numerous bat surveys have been conducted across the Resource Area. Several known roost and foraging sites have been documented for Townsend's big-eared bats. Pallid bats have been documented in a few sites within forested and semi-forested areas. Few records exist for either spotted bats or fringed myotis within the Resource Area.

Elk

Because the Rocky Mountain elk is a game species in Oregon, there is a high degree of public interest relative to the population levels and habitat condition. The elk is also valued by the public for wildlife viewing. Based on ODFW estimates, the present population of Rocky Mountain elk in the Resource Area and adjacent lands administered by the U.S. Forest Service are expanding toward the management objectives or goals of Oregon's Elk Management Plan (ODFW 2003b). The management objectives for the area call for 3,000 elk in the South Central Zone (Silver Lake, Interstate Unit, and includes the Sprague and Klamath Falls units outside the zone administered by the Resource Area), 500 elk in the Warner Unit, 1,000 elk in the High Desert Zone (Beatys Butte, Wagontire, and Juniper units; and includes the Owyhee, Whitehorse, Steens Mountain, and Malheur units that fall outside lands administered by the Resource Area), and 1,600 elk in the Paulina/East Fort Rock Unit. The Resource Area big game populations are managed by ODFW to emphasize mule deer. Elk are managed as a secondary species to provide numbers proposed in their elk management plan designed to minimize competition with mule deer. Approximately 800,000 acres of identified yearlong elk habitat occur in the Resource Area at this time.

On the BLM-administered lands in the Resource Area, habitat is primarily winter range. Summer and transitional range is on U.S. Forest Service -administered lands; however, in the northern portion of the Resource Area, elk use BLM-administered lands year-round.

Mule Deer

Because the mule deer is a game mammal in Oregon, the public has a high level of interest in this species. In addition to interest in hunting, the public also values opportunities to view deer. Mule deer are one of the most numerous big game species in the Resource Area.

The ODFW's *Oregon Mule Deer Management Plan* (2003a) set management objectives for the deer units within the Resource Area as follows: Fort Rock – 11,200; Silver Lake – 10,300 – Interstate – 14,800; Warner – 5,500; Wagontire – 1,400; Beatys Butte – 2,300; Juniper Unit – 2,300; and South Paulina Unit – 11,000. Four of the units are at management objective levels, and the others are just slightly below. Production has been good in two of the units, and limited antlerless hunts have been offered in the last few years. Approximately 1 million acres of important deer winter range exists in the Resource Area. In general, higher elevations are used as summer ranges, and areas below 4,500 feet are considered winter range. Seasonal movements and routes can be critical to maintaining migratory habitat.

The winter range is primarily juniper woodland and sagebrush communities with interspersed grasses. Browse is the major component of the winter diet, primarily antelope bitterbrush, big sagebrush, curl-leaf mountain mahogany, and western juniper. Habitat conditions on the winter ranges in the Resource Area vary considerably and are site specific. It is generally recognized by wildlife biologists and range managers that it is extremely difficult to precisely measure habitat condition and productivity and even more difficult to relate these measures to herd parameters. Winter deer habitat in the Warner Mountains is generally improving under current management practices. The Fort Rock/ Silver Lake winter range conditions are fair to poor.

Pronghorn

Pronghorn are a very common big game species in the Resource Area. The diet consists primarily of forbs and grasses during the spring and early summer. The rest of the year, pronghorn are primarily dependent upon sagebrush and antelope bitterbrush. Seasonal movements are controlled primarily by snow depth, with deep snows hindering movement and covering the short brush.

There are about 1 million acres of pronghorn winter habitat identified in the Resource Area. Pronghorn populations fluctuate, depending on environmental conditions, and range from 3,000 to 7,000 animals in the Resource Area. Predation of kids by coyotes appears to be a primary factor limiting pronghorn populations.

California Bighorn Sheep
California bighorn sheep occupy sagebrush-grassland habitat, which is characterized as yearlong and totals about 500,000 acres in the Resource Area. Escape areas, lambing areas, thermal protection, rutting areas, and foraging areas are provided by the rugged mountains, canyons, and escarpments. Most water sources for bighorn sheep in this area consist of big game guzzlers, natural seeps and springs, and waterholes. There are approximately 500 to 800 bighorn sheep currently occupying the Resource Area. California bighorn sheep numbers are managed in accordance with ODFW's December 2003 "Bighorn Sheep and Rocky Mountain Goat Management Plan" (ODFW 2003c).

Other Small Resident Animal Species
Pygmy Rabbits -- Pygmy rabbits occur in dense stands of big sagebrush in deep loose soils; however, the rabbit's distribution and abundance is not fully known due to a lack of systematic surveys in the entire Resource Area. Systematic surveys have been completed on portions of the Resource Area since 2002 and have documented occurrence and density in suitable habitats. The species is a U.S. Fish and Wildlife species of concern, so pygmy rabbit surveys are required for all range improvement projects, including prescribed fire.

Other Small Mammals and Resident Species--Limited small mammal inventories conducted by the ODFW documented white-tailed and black-tailed jackrabbits, cottontail rabbits, deer mice, kangaroo mice, kangaroo rats, northern grasshopper mice, Townsend's ground squirrels, least chipmunks, sagebrush voles, and others, within the Resource Area.

Other resident species including small birds also inhabit much of the Resource Area. No specific inventories have been conducted for these species; however, many are common and widely distributed.

Reptiles

Limited reptile surveys have been conducted in the Resource Area; however, northern sagebrush lizard, western fence lizard, desert horned lizard, short-horned lizard, western rattlesnake, garter snake, and gopher snake appear to be common in appropriate habitat types. Side-blotched lizard, long-nosed leopard lizard, western skink, and striped whipsnake are known to occur in the Resource Area, but limited data is available on distribution and abundance of these species.

Invertebrates

Numerous species of aquatic and terrestrial invertebrates inhabit the Resource Area. The majority of these species are sedentary in nature and would be unable to escape or move to a new location away from treatment areas. There are three species of invertebrates on the BLM special status species list that have habitats or are suspected of occurring within the Resource Area. These include the Western bumblebee (*Bombus occidentalis*), the Crooked creek springsnail (*Pyrglopsis intermedia*), and the Great Basin Ramshorn (*Helisoma Newberryi Newberryi*). Limited surveys have been conducted on the Resource Area for these species. There are Invertebrate biodiversity and habitat relationships are poorly researched (King and Porter 2005).

Treatments Planned Relating to the Issues

No Action Alternative

Known infestations of invasive plants occupy 11,577 acres of Greater Sage-Grouse Preliminary Priority Management Areas within the Resource Area. Additionally, control treatments would be conducted on invasive plants in, pygmy rabbit habitats (557 acres), mule deer habitats (17,658 acres) and elk habitats (669 acres), pronghorn habitats (19,006 acres) and in bighorn sheep habitats (8,492 acres) over the next 10 to 15 years (Treatment Category 1).

At current funding levels and assuming these habitats are treated at about the same rate as other habitats on the Resource Area, roughly 2,000 to 4,000 acres per year would be treated within these wildlife habitats. Most of this would likely be with one or more of the herbicides, 2,4-D, dicamba, glyphosate, or picloram. These treatments would primarily be on thistles and other herbaceous plants, Mediterranean sage, and perennial pepperweed, with some glyphosate treatments on some invasive annual grasses at the seedling stage. Treating invasive annual grasses with these four herbicides is very inefficient and very few acres of invasive annual grasses would likely be treated.

Proposed Action

Except for the invasive annual grasses, treatment levels would be about the same as for No-Action, but as many as 14 different herbicides would be used instead of just 4. Additionally, control treatments would be conducted on annual grasses in all of the wildlife habitats listed above (Treatment Categories 4-6). Treatment of invasive annual grasses infesting these Categories could be up to 20,000 acres in some years. These treatments would generally be done with imazapic (usually applied as a pre-emergent) and thus be essentially unavailable for ingestion by wildlife species.

Standard Operating Procedures and Mitigation Measures Relevant to Effects

The potential for adverse herbicide-related wildlife health effects is minimized for both alternatives by existing Standard Operating Procedures and Mitigation Measures (see Appendix A, *Project Design Features, Standard Operating Procedures, Mitigation Measures, Conservation Measures, Prevention Measures, and Best Management Practices Standard Operating Procedures and Mitigation Measures*, *Wildlife* and *Threatened and Endangered Species* Sections). These include, but are not limited to:

- Minimize treatments during nesting and other important periods for birds and other wildlife.
- Use herbicides of low toxicity to wildlife, where feasible.
- Use spot applications or low-boom broadcast operations where possible to limit the probability of contaminating non-target food and water sources, especially non-target vegetation over areas larger than the treatment area.
- Use timing restrictions (e.g., do not treat during critical wildlife breeding or staging periods) to minimize impacts to wildlife where feasible.
- To minimize risks to terrestrial wildlife, do not exceed the typical application rate for applications of dicamba, glyphosate, hexazinone, or triclopyr, where feasible. (MM)
- Minimize the size of application areas, where practical, when applying 2,4-D and Overdrive® to limit impacts to wildlife, particularly through contamination of food items. (MM)
- Where practical, limit glyphosate and hexazinone to spot applications in grazing land and wildlife habitat areas to avoid contamination of wildlife food items. (MM)
- Impacts to wildlife from herbicide applications can be reduced by treating habitat during times when the animals are not present or are not breeding, migrating or confined to localized areas (such as crucial winter range). (Oregon FEIS MM)
- When treating native plants in areas where herbivores are likely to congregate, choose herbicides with lower risks due to ingestion. This mitigation measure is applicable if large areas of the herbivores' feeding range would be treated, because either the treatment areas are large or the feeding area for an individual animal is small. (Oregon FEIS MM)
- Where there is a potential for herbivore consumption of treated vegetation, apply dicamba, imazapyr, and metsulfuron methyl at the typical, rather than maximum, application rate to minimize risks. (Oregon FEIS MM)
- Avoid treating vegetation during time-sensitive periods (e.g., nesting and migration, sensitive life stages) for Special Status species in area to be treated.

Environmental Consequences

Effects of Treatment Methods to Wildlife

Non-Herbicide Treatments

Non-herbicide control methods would likely not result in any major modifications to wildlife habitats. This is primarily because selective mechanical removal of individual plants would change the habitats very little from a structural standpoint. Some disturbance to wildlife would occur from human presence and potentially from operating machinery in the immediate area. These impacts would be minor and temporary in nature and would not be significant.

Herbicide Treatments

The following discussions of herbicide risks have been adapted from the *Wildlife Resources* section of the Oregon FEIS. Stated risks are for the exposure scenarios described in the Ecological Risk Assessments. As discussed under the *Effects of the Treatments* section below, such exposures are limited by the Standard Operating Procedures and Mitigation Measures, and are usually unlikely because of the dispersed nature of wildlife species.

BLM-Evaluated Herbicides

Several herbicides do pose a risk to wildlife under a scenario of ingestion of food items contaminated by direct spray. See Appendix D, *Herbicide Risk Tables* for further information about the Ecological Risk Assessments including the risk quotients, levels of concern (LOCs), and other Assessment terms used below.

Chlorsulfuron (Proposed Action) is an ALS-inhibitor; a group of herbicides that has the lowest risk to all groups of wildlife of the herbicides evaluated. All likely application scenarios are below the LOCs for wildlife groups under tested scenarios, even under spill or off-site drift scenarios. It is unlikely to cause any adverse effect on aquatic animals (see Appendix D, *Herbicide Risk Tables*). No studies on invertebrates, amphibians or reptiles were found (SERA 2004a).

Diflufenzopyr + dicamba (Proposed Action): Diflufenzopyr has slightly more toxic impacts to wildlife than dicamba based on evaluations in the Ecological Risk Assessment. The mixture has a moderate residual effect that could affect insects and mammals through ingestion but insect lethal effects are unlikely. It is practically non-toxic to aquatic invertebrates and has low toxicity to honeybees. Risk Quotients for terrestrial wildlife were all below the most conservative LOC of 0.1 (acute Endangered species), indicating that accidental direct spray impacts are not likely to pose a risk to terrestrial animals. The mixture is practically non-toxic to birds, but there are some concerns for ingestion of contaminated thistle or knapweed manifesting in reproductive effects at high application rates. There are chronic and acute ingestion concerns for mammals as well (see Appendix D, *Herbicide Risk Tables*). Aquatic invertebrates are more susceptible to dicamba than fish. One study on dicamba indicates it is practically non-toxic to amphibians (ENSR 2005d, i). Dicamba is practically non-toxic to honeybees, but aquatic invertebrates appear to be slightly more susceptible to dicamba than fish or amphibians.

Fluridone (Proposed Action) is used for submerged weeds that threaten aquatic wildlife such as watermilfoils. It has a low tendency to bioaccumulate (in fish). Fluridone exhibits low toxicity to most terrestrial mammals and small mammals may be more susceptible than large. Acute oral exposure of fluridone is practically non-toxic to birds. Fluridone is one of the aquatic herbicides with the highest risk factors; however, it has very low risk to other wildlife forms (see Appendix D, *Herbicide Risk Tables*). Application timing could avoid most susceptible (water-associated) stages of amphibian development, if this information is available for resident herptiles at the treatment site (ENSR 2005g). No studies on invertebrates were found.

Imazapic (Proposed Action) is an ALS-inhibitor that rapidly metabolizes and does not bioaccumulate. It is effective against Medusahead rye, leafy spurge, and cheatgrass, which adversely affect wildlife habitat. Imazapic is not highly toxic to most terrestrial animals. Mammals are more susceptible during pregnancy and larger mammals are more susceptible than small mammals. No adverse short-term exposure risks to birds were noted for imazapic, but some chronic growth reduction was noted. None of the risk ratings for susceptible or non-susceptible shows any ratings that exceed the LOC. Imazapic is one of the lowest toxic risks to wildlife of herbicides evaluated in this EA along with other ALS-Inhibitors (SERA 2004c). No studies on invertebrates were found.

Sulfometuron methyl (Proposed Action) is an ALS-inhibitor. Sulfometuron methyl could be used to control weeds in riparian areas when no water exposure is likely. It is highly toxic to aquatic plants. The Ecological Risk Assessments indicated no risks to aquatic invertebrates from any scenario. Sulfometuron methyl has the lowest risk to all groups of wildlife of the herbicides evaluated (with other ALS-inhibitors). The Ecological Risk Assessments indicated no risks to aquatic invertebrates.

Forest Service-Evaluated Herbicides

Modeled risk scenarios may be different from those used by BLM-evaluated herbicides. See Appendix D, *Herbicide Risk Tables* for discussion of the Ecological Risk Assessments including the referenced risk quotients.

2,4-D (common to both alternatives) is a possible endocrine disrupter and is one of the more toxic herbicides for wildlife of the foliar-use herbicides considered in this EA. The ester form is more toxic to wildlife than the salt form. Ingestion of treated vegetation is a concern for mammals, particularly since 2,4-D can increase palatability of treated plants (USDA 2006a) for up to a month following treatment (Farm Service Genetics 2008). Mammals are more susceptible to toxic effects from 2,4-D, and the sub-lethal effects to pregnant mammals were noted at acute rates below LD_{50}. Birds are less susceptible to 2,4-D than mammals, and the greatest risk is ingestion of contaminated insects or plants. There is little information on reptile toxicity, although one study noted no sexual development abnormalities. No studies on invertebrates were found.

Clopyralid (Proposed Action) is useful in treating starthistle, thistles, and knapweeds, which are noted as damaging to wildlife habitat. Clopyralid is unlikely to pose risk to terrestrial mammals. All of the estimated mammalian acute exposures are no or low risk; mammalian chronic exposures are below the no observed adverse effects level at the typical rate. At the maximum rate, all but one risk scenario has no risk. Large and small birds have some risk of ingestion of contaminated food but hazard quotients are below the level of concern for all exposure scenarios under the typical rate. No studies on reptiles or invertebrates were found. (SERA 2004b).

Dicamba (common to both alternatives): No adverse effects on mammals are plausible for either acute or chronic exposures of dicamba. At the highest tested rate, there are adverse reproductive effects possible for acute scenarios consuming contaminated vegetation. There is little basis for asserting that adverse effects in aquatic animals is plausible. Dicamba has no adverse effects on birds for acute or chronic exposures, although highest tested application rates had possible adverse reproductive concerns for acute scenarios involving birds consuming contaminated vegetation or contaminated insects (SERA 2004g). Dicamba is practically non-toxic to honeybees, but aquatic invertebrates appear to be slightly more susceptible to dicamba than fish or amphibians.

Glyphosate (common to both alternatives) is a low toxicity herbicide, widely used for terrestrial applications and is approved for aquatic use. Toxicity to most wildlife groups is very low, so much so that No Observed Adverse Effects Level levels are used because the LD50 were not found at high doses in many cases. Observed effects had to do with reduced feeding efficiency and reduced weight gain. Glyphosate adheres to soil, is degraded by soil bacteria, and does not bioaccumulate. Formulas vary in toxicity: 1) technical grade (pure) glyphosate is much less toxic than some of the commercial formulations; 2) commercial glyphosate formulations with the surfactant POEA are similar in toxicity to the surfactant POEA alone; 3) glyphosate herbicide formulations, such as Rodeo®, that are formulated without a surfactant are much less toxic than formulations with the surfactant POEA; and, 4) glyphosate herbicides with alternative surfactants would be much less toxic to frogs than Roundup Original/Vision® (Mann and Bidwell 1999, Perkins et al. 2000, Edginton et al. 2004a, Howe et al. 2004, all cited in

Govindarajulu 2008, Relyea 2006). These studies support the conclusion that the toxic effect of POEA-containing glyphosate herbicides is due to POEA rather than to the active glyphosate ingredient. Ephemeral wetlands important to amphibians may not be protected by standard buffers (Govindarajulu 2008). There may be short-term adverse effects to terrestrial and aquatic amphibians where POEA formulations of glyphosate are used. Effects would vary by species and by developmental stage (Relyea 2005a (lethal impact), Relyea et al. 2005). Larval amphibians were more susceptible in some studies (Relyea 2005b), but less so in other studies (Thompson et al. 2004). Glyphosate has not been tested on a wide range of amphibians, nor does EPA require the testing of surfactants. Proprietary labels do not always identify the surfactants used. Pre-project clearance evaluations for Special Status amphibians would help project planners choose appropriate invasive plant treatments that have lower chance of adverse effects where these amphibians are likely to occur. In any event, a Mitigation Measure specifies avoiding using glyphosate formulations containing POEA, or seeking the use of formulations with the least amount of POEA, to reduce risks to amphibians (Appendix A, *Project Design Features, Standard Operating Procedures, Mitigation Measures, Conservation Measures, Prevention Measures, and Best Management Practices Standard Operating Procedures and Mitigation Measures*). Glyphosate is low risk to honeybees, but little information is available for other terrestrial invertebrates.

Hexazinone (Proposed Action): The commercial formulas are less toxic than hexazinone by itself and the liquid form is more toxic than granular. For granular formulations, none of the hazard quotients for mammals exceeds a level of concern even at the highest application rate. For liquid formulations of hexazinone, hazard quotients exceed the level of concern at all application rates and all of the scenarios involving residue rates for contaminated vegetation or insects (Fletcher et al. 1994). Hexazinone and its degradates are persistent and highly mobile and hexazinone has been identified as a groundwater contaminate in some states. Bullfrogs were slightly more susceptible to behavioral change (diminished response to prodding) than leopard frogs over a 9-day study but amphibian studies were not adequate to determine the LD50. Hexazinone poses zero to moderate risk to mammals for ingestion under both acute and chronic scenarios (see Appendix D, *Herbicide Risk Tables*). Birds are more tolerant than mammals (SERA 2005c). No studies on invertebrates were found.

Imazapyr (Proposed Action) is approved for aquatic use and is an ALS-inhibitor. There is a lack of information on dose levels that demonstrate harm to mammals, amphibians, or birds. Effects of field studies (Brooks et al. 1995) suggest observed changes to birds and mammals following treatment are habitat related, and not due to toxic effects. Imazapyr is one of the least toxic aquatic herbicides evaluated. Imazapyr is only slightly more toxic than the other ALS-inhibitors, all of which are the least toxic of any of the herbicides evaluated (SERA 2011b). No studies on invertebrates were found.

Metsulfuron methyl (Proposed Action) is an ALS-inhibitor that does not appear to bioaccumulate. Metsulfuron methyl can be effective for invasive plants that are unsusceptible to other herbicides. None of the acute or chronic exposure scenarios exceeded the LOC at the typical rate, and few exceeded LOC at maximum rate. Metsulfuron methyl has very low toxicity to birds for direct spray and consumption; no mortality of acute spray on honeybees; and, aquatic invertebrates do not appear to be susceptible. One study on Rove beetle indicated reduced egg hatching. Daphnia are relatively tolerant. Like other ALS-inhibitors, it is one of the least toxic of herbicides evaluated (SERA 2004e). There is no mortality of acute spray on honeybees; and, aquatic invertebrates do not appear to be susceptible. One study on Rove beetle indicated reduced egg hatching. Daphnia are relatively tolerant.

Picloram (common to both alternatives): Studies on birds, bees, and snails generally support picloram as relatively nontoxic to terrestrial animals. The few field studies indicated no change to mammal or avian diversity following picloram treatment. Variations in different exposure assessments have little impact to risk through ingestion, grooming or direct contact. Maximum rates have higher risk to mammals due to contaminated grass or insects. No information was found in the literature about picloram's effect on reptiles (SERA 2011c). No studies on invertebrates were found.

Triclopyr (Proposed Action) is approved for aquatic use and can be used on saltcedar, watermilfoil, and purple loosestrife, all species known to adversely affect wildlife habitat. Triclopyr, as triethylamine (TEA) salt and butoxyethyl ester (BEE), is covered in the Ecological Risk Assessments. Some formulations of the TEA salt of triclopyr have been labeled for aquatic invasive plant control. Triclopyr TEA is less toxic to wildlife than triclopyr BEE. The major metabolite of triclopyr, 3,5,6-trichloro-2-pyridinol (TCP) is more toxic than triclopyr to mammals. At the upper range of exposures, hazard quotients for triclopyr exceed the LOC for mammals, but average hazard quotients do not exceed the LOC for any exposure scenario. Triclopyr is practically non-toxic to slightly toxic to birds at the typical rate. Consumption of treated vegetation (and insects) is the greatest concern for birds or mammals. Of aquatic-approved herbicides evaluated in this EA, triclopyr risk is about average. Using less toxic formulas reduces risk (SERA 2011d). No studies on invertebrates were found.

Effects by Alternative

Common to Both Alternatives

The risk of adverse effects to wildlife from dermal contact or ingestion would vary by the amount of herbicide placed on vegetation that is used as forage (which is affected by the extent and method of treatment), the toxicity of the herbicide, physical features of the terrain, weather conditions, and the time of year. The likelihood of most larger and mobile wildlife species being directly sprayed is very low since human activity generally would cause wild animals to flee. Some smaller less mobile resident species of wildlife unable to leave the treatment area could be directly sprayed or be forced to ingest sprayed vegetation. This could lead to negative effects to these individual animals.

Individual treatment areas would generally be less than 5,000 acres, but could be larger in some cases. However, treatments this size would be either perennial pepperweed in the Warner Wetlands or cheatgrass treatments to rehabilitate large infestations of improve Greater Sage Grouse habitat. Spot treatments might cover hundreds of contiguous acres but only individual plants would be treated. Boom sprays along roads and other areas would usually not cover more than dozens of acres at one location. Treatments would treat only the invasive plant portion of the vegetation or be on recently burned areas (e.g., aerially applied imazapic on burned areas to control invasive annual grasses). This would allow most wildlife species to shift their use of these habitats to other adjacent areas. Smaller less mobile resident species (e.g. mice, squirrels, rabbits) that are unable to shift their use to other areas could be negatively impacted. These impacts could be mitigated by using the least toxic herbicide or least impactful treatment method as well as using the Standard Operating Procedures and Mitigation Measures outlined above such as limiting timing of treatments, using selective herbicides, and reducing the concentrations of herbicides used.

Some wildlife species such as elk and occasionally pronghorns consume large quantities of grass and are therefore potentially at risk where broad-scale applications of selective herbicides have been made on invasive plants over native grasses. Thus, 100 percent grass grazing scenarios were specifically modeled in the Ecological Risk Assessments. However, reaching Ecological Risk Assessment-identified risk levels would be unlikely unless the animals foraged exclusively within the treatment area for an entire day (USDI 2010a:269).

Manual control methods including the presence of humans can affect terrestrial wildlife species by causing disturbance and/or displacement when animals flee the area surrounding the treatment activities. Wildlife would likely not be displaced for long periods from manual treatments nor would manual treatments likely modify habitats to the extent that negative effects would occur from these treatment methods.

Biological control methods would be unlikely to negatively affect terrestrial wildlife or their habitats. Disturbances associated with the release of agents into habitat would be minimal. Impacts from modification of habitats by biological control agents are unlikely; however, unforeseen negative effects could occur.

Targeted grazing methods would have some minor impacts to wildlife species. Presence of livestock within an enclosed area can be disturbing to some wildlife species thereby displacing them to other areas. This displacement would generally only last as long as the livestock were in the area and wildlife use would likely return after livestock were removed. Much of the area where targeted grazing would be used is already grazed under BLM grazing permits. The addition of targeted grazing within these areas would not likely increase the impacts between the alternatives.

Use of prescribed fire as a tool for managing invasive plants could have negative effects if not used properly. This tool would generally be used in areas that were predominantly covered with invasive plants where little or no wildlife habitat values are present. An example of this would be areas dominated by invasive annual grasses with no overstory shrubs present. In these cases, fire could be used as a tool to reduce the invasive plant seed bank on these sites. Fire methods that remove sagebrush from areas with densities greater than five percent would have negative impacts to all sagebrush obligate species and several other species as well. However, adopted mitigation measures eliminate fire as a management tool in areas with more than five percent sagebrush cover.

No Action Alternative

2,4-D and glyphosate present low to moderate risks to mammals under scenarios of direct spray and consumption of contaminated grass at the typical and maximum application rates. Inadvertent spraying of grass and other forage near treated invasive plants, as well as drift and other avenues, could result in exposure. In addition, treating invasive grasses with glyphosate when they are young and palatable could result in exposure.

Dicamba and picloram also presents low to moderate risks under some exposure scenarios. The primary targets for these two herbicides are broadleaf and woody species, so it can be used to target species infesting native or other desirable grass species without affecting the grass. Grazing of these sprayed grasses by wildlife could result in exposure (USDI 2010a:270). (See Oregon FEIS at 246-250 for further herbicide-specific discussion of risks to Wildlife.)

Specific Standard Operating Procedures and Mitigation Measures help prevent the moderate risks described above. These include minimizing treatments during nesting seasons, restricting timing of treatments when wildlife species are absent or less vulnerable, and minimizing treatments around Special Status species (USDI 2010a:93), and would further reduce the potential for negative effects. Further, for the reasons described, the likelihood of an exposure leading to illness or death of wildlife is slight to non-existent.

Targeted livestock grazing would continue under this alternative in most areas except for a limited number of exclosures where livestock grazing currently does not occur (3,164 acres). Under this alternative, no targeted grazing would be allowed in these limited exclosures. Without the use of targeted grazing as a tool in these areas, some invasive plants could be more difficult to control, thereby slightly increasing the negative impact of this alternative to wildlife species.

Effects to wildlife at the population scale would be positive, as the benefits of controlling invasive plants would result in fewer degraded sites and better retention of native habitats. These benefits would be proportionately[59] less under the No Action Alternative than under the Proposed Action.

Proposed Action

Impacts from the Proposed Action would be very similar to the impacts described in the No Action Alternative, except that several additional herbicides could be used under the Proposed Action. Additional treatments would occur in areas with invasive annual grasses (up to 20,000 acres a year), Greater Sage-Grouse habitats (within 4 miles of leks), and as part of post fire emergency stabilization (Treatment Categories 4-6). Existing Standard Operating Procedures and Mitigation Measures (see Appendix A) would apply to both alternatives.

[59] At the current 12 percent spread rate, the 44,090 acres of documented sites would grow to 215,000 ac in 15 years. For the Proposed Action, this spread would be reduced about 40 percent or 68,000 acres (see *Invasive Plants* earlier in this chapter).

Many species of wildlife tend to avoid large areas infested with noxious weeds. This is primarily due to the vegetation structural changes caused by noxious weeds competing with natural vegetation as well as low palatability due to noxious weed defenses such as toxins, spines, and/or distasteful compounds (DiTomaso et al. 2006). Nevertheless, some invasive plants such as the invasive annual grasses early in the spring when they are small and green will be utilized (grazed or browsed) by some wildlife species.

Under this alternative, the use of the four herbicides available under the No Action Alternative would decrease, and herbicides generally less toxic to wildlife would be used (see Appendix D, *Herbicide Risk Tables*). Potentially half or more of the projected herbicide use under this alternative would be with imazapic, an herbicide with very low measured risk to wildlife under any of the exposure scenarios. Other herbicides including chlorsulfuron, fluridone, clopyralid, and sulfometuron methyl had risk quotients that were all below the most conservative Levels of Concern, indicating that direct spray would not likely pose a risk. Sulfometuron methyl is also not generally registered for rangelands. The herbicides imazapyr and metsulfuron methyl under typical application rates had no risk to wildlife predicted under any scenario (imazapyr is not registered for rangeland application and therefore it would be unlikely that wildlife would either eat contaminated vegetation or come in direct contact with it).

For the other five herbicides added by this alternative, hexazinone presents a low to moderate risk for some scenarios, but it is typically utilized for treatment of woody species and is semi-selective with spot application, so risk to wildlife under normal applications may be lower than those predicted by the Ecological Risk Assessment. Triclopyr presents low risk through consumption of contaminated vegetation at the typical rate and moderate risk at the maximum rate. It is utilized in rangelands due to selectivity for woody species, and has low residual activity (USDI 2010a:271). Impacts from 2,4-D, glyphosate, picloram and dicamba are discussed in the *No Action Alternative* section.

The increased number of herbicides available under this alternative would lower risk to wildlife species because more choices would be available to meet site-specific concerns. As with the No Action Alternative, specific Standard Operating Procedures and Mitigation Measures would help prevent the risks described above (USDI 2010a:93). Further, for the reasons described, the likelihood of an exposure leading to illness or death of wildlife is slight to non-existent. Effects at the population scale would be positive, as the benefits of controlling invasive plants would result in proportionately fewer degraded sites and better retention of native forage compared to the No Action Alternative.

A potential increase in targeted livestock grazing within some existing exclosures would slightly increase potential displacement impacts to wildlife within these limited areas. The ability to use grazing as a tool to assist in controlling invasive plants would have greater positive impacts to wildlife under this alternative than the No Action Alternative in the long term.

Cumulative Effects

Common to Both Alternatives

Loss of native vegetation and declining ecosystem health on public lands due to noxious weeds and other invasive vegetation has contributed to reductions in the ability of public lands to support healthy wildlife populations. Both alternatives would control invasive plants and restore native habitats. Other ongoing projects such as the South Warner, Bridge Creek and Silver Creek juniper removal projects would reduce the impacts of western juniper on native shrubs and grasses, thereby allowing more native grass and shrub habitats for a variety of wildlife species. These projects would also restore ecosystem processes and rangeland health, reduce invasive plant spread and help create and/or maintain plant communities resistant to disturbance. Positive cumulative impacts would be expected to occur from these projects.

Maintaining fuels breaks to reduce the size of wildfires would also have positive cumulative impacts by reducing the spread of invasive annual grasses after wildfires. By reducing the likelihood of more annual greases, the impacts of those annual grasses on wildlife species is reduced as well as having a reduced need to apply additional herbicides to control these annual grasses.

Continued targeted livestock grazing would not cause any significant additional positive or negative impacts to wildlife species.

Livestock Grazing

Issues

- How would herbicide treatments and restrictions affect livestock grazing on BLM allotments?
- How would the use of herbicides affect livestock and their forage?

Affected Environment

Livestock grazing is administered on 120 allotments in the Resource Area. The primary kind of livestock authorized on these allotments is cattle. Existing allotment boundaries are illustrated on Map G-3 of the *Lakeview Resource Management Plan and Record of Decision* (USDI 2003b). Information specific to each of the 120 allotments in the Resource Area is provided in the 2003 *Lakeview Proposed Resource Management Plan and Final Environmental Impact Statement* Appendix E1 and is summarized in Table 2-26 of that document (USDI 2003a). 69 permittees are currently authorized to graze livestock in these allotments under Section 3 of the *Taylor Grazing Act*. Five permittees are authorized to graze livestock in parcels included under section 15 of the *Act*. Total active preference of all permittees in the Resource Area is 164,128 animal unit months.

When additional forage (above full permitted levels) is available on public lands, temporary nonrenewable grazing use is periodically authorized for qualified applicants when such use is consistent with meeting multiple use objectives.

In the Lakeview Resource Area, 240,535 acres of public land have been set apart from grazing allotments specifically to either (1) improve or protect resource values, or (2) they were found to be unsuitable for livestock grazing. Table 2-28 in the *Lakeview Proposed Resource Management Plan and Final Environmental Impact Statement* (USDI 2003a) identifies land that is not allocated to livestock production and is not included in a grazing allotment. About 155,734 acres within the Resource Area have available forage produced annually but are not allocated to specific livestock operators. Livestock use in some of these areas is authorized on a temporary basis to provide management flexibility for livestock operators. That flexibility has been used for fire closures, poor climatic conditions, and recovery of resource values. It has also been used to rest or defer the use of other pastures or allotments so that resource values can recover. About 84,801 acres are excluded from grazing on a permanent basis (USDI 2003a)

The BLM conducts grazing management practices according to BLM Manual Handbook H-4120-1 (Grazing Management; USDI 1984a). Management of livestock grazing is authorized and enforced through both permits and leases. The grazing permit establishes the allotment(s) to be used, the total amount of use, the number and kind of livestock, and the season of use. Term grazing permits/leases may also contain terms and conditions as appropriate to achieve management and resource condition objectives. Allotment management plans further outline how livestock grazing is to be managed to meet multiple-use, sustained yield, and other needs and objectives, as identified in the resource management plans.

Public lands provide an important source of forage for many ranches, especially during spring and summer months, allowing private lands to be devoted to the production of feed sources and resources to sustain operations the remainder of the year. Grazing on these lands helps support the agricultural component of many communities scattered throughout the west.

Livestock consume annual and perennial native and introduced grass species, and seasonally utilize forbs and some shrubs. Healthy plant communities support current livestock grazing levels. Invasive plants reduce forage for livestock, degrade plant community health, and result in reduced capacity to sustain existing grazing levels. A combination of invasive plants and shorter fire return interval invasive annual grasses can further limit forage use from year-round, to seasonal, or to none at all (USDI 2010a).

Some grazing permit holders are seeking, or have, organic certification. Herbicide use within these allotments could conflict with this objective.

Grazing animals tend to avoid many invasive plants because of low palatability or due to defenses such as toxins, spines, and/or distasteful compounds (DiTomaso et al. 2006). In addition, some invasive plants (e.g., poison hemlock and St. John's wort) are poisonous to cattle. Nevertheless, some invasive plants such as invasive annual grasses early in the spring when they are small and green will be grazed by cattle. Thus, exposure to herbicides used for invasive plant control in allotments can be a concern.

Approximately 94 percent of the Resource Area are active livestock grazing allotments. Of the 44,090 acres of documented invasive plants (Treatment Category 1), approximately 74 percent (32,603 acres) occur within grazing allotments. Most of the 15,065 acres of perennial pepperweed in the Warner Wetlands do not fall within active grazing allotments.

Ninety-six percent of the Preliminary Priority Management Area for Greater Sage-Grouse (Treatment Category 5) falls within Resource Area livestock grazing allotments, as do 97 percent of the cheatgrass and recent wildfires (Treatment Category 6).

Treatments Planned Relating to the Issues

No Action Alternative

Perennial pepperweed, Medusahead rye, Mediterranean sage, Canada thistle, whitetop, musk thistle, halogeton, bull thistle, and Russian knapweed make up about 98 percent of the documented invasive plants, and by extension, spread from those sites (Treatment Categories 1 and 2) that can be treated under this alternative within Resource Area livestock grazing allotments. For the invasive plant treatments under this alternative within livestock grazing allotments, and according to Table 2-5, *Treatment Key, No Action Alternative*, 2,4-D and glyphosate would each be applied on over 40 percent of the acres treated, picloram about 25 percent, and dicamba about 10 percent[60] (see also Table C-4, *Estimated Treatment Acres, by Alternative and Category*, in Appendix C). Mediterranean sage occupies the largest acreage of the Treatment Category 1 invasive plant species in Resource Area grazing allotments. Most of the Mediterranean sage treatments would be made with a picloram and 2,4-D combination. Few (if any) herbicide treatments would occur in Treatment Categories 5 or 6 because no herbicide is available under the alternative that is selective for the invasive annual grasses.

Proposed Action

Almost all of the 35 species represented on Table 2-1, *Summary of Documented Invasive Plant Sites, Lakeview Resource Area*, are represented within the 32,600 acres of invasive plants documented within range allotments.

[60] Percentages total more than 100 because some treatments use two herbicides.

Specific herbicides that would be used to control each species can be found in Table 2-7, *Treatment Key, Proposed Action*. For example, metsulfuron methyl + 2,4-D, picloram, and chlorsulfuron would be the preferred herbicides for Mediterranean sage. All 14 herbicides could be used, although there are presently no species on the Resource Area for which fluridone would be used. With 80 percent of the perennial pepperweed outside of range allotments, the largest area of treatment would be about 1,500 acres per year of documented Medusahead rye and other invasive annual grass sites (Treatment Category 1 only) treated with imazapic. For the remaining herbicides, in order of most to least used, 2,4-D would be used on approximately 680 acres per year, usually as part of a tank mix. Glyphosate, clopyralid, chlorsulfuron, and metsulfuron methyl would each be used on about 300 acres per year. Picloram and sulfometuron methyl would average about 200 and 150 acres respectively, and the other herbicides would average 35 acres or less each year (calculated from Table C-4, *Estimated Treatment Acres, by Alternative and Category*, in Appendix C).

In addition, imazapic could be used on up to twenty thousand acres per year depending upon funding and management emphasis, to control invasive annual grasses in Greater Sage-Grouse habitat (Treatment Category 5) or to rehabilitate areas otherwise infested with invasive annual grasses (Treatment Category 6). Similar treatments could occur in Treatment Category 4 (post-fire emergency stabilization) as well. For most of these treatments, imazapic would usually be applied as a pre-emergent and thus be essentially unavailable for ingestion via grazing.

These treatments are for the existing invasive plant species. If a new species invades the Resource Area, the same herbicides or non-herbicide treatments would be used that are already described under the Proposed Action for existing species.

Standard Operating Procedures and Mitigation Measures Relevant to Effects

The potential for adverse herbicide-related livestock health effects is minimized for both alternatives by existing Standard Operating Procedures and Mitigation Measures (see Appendix A, *Project Design Features, Standard Operating Procedures, Mitigation Measures, Conservation Measures, Prevention Measures, and Best Management Practices, Livestock*). These include, but are not limited to:

- Whenever possible and whenever needed, schedule treatments when livestock are not present in the treatment area. Design treatments to take advantage of normal livestock grazing rest periods, when possible.
- As directed by the herbicide product label, remove livestock from treatment sites prior to herbicide application, where applicable.
- Take into account the different types of application equipment and methods, where possible, to reduce the probability of contamination of non-target food and water sources.
- Notify permittees of the herbicide treatment project to improve coordination and avoid potential conflicts and safety concerns during implementation of the treatment.
- Notify permittees of livestock grazing, feeding, or slaughter restrictions, if necessary.
- Provide alternative forage sites for livestock, if possible.
- Minimize potential risks to livestock by applying glyphosate, hexazinone, or triclopyr at the typical application rate where feasible. (MM)
- Do not apply 2,4-D, dicamba, Overdrive®, picloram, or triclopyr across large application areas, where feasible, to limit impacts to livestock, particularly through contamination of food items. (MM)
- Where feasible, limit glyphosate and hexazinone to spot applications in rangeland. (MM)
- Where there is a potential for livestock consumption of treated vegetation, apply dicamba, imazapyr, and metsulfuron methyl at the typical, rather than maximum, application rate to minimize risks to livestock. (Oregon FEIS MM)
- Do not apply triclopyr by any broadcast method. (Oregon FEIS MM)

Environmental Consequences

Effects of Herbicides on Livestock

The extent of direct and indirect impacts to livestock from herbicides would vary by the application method, herbicide used, physical features of the terrain including the presence of forage, and the weather conditions at the time of application. Possible adverse direct effects to individual animals include death, damage to vital organs, change in body weight, decreases in healthy offspring, and increased susceptibility to predation. The impacts of herbicide use on individual livestock would depend directly on the susceptibility of each species to the particular herbicides used, how the individual animal was exposed to the herbicide, and indirectly to the degree to which a species or individual is positively or negatively affected by changes in rangeland conditions, including forage quality and availability. Livestock would have a greater chance of being adversely impacted by herbicide use if the pasture or use area was partially or completely sprayed because they would have greater exposure to herbicides through direct contact with the herbicide upon application or indirect contact via dermal contact with vegetation or ingestion of vegetation.

When herbicide labels prohibit grazing, or risks are otherwise anticipated, exposure is typically reduced by the removal of livestock during vegetation treatments, scheduling treatments when livestock are not present, temporarily fencing the treated area, or herding the livestock away from the treatment area and shutting off water or using other techniques to keep them away. However, the grazing permit holder would be adversely affected in the short term because of the area being temporarily unavailable for grazing purposes. Additionally, in the short term, there could be impacts to the sale and consumption of livestock because of mandatory restrictions (quarantine) associated with the use of herbicides. During the interim period, the permit holder may incur additional costs for replacement forage and/or a loss of income. Livestock may experience greater impacts in systems where herbicide transport is more likely, such as areas where herbicides are aerially sprayed adjacent to rangeland, dry areas with high winds, or areas where rainfall is high and soils are porous; however, these scenarios have not been modeled. The degree of interception by vegetation, which depends on site and application characteristics, would also affect direct spray impacts.

Stated risks are for the exposure scenarios described in the Risk Assessments (see Appendix D, *Herbicide Risk Tables*). As discussed under the *Effects by Alternative* section below, such exposures are limited by the Standard Operating Procedures and Mitigation Measures.

BLM-Evaluated Herbicides

Several herbicides do pose a risk to large mammalian herbivores under a scenario of ingestion of food items contaminated by direct spray. The receptor chosen for the large mammalian herbivore was a 154-pound deer. See Appendix D, *Herbicide Risk Tables,* for further information about the Ecological Risk Assessments including the risk quotients, levels of concern, and other Ecological Risk Assessment terms used below.

Chlorsulfuron (Proposed Action) risk quotients for mammals for all modeled scenarios were below the conservative level of concern (LOC) of 0.1, indicating that direct spray and ingestion of sprayed vegetation is not likely to pose a risk to livestock (Appendix D; ENSR 2005c). Based on label directions, there are no restrictions on livestock use of treated areas.

Fluridone (Proposed Action): Risk quotients for large terrestrial animals were below the most conservative LOC of 0.1 for all scenarios (Appendix D; ENSR 2005g). These results indicate that accidental direct spray or drift of this aquatic herbicide would be unlikely to pose a risk to livestock.

Imazapic (Proposed Action): Risk quotients for terrestrial animals were all below the most conservative LOC of 0.1, indicating that direct spray or drift of imazapic would be unlikely to pose a risk to livestock (Appendix D; ENSR 2005h). Based on label directions, there are no restrictions on livestock use of treated areas.

Dicamba + diflufenzopyr (Proposed Action) poses a low chronic risk to large mammalian herbivores that consume plants contaminated by direct spray at the typical application rate and a moderate risk for ingestion scenarios involving direct spray at the maximum application rate (Appendix D; ENSR 2005i). Because it is proposed for use in rangelands and has moderate residual activity, livestock may be at risk from the application of this herbicide, particularly if it is sprayed throughout the range area. Based on label directions, there are no restrictions on livestock use of treated areas.

Sulfometuron methyl (Proposed Action): This herbicide is relatively non-selective. It would be used on rights-of-way, but it is not registered for sites that are grazed. Risk quotients for terrestrial animals were all below the most conservative LOC of 0.1, indicating that direct spray or drift of sulfometuron methyl would be unlikely to pose a risk to livestock (Appendix D)(ENSR 2005j).

Forest Service-Evaluated Herbicides

Modeled risk scenarios may be different from those used by BLM-evaluated herbicides. See Appendix D, *Herbicide Risk Tables,* for discussion of the Ecological Risk Assessments including the referenced risk quotients.

2,4-D (common to both alternatives) presents a low acute risk to livestock under the direct spray, ingestion, and spill scenarios, and a low chronic risk for large mammals for consumption of on-site contaminated vegetation under both typical and maximum rate, for both acid and ester formulations (SERA 2006). The Risk Assessment suggests that because large livestock eating large quantities of grass and other vegetation are at risk from routine exposure to 2,4-D and because 2,4-D is considered for use in rangeland, it should not be applied over large application areas where livestock would only consume contaminated food. According to label directions for one formulation, dairy animals should be kept out of areas treated with 2,4-D for seven days. Grass for hay should not be harvested for 30 days after treatment. Meat animals should be removed from treated areas three days prior to slaughter. Similar restrictions may be in place for other formulations.

Clopyralid (Proposed Action): Large mammals face low acute risks from direct spray and from consumption of contaminated grass at the typical and maximum application rates. The maximum application rate also poses a low chronic risk to large mammals consuming on-site contaminated vegetation (SERA 2004b). All risks identified fall within the lowest risk rating; adverse effects to livestock are unlikely with expected exposure scenarios. According to label directions, there are no restrictions on grazing or hay harvest following application at labeled rates, but livestock should not be transferred from treated grazing areas to susceptible broadleaf crop areas without first allowing for seven days of grazing on untreated pasture.

Dicamba (common to both alternatives): The ingestion of food items contaminated by direct spray of dicamba at the typical and maximum application rate would pose a low and moderate acute risk to large mammalian herbivores respectively, and no chronic risk (SERA 2004g). Because dicamba is proposed for use in rangelands and forestlands and does have moderate residual activity, livestock may be at risk, particularly if it is sprayed throughout the range area. Based on label directions, there are no restrictions on livestock use of treated areas, other than for lactating animals.

Glyphosate (common to both alternatives) with POEA presents a low acute risk to livestock under the direct spray scenario at the maximum rate, and under the ingestion scenario at the typical and maximum rate (SERA 2011a). Glyphosate without POEA (e.g. aquatic formulations) present a low risk at maximum rate for consumption of contaminated grass (SERA 2011a). Ingestion of treated grasses could represent a risk, but glyphosate is non-selective and kills grass, suggesting that spot applications in rangeland would be the most appropriate use of this herbicide (although risk could occur if invasive grasses were treated when they were young and palatable). Spot applications would reduce risks associated with consumption of contaminated vegetation, as fewer non-target areas would be impacted by direct spray or spray drift. Based on label directions, there are no restrictions on livestock use of treated areas.

Hexazinone (Proposed Action): Applications of hexazinone at the typical and maximum application rates would pose a low acute risk to livestock under the direct spray, accidental spill, and ingestions of treated vegetation scenarios, and a low to moderate chronic risk to large mammals under the on-site consumption of contaminated vegetation scenario at typical and maximum rates respectively (SERA 1997). According to label directions, livestock should not be grazed, nor forage or hay cut, on treated areas for 60 days after application.

Imazapyr (Proposed Action): applications at the typical and maximum rate should not pose a risk to livestock (SERA 2011b). Imazapyr is not registered for use in rangelands; therefore, it is unlikely that impacts via direct spray or consumption of contaminated vegetation would occur. Based on label directions, there are no restrictions on livestock use of treated areas.

Metsulfuron methyl (Proposed Action) applications at the typical application rate (0.03 lbs. /acre) should not pose a risk to livestock (SERA 2004e). Applications at the maximum application rate (0.15 lbs. /acre) pose a low acute risk to small animals under scenarios involving 100 percent absorption of direct spray and to large mammals under scenarios involving consumption of contaminated vegetation. However, a supplemental label restricts the application on rangelands to 0.0625 pounds of active ingredient per acre. Metsulfuron methyl is registered for use in rangeland, but impacts to livestock are unlikely if the typical application rate is used.

Picloram (common to both alternatives) poses a low to moderate risk for applications at the typical and maximum application rates for consumption of contaminated vegetation by a small animal, and low risk for consumption of contaminated vegetation by a large mammal at the maximum rate (SERA 2011c). Picloram is registered for use in rangeland, and can be applied over large areas heavily infested with weeds, as its primary targets are broadleaf and woody species. Therefore, it might be used to manage certain broadleaved plants without impacting native or other desirable grasses, but with the potential to expose livestock. Picloram has a number of restrictions on use in areas grazed by livestock or used for cutting hay. In general, livestock should not be grazed on treated areas, nor should hay be cut, for 2 weeks after treatment.

Triclopyr (Proposed Action) presents low risk to livestock under the direct spray scenario at the maximum rate, and a moderate to high acute and chronic risk for consumption of contaminated vegetation at the typical and maximum rate respectively (SERA 2011d). Triclopyr can be used in rangelands to selectively manage woody species without impacting native or other desirable grasses, so broadcast treatments could create exposure scenarios if livestock are not removed or the treatment area is limited in scope. There are few grazing restrictions for triclopyr, except for lactating dairy cattle. Hay should not be harvested within 14 days of application. Although cattle can graze at any time, they would be removed from treated areas at least three days prior to slaughter.

Effects by Alternative

Common to Both Alternatives

The risk of adverse effects to livestock from dermal contact or ingestion would vary by the amount of herbicide placed on vegetation that is used as forage (which is affected by the extent and method of treatment), the toxicity of the herbicide, physical features of the terrain, weather conditions, and the time of year (e.g., newborn calves would be susceptible during calving season, with March through June being a critical period). Aerial treatments (e.g., aerially applied imazapic on burned areas to control invasive annual grasses) would be coordinated with permittee to occur when livestock are not in the pasture to be treated, when possible. Treatments within individual pastures, regardless of treatment size, if coordinated well in advance with permittee, would not greatly disrupt livestock grazing on allotment, due to rest-rotation of individual pastures.

Cattle consume large quantities of grass and are therefore potentially at risk where broad-scale applications of selective herbicides have been made on invasive plants over native grasses. Thus, 100 percent grass grazing scenarios were specifically modeled in the Risk Assessments. However, reaching Ecological Risk Assessment-identified risk levels with herbicides other than triclopyr broadcast at the maximum rate would be unlikely unless the animals foraged exclusively within the treatment area for an entire day (USDI 2010a:269).

No Action Alternative

2,4-D and glyphosate present low to moderate risks to mammals under scenarios of direct spray and consumption of contaminated grass at the typical and maximum application rates. Inadvertent spraying of grass and other forage near treated invasive plants, as well as drift and other avenues, could result in exposure. In addition, treating invasive grasses with glyphosate when they are young and palatable could result in exposure.

Picloram presents a low to moderate risk at typical and maximum rates for small mammals, and a low risk for consumption of treated vegetation at the maximum rate, and has livestock grazing restrictions. Dicamba presents a low to moderate risk for consumption of sprayed vegetation at the typical and maximum rate respectively. The primary targets for these two herbicides are broadleaf and woody species, so they can be used to target species infesting native or other desirable grass species without affecting the grass. Grazing of these sprayed grasses by livestock could result in exposure. Pertinent Mitigation Measures include scheduling treatments when livestock are not present in the treatment area; design treatments to take advantage of normal livestock grazing rest periods, when possible; as directed by the herbicide product label, remove livestock from treatment sites prior to herbicide application, where applicable; notify permittees of livestock grazing, feeding, or slaughter restrictions, if necessary; notify permittees of the herbicide treatment project to improve coordination and avoid potential conflicts and safety concerns during implementation of the treatment.

For the reasons described, the likelihood of an exposure leading to livestock illness or death is slight to non-existent. Long-term effects, and effects at the herd scale, would be positive, as the benefits of controlling invasive plants would result in fewer degraded sites and better retention of native forage. These benefits would be proportionately[61] less under the No Action Alternative than under the Proposed Action.

Proposed Action

In addition to the four herbicides discussed under the No Action Alternative, five other herbicides added by this alternative present risks under some scenarios. Hexazinone has a low risk under several of the Risk Assessment exposure scenarios and a moderate risk under consumption of treated vegetation at the maximum rate. There is also a 60-day grazing restriction, which a Mitigation Measure suggests be applied to livestock grazing. Hexazinone is planned for about 20 acres per year on average, at least on the existing documented sites (see Table C-4, *Estimated Treatment Acres, by Alternative and Category*, in Appendix C). Hexazinone is typically utilized for treatment of woody species and is semi-selective with spot application, so risk to livestock under normal applications may be lower than those predicted by the Risk Assessment. Triclopyr presents a moderate to high acute and chronic risk for consumption of contaminated vegetation at the typical rate and maximum rate respectively. Although it is utilized in rangelands due to selectivity for woody species, and has low residual activity (USDI 2010a:271), this risk rating (new since the Oregon FEIS)(SERA 2011d) supports existing Mitigation Measures stating triclopyr should not be used at the maximum rate when livestock are present, and precludes treating large areas where cattle graze, where feasible. Dicamba + diflufenzopyr present a low to moderate chronic risk at the typical and maximum rate respectively for consumption of treated vegetation, suggesting against large-scale broadcast use. Metsulfuron methyl presents a low risk under two scenarios at the maximum rate, but rangeland use is restricted on the label to less than half of the maximum rate. Clopyralid shows a low risk under several exposure scenarios and has no label grazing restrictions.

Imazapic, chlorsulfuron, fluridone, sulfometuron methyl, and imazapyr have no measured risk to livestock grazing under any of the exposure scenarios, and metsulfuron methyl shows a low risk only at the maximum rate, which is not permitted on rangelands.

[61] At an existing 12% spread rate, the 44,090 acres would spread to 215,000 acres in 15 years. Under the Proposed Action, this total would be reduced about 68,000 acres and to a 7% annual spread rate (see *Invasive Plants* section later in this Chapter).

Under this alternative, use of the four herbicides available under the No Action Alternative would decrease, and herbicides generally less toxic to livestock would be used (see Appendix D, *Herbicide Risk Tables*). The total acres treated with herbicide having a measureable risk to livestock at the levels likely to be applied would decrease approximately 30 percent. Annual treatments of up to twenty thousands of acres of invasive annual grasses (Treatment Categories 4, 5, and 6) could also occur, generally using imazapic, which shows no risk to livestock.

In general, the increased number of herbicides available under this alternative would lower risk to livestock on the Resource Area allotments because more choices would be available to meet site-specific concerns. As with the No Action Alternative, however, specific Standard Operating Procedures and Mitigation Measures help prevent the risks described above (USDI 2010a:93 and others). Further, for the reasons described, the likelihood of an exposure leading to illness of livestock is slight to non-existent. Long-term effects, and effects at the herd scale, would be positive, as the benefits of controlling invasive plants would result in proportionately fewer degraded sites and better retention of native forage compared to the No Action Alternative.

Cumulative Effects

Common to Both Alternatives

Loss of native and other non-invasive vegetation and declining ecosystem health on public lands due to noxious weeds and other invasive vegetation has contributed to reductions in the ability of public lands to support livestock. Under both alternatives, the control of invasive plants and restoration of invasive grass dominated areas would benefit livestock far more than the risk from herbicides might harm them.

Foreseeable actions in the planning area include juniper treatments; sagebrush treatments, and mowing of vegetation to achieve fuel breaks (see Table 3-3). These treatments would include both mechanical and burning to achieve desired vegetation results. These actions would have a short term effect on native vegetation, primarily juniper removal, where it has invaded sagebrush-perennial native grass and forb communities. The creation of fuel breaks, as well as some juniper removal would have long term benefit to native plant communities. When juniper invades a sagebrush community, primarily due to fire exclusion, the sagebrush overstory, as well as the perennial grass and forb understory are slowly lost as the plants compete for limited resources (mostly water). The juniper may eventually form a monoculture with the exclusion of other plants such as sagebrush, perennial grasses, and forbs that are beneficial to both livestock and wildlife.

Proposed Action

The herbicides selective to the invasive annual grasses in this alternative would make it possible to incorporate mechanical and fuel treatments into invasive annual grass treatments. Disturbance, including prescribed fire and mechanical treatments can create an environment for invasive plants to establish or spread. Wildfires would have a similar effect to some of the vegetation treatments, including temporary removal of native vegetation. The scope of a wildfire could include vast acreage and far exceed the scope of planned vegetation treatments. These acres would potentially be susceptible to invasive plants. The action alternative would allow treatment of annual invasive plants following the wildfire. Burned areas, depending on intensity of the fire, may be seeded following a wildfire. Seedlings typically have greater chances for success if the treatment areas are treated with a pre-emergent herbicide like imazapic to reduce the establishment of invasive annual grasses and invasive forbs which may compete with the desirable seeded plants.

Continued livestock grazing on the Lakeview Resource Area is another foreseeable action. Restoring ecosystem processes and continuing to balance livestock use and rangeland health reduces invasive plant spread and helps create and/or maintain plant communities resistant to disturbance. However, even with invasive plant control, BLM would continue to manage livestock to attain rangeland health standards (USDI 2010a:273).

Wild Horses

Issues

- How would consuming herbicide-treated vegetation affect wild horse health?

Affected Environment

There are two primary wild horse Herd Management Areas (HMAs) within the Lakeview Resource Area, Paisley Desert at about 272,000 available acres with an Appropriate Management Level of 60-150 horses, and Beatys Butte at about 436,000 acres with an Appropriate Management Level of 100-250 horses. About 37,000 acres of the 475,000 acres Warm Springs HMA extend into the Resource Area, but this HMA is managed by the Burns BLM District (see Figure 3-10). Herd numbers are established to ensure that resources, including wild horse habitat, are maintained in a satisfactory, healthy condition and that unacceptable impacts to these resources are minimized (USDI 2003a:2-53). Horse grazing, and thus the calculation of carrying capacity, is essentially the same as for livestock grazing, with the animal unit months adjusted to reflect year round occupancy.

Grazing animals tend to avoid many noxious weeds because of low palatability due to plant defenses such as toxins, spines, and/or distasteful compounds (DiTomaso et al. 2006). In addition, some noxious weeds (e.g., poison hemlock, yellow starthistle, and St. John's wort) are poisonous to horses. Nevertheless, some invasive plants such as the invasive annual grasses early in the spring when they are small and green, will be grazed, browsed, or touched by horses. Thus, exposure to herbicides used for invasive plant control in HMAs can be a concern.

Although the three HMAs occupy 24 percent of the Resource Area, less than one percent of the 44,090 acres of documented invasive plant sites (Treatment Category 1) occur within the HMAs.[62] Beatys Butte has 84 infestations totaling 390 acres, with 344 of these acres being bull thistle and 39 being St. John's wort. Paisley Desert has eleven infestations totaling more than 1,000 acres, with all but two of these acres being Mediterranean sage. The Lakeview Resource Area portion of the Warm Springs HMA has no documented invasive plant sites.

Preliminary Priority Management Area for Greater Sage-Grouse (Treatment Category 5) occupies 62 percent of the Beatys Butte HMA, 80 percent of the Lakeview portion of the Warm Springs HMA, and does not occur within the Paisley Desert HMA. ESI cheatgrass and recent wildfires (Treatment Category 6) occupy 9 percent of the Beatys Butte HMA, 15 percent of the Paisley Desert HMA, and less than 1 percent of the Lakeview Resource Area portion of the Warm Springs HMA.

Treatments Planned Relating to the Issues

No Action Alternative

Although not on the Annual Treatment Plan for 2014-15, most Treatment Category 1 sites could conceivably be treated in a single year. At Beatys Butte, according to Table 2-5 (*Treatment Key, No Action Alternative*), picloram or picloram with 2,4-D would be the most heavily used herbicide combination, but dicamba with 2,4-D could also be used. At Paisley Desert, most of the Mediterranean sage treatments would be made with a picloram + 2,4-D

[62] It is unknown if this lower percentage is because the HMAs have a lower road, recreation site, and stream density than the Resource Area as a whole, or if these relatively remote areas have simply been subject to fewer inventories.

combination. Few if any herbicide treatments would occur in Treatment Categories 5 or 6 because no herbicide is available under the alternative that is selective for the invasive annual grasses.

Proposed Action

Again, most Treatment Category 1 sites could conceivably be treated in a single year. At Beatys Butte, according to Table 2-7 (*Treatment Key, Proposed Action*), most of the bull thistle would be treated with clopyralid, chlorsulfuron, or a combination of these and 2,4-D. The St. John's wort would be most likely treated with metsulfuron methyl with 2,4-D or picloram. At Paisley Desert, most of the Mediterranean sage would be treated with metsulfuron methyl with 2,4-D, clopyralid, or clopyralid with 2,4-D.

Imazapic could be used on up to several thousand acres per year depending upon funding and management emphasis, to control invasive annual grasses in Greater Sage-Grouse habitat (Treatment Category 5) or to rehabilitate areas otherwise infested with invasive annual grasses (Treatment Category 6). Similar treatments could occur in Treatment Category 4 (post-fire emergency stabilization) as well. For all of these treatments, imazapic would usually be applied as a pre-emergent and thus would be essentially unavailable for ingestion via grazing.

These treatments are for most of the existing invasive plant species. In the future, other species may infest one of more of the HMAs, which may necessitate the use of other herbicides.

Standard Operating Procedures and Mitigation Measures Relevant to Effects

The potential for adverse herbicide-related wild horse health effects is minimized for both alternatives by existing Standard Operating Procedures and Mitigation Measures (see Appendix A for Wild Horses and for Livestock). These include, but are not limited to:

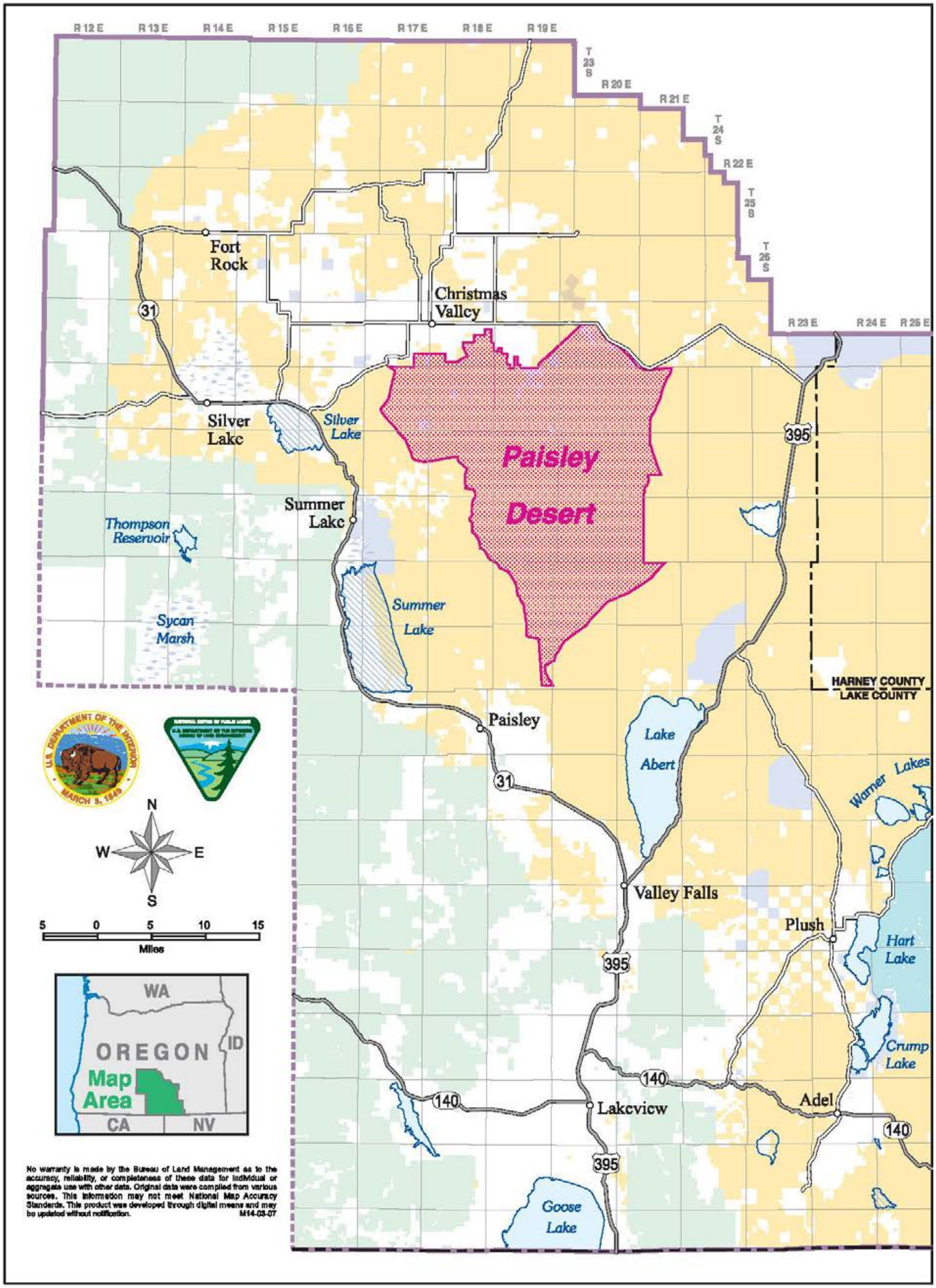
- Minimize potential risks to wild horses by applying glyphosate, hexazinone, and triclopyr at the typical application rate, where feasible, in areas associated with wild horse use. (MM)
- Consider the size of the application area when making applications of 2,4-D, dicamba, Overdrive®, picloram, and triclopyr in order to reduce potential impacts to wild horses. (MM)
- Apply herbicide label grazing restrictions for livestock to herbicide treatment areas that support populations of wild horses. (MM)
- Where practical, limit glyphosate and hexazinone to spot applications in rangeland. (MM)
- Do not apply 2,4-D in HMAs during the peak foaling season (March through June, and especially in May and June), and do not exceed the typical application rate of Overdrive® or hexazinone in HMAs during the peak foaling season in areas where foaling is known to take place. (MM)

Environmental Consequences

Effects of Treatment Methods to Wild Horses

The discussion of individual herbicides in the *Livestock Grazing* section in this Chapter also applies to wild horses, in part because label restrictions and other information about livestock effects are potentially pertinent to wild horses. Stated risks for each herbicide are for the exposure scenarios described in the Risk Assessments (see Appendix D). However, such exposures are limited by the Standard Operating Procedures and Mitigation Measures, and are usually unlikely because of the dispersed nature of wild horses.

Figure 3-10. Wild Horse Herd Management Areas



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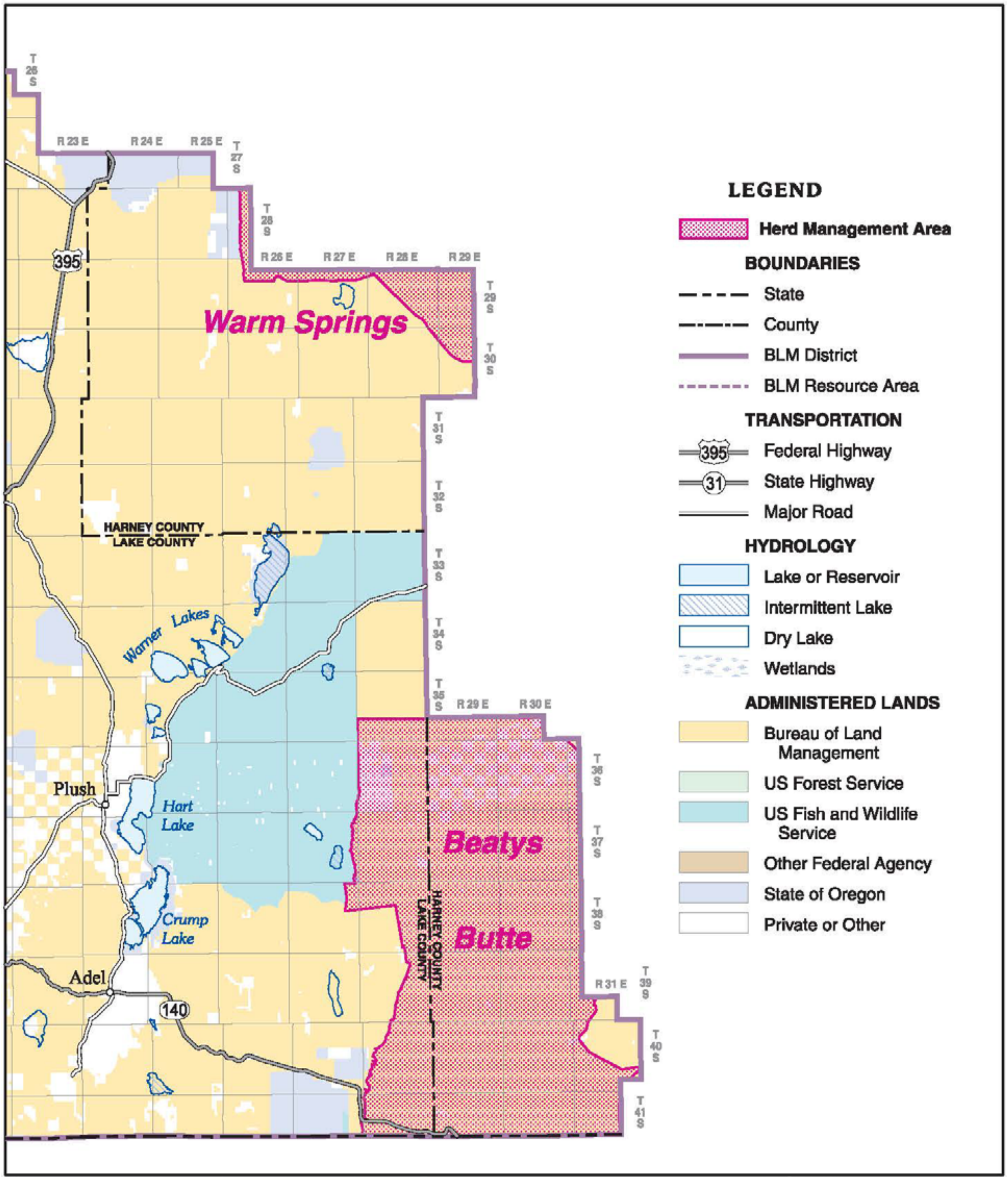
Bureau of Land Management
Integrated Invasive Plant Management Environmental Assessment
Lakeview Resource Area
2014

Figure 3-10. Wild Horse Herd Management Areas



Effects by Alternative

Common to Both Alternatives

The risk of adverse effects to wild horses from dermal contact or ingestion would vary by the amount of herbicide placed on vegetation that is used as forage (which is affected by the extent and method of treatment), the toxicity of the herbicide, physical features of the terrain, weather conditions, and the time of year (e.g., newborn foals would be susceptible during foaling season, with March through June being a critical period). The likelihood of wild horses being directly sprayed is nil since human activity (particularly aircraft) will cause wild horses to flee unless there is a sole water source. There should be little exposure where herbicides are used around campgrounds and even moderately used roads, because the horses avoid human activity.

Wild horses consume large quantities of grass and are therefore potentially at risk where broad-scale applications of selective herbicides have been made on invasive plants. Thus, 100 percent grass grazing scenarios were specifically modeled in the Risk Assessments. However, reaching Ecological Risk Assessment-identified risk levels with herbicides other than triclopyr broadcast at the maximum rate would be unlikely unless the animals foraged exclusively within the treatment area for an entire day (USDI 2010a:269).

No Action Alternative

2,4-D and glyphosate present low risks to mammals under scenarios of direct spray and consumption of contaminated grass at the typical and maximum application rates. Inadvertent spraying of grass and other forage near treated invasive plants, as well as drift and other avenues, could result in exposure. The Risk Assessment results suggest 2,4-D should not be broadcast over wide areas being grazed. In addition, treating invasive grasses with glyphosate when they are young and palatable could result in exposure.

Dicamba presents a low to moderate risk for consumption of sprayed vegetation at the typical and maximum rate respectively. Picloram presents a low to moderate risk at typical and maximum rates for small mammals, and a low risk for consumption of treated vegetation at the maximum rate, and has livestock grazing restrictions. The primary targets for these two herbicides are broadleaf and woody species, so it can be used to target species infesting native or other desirable grass species without affecting the grass. Grazing of these sprayed grasses by horses could result in exposure.

Treatment of the invasive plants currently in the HMAs would be planned mostly with picloram or a picloram/2,4-D combination, but dicamba with 2,4-D could also be used at Beatys Butte. Pertinent existing Mitigation Measures (See Appendix A) include considering the size of the application area when applying 2,4-D, dicamba, and picloram, not applying 2,4-D during peak foaling season in areas where foaling is known to take place, limiting glyphosate to typical rates in HMAs, where feasible, and applying label grazing restrictions to wild horse areas.

For the reasons described, the likelihood of an exposure leading to illness or death of a wild horse is slight to non-existent. Effects at the herd scale would be positive, as the benefits of controlling invasive plants would result in fewer degraded sites and better retention of native forage. These benefits would be proportionately[63] less under the No Action Alternative than under the Proposed Action.

Proposed Action

In addition to the four herbicides discussed under the No Action Alternative, five other herbicides added by this alternative present risks under some scenarios. Hexazinone has a low risk under several scenarios and a moderate risk under consumption of treated vegetation at the maximum rate. There is also a 60-day grazing restriction,

[63] See differences in invasive plant spread between the alternatives in the Invasive Plant section of this Chapter.

which a Mitigation Measure suggests be applied to the HMA. Hexazinone is typically utilized for treatment of woody species and is semi-selective with spot application, so risk to wild horses under normal applications may be lower than those predicted by the Risk Assessment. Triclopyr presents a moderate to high acute and chronic risk for consumption of contaminated vegetation at the typical rate and maximum rate respectively. Although it is utilized in rangelands due to selectivity for woody species, and has low residual activity (USDI 2010a:271), this risk rating (new since the PEIS and Oregon FEIS) suggests triclopyr should not be used in HMAs at the maximum rate, and might be limited to spot treatments at the typical rate where feasible. Dicamba + diflufenzopyr presents a low to moderate chronic risk at the typical and maximum rate respectively for consumption of treated vegetation, suggesting against large-scale broadcast use. Metsulfuron methyl presents a low risk under two scenarios at the maximum rate, but rangeland use is restricted on the label to less than half of the maximum rate. Clopyralid shows a low risk under several exposure scenarios, but has not label grazing restrictions.

Imazapic, chlorsulfuron, fluridone, sulfometuron methyl, and imazapyr have no measured risk to wild horses under any of the exposure scenarios, and metsulfuron methyl shows a low risk only at the maximum rate, which is not permitted on rangelands.

Under this alternative, use of the four herbicides available under the No Action Alternative would decrease, and herbicides generally less toxic to wild horses would be used. For treating the currently documented invasive plant populations in the HMAs, treatments would favor metsulfuron methyl with 2,4-D, clopyralid, clopyralid with 2,4-D, chlorsulfuron, chlorsulfuron with 2,4-D, or picloram. The total acres treated with herbicide having a measureable risk to wild horses at the levels likely to be applied would decrease at least 50 percent. The three herbicides expected to be aerially applied to Mediterranean sage would not pose more than a low risk to wild horses. Treatments of up to several thousands of acres of invasive annual grasses (Treatment Categories 4, 5, and 6) could also occur, generally using imazapic, which shows no risk to wild horses.
In general, the increased number of herbicides available under this alternative would lower risk to wild horses because more choices would be available to meet site-specific concerns in HMAs. As with the No Action Alternative, however, specific Standard Operating Procedures and Mitigation Measures help prevent the risks described above (USDI 2010a:93 and others). Further, for the reasons described, and assuming triclopyr is not broadcast sprayed on vegetation likely to be consumed, the likelihood of an exposure leading to illness of a wild horse is slight to non-existent. Effects at the herd scale would be positive, as the benefits of controlling invasive plants would result in proportionately fewer degraded sites and better forage conditions when compared to the No Action Alternative.

Cumulative Effects

Common to Both Alternatives

Livestock grazing on the Resource Area probably likely reduces wild horse forage more than invasive plants do now, although the continued advance of cheatgrass-dominated plant communities could change this balance in the future. Other activities listed on Table 3-3 usually have little effect on wild horses. Loss of native and other non-invasive vegetation and declining ecosystem health on public lands due to invasive plants has contributed to reductions in the ability of public lands to support wild horses. The wild horses themselves have caused some of these changes. Under both alternatives, the control of invasive plants and restoration of invasive grass dominated areas benefit wild horses far more than the risk from herbicides might harm them. Restoring ecosystem processes and continuing to balance wild horse use and rangeland health reduces invasive plant spread and helps create and/or maintain plant communities resistant to disturbance. However, even with invasive plant control, BLM would continue to have a need to manage wild horses within herd size guidelines to attain rangeland health standards (USDI 2010a:273).

Fire and Fuels Management

Issues

- How would the alternatives affect wildfire frequency and intensity?
- How would the alternatives affect the use of fire as a resource management tool?

Affected Environment

With the exception of Medusahead rye and other invasive annual grasses (primarily in the Sagebrush Steppe Biome), the effects of invasive plants on fire frequency and intensity are mixed and generally subdued. The potential effects of invasive plants on fire regimes and fire behavior is largely dependent on the structure and characteristics (flammability) of the plants themselves, and their indirect effect of altering the abundance and arrangement of native plant fuels. Invasive plants may reduce fuels in ways that suppress the spread of fire in ecosystems where fire is desirable; or may increase hazardous fuels in ways that increase fire intensity or frequency in ecosystems where it is not (Brooks et al. 2004).

In the Sagebrush Steppe Biome, invasive annual grasses have not just increased fuel loading; they have become sufficiently established to create a self-sustaining cheatgrass-wildfire regime. Plant invasions that alter fire regimes typically do so by altering more than one fuel or fire regime property (Brooks et al. 2004). When an invasive plant with different fuel characteristics is established enough to dominate the landscape, its intrinsic characteristics and effects on native vegetation combine to alter fuel properties sufficiently to shift the historic fire regime outside of the reference range of variation. If the new fire regime favors the dominance of the invasive plants causing new fuel conditions and negatively affecting native species, an invasive plant/fire regime cycle becomes established (Zouhar et al. 2008).

Native sagebrush plant communities in the Sagebrush Steppe Biome were historically made up of sagebrush, separated by native forbs and bunchgrasses that retained moisture long into the dry summer season and existed in discontinuous bunches, often separated by areas of soil crust. Natural fire return intervals in this type were 32 to 70 years (Quigley and Arbelbide 1997:797). In the past 130 years, invasive annual grasses (particularly cheatgrass) have become established in many sagebrush communities. When wildfires occur, these grasses increased exponentially. Large areas of these sagebrush communities have experienced a total vegetation conversion to these fire-prone invasive annual grasses, which has converted vast landscapes of native sagebrush steppe to invasive annual grasslands (Menakis et al. 2003). The invasive annual grasses cheatgrass, North Africa grass, and Medusahead rye (noxious) are estimated to moderately or heavily infest more than 300,000 acres on the Resource Area.[64] Most of these acres are located either within the 327,000 acres of ESI where cheatgrass is labeled the dominant grass, or (because these grasses are so efficient at invading disturbed sites), within the roughly 509,000 acres in the Resource Area burned by wildfire in the past 45 years. In the Sagebrush Steppe Biome, these grasses can increase horizontal fuel continuity and create a fuel bed more conducive to ignition and spread, and have been shown to increase fire frequency and size as well as expand the seasonal window of burning (Zouhar et al. 2008). These grasses have increased fuel continuity across large areas of contiguous landscape, supporting more frequent and more intense fast-moving fires that are initially difficult to contain and result in large landscape fires.

Adel, Plush, Silver Lake, Fort Rock, and Christmas Valley are bordered by BLM-administered lands. These communities are considered to be in the wildland urban interface and at risk from fire coming into the community from BLM-administered lands.

[64] Inventories have not been conducted, as the Resource Area has not had an effective way to manage invasive annual grasses.

Treatments Planned Relating to the Issues

No Action Alternative

Few if any treatments would occur in Treatment Categories 5 or 6 because no herbicide is available under the alternative that is effective against the invasive annual grasses. Planned treatments in Treatment Category 1 and others would have little effect on fire frequency and intensity at current and expected infestation levels. Glyphosate is used in high-priority invasive grass monocultures where there are few desirable native species to suffer collateral damage; such treatments may be used in the WUI to partition large expanses of invasive annual grass monocultures.

Proposed Action

Imazapic could be used on up to twenty thousand acres per year depending upon funding and management emphasis, to control invasive annual grasses in Greater Sage-Grouse habitat (Treatment Category 5) or to rehabilitate areas otherwise infested with invasive annual grasses (Treatment Category 6). A priority is to treat where desirable species are present so controlling the invasive annual grasses can benefit intermixed perennials. Where desirable vegetation permits it (either absent, dormant, or fire tolerant), prescribed fire may be used prior to the application of imazapic (or other pre-emergent) to expose the soil and help the herbicide reach the ground. Similar treatments could occur in Treatment Category 4 (post-fire emergency stabilization) as well.

As with the No Action Alternative, treatments in Treatment Categories 1, 2, and 3 would have little effect on fire frequency and intensity.

Standard Operating Procedures and Mitigation Measures Relevant to Effects

The potential for adverse herbicide-related effects to fire and fuels management is minimized for both alternatives by existing Standard Operating Procedures and Mitigation Measures (see Appendix A). These include, but are not limited to:

- Time treatments to encourage rapid recovery of vegetation.
- When appropriate, reseed following burning to re-introduce species, or to convert a site to a less flammable plant association, rather than to specifically minimize erosion.
- Limit area cleared for firebreaks and clearings to reduce potential for weed [invasive plant] infestations.

Environmental Consequences

Effects of Treatment Methods on Fire and Fuels Management

Currently allowed herbicide treatment of noxious weeds under the No Action Alternative could have a fuels treatment objective, but the four herbicides currently available are not capable of selectively controlling the most pressing case of the invasive annual grasses. These herbicides are only allowed for use on designated noxious weeds including Medusahead rye, but not the other invasive annual grasses (notably cheatgrass and North Africa grass). The Proposed Alternative would add imazapic and other herbicides capable of treating this fuels problem.

Herbicides would be used as part of an integrated vegetation management approach. Treatment goals would include reducing fire intensity and spread rates to protect resource values and to increase firefighter and public safety, and restoring fire adapted ecosystems or fire regimes through the modification of vegetation (fuels) structure and composition. Herbicides would be used to help achieve these goals in a number of different ways:

- As a standalone treatment or in combination with other vegetation treatments to change the vegetation structure and composition to reduce fire behavior characteristics (rate of spread, fire line intensities) and facilitate suppression actions;
- As a follow up or maintenance treatment to mechanical or prescribed fire treatments or post wildfire rehabilitation treatments, to either further reduce the fuels hazard or to help control new or existing invasions from occurring or spreading;
- To create strategically placed breaks in invasive annual grass (fuel) continuity adjacent to wildland urban interface communities (where treatment of the entire infested area would be either impractical or too expensive); and/or
- In combination with targeted grazing so herbicide use can be decreased.

Effects by Alternative

No Action Alternative

Under the No Action Alternative, manual and mechanical treatments would be the most effective treatment in removing invasive annual grasses. The reduction of invasive annual grasses through mechanical and prescribed burning would be limited and dependent on the current condition of the fire regime prior to treatment, the intensity, severity, size, and seasonality of a fuel treatment, and site factors such as, topography, soil characteristics, and weather conditions (Zouhar et al. 2008). Mechanical methods could create non-vegetated or brown stripping in the wildland urban interface when opportunities to use prescribed fire are limited. These areas would likely require annual maintenance or retreatment to remain effective in reducing the fire risk to communities. This cost is likely to keep treatments small in scale, providing protection to limited areas of the wildland urban interface.
Prescribed burning could be used to suppress invasive annual grasses in the short term. However, lower elevation or drier sagebrush steppe is very susceptible to reestablishment, and invasive annual grasses will increase after prescribed burning will happen on sites without a sufficient component of native perennials to naturally reestablish (Zouhar et al. 2008). Using prescribed fire alone to reduce fire-induced invasions is not likely to be effective, but used in combination with other treatments it can reduce the grasses (Zouhar et al. 2008). For example, burning cheatgrass and Medusahead rye may be more successful when used as a seedbed preparation technique followed by seeding of desirable species within a year of the burning so they do not become reinvaded (Zouhar et al. 2008). Using herbicides to maintain mechanical non-vegetated or brown stripping breaks would reduce the cost of maintaining these areas and increase their effectiveness at reducing fires.

Glyphosate is sometimes used for Medusahead rye control, but it no residual pre-emergent effect against new seedlings from the seed bank . Because glyphosate in non-selective, it removes native shrubs and forbs needed to help restore the site. As with prescribed fire, active restoration is usually required. Actual fuel hazard reduction benefits (even in the short term) are limited. The reduction in the severity of fire behavior characteristics (rate of spread, fire line intensities) under the No Action Alternative would be relatively labor-intensive, and benefits would be localized to the area treated.

Proposed Action

Herbicides that would become available under this alternative include pre-emergents (e.g., imazapic) that would selectively control invasive annual grasses, making some combination of prescribed fire-herbicide-seeding treatments effective at removing these grasses and restoring native vegetation. This treatment could be used to meet a variety of restoration objectives, including somewhat reducing the likelihood the area will burn again. Significant to this discussion, the treatment can reduce the risk of fast-moving, intense, invasive annual grass-fueled fires when applied to meet fuel reduction objectives within the wildland urban interface.

Herbicides would also increase the effectiveness of greenstripping – a proactive technique to reduce the magnitude of the cheatgrass-wildfire cycle by growing fire-resistant vegetation at strategic locations in order to slow or stop the spread of wildfires (Quigley and Arbelbide 1997:801). This would increase the likelihood of successfully working with adjacent landowners on fuel breaks and related treatments.

Cumulative Effects

No Action Alternative

As noted above, actions under this alternative would have little effect wildfire or the use of prescribed fire. If the fuels in the WUI were Medusahead, some fuel treatments could be accomplished if other vegetation conditions were right. Such treatments are unlikely in the foreseeable future under this alternative, because most of the WUI grasses are cheatgrass.

Proposed Action

The Resource Area could treat up to 20,000 acres per year in Categories 4, 5, and 6, mostly with the herbicide imazapic. These treatments would be possible because of the availability of herbicides selective to the invasive annual grasses. The Resource Area plans to continue to mow 1,300 acres of fuel breaks in annual grasses. It should be noted that if invasive annual grasses were treated at 20,000 acres a year for the life of the EA (10-15 years), along with the 1,300 acres, only 8.6 percent of the Resource Area would be treated. In the context of managing vegetation conditions to reduce wildfires, such treatments would more likely to have an ecosystem rehabilitation benefit and a fire reduction one. Continued increases in invasive annual grasses as well as global climate change will likely usher in larger, more intense, wildfires in the foreseeable future, and the rehabilitation treatments will likely only slow this increase. Other measures to protect the WUI might include more fire resistant building materials, and better fire planning by communities.

Air Quality

Issues

- How would the alternatives affect air quality?

Affected Environment

Because air pollution can directly pose health risks and cause significant welfare effects to humans, management and improvement of air quality in the U.S. is an important regulatory goal. The *Clean Air Act*, originally passed in 1955 and amended several times since, establishes a mandate to reduce emissions of specific pollutants via uniform Federal standards. Under the *Act*, the EPA identifies criteria pollutants, sets regulatory standards for those pollutants, and approves State and Tribal Implementation Plans. States and tribes enforce the standards set by EPA and can delegate that authority to local air pollution control boards. States and tribes can set more stringent standards than the *National Ambient Air Quality Standards* (NAAQS) but cannot relax standards.

The EPA set primary and secondary NAAQS. The primary NAAQS protect the health of susceptible individuals and the secondary NAAQS protect the general welfare of the public, including visibility in Class I areas (EPA 2007a). Different averaging periods are established for the criteria pollutants based on their potential health and welfare effects. The six pollutants currently regulated are sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), ozone (O_3), lead (Pb), and particulate matter (PM).

Particulate matter is a generic term for a broad class of chemically and physically diverse substances that exist as discrete particles over a wide range of sizes. For regulatory purposes, particulate matter is further classified by the particle's aerodynamic diameter. PM_{10} includes all particulate matter with an aerodynamic diameter of 10 microns or less and is referred to as inhalable PM. $PM_{2.5}$ includes all particulate matter with an aerodynamic diameter of 2.5 microns or less, called fine PM, and is by definition a subset of PM_{10}. Studies have shown more serious health effects associated with $PM_{2.5}$; therefore, EPA promulgated more stringent standards for this class of particulate matter.

All areas of the nation have been classified based on their status with regard to attaining the NAAQS. The EPA designates an area as being in attainment for a criteria pollutant if ambient concentrations of that pollutant are below the NAAQS, or being in non-attainment if criteria pollutant concentrations violate the NAAQS. Once non-attainment areas comply with the NAAQS, they are designated as maintenance areas. Areas classified as non-attainment must implement a plan to reduce ambient concentrations below the NAAQS. Areas where insufficient data are available to determine attainment status are designated as unclassified, and are treated as attainment areas for regulatory purposes.

In general, the air quality in Oregon is good but with persistent problem areas where strong inversions tend to trap either CO or particulate matter at certain times of the year. Currently, the town of Lakeview is trying to avoid being classified as non-attainment for not meeting the $PM_{2.5}$ standard. The town of Lakeview is positioned in a basin with the Warner Mountains to the east. During times of stable air conditions, an inversion can occur, causing an exceedance of the $PM_{2.5}$ standard. The inversion and $PM_{2.5}$ exceedance normally occur during the winter months, mainly due to the use of wood burning for heat. On occasion, the town of Lakeview has exceeded the $PM_{2.5}$ standard when smoke from wildfires or prescribed fires accumulates in the basin. Smoke coming into Lakeview airshed is considered an intrusion. The town of Lakeview is currently working with the Department of Environmental Quality, the EPA, and the Oregon Department of Environmental Quality to come up with a plan to meet the $PM_{2.5}$ standard. This would include regulating open burning. The Lakeview Resource Area voluntarily complies with the Oregon Smoke Management Plan, whose goal it is to minimize emissions from prescription burning consistent with air quality objectives of State and Federal clean air laws.

Visibility Protection in Mandatory Federal Class I Areas

Visibility protection in mandatory Class I areas is the most significant aspect of the human welfare part of the *Clean Air Act* standards. The EPA promulgated the Regional Haze Rule in 1999 to further improve visibility in mandatory Federal Class I National Parks and Wilderness areas. Mandatory Class I areas include National Parks over 6,000 acres in size and wilderness areas over 5,000 acres in size that were in existence on August 7, 1977 plus any subsequent additions to those areas or any wilderness areas designated as Class I in their enabling legislation. All areas that have not been designated Class I are designated as Class II areas. There are two mandatory Class I airsheds within 100 miles of the Lakeview Resource Area: the Gearhart Wilderness and Crater Lake National Park.

In all mandatory Class I areas, improvement in visibility must be made every 10 years for the 20 percent most impaired (haziest) days, regardless of current condition, and there must be no degradation for the 20 percent best (clearest) days, until the National visibility goal is reached in 2064. State and Tribal Implementation Plans outline how reasonable progress towards this goal will be achieved and demonstrated. Section 308 of the Regional Haze Rule provides nationally applicable provisions of the rule in the development of State and Tribal Implementation Plans.

Treatments Planned Relating to the Issues

No Action Alternative

Few if any herbicide treatments would occur in Treatment Categories 5 or 6 because no herbicide is available under the alternative that is selective for the invasive annual grasses, so no pre-burning is expected. Driving (to access treatment areas) will create dust and exhaust.

Proposed Action

Imazapic could be used on up to twenty thousand acres per year (depending upon funding and management emphasis) to control invasive annual grasses in Greater Sage-Grouse habitat (Treatment Category 5) or to rehabilitate areas otherwise infested with invasive annual grasses (Treatment Category 6). Similar treatments could occur in Treatment Category 4 (post-fire emergency stabilization) as well. An unknown portion (but potentially thousands of acres) of the treatments in Category 6 may be preceded by burning to remove grass and expose the soil prior to the application of the herbicide. As with the No Action Alternative, driving will create dust and exhaust.

Standard Operating Procedures and Mitigation Measures Relevant to Effects

The potential for adverse herbicide-related effects to air quality is minimized for both alternatives by existing Standard Operating Procedures and Mitigation Measures (see Appendix A). These include, but are not limited to:

Fire Use

- Have clear smoke management objectives.
- Evaluate weather conditions, including wind speed and atmospheric stability, to predict effects of burn and impacts from smoke.
- Burn when weather conditions favor rapid combustion and dispersion.
- Manage smoke to prevent air quality violations and minimize impacts to smoke-sensitive areas.
- Coordinate with air pollution and fire control officials, and obtain all applicable smoke management permits, to ensure that burn plans comply with Federal, State, and local regulations.

Chemical

- Apply herbicides in favorable weather conditions to minimize drift. For example, do not treat when winds exceed 10 mph (>6 mph for aerial applications) or rainfall is imminent.
- Use drift reduction agents, as appropriate, to reduce the drift hazard.
- Select proper application equipment (e.g., spray equipment that produces 200- to 800-micron diameter droplets [spray droplets of 100 microns and less are most prone to drift]).
- Select proper application methods (e.g., set maximum spray heights, use appropriate buffer distances between spray sites and non-target resources).

Environmental Consequences

Effects of Treatment Methods on Air Quality

Fugitive dust from driving on unpaved roads is not expected to measurably alter air quality in mandatory Class I areas or in air quality non-attainment or maintenance areas. The highest emissions from manual treatments are CO, which largely comes from the exhaust of transportation vehicles, although manual emissions are minor relative to prescribed burning and mechanical treatments. Prescribed burning would likely take place in late summer or early fall so that follow-up seeding could have the advantage of winter precipitation, which would enhance germination and establishment. Direct effects to air quality from burning annual grasses are of very short duration due to the lack of smoldering. Emissions are quickly dispersed and diluted, and therefore are not expected to impair visibility in any mandatory Class I areas. There is some potential for short-term (1-4 hours) effect, depending on individual treatment unit size.

Effects by Alternative

No Action Alternative

Since there is no herbicide available under the alternative that is selective for the invasive annual grasses, no burning for pretreatment would happen. Manual treatments and herbicide application result in few emissions of the pollutants analyzed, mostly related to travel exhaust and dust, or incidental mechanical treatments exhaust (almost none planned).

Proposed Action

Under this alternative, the availability of imazapic to treat invasive plants may increase the use of prescribed fire. Prescribed fire could be used as preparation treatment in a three-step treatment regimen for controlling and rehabilitating some sites infested with invasive annual grasses (Treatment Category 6). As a result, emissions of particulate matter, CO, and CO_2 will be higher due to an increase in prescribed burning and only minor decreases in mechanical treatments over the No Action Alternative. The prescribed fires are expected to take place within recent wildfire areas (1968-2012) or where the ESI has recorded cheatgrass as the dominant understory (see Figure 2-3, *Recent Wildfires and Cheatgrass Dominated Plant Communities from Ecological Site Inventory*, in Chapter 2). These areas are not located within the town of Lakeview's airshed or near any Class I airsheds. Standard Operating Procedures and Mitigation Measures prevent the risk of intrusion by smoke into Lakeview or Class I airsheds if burning is used as a pre-treatment tool.

Cumulative Effects

No Action Alternative

The amount of fugitive dust and motor exhaust from travel to the control sites, exhaust from ATVs used during treatments, and exhaust from occasional motorized equipment such as chainsaws, will provide a negligible (immeasurable) negative contribution to air quality in Lakeview and surrounding towns. Mill and home heating, smoke are the primary cause of air quality concerns in Lakeview, with occasional contributions from Wildfire. Other management activities on the Resource Area provide negligible effects to air quality. The Resource Area burns 5,000 acres of cut juniper per year, but can typically schedule this when atmospheric conditions promote dispersal and protection of Class 1 air sheds.

Proposed Alternative

The Resource Area burns (on average) 5,000 acres a year of cut juniper, and does not currently have the personnel or resources to burn more. Burning as an invasive plant control method will reduce the amount of juniper burning conducted, which in turn will reduce the amount of particulate matter put into air - burning an acre of cut juniper produces ten tons of smoke, compared to two tons with annual grasses (Ottermar et al. 1998).

Neighboring BLM Districts, the United States Forest Service, and private landowners do controlled burning at the same time as the Resource Area with no adverse air quality effects. This is due to coordination of burning and following the Oregon Smoke Management Plan. Burning as a pre-treatment for invasive plant control should have little to no cumulative effect. Smoke from invasive annual grass restoration projects on adjacent BLM districts should not noticeably contribute to adverse air quality in Lakeview. Air quality in Lakeview is primarily affected by heating and mill smoke and the topographic and weather conditions of the town.

Cultural Resources and Native American Concerns

Issues

- How would the alternatives affect fungi, plants (including fruit), and wildlife used for Native American subsistence, religious, or ceremonial purposes?
- How would the alternatives affect historic and prehistoric cultural sites?

Affected Environment

The Tribes

The Lakeview Resource Area has had use and occupation by various Native American Groups for over 14,000 years. Throughout the area, cultural resources in the form of archaeological sites are an abundant testament to this use. While the overwhelming majority of the lands previously occupied by Native Americans of the region were ceded to the Federal Government to be placed in private ownership or Public Lands, Native Americans still have an attachment to the lands that they no longer occupy in the form of hunting, fishing, plant gathering, and a general concern that plants of importance to them be maintained on their former lands. Within the Lakeview Resource Area there are four Native American groups, now referred to as Tribes, which used and occupied the area. These are the Fort Bidwell Indian Community, The Burns Paiute Tribe, The Confederated Tribes of Warm Springs, and The Klamath Tribes. These last two have off-reservation treaty rights within the Resource Area, but the needs of all four tribes are accommodated as much as possible.

The Fort Bidwell Tribe is currently located in Fort Bidwell, California, where they have a small reservation area. Historically they occupied the Warner Valley area of the Resource Area, and the surrounding uplands. Seasonal movements were made between Warner Valley, Oregon and Surprise Valley, California. Several village locations are known within the Warner Valley area for this group. A large list of known places and place names are contained in the publication *Ethnography of the Surprise Valley Paiute*, which is an ethnographic study of this group (Kelly 1932). Within it, important plants and the places where plants were gathered are noted. Past consultation with this group has indicated that they maintain the need and right to collect various plants within their former territory in order to maintain their cultural heritage.

The Burns Paiute Tribe is currently located in Burns, Oregon, where they have a small reservation. This group, while centered in the Malheur National Forest and Malheur Wildlife National Refuge regions, periodically travelled into the Lake County area for collection of plants. In addition, the northeastern portions of the Resource

Area would have been used by them on a regular basis. Most important for this group were trips to the areas south of Lakeview where in the creek drainages, large amounts of plum could be gathered.

The Confederated Tribes of Warm Springs have members of Paiute heritage, which have long-standing relationships to the Resource Area. Many members have family ties to other groups that used the area. Consultation work in the past has shown that the Confederated Tribes of Warm Springs has an interest in all matters dealing with the Resource Area and they have asked to be consulted on projects on a regular basis.

The Klamath Tribes is comprised of the Klamath, Modoc, and Yahooskin Paiute groups. These three separate but related groups were placed together on the Klamath Reservation during the period of relocation of tribes onto reservations in the 1800s. They have specific interests in the northern and western portions of the Resource Area. Historically, they were located on the west shore of Goose Lake, along the western margin of Summer Lake, and in the Fort Rock and Christmas Valley areas. Over the years, the Klamath Tribes have expressed great interest in the lands of the Resource Area and the health of plant resources, as well as prehistoric archaeological sites within the area.

Plant Resources

While the Tribes no longer rely upon the traditional collection and processing of plants for food, fiber, and medicine for their existence, they still consider the preservation of these plants, their use in ceremonies, and the knowledge that they exist to be important to the maintenance of their cultural heritage. For instance, Lambs' Quarter (or Wada, as it is known to the Burns Paiute) was a major food plant. The Burns Paiute were known as the "Wada Eaters," and they consider the protection and preservation of these plants to be important to their culture. Plants are mostly used today in cultural ceremonies, special occasions, for medication, and for the perpetuation of cultural traditions within families. Great concern is expressed for the preservation of significant plant areas and plant types. While the Resource Area does not know how often plants are collected or where, strong indications are given that this is done on a regular basis by all four Tribes.

Plants identified during consultation as important to Native Americans fall into four categories: food plants, medical plants, ceremonial/religious plants and fiber plants[65].

Food Plants

While there was a somewhat longer list of plants used by the Tribes historically, following is a listing of the plants that have been identified by the Tribes as being of most importance to them today.

- Camas, Blue camas
- Biscuit Root
- Bitterroot
- Yampa, Yampah, Ipos, Bolanger's Yampa
- Chokecherry
- Klamath Plum
- Service Berry
- Huckleberry
- Pond Lily or Wocas
- Arrowhead or Wapato
- Elderberry
- Wild Onions
- Sego Lily
- Yellow Bell
- Currants

[65] Additional plants may continue to have some minor use.

Gooseberry
Lamb's Quarter or Wada
Bitter Cherry
Wild Rose
Tobacco Root
Balsam Root Seeds

Medicinal Plants

Most members of all four tribes are reluctant to give specific information regarding the types of plants that are used for medication. They fear that doing so will lead to their use by non-native individuals who will compete with Tribal Members for their use. Medicinal plants include:

Balsamroot
Tobacco Root
Wild Rose
Native Tobacco

Ceremonial/Religious Plants

Any or all of the food and medicinal plants listed above could fall into this category. Most of the food plants are collected and used during ceremonies to celebrate the cultural heritage of these groups. Specific plants used in religious practices are generally not identified by the Tribes for the same reasons that medical plants are not identified.

Fiber Plants for Construction

In the past, most of the necessary weapons, tools, baskets, housing, storage containers, etc. were constructed out of native fibers or woods collected and processed by Native Americans. Some members of the Tribes still practice these skills either for personal enjoyment, to earn an income, or simply to preserve cultural traditions and practices. Plants used for these purposes include:

Yew Tree
Indian hemp
Willow
Juniper
Mountain Mahogany
Bear Grass
Tule
Cattails
Cane Reed

Known Plant and Ceremonial Areas

During consultation, the tribes identified following areas as significant because of plant gathering, ceremonial, or religious concerns. The Klamath Tribes also identified rock cairns or stacked rocks as sacred.

Red Knoll ACEC[66] - The Red Knoll ACEC area is located in the Chewaucan Basin area. Within the ACEC, large numbers of stacked rock features are known to exist.

[66] The ACECs listed in this section, as well as several others on the Resource Area, were created in part to protect cultural values.

Table Rock ACEC - The Table Rock ACEC area is located in the Christmas Valley area. Rock construction features in the area are considered by The Klamath Tribes to be sacred.

Back slope of Fish Creek Rim - Fish Creek Rim is located on the western edge of the Warner Valley, where a high fault block makes up the western margin of the valley. From its upper edge, it slopes off to the west in a broad open "back slope." The area is made up of shallow lithosols over bedrock. Several small rims, canyons, and draws are located in the area. Vegetation is mostly sagebrush, junipers, and mountain mahogany. The area has an abundance of important plants, primary of which are Yampa, biscuit root, onions and bitterroot. Along the rims, drainage canyons, and draws, areas of currants, plum, chokecherry and other fruit plants occur.

Abert Rim Back slope - Abert Rim makes up the eastern edge of the Abert Lake Basin. From the top of the rim, the fault block slopes off to the east in a broad open "back slope" where large amounts of Yampa, biscuit root, onions and bitterroot occur. Yampa in particular occurs in this area. Within the rims, drainages, and draws, areas of current, plum, chokecherry, and other fruit plants occur.

High Lakes ACEC - The High Lakes ACEC Area is located in the upland areas to the east of Warner Valley and south of Hart Mountain. This is a broad open area of lithosols that have large stands of biscuit root, Yampa, and bitterroot. Large amounts of wild onions are also present. Along the numerous rims and drainages, currants, plum, chokecherry and other fruit plants occur.

Rahilly-Gravelly ACEC - The Rahilly-Gravelly ACEC area is located in the upland area to the south of South Warner Valley. The area has large stands of Yampa along with biscuit root and bitterroot. Along the rims and canyons of the area are locations where plum, currants, and chokecherry occur along with other fruit plants.

Big Valley Area - The big valley area is located in the mountainous upland area to the west of the Warner Valley. It is a broad open large meadow valley surrounded by pine forest on the south and west and sagebrush scablands to the north and east. This area is mostly under private ownership. The area is of special interest to the Fort Bidwell Paiute who collected Tobacco root in the valley bottom. They have asked that an ACEC or Traditional Cultural Property designation be given to the area. Due to private ownership of most of the area, this has not been done by the BLM.

Drainage Canyons south of Lakeview and north of Lakeview - Along the western edge of the Warner Mountains, which make up the eastern edge of Goose Lake Valley, there are several stream drainages which empty out into the Goose Lake Valley. Within the bottoms and edges of these drainages are often large stands of plum, chokecherry, and other fruit plants. Several of the Tribal Groups reported that they would often journey to these drainages to collect fruit. The Burns Paiute report that this was a trip often made in the past by members of their Tribe.

Rims of the Resource Area - Most of Lake County and the Lakeview Resource Area is a volcanic area where bedrock of basalt lava flows lies just under the surface. The area is also an area of geologic faulting and fault block tilting. This activity within the lava flows has created thousands of large to small rimrock areas. In the winter, snows will drift over the edges of these rims and collect into drifts that can be many feet thick. This moisture creates habitat for plants such as plum, chokecherry, and currants, which can often be abundant along the face of a rim.

Creeks and River Drainages - Drainages of creeks and rivers of the area often will have large stands of willows along with chokecherry and other plants. Willows are an important source of fiber materials for the manufacture of baskets. The Fort Bidwell Indian Community has specifically identified the areas of 12 Mile Creek, 15 Mile Creek, and 20 Mile Creek as areas where they manipulate the willows to provide strong, narrow long shoots for basket making. The Tribe has not been willing to provide exact locations of this activity in these areas.

Marsh Edge Areas - Similar to stream drainages, the edges of marshes provide fiber plants used in making baskets of willow, Indian hemp, tulle and cattails.

Slope of Winter Rim on Western Edge of Summer Lake Basin - The slope of Winter Rim has a large abundance of Klamath Plum growing on its face. Since the area was burned by a wildfire in 2002, the plum plants of the area have grown back in abundance. This area is specifically identified by the Klamath Tribes as an area where they go to collect plums.

Treatments Planned Relating to the Issues

Common to Both Alternatives

Any of the full range of herbicide and non-herbicide treatments in Categories 1, 2, and 3, and potentially some in all six Treatment Categories, could potentially affect one or both of the issues. Cultural plants appear to be spread throughout the Resource Area, so it is impossible to generalize the level of risk until Annual Treatment Plans are reviewed by the Tribes, other than to note that invasive plants are more likely to be in disturbed areas (including along roads), which are areas less likely to have certain (but not all) of the culturally significant plants. Prehistoric cultural sites should be protected by the requirement to conduct pre-project surveys prior to treatments that could adversely affect such resources.

Water-soluble dyes are used in many herbicides. Many sprays are applied using an all-terrain vehicle (ATV). Non-herbicide treatments include mowing, grubbing, and targeted grazing.

Proposed Action

With additional herbicides including those selective to the invasive annual grasses, newly burned sites may be sprayed if cheatgrass is predicted (Treatment Category 4). Imazapic or may be used to control light to moderate infestation levels on invasive annual grasses in Greater Sage-Grouse Preliminary Priority Management Areas (Treatment Category 4), or to limit or rehabilitate sites more heavily infested with these grasses (Treatment Category 6). Prescribed burning may be conducted prior to imazapic application in annual grass rehabilitation areas

Concerns Expressed by the Tribes

During consultation, tribes asked that spraying not be done in plant gathering, ceremonial, or religious concern areas, or directly on any rock cairn or stacked rock (considered sacred by the Klamath Tribes). They also expressed concern that archaeological sites in general should be protected from contamination by herbicide use.

Tribes expressed concern that the spraying of herbicides on plants, which they use for food, medicine, ceremonial uses, and for fibers for construction projects, will lead to health problems for Tribal Members. They considered this issue most critical during the months of May and June when plants are growing and collected for use, and specifically requested that no spraying be done during this time of year.

Concern was expressed that use of herbicides could harm wildlife by contamination of the foods which elk, deer, antelope, marmot, ground squirrel may depend upon. Concern was also expressed that use of herbicides could lead to contamination of springs, ground water, streams and rivers and have an impact upon fish within these areas.

The Tribes have requested that the least disruptive or harmful method of treatment be used to control invasive plants. For instance, if a plant can be removed by hand digging or picking rather than through application of herbicide, that would be the preferred method of treatments. Spot spraying is preferred over broadcast spraying.

The Tribes asked to be notified of treatment plans in advance, notified about large treatment areas through signing, and about specific treatments by the use of dyes in spray mixes. They also asked for infestation maps so they could understand future treatment needs.

Standard Operating Procedures and Mitigation Measures Relevant to Effects

The potential for adverse herbicide-related effects to Native American interests, resources, and concerns is minimized for both alternatives by existing Standard Operating Procedures and Mitigation Measures (see Appendix A). These include, but are not limited to:

- Identify cultural resource types at risk from manual treatments and design inventories that are sufficient to locate these resources. Provide measures to minimize impacts.
- Follow guidance under Human Health and Safety Standard Operating Procedures and Mitigation Measures in areas that may be visited by Native peoples after treatments.
- Do not exceed the typical application rate when applying 2,4-D, fluridone, hexazinone, and triclopyr in known traditional use areas. (MM)
- Consideration should be given to herbicides other than 2,4-D; use of 2,4-D should be limited to situations where other herbicides are ineffective or in situations in which the risks posed by 2,4-D can be mitigated. (Oregon FEIS MM)
- Do not apply triclopyr by any broadcast method. (Oregon FEIS MM)
- For herbicides with label-specified re-entry intervals, post information at access points to recreation sites or other designated public use or product collection areas notifying the public of planned herbicide treatments in languages known to be used by persons likely to be using the area to be treated. Posting should include the date(s) of treatment, the herbicide to be used, the date or time the posting expires, and a name and phone number of who to call for more information. (Oregon FEIS MM)

Project Design Features Adopted for this Analysis

- At least one month prior to beginning annual treatments, the Annual Treatment Plan will be presented to the affected tribes. . The BLM will coordinate with tribes to identify where treatments may need to be delayed to avoid use conflicts, where cultural features must be avoided or protected, and where posting would help tribe members avoid treatment areas. Maps of known invasive plant infestations (see Figure 2-1, *Documented Invasive Plants*, for example) can also be shared with the tribes at this time.
- Where coordination with a tribe about an Annual Treatment Plan identifies areas where herbicide use would not be consistent with cultural values and uses, alternative treatment methods will be implemented where feasible, consistent with existing law, regulation, and policy.
- An existing mitigation measure requires that “for herbicides with label-specified re-entry intervals, post information at access points to recreation sites or other designated public use or product collection areas notifying the public of planned herbicide treatments…” (Appendix A, *Project Design Features, Standard Operating Procedures, Mitigation Measures, Conservation Measures, Prevention Measures, and Best Management Practices*). Similar posting for any herbicide use can be made in traditional gathering areas identified by the tribes. Coordination following receipt of the Annual Treatment Plan will help identify where such posting will occur.
- An infestation map or database can be supplied to the tribes any time, and will be supplied with the Annual Treatment Plan. Discussions about the implications of infestations, treatment and coordination ideas and options, possible effects and conflicts relating to those infestations , and related topics would be welcome as part of coordination with the tribes.

Environmental Consequences

Effects of Treatment Methods to Cultural Resources and Native American Concerns

Non-Herbicide Treatments

Non-herbicide treatments including mowing, grubbing, and targeted grazing would be unlikely to affect caves, large stone structures, and petroglyphs if they exist. If treatments have the potential to adversely affect ground level paleontological resources, pre-project clearances are required. These treatments may also reduce culturally significant plants, but their directed nature minimizes such a possibility. Prescribed burning associated with rehabilitation treatments could remove desirable plants if present, but such fires are conducted either on sites so dominated with invasive plants that there are few desirable native plants on the site, or they are conducted at times of the year and under conditions that seek to retain the native vegetation. Such fires are conducted at lower intensity than wildfires, and are part of rehabilitation that would provide long-term benefits to native vegetation.

Herbicide Treatments

An herbicide-by-herbicide discussion of their potential to harm non-target plants is included in the *Native Vegetation* section in this Chapter. Herbicides are designed to kill plants, so culturally significant plants would be damaged or killed if sprayed with any of the herbicides to which they are susceptible. Selective herbicides such as imazapic would reduce this risk on broadleaf plants but not on grasses. Further, chlorsulfuron, metsulfuron methyl, sulfometuron methyl, imazapic, and imazapyr are effective at very low dosages (half ounce to a few ounces per acre). Because of their high potency and longevity, these herbicides can pose a particular risk to non-target plants. Off-site movement of even small concentrations of these herbicides can result in extensive damage to surrounding plants, and damage to non-target plants may result at concentrations lower than those reportedly required to kill target invasive plants (Fletcher et al. 1996, USDI 2010a:145). 2,4-D is a selective herbicide that kills broadleaf plants but not grasses, and is used in many tank mixes. Direct spray and nearby drift can kill non-target plants. Triclopyr is selective to broadleaf and woody plants, and susceptible species could be impacted by drift as far as 1,000 feet away at the maximum rate. Post-fire imazapic treatments could contaminate pre- and post-emergent fungi, but there is no potential human health effect from such contamination identified in the Human Health Risk Assessments (Appendix D). Dyes used with herbicide formulations have the potential to deface cultural sites for a time if they are directly sprayed.

Individual plants as well as cultural sites at ground level could be mechanically impacted by ATVs used to apply herbicides, but such effects would be unlikely on escarpments, large rock areas, and the like.

Human Health Risks from Herbicide Treatments

Human health risks are addressed in the *Human Health and Safety* section in this Chapter, which itself tiers to over 6,000 pages of Risk Assessments closely examining the potential for adverse human health and environmental effects. Within those Assessments, a variety of possible human exposures are examined, including contact with sprayed vegetation, consumption of sprayed fruit and berries, consumption of contaminated water, and consumption of contaminated fish by subsistence populations. The possible herbicide exposure under each scenario was compared with levels of each herbicide known to cause adverse effects in humans. In many cases, the adverse effect was eye or other irritation, typically reversible. Where modeled scenarios resulted in herbicide exposures less than one-tenth of the lowest level to cause an adverse effect, the Risk Assessments (and this EA) consider the herbicide to have “zero” or “no” risk. Where modeled scenarios resulted in exposures between one-tenth and the lowest level to cause an adverse effect, risks were rated as “low.” And so forth. It is important to note the modeled exposure scenarios were generally conservative, and various uncertainty factors were used wherever data were missing. Risk ratings for all of the modeled exposures, for all 14 of the herbicides, are included in Appendix D, *Herbicide Risk Tables* of this EA, and discussed individually in the *Human Health and Safety* section in this Chapter.

All of the human health scenarios for the public or subsistence populations, including accidental spill scenarios, have zero or no risk except:

- 2,4-D has a low risk for direct spray, child, at the maximum rate. A mitigation measure precludes use of the maximum rate where feasible.
- Glyphosate has a low risk for consumption of contaminated water, child, at the maximum rate. No maximum rate treatments are anticipated (see Table 2-7, *Treatment Key, Proposed Action*).
- Triclopyr has a low risk for consumption of contaminated water, child, at the maximum rate, and triclopyr BEE has a low risk at the maximum rate for scenarios of consumption of contaminated fruit; dermal – contaminated vegetation, woman; and, direct spray, woman, lower legs. A mitigation measure precludes use of the maximum rate where feasible, or its application by any broadcast method.
- Fluridone has a low risk for accidental spill scenario for berry picker, child and for residential – contaminated water, child and adult. This is an aquatic herbicide for which use would be extremely limited, and well posted.

Two other factors reduce exposure. First, invasive plants displace native vegetation of interest to the tribes. Herbicide and other treatments discussed in this EA focus exclusively on invasive plants. Second, anticipated annual herbicide use is less than one-third of one percent of the Resource Area, and more than 70 percent of the treatment areas would be to rehabilitate invasive annual grass (e.g. cheatgrass) monocultures or control perennial pepperweed in the Warner Basin. Both of these treatments would be specifically identified on Annual Treatment Plans.

Effects by Alternative

Common to Both Alternatives

Effects of treatments to water, fish, and wildlife are discussed in other sections in this Chapter. Those sections indicate treatments, and specifically herbicides, will not adversely affect the abundance or availability of these resources.

Almost all of the non-herbicide treatments would be hand pulling of individual plants. Efforts are made to disturb as little of the site as possible because ground disturbance encourages reinfestation or the germination of seed-bank seeds. Larger rehabilitation projects in cheatgrass could impact large areas; a project design feature in this EA is to notify the tribes of such proposals and coordinate with them to avoid conflicts where possible.

The primary risk to cultural sites is from ATVs, which are variously used to spot or boom spray invasive plant populations off roads. However, treatments with the potential to damage cultural sites are subject to cultural surveys. Treatments along roads and other disturbed areas (where most new infestations start), and aerial treatments, are not likely to put undiscovered sites at risk of damage. Rock cairns and other rock features would not, as a matter of policy, be sprayed with spot herbicide use; herbicides are expensive and unsightly, use away from plants could expose non-target organisms (including lichens) to sprays, and thus spot sprays are applied only to the target plants. Where broadcast sprays are planned, tribal reviews of Annual Treatment Plans (including maps) and resultant coordination would be expected to identify cairns and other features to avoid. Undetected features could be contaminated with aerial treatments, but cultural surveys would likely be conducted for treatments at that scale. Dyes used in all herbicide treatments photo degrade in a few weeks.

Many treatments, particularly those associated with small, new populations, need to be treated in May and June when flowers make the plants visible and seed set must be avoided. Many such treatments would be associated with intensive surveys of the Resource Area conducted on a three-year cycle. Survey areas, and treatments planned on established sites, can be identified on the Annual Treatment Plan, and coordination can decide if treatments can be rescheduled or treatment areas need to be posted so persons seeking no exposure can avoid them. However, conflicts with the gathering of subsistence or ceremonial material is more likely because much of this use takes place during this same season.

No Action Alternative

Of the herbicides used in this alternative, two maximum rate scenarios create a low risk to the public – direct spray, child, with 2,4-D, and consumption of contaminated water, child, with glyphosate. The Risk Assessments show no health risks associated with all other exposure scenarios for the four herbicides included in this alternative, including those for accidental spill. The Mitigation Measure restricting 2,4-D to typical rates in known traditional use areas, and the plan of sharing Annual Treatment Plans with tribes, would substantially reduce this risk. All herbicide treatments include dyes to facilitate uniform application and compliance checking. These dyes would also help identify treated vegetation.

Effects to non-target plants could occur, but would be limited because sprays are directed at the target plants, and because it is always desirable to retain nearby native species to repopulate the site and resist reinfestations. The risk to non-target plants is higher under this alternative than under the Proposed Action, however, because the use of 2,4-D is higher, and because the herbicides available under this alternative are not as selective as those included in the Proposed Action.

Proposed Action

None of the herbicides included in this alternative have Human Health Risk Assessment-identified risks under public exposures scenarios at the typical rate, and only fluridone (and aquatic herbicide), triclopyr, and 2,4-D have any identified risk to human health at the maximum rate, even when accidental spill scenarios are considered. The Mitigation Measure restricting these three herbicides to typical rates in known traditional use areas, and the plan of sharing Annual Treatment Plans with tribes, would substantially negate this risk. All herbicide treatments include dyes to facilitate uniform application and compliance checking. These dyes would also help identify treated vegetation.

The increase in the number of herbicides available under the Proposed Action would generally allow for the selection of herbicides that are more target-specific, generally decreasing the likelihood of damaging or killing non-target species. The Oregon FEIS identified a potential to damage native plants with herbicide treatments.

Cumulative Effects

Common to Both Alternatives

A variety of factors can stress plants important to tribes, including grazing, wildfires for some species, wildfire control for others, climate change, decreasing stream flows, public uses including off-highway vehicles, management activities and developments including mining, and invasive plants. While invasive plant control activities must be conducted in a way that minimizes adverse impacts to culturally important plants, implementing an aggressive invasive plant control program will have a significant net positive effect on the retention of culturally significant plants.

Cultural sites do not heal. Completing cultural surveys in areas where such features occur, and using treatment methods unlikely to adversely affect such resources (such as avoidance), will reduce the likelihood the invasive plant management program would significantly contribute to this loss. Nevertheless, some impact is possible. The impacts of walking and one-time ATV use usually would not be any greater than cows walking over the same route.

Mitigation Requested by one or more Tribes During Consultation

No spraying during the primary collecting times in May and June or the Growing Season: A Project Design Feature to share and discuss the Annual Treatment Plan and to share current invasive plant maps was adopted to help address this request.

Use herbicides as a last resort and then in a form using the least dangerous to humans and apply them in the manner least likely to spread them to humans. This would be such actions as hand application to specific plants rather than spraying an area: Department of the policy states that "Bureaus will accomplish pest management through cost-effective means that pose the least risk to humans, natural and cultural resources, and the environment" and requires bureaus to "[e]stablish site management objectives and then choose the lowest risk, most effective approach that is feasible for each pest management project" (USDI 2007d). Non-herbicide methods will continue to be used where they can be effective, but excessive expenditures where the analysis indicates no measurable risk decreases the effectiveness of the overall invasive plant control program. That said, where consultation coordination about the Annual Treatment Plan identifies areas where herbicide use would not be consistent with cultural values and uses, alternatives will be implemented wherever feasible.

Use of Dyes in Spray or Hand Applications so collectors would know what has been treated: This is already being done. Water-soluble dyes are used so applicators and others can identify treatment areas. The dyes fade or wash out within a few weeks.

Post (sign) all areas where herbicides have been used with warning signs that state where and when herbicides were applied: A Project Design Feature has been adopted to address this request.

Whenever herbicides are used, public notification should be made in local papers, web sites such as the BLM's and on news media. Specific notification to Tribes was requested as mandatory for all applications of herbicides. This notice is to be given at least 30 days prior to applications: It appears that supplying the Annual Treatment Plan at least 30 days before beginning work, and resultant consultation coordination about that plan, would achieve the objectives sought be this request. The scattered nature of the treatments and treatment methods to be used would make newspaper notices large and complex.

Burn or hand remove noxious plants rather than apply herbicide whenever possible: A Project Design Feature has been adopted that helps to address this request on a site-specific basis.

Review major infestation areas with the Tribes so that they would know what areas might be affected and be able to make comments specific to those areas: A Project Design Feature has been adopted to address this request.

Develop a Programmatic Agreement with the Tribes for the use of herbicides. This would be in addition to continued consultation coordination and mitigation measures developed on a case-by-case basis with the Tribes: It is unclear what the objective of such an agreement would be that is not available through annual consultation coordination related to the Annual Treatment Plan and maps of infestations. The BLM is open to further discussion on this topic. Adjacent private landowner values and uses would benefit from improved invasive plant control on BLM-administered lands because invasive plant spread onto non-BLM-administered lands would be reduced if overall invasive plant spread on BLM-administered lands were reduced. In addition, the additional herbicides would make cooperative, cross-boundary treatments more feasible and effective for both other landowners and BLM managers, which could have an effect of reduced herbicide use on lands adjacent to BLM-administered lands. The Fremont-Winema National Forest has recently added more effective herbicides to their integrated invasive plant management plan, and the additional herbicides allowed on BLM-administered lands will allow for more effective interagency projects.

Visual Resources

Issues

- How would treatments affect Visual Resources?

Affected Environment

Sect. 102(8) of the *Federal Land Policy and Management Act* requires the BLM to inventory and manage for scenic values. Public lands have a variety of visual (scenic) values that warrant different levels of management. The BLM uses a system called Visual Resource Management (VRM; Manual 8400) to systematically identify and evaluate these values in order to determine the appropriate level of scenery management (USDI 1984b).

The VRM process involves identifying scenic values; establishing management objectives for those values through the land use planning process; and designing and evaluating proposed activities in order to analyze impacts and develop mitigations to meet the established VRM objectives (USDI 1986a).

The BLM Visual Resource Inventory Handbook (Handbook 8410-1; USDI 1986a) sets forth the procedures for inventorying scenic values and establishing VRM objectives (referred to as Management Classes). A visual resource inventory is informational in nature and does not set forth management direction. A visual resource inventory is based upon an analysis of three primary criteria influencing visual values: 1) inherent scenic quality, 2) public sensitivity to landscape change, and 3) distance zones from primary travel ways or special areas. These criteria are ranked for all acres of public land and a final VRM inventory rating is identified. These ratings are then used during the land use planning process, and are considered along with other resource objectives to determine final VRM objectives, or classes.

BLM policy requires that every acre of BLM land be inventoried and assigned a VRM class ranging from Class I to Class IV. After VRM classes have been established, BLM policy requires all management activities to be designed to meet the assigned classes. Class IV allows for the most visual change to the existing landscape, while Class I allows the least (see Table 3-18 and Table 3-19).

Table 3-18. VRM Classes, Objectives, and Appropriate Management Activities

VRM Class	Visual Resource Objective	Change Allowed (Relative Level)	Relationship to the Casual Observer
Class I	Preserve the exiting character of the landscape. Manage for natural ecological changes.	Very Low	Activities should not be visible and must not attract attention
Class II	Retain the existing character of the landscape.	Low	Activities may be visible, but should not attract attention
Class III	Partially retain the existing character of the landscape	Moderate	Activities may attract attention but should not dominate the view
Class IV[1]	Provide for management activities that require major modification.	High	Activities may attract attention and may dominate the view

1. While VRM IV is managed to allow for “major modifications to the landscape,” …“every effort should be made to … minimize disturbances and design projects to conform to the characteristic landscape” (USDI 2001a:290).

Table 3-19. VRM Classes Applied to the Lakeview Resource Area

VRM Class	Acres	Percentage of BLM Land Base	Representative BLM Areas
Class I	495,398	16	Wilderness Study Areas, Abert Rim corridor.
Class II	160,404	5	Deep, Twentymile, and Twelvemile Creeks, Table Rock, Egli Rim
Class III	373,643	12	Warner Wetlands ACEC, Highways 140 and 31 corridors,[1] Connley Hills
Class IV	2,127,766	67	Seldom seen areas or those of low visual quality and low sensitivity. Sunstone Public Collection Area

1. Also minimize visual impacts within 3 miles of major travel routes and recreation use areas (USDI 2003b:88).

To help maintain the management objectives of a VRM class, the BLM's visual contrast rating system, outlined in handbook H-8431-1, is used for proposed projects and activities to help analyze and mitigate visual impacts (USDI 1986b). This systematic process uses the basic design elements of form, line, color, and texture to compare the proposed project/activity with the major features of the existing landscape. Contrast ratings are required for all major projects proposed on public lands that fall within VRM class I, II, and III that have high sensitivity levels (USDI 2005a).

Additionally, all developments, land alterations, and vegetative manipulations within a 3-mile buffer (6 mile total corridor width) of all major travel routes and recreation use areas will be designed to minimize visual impacts (unseen areas within these zones will not be held to this standard). Travel routes included in these buffers are State and Federal highways, and designated scenic or back county byways. All projects will be designed to maximize scenic quality and minimize scenic intrusions (USDI 2003b:88).

Visual resource management objectives in ACECs and RNAs are displayed in Table 3-20.

Table 3-20. Existing ACECs/RNAs in the Lakeview Resource Area by VRM Class

Name (Designation Year)	Acres [1]	VRM Class[2]
Devils Garden Lava Beds (1984)	28,244	I (II)
Lake Abert (1996)	50,141	I (II)
Lost Forest (RNA), Sand Dunes, Fossil Lake, remainder of ACEC	35,677	I (III), I (III), III, III
Warner Wetlands (1989)	51,982	III
Abert Rim (2003)	18,039	I (IV)
Black Hills RNA (2003)	3,048	III
Connley Hills RNA (2003)	3,600	III
Fish Creek Rim RNA (2003)	8,718	I (II)
Foley Lake RNA (2003)	2,228	III
Guano Creek - Sink Lakes RNA (2003)	11,186	I (III)
Hawksie-Walksie RNA (2003)	17,310	I (III)
High Lakes (2003)	38,942	III
Juniper Mountain RNA (2003)	6,330	IV
Rahilly-Gravelly RNA (2003)	19,632	III
Red Knoll (2003)	11,123	II
Spanish Lake RNA (2003)	4,695	IV
Table Rock (2003)	5,139	II
Total	316,034	

Source*:* USDI 2000a and USDI 2003a.
1. Acreage estimates are based on current boundaries contained in GIS.
2. Class in parenthesis is how the area would be managed if released from wilderness study.

Treatments Planned Relating to the Issues

Common to Both Alternatives

VRM Class 1 areas and the three miles either side of the main travel corridors (Class 1 or 3) with Resource Management Plan direction to "minimize visual impacts" total 20 to 25 percent of the Resource Area. Treatments within the roughly ten percent that are Wilderness Study Areas must already meet the more stringent standards for those areas (see *Special Management Areas* section in this Chapter) and are not discussed here. Treatments on the remaining 10 to 15 percent could include the full range of invasive plant treatments, as these areas are proportionately more infested than the Resource Area as a whole.

No Action Alternative

Treatments under this alternative would mostly be spot treatments, although some small broadcast treatments could be conducted from ATVs. Treatments are restricted to noxious weeds and generally would not include aerial applications near roads, nor of invasive annual grasses.

Proposed Action

Treatments under this alternative would include spot treatments as well as some broadcast and aerial. Aerial treatments would either be with selective material targeting only the invasive plant portion of the area, or would target invasive annual grasses for habitat improvement (removal of cheatgrass from Sage-Grouse habitat) or as part of a restoration treatment. This latter could be accompanied by pre-burning and in any event, be very visible at least for a short time.

Standard Operating Procedures and Mitigation Measures Relevant to Effects

The potential for adverse herbicide-related effects to visual resources is minimized for both alternatives by existing Standard Operating Procedures and Mitigation Measures (see Appendix A). These include, but are not limited to:

- Revegetate sites with native species if there is no reasonable expectation of natural regeneration.
- Minimize loss of desirable vegetation near high public use areas.
- Minimize the use of broadcast foliar applications in sensitive watersheds to avoid creating large areas of browned vegetation.
- Consider the surrounding land use before assigning aerial spraying as an application method.
- Minimize off-site drift and mobility of herbicides (e.g., do not treat when winds exceed 10 mph; minimize treatment in areas where herbicide runoff is likely; establish appropriate buffer widths between treatment areas and residences) to contain visual changes to the intended treatment area.
- If the area is a Class I or II visual resource, ensure that the change to the characteristic landscape is low and does not attract attention (Class I), or if seen, does not attract the attention of the casual viewer (Class II).
- Lessen visual impacts by: 1) designing projects to blend in with topographic forms; 2) leaving some low growing trees or planting some low-growing tree seedlings adjacent to the treatment area to screen short-term effects; and 3) revegetating the site following treatment.
- When restoring treated areas, design activities to repeat the form, line, color, and texture of the natural landscape character conditions to meet established Visual Resource Management (VRM) objectives.

Environmental Consequences

Effects by Alternative

Common to Both Alternatives

The effects of implementing manual, fire, mechanical, biological controls, and targeted grazing on visual resources within the Resource Area could potentially have both short and long-term negative effects. Manual (hand-pulling and grubbing) treatments would cause some short-term ground-disturbance effects that would vary in magnitude, depending on the size of the area treated. Manual methods would generally be limited to small infestations and would cause very little discernable ground disturbance. Biological control agents would kill or reduce the vigor of target species, but would generally not result in ground disturbance (USDI 2007b). Targeted grazing utilizing increased units of cattle or a change in season would likely result in increased areas of disturbance (trampling and denuding of areas) around water developments and fences. Targeted grazing in areas that are both in VRM 1 and Wilderness Study Areas would probably not meet Resource Management Plan visual resource objectives for these areas. (See *Wilderness Study Area* discussion in *Special Management Areas* section). Fire and mechanical methods could potentially produce long-term negative effects to visual resources. However, fire and mechanical prescriptions (with applicable Standard Operating Procedures and Mitigation Measures), could, over the long-term, re-establish native vegetation and meet VRM Class objectives. Depending on the magnitude, size, and anticipated impacts of treatments (and particularly for projects in Treatment Category 6), Visual Contrast Rating Worksheets will likely be required for projects proposed within VRM class I, II, III, and scenic corridors that have high sensitivity levels (USDI 2005a).

No Action Alternative

The effects of conducting herbicide treatments using the four existing herbicides on visual resources within the Resource Area would cause some short-term, low to moderate negative effects associated with vegetation removal that would vary in magnitude depending on the size of the area treated and whether or not motorized equipment was used for application. Herbicide applications could result in hard, angular, unnaturally appearing edges along the treatment area boundaries and undesirable impacts to non-target native vegetation. In addition, there a number of noxious weeds that are not likely to be adequately controlled under this alternative, as the four herbicides are not particularly effective on these species, and as a result have gone untreated for many years (see Tables 2-4, *Herbicide Information for the Four Herbicides Available Under the No Action Alternative,* and 2-5, *Treatment Key, No Action Alternative,* in Chapter 2).

Over the long-term, application of the four existing herbicides (with applicable Standard Operating Procedures and Mitigation Measures), native vegetation would generally re-establish at treated sites and meet VRM Class objectives. However, depending on the magnitude, size, and anticipated impacts of treatments, the use of Visual Contrast Rating Worksheets for projects proposed within VRM class I, II, III, and scenic corridors that have high sensitivity levels will help insure treatments meet established visual objectives (USDI 2005a).

Proposed Action

The effects of conducting herbicide treatments using the additional herbicides on visual resources within the Resource Area would cause some short-term negative effects that would vary in magnitude depending on the size of the area treated. However, under this alternative, additional herbicides would be used that are more effective and/or selective then the four currently available for use (see Table 2-7, *Treatment Key, Proposed Action*, in Chapter 2). The additional herbicides would remove or reduce invasive plants, and would do so in a much more targeted manner, having fewer negative ground disturbance impacts compared to the No Action Alternative. Generally, treatments would be more effective in controlling invasive plants and would have fewer negative effects on non-target species. Thus, the Proposed Action would minimize disturbances to visual resources in terms of the basic design elements of form, line, color, and texture to conform more esthetically with the existing characteristic landscape (USDI 2001a:290).

Over the long-term, under the Proposed Action (with applicable Standard Operating Procedures and Mitigation Measures), native vegetation would generally re-establish at treated sites and meet VRM Class objectives with fewer impacts to visual resources than the No Action Alternative. Depending on the magnitude, size, and anticipated impacts of treatments, the use of Visual Contrast Rating Worksheets for projects proposed within VRM class I, II, III, and scenic corridors that have high sensitivity levels will help insure treatments meet established visual objectives (USDI 2005a). This would particularly apply to large invasive annual grass restoration projects, especially those requiring pre-treatment burning.

Cumulative Effects

A variety of avoidable and unavoidable changes affect visual quality in the Resource Area both in the short and long term. Transmission corridors, for example, typically create a permanent reduction in visual quality. Prospecting and other mining activities can have long-term effects when the removal of soil prevents re-vegetation. Signing, fuel breaks, wildfires, well drilling and other project development contribute to negative visual effects. All five activities listed on Table 3-3, Foreseeable Actions Relating to Cumulative Effects, can be expected to be noticeable as a visual change for the short and mid-term. Visual quality standards are applied during the design and implementation of these activities in order to minimize or eliminate their negative effect. Most of the treatments planned under both alternatives will not noticeably contribute to these cumulative effects, at least not any more than in the short term, and may be positive to cumulative effects in the mid and long term. Invasive annual grass restoration projects would likely be one more thing discernable as “different” visually for up to several years. However, projects are expected to be shaped and implemented to meet visual objectives applicable to each site.

Special Management Areas

Issues

- How would Special Management Areas like Wilderness Study Areas (WSAs), Areas of Critical Environmental Concern (ACECs), and Research Natural Area (RNAs) affect the BLM’s ability to implement the alternatives?
- How would the alternatives affect Special Management Areas including those determined to be administratively suitable for national wild and scenic rivers designation?

Affected Environment

Special designations include Areas of Critical Environmental Concern (ACECs), Research Natural Areas (RNAs), Wilderness Study Areas (WSAs), and wild and scenic rivers. An ACEC is a parcel of public land that requires special management attention to protect relevant or important values. A RNA is a subcategory of ACEC that contains natural resource values of scientific interest and is managed primarily for research and educational purposes. There are 17 ACECs totaling about 316,014 acres in the Lakeview Resource Area. Portions of nine ACECs are also designated as RNAs (see Table 3-21; see also Map SMA-4 in the *Lakeview Resource Management Plan and Record of Decision*, USDI 2003b).

Table 3-21. Existing ACECs and RNAs in the Lakeview Resource Area

Name/Designation Year	Acres [1]	Relevant and Important Values [2]
Devils Garden Lava Beds/1984	28,244	Natural system values: Lava tubes, cinder and spatter cones, ecological transition zone containing both forest and high desert plant communities.
Lake Abert/1996	50,141	Natural system, cultural, scenic, and wildlife values: aquatic ecology, important snowy plover and migratory bird populations and habitat,

Name/Designation Year	Acres [1]	Relevant and Important Values [2]
		prehistoric cultural sites, National Historic Register District, and scenic quality.
Lost Forest (RNA) - Sand Dunes - Fossil Lake/1972 and 1983	35,677	Natural system and cultural values: Two ONHP[3] Basin and Range Ecosystem cells: (1)[4] relic ponderosa pine/big sagebrush-bitterbrush, (2) ponderosa pine-western juniper/big sagebrush/needle-and-thread grass. Interior sand dunes, prehistoric cultural and paleontological sites.
Warner Wetlands/1989	51,982	Natural system, cultural, and wildlife values: wetlands/wildlife habitat, including migratory birds and Special Status species, one Special Status plant, one ONHP[3] cell (which ONHP did not recommend for RNA): (9) low-elevation alkaline pond with aquatic beds and marshy shore, and prehistoric cultural sites.
Abert Rim/2003	18,039	Cultural values: Cultural sites and cultural plants.
Black Hills RNA/2003	3,048	Natural system values: Meets ONHP cells for Basin and Range Ecosystem: (4) Western juniper/big sagebrush/bluebunch wheatgrass and (11) Wyoming big sagebrush/bluebunch wheatgrass. Special Status plant species.
Connley Hills RNA/2003	3,600	Natural system and cultural values: Unique plant communities that fill ONHP cells for Basin and Range Ecosystem: (4) western juniper/big sagebrush, bluebunch wheatgrass, (7) western juniper/bluebunch wheatgrass, (8) western juniper/Idaho fescue, (11) Wyoming big sagebrush/bluebunch wheatgrass. Prehistoric archaeological sites.
Fish Creek Rim RNA/2003	8,718	Cultural, wildlife, and natural system values: Fills ONHP cells in Basin and Range Ecosystems: (20) big sagebrush- bitterbrush/Idaho fescue, (26) low sagebrush/Idaho fescue scabland, (37) mountain mahogany/mountain/big sagebrush/bitterbrush, (41) snowbrush/ bittercherry shrub. Special Status plant species. Cultural plants and prehistoric archeological sites.
Foley Lake RNA/2003	2,228	Cultural and natural system values: High concentration of cultural sites related to resource procurement and settlement patterns. One Special Status plant. Meets ONHP cell for Basin and Range Ecosystem: (30) black sagebrush/bunchgrass.
Guano Creek - Sink Lakes RNA/2003	11,186	Natural system values: Low elevation vernal pool and sagebrush/Sandberg bluegrass scabland. Fills ONHP cells for Basin and Range Ecosystem: (28) low sagebrush/Sandbergs bluegrass scabland, (53) low elevation vernal pond, (15) big sagebrush/needle-and-thread, (82) low elevation riparian. Special Status plant species.
Hawksie-Walksie RNA/2003	17,310	Cultural and natural system values: Fills ONHP cell for Basin and Range Ecosystem: (11) Wyoming big sagebrush/bluebunch wheatgrass, (12) big sagebrush/Idaho fescue. Prehistoric archaeological sites.
High Lakes/2003	38,942	Cultural, wildlife, and natural system values: High concentration of prehistoric rock art sites. Cultural plants. Special Status plant species. Greater Sage-Grouse habitat.
Juniper Mountain RNA/2003	6,330	Natural system values: Old-growth western juniper. Meets ONHP cell for Basin and Range Ecosystem: (5) western juniper/big sagebrush/Idaho fescue. (Note: a 2003 wildfire reduced the extent of the western juniper component of the ONHP cell along with about 50 percent of the old-growth juniper).
Rahilly-Gravelly RNA/2003	19,632	Cultural, wildlife, and natural system values: High density and variety of prehistoric and historic sites. One Special Status plant. Meets ONHP cell needs for Basin and Range Ecosystem: (6) western juniper/big sagebrush-bitterbrush, (21) mountain brush (mountain big sagebrush-bitterbrush-squawapple), (40) bitterbrush-sagebrush/ mountain snowberry/Thurber needle grass. Greater Sage-Grouse habitat.
Red Knoll/2003	11,123	Cultural and wildlife values: High density and wide variety of cultural sites. Cultural plants. Unique plant community containing Special Status plant species. Greater Sage-Grouse habitat.
Spanish Lake RNA/2003	4,695	Natural system values: Diversity of salt desert scrub communities with

Name/Designation Year	Acres [1]	Relevant and Important Values [2]
		limited distribution in Resource Area and Northern Great Basin. Meets ONHP cell for Basin and Range Ecosystems: (19) black greasewood-shadscale/bunchgrass/playa margin (73) playa with greasewood/Great Basin wildrye, (34) shadscale-budsage/bunchgrass/salt desert shrub.
Table Rock/2003	5,139	Cultural, natural system, and scenic values: High density of unique archeological site types. Table Rock formation is regionally significant scenic feature. Special Status plant species.
Total	316,034	

Source: USDI 2000a and USDI 2003a.
1. Acreage estimates are based on current boundaries contained in GIS.
2. Relevant and Important Values worthy of ACEC designation are significant historic, cultural, or scenic values; fish or wildlife resources, including Threatened and Endangered species; or natural hazards (BLM Manual 1613, Areas of Environmental Concern).
3. Oregon Natural Heritage Program
4. Numbers in parentheses are Oregon Natural Heritage Program Basin and Range cell identifiers, unique ecosystem types used in the Natural Heritage Plan to describe and evaluate natural areas (http://orbic.pdx.edu/documents/ornh_plan.pdf pp. 138-144).

A WSA represents an area that the BLM has identified as having wilderness characteristics and has made a recommendation to the President regarding wilderness designation. While the President subsequently passed his recommendations on to the Congress in 1991, Congress has yet to act on the majority of these recommendations. In the interim, WSAs are managed in accordance with the WSA Management Manual (USDI 2012b) to preserve their wilderness character, pending action by Congress. There are 14 WSAs and 1 Instant Study Area totaling about 486,873 acres in the Lakeview Resource Area (see Table 3-22, *Existing Wilderness Study Areas and Instant Study Areas in the Lakeview Resource Area*; see also Map R-9 in the *Lakeview Resource Management Plan and Record of Decision*, USDI 2003b).

Table 3-22. Existing Wilderness Study Areas and Instant Study Areas in the Lakeview Resource Area

Name of Area (WSA number)	Acres
Devils Garden Lava Bed (OR-1-2)	28,241
Squaw Ridge Lava Bed (OR-1-3)	28,684
Four Craters Lava Bed (OR-1-22)	12,472
Sand Dunes (OR-1-24)	16,495
Lost Forest Instant Study Area	9,047
Diablo Mountain (OR-1-58)	118,799
Orejana Canyon (OR-1-78)	24,210
Abert Rim (OR-1-101)	25,129
Fish Creek Rim (OR-1-117)	19,146
Guano Creek (OR-1-132)	10,591
Spaulding (OR-1-139)	68,589
Hawk Mountain (OR-1-146A)[1]	45,604
Sage Hen Hills (OR-1-146B)[1]	7,988
Basque Hills (OR-2-84) [1,2]	68,368
Rincon (OR-2-82) [1,2]	3,510
Total	486,873

Source: USDI 1991b.
1. Acreages listed are only those acres located in the Resource Area and are based on GIS data. The remainder of the WSA falls within the Burns District.
2. These WSAs are managed by the Burns District. (USDI 2003a:2-60)

The 6.6-mile Twelvemile Creek corridor was recommended as suitable for potential designation as a wild and scenic river. The 4.4-mile segment of this river corridor in Oregon was recommended as suitable, with a tentative classification as “recreational” in the *Lakeview Resource Management Plan and Record of Decision* (USDI 2003b; see also Map SMA-22). The 2.2- mile segment in northeastern California and northwestern Nevada was recommended as suitable with a tentative classification as “recreational” in the *Surprise Resource Management Plan and Record of Decision* (USDI 2008b).

Treatments Planned Relating to the Issues

Invasive plant treatments within currently documented sites (Treatment Category 1) would occur under both alternatives within portions of many special management areas (See Appendix E, Table E-1, *Documented Invasive Plant Sites*). In addition, treatments could occur in other special management areas in the future, if subsequent inventories find new sites or species (primarily Treatment Categories 2 and 3).

Management Direction, Standard Operating Procedures, and Mitigation Measures Relevant to Effects

Areas of Critical Environmental Concerns and Research Natural Areas

Management direction in the *Lakeview Resource Management Plan and Record of Decision* states "[invasive plants] would be aggressively controlled in all ACEC/RNAs using integrated weed management methods such as biological control, site-specific spraying (of herbicides), and grubbing by hand, consistent with protection or enhancement of relevant and important values…. Any weed control measures proposed in ACECs over-lapping with WSAs will be consistent with WSA management policy" (USDI 2003b:57). The Lake Abert ACEC Management Plan also calls for implementing an integrated invasive plant management strategy (USDI 1996b).

There are no Standard Operating Procedures, Mitigation Measures, or best management practices listed in the 17-States PEIS, Oregon FEIS, or the *Lakeview Resource Management Plan and Record of Decision* for invasive plant management that are associated with any specific ACEC or RNA under either alternative. However, there may be other measures identified for vegetation, wildlife, or cultural resources that could be applied to a particular ACEC or RNA based on the presence of one of those relevant and important values (see Table 3-21, *Existing ACECs and RNAs in the Lakeview Resource Area*). These measures are discussed elsewhere in the appropriate section of this Chapter, as well as in Appendix A, *Project Design Features, Standard Operating Procedures, Mitigation Measures, Conservation Measures, Prevention Measures, and Best Management Practices*.

Wilderness Study Areas

All management activities in WSAs, including the control of invasive plants, must be conducted in a manner that is consistent with the WSA management policy and must either meet the non-impairment standard or one of the exceptions (e.g., protect or enhance wilderness characteristics). This policy allows restoration activities that include treatment of "non-native vegetation that interferes, or has the potential to interfere with ecosystem processes or function… and allows control using the method or combination of methods known to be effective, while causing the least damage to non-target species" (USDI 2012b:1-33 to 1-34).

Reseeding or planting of native species may also be done following invasive plant treatments, fire, or disturbance as needed where natural regeneration is not likely, as well as to prevent invasive plants vegetation from becoming dominant (USDI 2012b:1-34).

If subsequent inventories find new invasive plant infestation sites in WSAs beyond reasonable spread predictions (e.g., likely road and waterway pathways), management activities will likely require additional analysis to evaluate whether the treatment will meet the non-impairment standards or an exception.

In addition, Appendix A lists a number of existing Standard Operating Procedures and Mitigation Measures applicable to both alternatives that would help reduce or eliminate adverse effects within WSAs. Those most pertinent to this analysis include:

Mechanical

- If mechanized equipment is required, use the minimum amount of equipment needed.
- Require shut down of work before evening, if work is located near campsites.
- Time the work for weekdays or off-season.

Manual

- Use the least intrusive methods possible to achieve objectives, and use non-motorized equipment …off existing routes in wilderness study areas, and where possible in other areas.

Chemical

- Use the "minimum tool" to treat noxious weeds and other invasive plants, relying primarily on the use of ground based tools, including backpack pumps, hand sprayers, and pumps mounted on pack and saddle stock.
- Implement herbicide treatments during periods of low human use, where feasible.
- Give preference to herbicides that have the least impact on non-target species and the wilderness environment.

Project Design Features Adopted for this Analysis

- When planning invasive plant treatments, the BLM will consider the feasibility and effectiveness of adopting *Standard Operating Procedures, Mitigation Measures, Prevention Measures, and Best Management Practices* for Wilderness and Special Areas (Appendix A), where appropriate.

Wild and Scenic Rivers

The primary management objective for wild and scenic rivers is to protect and enhance the outstandingly remarkable values of any rivers determined to be suitable for inclusion in the national wild and scenic river system, until Congress acts (USDI 2003b:73). Since Twelvemile Creek was tentatively classified as a recreational river, the recreational river management objective also applies. This objective generally calls for protecting and enhancing existing recreational values (USDI 2001a:Appendix J3, A-273). However, no specific management standards or directions were provided regarding how to treat noxious weeds and other invasive plants.

Appendix A lists existing Standard Operating Procedures and Mitigation Measures applicable to both alternatives that would help reduce or eliminate impacts within wild and scenic rivers. Those most applicable to Twelvemile Creek are:

- Control of weed infestations shall be carried out in a manner compatible with the intent of Wild and Scenic River management objectives.
- Maintain adequate buffers for Wild and Scenic Rivers.

Since the Twelvemile Creek Wild and Scenic River was proposed as suitable primarily due to the presence of one outstandingly remarkable value (a Federally Listed Threatened fish), some of the Standard Operating Procedures, Mitigation Measures, and Conservation Measures listed in Appendix A for water, riparian, fish and aquatic resources, and Threatened and Endangered species would also apply to treatments within the wild and scenic river corridor. These measures are discussed elsewhere in the appropriate sections of this Chapter, and would adequately mitigate potential effects to wild and scenic rivers.

Environmental Consequences

Effects to ACEC/RNAs

Common to Both Alternatives

Implementing manual, fire, mechanical, and biological control treatments within ACEC/RNAs would have some short-term negative effects such as soil disturbance, but would generally protect or improve the relevant and important values of native plant communities, cultural plants, wildlife habitat, and overall ecological integrity in these areas over the long-term by removing or reducing invasive plants. A more detailed discussion of the potential impacts to vegetation, wildlife habitat, and cultural plants can be found in other sections in this Chapter.

No Action Alternative

Herbicide treatments using the four existing herbicides within ACEC/RNAs would have some short-term negative effects such as the creation of bare soil areas, but would generally protect or improve the relevant and important values of plant communities, wildlife habitat, and overall ecological integrity by removing or reducing invasive plants. However, there are two noxious weeds and several other invasive plants that are not likely to be adequately controlled under this alternative, as the four herbicides are not particularly effective on these species (see Tables 2-4, *Herbicide Information*, and 2-5, *Treatment Key*). A more detailed discussion of the potential impacts to vegetation, wildlife, and cultural plants is found in other sections in this Chapter.

Proposed Action

Under this alternative, additional herbicides would be available that are more effective or selective then the four currently available for use within ACEC/RNAs (see Table 2-6, *Herbicide Information*). The use of these herbicides would also protect or improve the relevant and important values (native plant communities, wildlife habitat, and overall ecological integrity) of these areas, but would do so in a much more targeted manner, using fewer total pounds of chemicals, and having fewer negative ground disturbing impacts than the No Action Alternative. In addition, due to lower treatment costs, more acres would be treated under this alternative per year, which would improve ecological conditions within ACEC/RNAs at a faster rate than the No Action Alternative. A more detailed discussion of the potential impacts to vegetation, wildlife, and cultural plants is found in other sections in this Chapter.

Effects to Wilderness Study Areas

Common to Both Alternatives

The effects of implementing manual, fire, mechanical, biological controls, and targeted grazing within WSAs could potentially have both short and long-term negative effects to wilderness values. Manual treatments would cause some short-term ground-disturbance effects that would vary in magnitude, depending on the size of the area treated. Manual (hand-pulling, digging, and grubbing) methods would generally be limited to small infestations and would cause some discernable ground disturbance. Biological control agents would kill or reduce the vigor of target species and would generally not result in ground disturbance (USDI 2007b). Disturbance associated with fire and mechanical methods could potentially produce longer-term negative effects to wilderness values, primarily naturalness. However, fire and mechanical treatments that pass the non-impairment standards/exceptions could, over the long-term, re-establish native vegetation and result in a neutral or slightly enhanced effect on the natural character of WSAs.

Targeted grazing utilizing increased units of cattle or a change in season would likely result in increased areas of disturbance (trampling and denuding of areas) at invasive plant sites. Although targeted grazing would likely not qualify as "grandfathered use," it could still be utilized if it meets the non-impairment standard or one of its exceptions. Outstanding recreation and solitude opportunities could also be impacted during the short period of time when treatments are being implemented. Nonetheless, in the long-term, effects would likely go unnoticed by the casual observer. Overall, wilderness values would likely not be impaired.

No Action Alternative

The effects of conducting herbicide treatments using the four existing herbicides within WSAs would cause some short-term negative effects associated with vegetation removal that would vary in magnitude, depending on the size of the area treated and whether or not motorized equipment was used for application. Herbicide applications could result in hard, angular, unnaturally appearing edges along the treatment area boundaries and undesirable impacts to non-target native vegetation. In addition, there are two noxious weeds as well as other invasive plants that are not likely to be adequately controlled under this alternative, as the four herbicides are unavailable or not particularly effective on these species, and as a result these species have gone relatively untreated for many years (see Tables 2-4, *Herbicide Information*, and 2-5, *Treatment Key*). Furthermore, outstanding recreation and solitude opportunities could be impacted during the short period of time when treatments are being implemented.

Over the long-term, although likely unnoticed by the casual observer, native vegetation would generally re-establish at treated sites and result in neutral or slightly enhanced effects on natural character. In cases where motorized use is found to be the minimum tool and non-impairment standards/exceptions are met, motorized use may be utilized in WSAs. Overall, wilderness values would not be impaired over the long term by application of the four existing herbicides.

Proposed Action

The effects of conducting herbicide treatments using the additional herbicides within WSAs would also cause some short-term negative effects that would vary in magnitude, depending on the size of the area treated and whether or not motorized equipment was used for application. In cases where motorized use is found to be the minimum tool and non-impairment standards/exceptions are met, motorized application methods may be utilized.

Under this alternative, additional herbicides would be used that are more effective or selective then the four currently available for use (see Table 2-6, *Herbicide Information*). The additional herbicides would remove or reduce invasive plants, and would do so in a much more targeted manner, using fewer total pounds of herbicides, and having fewer negative, ground-disturbing effects compared to the No Action Alternative. Generally, treatments would be more effective in controlling invasive plants and would have fewer negative effects on non-target species. Due to lower treatment cost per acre under this Alternative (see *Implementation Costs* section in this Chapter), more WSA acres could potentially be treated under this alternative per year, which would improve ecological conditions within WSAs at a faster rate than under the No Action Alternative.

Outstanding recreation and solitude opportunities could be impacted during the short period of time when treatments are being implemented. Over the long-term, native vegetation would re-establish at a given treatment site and result in neutral or slightly enhanced effects on the natural character, though this would likely be unnoticed by the casual observer. Overall, WSAs would not be impaired over the long-term.

Effects to Wild and Scenic Rivers

Common to Both Alternatives

There are currently two known noxious weed sites within the Twelvemile Creek wild and scenic river corridor (Scotch thistle and Mediterranean sage). Treating these sites using integrated methods, which would include the use of up to four herbicides, and application of appropriate Standard Operating Procedures, Mitigation Measures, herbicide buffer distances, and Aquatic Animal Conservation Measures from Appendix A, would reduce or eliminate potential impacts to the outstandingly remarkable value (Federally Listed Threatened fish species). A more detailed discussion of the potential impacts to Special Status fish is found in the *Fish and Other Aquatic Resources* section in this Chapter.

Proposed Action

Under this alternative, additional herbicides would available to use that are more effective or selective then the four currently available for use (see Table 2-6, *Herbicide Information*). The effects of using additional herbicides to treat existing invasive plant sites within wild and scenic rivers would reduce or eliminate potential impacts to the outstandingly remarkable value (Federally Listed Threatened fish species) in a much more targeted manner than the No Action Alternative.

Cumulative Effects

None of the reasonably foreseeable actions displayed on Table 3-3 would occur within special management areas with the exception of grazing. As noted in the *Invasive Plants* section earlier in this chapter, grazing can contribute to the spread of invasive plants by disturbing soil and trampling in seed, and by carrying invasive plant seeds in their fur. Visiting public and Native American users may also import seed. Also ground disturbance associated with control treatments would be cumulative to, and in some cases unnoticeable because of, the ground disturbance from cattle.

Lands with Wilderness Characteristics

Issues

- How would the alternatives affect lands with wilderness characteristics?

Affected Environment

Section 603 of the *Federal Land Policy and Management Act* required the BLM to complete a wilderness review of all public lands within 15 years of passage of the *Act*. This process ultimately resulted in the designation of 14 Wilderness Study Areas and 1 Instant Study Area in 1991 (USDI 1991b) (see *Wilderness Study Areas* portion of *Special Management Areas* section earlier in Chapter 3). Section 201 of the *Federal Land Policy and Management Act* requires BLM to maintain its inventory. Since 2001, BLM has completed a number of updates to its wilderness inventory for public lands outside of designated Wilderness Study Areas. The wilderness inventory updates have been published or made available to the public on the Lakeview District's website at http://www.blm.gov/or/districts/lakeview/plans/inventas.php (see also Appendix J4, USDI 2001a). BLM's wilderness inventory updates have been documented by geographic area on a series of route analysis and wilderness character forms and are summarized in Appendix B, *Additional Information about Lands with Wilderness Characteristics*. Pursuant to 40 CFR Section 1502.21, the BLM hereby incorporates, by reference, the entirety of its wilderness inventory update documentation files into this analysis.

BLM's inventory update considered citizen-provided information. In particular, the Oregon Natural Desert Association (ONDA) proposed 21 new Wilderness Study Areas covering over 1.7 million acres of the Lakeview Resource Area. Several of these proposals included lands administered by the Burns and Prineville BLM Districts (Oregon), the Surprise BLM Field Office (Nevada), and other State and Federal agencies. These proposals and BLM's current findings are summarized in Table 3-23 (see also Appendix B, *Additional Information about Lands with Wilderness Characteristics*). In general, the BLM found that these Wilderness Study Area proposals were not single, large roadless areas. The BLM found many more existing roads met BLM's wilderness inventory boundary road definition and resulted in defining smaller wilderness inventory units. The BLM examined these inventory units and found that most of them did not meet the minimum wilderness criteria (size, naturalness, outstanding opportunities for solitude, or outstanding opportunities for primitive and unconfined recreation).

Table 3-23. Summary of Citizen Proposed Wilderness Study Areas and BLM's Wilderness Characteristics Findings

Proposal Name	BLM's Findings
Abert Rim Addition	33 inventory units identified; only 2 units met size criteria, but did not meet the naturalness criteria; 2 small units met the exception to the size criteria, were contiguous with Abert Rim WSA, and met other wilderness criteria.
Bald Mountain Addition	2 inventory units identified; only 1 met size and naturalness criteria, but did not have outstanding opportunities for solitude or primitive recreation.
Black Hills	6 inventory units identified; only 2 met size and naturalness criteria, but did not have outstanding opportunities for solitude or primitive recreation.
Burma Rim	5 inventory units identified; only 2 met size and naturalness criteria, but did not have outstanding opportunities for solitude or primitive recreation.
Coglan Buttes	16 inventory units identified; 4 met size criteria; 1 of these did not meet the naturalness criteria; the other 3 were in a natural condition, but did not have outstanding opportunities for solitude or primitive recreation.
Coleman Rim	9 inventory units identified; 1 met size and naturalness criteria, but did not have outstanding opportunities for solitude or primitive recreation.
Coyote Hills	8 inventory units identified; 2 met size criteria, but did not meet the naturalness criteria.
Diablo Mountain Addition(s)	13 inventory units identified; 7 met size and naturalness criteria. 6 of these did not have outstanding opportunities for solitude or primitive recreation. 1 of these was contiguous with Diablo Mountain WSA and met other wilderness criteria. One small unit met the exception to the size criteria, was contiguous with Diablo Mountain WSA, and met other wilderness criteria.
Fish Creek Rim Addition	4 inventory units identified; 1 met size and naturalness criteria, but did not did not have outstanding opportunities for solitude or primitive recreation. One small unit met the exception to the size criteria, was contiguous with Fish Creek Rim WSA, and met other wilderness criteria.
Hart Mountain	Much of the proposal falls on U.S. Fish and Wildlife Service lands. 33 inventory units identified to date in on BLM-administered lands in Hart Mountain South and Hart Mountain Southeast areas; 5 met size and naturalness criteria, but did not have outstanding opportunities for solitude or primitive recreation. The other 5 did not meet the naturalness criteria. Hart Mountain Northeast area (shared with Burns District) has not yet been inventoried.
Juniper Mountain	6 inventory units identified; 4 met size criteria, but did not meet the naturalness criteria.
Lonesome Lakes	Inventory not yet completed on Lakeview portion.
Moonlight Butte	4 inventory units identified; 2 met size and naturalness criteria, but did not have outstanding opportunities for solitude or primitive recreation. 2 met size criteria, but did not meet the naturalness criteria.
Poker Jim Ridge Addition/Keg Springs	21 inventory units identified to date on BLM-administered lands; Portion of the area is State land; 2 units met size criteria; 1 of these did not meet the naturalness criteria; 1 of these met wilderness criteria. 5 small units met the exception to the size criteria, were contiguous with Poker Jim Ridge WSA (U.S. Fish and Wildlife), and met other wilderness criteria. Northern portion of proposal (shared with Burns District) remains to be inventoried.
Sand Dunes Addition	3 inventory units identified; 2 met size and naturalness criteria, but did not have outstanding opportunities for solitude or primitive recreation. 1 met size criteria, but did not meet the naturalness criteria.
Saunders Rim	6 inventory units identified; 3 met size and naturalness criteria, but did not have outstanding opportunities for solitude or primitive recreation.
Sheldon Rim Contiguous Addition	Most of the proposal falls on State lands. 1 inventory unit identified on BLM-administered land, but did not meet size criteria.
Spaulding Additions	12 inventory units identified; 8 met size and naturalness criteria, but did not have

Proposal Name	BLM's Findings
	outstanding opportunities for solitude or primitive recreation. 1 met size criteria, but did not meet the naturalness criteria. 1 small unit met the exception to the size criteria, was contiguous with Basque Hills WSA, and met other wilderness criteria.
Sucker Creek	4 inventory units identified; 1 met size and naturalness criteria, but did not have outstanding opportunities for solitude or primitive recreation. 1 met all wilderness criteria.
West Warm Springs/Buzzard Creek	28 inventory units identified; 6 met size and naturalness criteria, but did not have outstanding opportunities for solitude or primitive recreation. 2 met size criteria, but did not meet the naturalness criteria.
Yreka Butte	Inventory not yet completed on Lakeview portion.

Those areas/inventory units that the BLM determined to have wilderness characteristics total approximately 92,639 acres to date (see Figure B-1 and Table B-1 in Appendix B, *Additional Information about Lands with Wilderness Characteristics*). Approximately 400,000 acres still need wilderness inventory updates to be completed.

BLM received a supplemental report from a citizens group that consists of narrative text, maps and additional photos of areas that the group believes possess wilderness characteristics. The report was submitted too late in the process to allow for a thorough evaluation of the information for use in this analysis. However, it should be noted that if the BLM review finds additional areas possessing wilderness characteristics, the effects of the alternatives on these characteristics would be similar to what is described for areas currently deemed to possess wilderness characteristics in this analysis.

Treatments Planned Relating to the Issue

Based on the wilderness inventory updates and invasive plant inventories completed to date, Table 3-24 summarizes those wilderness inventory units that have documented wilderness characteristics with invasive plant infestations (Treatment Category 1) that could be treated during the life of this plan.

Table 3-24. Wilderness Inventory Units with Known Invasive Species

Inventory Unit Name	Species	Acres
Abert Rim Parcel 1	Mediterranean sage	75
Breezy	Whitetop	1
Coleman Rim South	Bull thistle, Canada thistle	10
Lynch Rim C	Whitetop	1
Snyder Creek 2	Medusahead rye	75
Warner Wetlands	Russian knapweed, whitetop, musk thistle, bull thistle, Canada thistle, halogeton, perennial pepperweed, spiny cocklebur	100
ZX Ranch	Tansy ragwort, perennial pepperweed	1

It is likely that some documented sites could expand (Treatment Category 2) or new invasive plants could invade (Treatment Category 3) into other portions of these units or into other lands with wilderness characteristics in the future and require treatment. Further, there may be areas with invasive annual grasses (Treatment Category 6) or emergency fire stabilization needs (Treatment Category 4) that may be identified for treatment within lands with wilderness characteristics in the future. However, the exact locations of such treatment areas are not known at this time.

Management Direction, Standard Operating Procedures, and Mitigation Measures Relevant to Effects

No management direction, Standard Operating Procedures, or Mitigation Measures were identified in the PEIS, Oregon FEIS, *Lakeview Resource Management Plan and Record of Decision*, or the 2004 *Integrated Noxious Weed Management Program EA* for lands with wilderness characteristics.

BLM has not yet completed a comprehensive plan amendment to determine how to best manage lands that it recently found to contain wilderness characteristics. As a matter of policy, these lands cannot be designated as WSAs or managed under the Wilderness Study Area Management manual (USDI 2011, 2012c). However, the following terms (paragraphs 18-20) from a 2010 Settlement Agreement[67] between the BLM and the Oregon Natural Desert Association do apply:

> “18. Subject to valid existing rights, until it completes the RMP [Resource Management Plan] amendments, the BLM shall not implement any projects in the respective RMP planning areas (Lakeview and Southeast Oregon) that fall within either a) an inventory unit determined by BLM to possess wilderness character, where such action would be deemed by BLM to diminish the size or cause the entire BLM inventory unit to no longer meet the criteria for wilderness character, or b) a unit identified in ONDA’s (Lakeview) April 1, 2005 or (Southeast Oregon) February 6, 2004 citizen inventory reports as having wilderness character, but where BLM has not yet completed its inventory update, where the action would be deemed by BLM to diminish the size or cause the entire ONDA inventory unit to no longer meet the criteria for wilderness character.
>
> “19. Until the BLM has completed an RMP amendment, if a project is proposed or scheduled for implementation in either of the respective planning areas and would be in an area that BLM has found to possess wilderness character, the BLM will analyze the effects on wilderness character through each project’s NEPA process. Such analysis shall include an alternative that analyzes both mitigation and protection of any BLM-identified wilderness character that exists within the project area. Consistent with paragraph 18, until the BLM has completed an RMP amendment, the BLM shall not implement any project if its analysis determines that the effects of the project would cause an area with BLM-identified wilderness character to no longer meet the minimum wilderness character criteria.
>
> “20. Until the BLM has completed an RMP amendment, where the BLM has not completed its inventory update, the BLM shall update the inventory for units in areas affected by proposed new activity plans, leases, or other projects that may cause surface disturbance or result in a permanent development.” (USDI et al. 2010)

The analysis contained in this EA addresses the potential impacts of implementing an integrated invasive plant management program on those areas where BLM has identified the presence of wilderness characteristics and, thus fulfills the requirements of paragraphs 18 and 19 from the 2010 Settlement Agreement described above. To comply with the requirements of paragraph 20, treatments within the 6 geographic areas identified in Table B-1 (Appendix B, *Additional Information about Lands with Wilderness Characteristics*), where wilderness characteristic inventory updates have yet to be completed (Crane Mountain, Hart Mountain East, Lonesome Lakes West, Poker Jim Addition North, Stateline, and Yreka Butte), will be limited to methods (biological control, spot-spraying herbicides, etc.) that do not incur ground disturbance, until such time as BLM has completed its wilderness inventory updates. Once inventory updates are completed, actions on those lands will follow the direction in this EA and the settlement agreement accordingly (depending on the inventory update findings). However, BLM assumes for purposes of this analysis, that other ground-disturbing treatment methods could be implemented under the Proposed Action on any additional lands BLM may identify with wilderness characteristics in the future

[67] June 7, 2010 agreement related to litigation involving the Lakeview and Southeast Oregon Resource Management Plans.

(once the inventories are completed), as long as the actions would not cause all or a portion of such an area(s) to no longer meet the wilderness criteria.

Project Design Features Adopted for this Analysis

- In any lands found by the BLM to contain wilderness characteristics, treatments would be designed so that there would be no effects on those values that would diminish the size of, or otherwise cause the inventory unit to not meet the wilderness criteria. This direction applies until BLM has completed a Resource Management Plan Amendment that addresses how to manage lands with wilderness characteristics.
- In any lands which BLM has not yet updated its inventory for wilderness characteristics, treatments will be limited to methods (biological control, spot-spraying herbicides, etc.) that do not incur ground disturbance, until such time as BLM has completed its wilderness inventory updates. This direction applies until BLM has completed a Resource Management Plan Amendment that addresses how to manage lands with wilderness characteristics.

Environmental Consequences

Effects by Alternative

Common to Both Alternatives

Treatments conducted under both alternatives would have no effect on, or would otherwise result in diminishing the size of those wilderness inventory units where BLM identified wilderness characteristics to be present, nor would they affect the size of any ONDA wilderness proposals where BLM has yet to complete its own inventory update.

No Action Alternative

The effects of implementing manual, fire, mechanical, targeted grazing, and herbicide treatment methods within lands with wilderness characteristics would cause some short-term ground-disturbance effects that would vary in magnitude, depending on the size of the area treated and whether or not motorized equipment was used. Most known weed sites within lands with wilderness characteristics (Treatment Category 1) are small (less than an acre) and widely scattered.

Manual methods (hand-pulling) would generally be limited to small infestations and would cause very little discernable ground disturbance, whereas mechanical and targeted grazing would produce short-term, negative effects to naturalness, due to vegetation removal, trampling, and exposure of bare ground over relatively larger sites. Biological control agents would kill or reduce the vigor of target species, but would generally not result in ground disturbance (USDI 2007b).

The effects of conducting herbicide treatments using the four existing herbicides on larger sites could result in hard, angular, unnaturally appearing edges along the treatment area boundary and undesirable impacts to non-target native vegetation. In addition, there are a number of invasive plants that are not likely to be effectively controlled, as the four herbicides are not particularly effective on Medusahead rye or perennial pepperweed, and cannot be used on non-noxious invasive plants at all. As a result, many invasive species have been poorly controlled or have gone untreated for many years (see Tables 2-4, *Herbicide Information,* and 2-5, *Treatment Key*) and this trend would continue.

Over the long-term, native vegetation would generally re-establish at a given treatment site and result in a neutral or slightly enhanced effect on natural character, but this would likely go unnoticed by the casual observer.

(A more detailed discussion of the potential impacts to plant communities is found in the *Native Vegetation* section in this chapter). Opportunities for solitude could be negatively impacted during the short period of time when treatments are being implemented. Overall, wilderness characteristics would not be impaired.

Proposed Action

The effects of conducting non-herbicide treatments within lands with wilderness characteristics would be similar to those described for the No Action Alternative. The effects of conducting herbicide treatments using the additional herbicides within lands with wilderness characteristics would also cause some short-term, negative effects that would vary in magnitude, depending on the size of the area treated and whether or not motorized equipment was used for application. However, additional herbicides would be used that are more effective and/or selective then the four currently available for use (see Tables 2-6, *Herbicide Information,* and 2-7, *Treatment Key*) and would remove or reduce invasive plants in a much more targeted manner with fewer negative, ground disturbing impacts compared to the No Action Alternative. Generally, treatments would be more effective in controlling invasive plants and would have fewer negative effects on non-target species. Due to lower treatment costs and/or increased control efficiency, more acres could potentially be treated under this alternative per year, which would improve ecological conditions within lands with wilderness characteristics at a faster rate than under the No Action Alternative.

Over the long-term, native vegetation would generally re-establish at a given treatment site and result in a neutral or slightly enhanced effect on natural character, but this would likely go unnoticed by the casual observer. (A more detailed discussion of the potential impacts to plant communities is found in the *Native Vegetation* section in this chapter). Opportunities for solitude could be negatively impacted during the short period of time when treatments are being implemented. Overall, those lands identified with wilderness characteristics would retain their wilderness character over the long-term.

Based on this analysis, it is likely that the impacts of implementing treatments within any additional lands with wilderness characteristics BLM may identify in the future (once the wilderness inventory updates are completed) would be similar to those described above, and such areas would retain their wilderness character over the long-term.

Cumulative Effects

Common to Both Alternatives

The only ongoing or reasonably foreseeable future management action (see Table 3-3, *Foreseeable Actions Relating to Cumulative Effects*) that could potentially affect lands with wilderness characteristics is livestock grazing management, which includes the maintenance of existing range improvement projects. While maintenance actions could negatively affect the natural character of a given inventory unit, these units were identified in spite of the level of existing range improvements present (see Table B-1, *Wilderness Characteristics Inventory Update Summary* in Appendix B, *Additional Information about Lands with Wilderness Characteristics*). Continuing grazing management in these areas, in the same degree and manner (which would include maintenance of existing range improvements), would, by the terms of the Settlement Agreement, not affect lands in a way that would remove them from wilderness qualification. Livestock disturbance, however, would be cumulative that disturbances caused by control activities. Mitigation measures and guidelines discussed above will prevent those effects from affecting the qualifications for any lands with wilderness characteristics.

No Action Alternative

The additive, cumulative effects of continuing to implement an integrated noxious weed management program using of only four herbicides, would generally allow native vegetation to re-establish and would likely maintain wilderness characteristics, particularly natural character, over the long-term.

Proposed Action

The additive, cumulative effects of implementing integrated invasive plant management, including the use of additional herbicides, would generally include the removal or reduction of ecologically undesirable species (invasive plants), done in a much more targeted manner, using fewer total pounds of chemicals and having fewer negative ground disturbing impacts compared to the No Action Alternative. This would allow native vegetation to re-establish. In addition, due to lower treatment costs, more acres could be treated under this alternative in a given year, which would improve the ecological conditions of lands with wilderness characteristics at a faster rate than under the No Action Alternative. For these reasons, wilderness characteristics, particularly natural character, would be maintained or enhanced over the long-term.

BLM received a supplemental report from ONDA that consists of narrative text, maps, and additional photos of areas that the group believes possess wilderness characteristics. The report was not presented specifically as a formal comment on this environmental analysis and was received after the close of the public comment period. Nonetheless, BLM reviews and determines whether this type of submittal meets the definition of “significant new information” that would require additional NEPA analysis. Under 50 CFR 1502.9(c) significant new information is defined as, new information that is relevant to environmental concerns and bearing on the actions or their impacts.

The new ONDA report addresses wilderness characteristics inventory updates that BLM previously completed, augmenting information relative to previous disagreements between ONDA and the BLM regarding roads and naturalness. BLM will address the report in detail as it continues to update and maintain its wilderness characteristics inventory.

But the report is not significant new information because it is not relevant to environmental concerns and does not bear on the Proposed Action in this EA or its impacts. The information would not substantially alter the impact analyses and conclusions in this EA, nor would it lead to substantial changes in proposed Action or decisions that are relevant to environmental concerns. This is due to the fact that the actions proposed and analyzed in this EA would not reduce the size of any inventory unit or eliminate wilderness characteristics from any unit. Any areas which BLM found to possess wilderness characteristics will be protected, pursuant to the settlement agreement and until a Resource Management Plan Amendment is completed. Units for which BLM has not yet completed an inventory update will also be protected from surface disturbances and permanent developments, pursuant to the settlement agreement and until a Resource Management Plan Amendment is completed. BLM had completed an inventory update for all the units at issue in the recent supplemental report submitted by ONDA and found none of them to possess wilderness characteristics. While the protections of the settlement agreement would no longer apply to those lands, the EA analysis shows no major impacts will occur to lands that are subjected to the full array of treatments ( ) and BLM does not believe that any of the actions analyzed in this EA would affect wilderness characteristics that ONDA believes may be present in the those areas. In other words, if a subsequent BLM review finds additional areas possessing wilderness characteristics, the effects of the alternatives on these characteristics would be similar to what is described for areas currently deemed to possess wilderness characteristics in this analysis.

Lands and Realty

Issues

- How would the alternatives affect rights-of-way and administrative site grants and leases?

Affected Environment

The Lakeview Resource Area encompasses approximately 3.2 million Acres. The dominant land use in the Resource Area is livestock grazing and outdoor recreation. There is also some mining in the area. The majority of these lands consist of solidly blocked public lands. Larger private land blocks occur in the valleys where the land is more fertile and water is more available for agricultural production. Rural home sites also occur throughout the agricultural areas, and there are large blocks of State ownership scattered throughout (see Figure 1-1*, Lakeview Resource Area*, in Chapter 1).

Rights-of-way grants and other land uses are recognized as major uses of the public lands and are authorized pursuant to sections 302 and 501 of the *Federal Land Policy and Management Act*. Section 503 of the *Federal Land Policy and Management Act* provides for the designation of rights-of-way corridors and encourages utilization of rights-of-way in common to minimize environmental impacts and the proliferation of separate rights-of-way grants and leases.

Land tenure actions are diverse and widespread, creating a need for case-by-case study for each of those actions. The *Lakeview Resource Management Plan* (2003) requires that these actions be monitored to ensure compliance with the terms and conditions of the authorizing document through the BLM accomplishment tracking process.

Lands actions are generally considered reactive. The alternatives and/or outcomes are driven by the action requested, with requirements including best management practices written into the stipulation portions of the land agreements. These can vary widely in such a diverse and large area of land, and cover invasive plant prevention and control.

There are six major rights-of-way presently crossing the Resource Area. Three of these contain large (500+ kilovolt) power transmission lines that also cross other BLM Districts. The other three are issued along State Highways 31 and 140, and U.S. Highway 395. Other grant or lease uses range from private driveways to mountaintop communication sites.

Treatments Planned Relating to the Issues

Common to Both Alternatives

Applications for rights-of-way will continue to be considered pursuant to existing policies and practices, identified transportation and utility corridors, identified avoidance and exclusion areas, valid existing rights, and as necessary for adequate and reasonable access to State or private land as well as access for utility or transportation services. The current language for new grants and leases, and being incorporated into existing grants and leases as they are renewed, requires that all vehicles and equipment will be cleaned off prior to operating on BLM-administered lands. High concentrations of noxious weeds in the immediate area of mechanical operations shall be mowed to ground level prior to the start of project activities, and removal of all dirt, grease, and plant parts that may carry noxious weed seeds or vegetative parts is required and may be accomplished with a pressure hose.

The BLM monitors invasive plants, even where noxious weeds are a grant holder's responsibility (see Table E-1, *Documented Invasive Plant Sites*, in Appendix E, *Invasive Plant List and Locations, Wildfires, and Treatment Summary)*. BLM recommends treatment methods when infestations are detected, and in some cases, may cooperate with the right-of-way holder to conduct treatments. Newer right-of-way holders are required to notify the Authorized Office of their intent to use herbicides so as to be given direction as to acceptable treatments. Under the No Action Alternative, herbicide use on BLM-administered lands is restricted to four herbicides and the constraints adopted with the 2010 Record of Decision (USDI 2010b:12). Under the Proposed Action, rights-of-way requirements would remain the same but nine[68] additional herbicides would become available.

Standard Operating Procedures and Mitigation Measures Relevant to Effects

The potential for adverse herbicide-related effects to lands and realty is minimized for both alternatives by existing Standard Operating Procedures and Mitigation Measures (see Appendix A). These include, but are not limited to:

- Coordinate vegetation treatment activities where joint or multiple use of a right-of-way exists.
- Use only herbicides that are approved for use in right-of-way areas.

Environmental Consequences

Effects by Alternative

Common to Both Alternatives

Under the Proposed Action and the No Action Alternative there would be no change to the current management of rights-of-way and no additional effects to those holding the grants or leases. Grants and leaseholders would continue to have responsibility for control and prevention of noxious weeds, although the BLM often recommends treatment methods when infestations are detected. In some cases, the BLM may cooperate with the right-of-way holder to conduct treatments. Right-of-way holders are monitored and required to use best management practices. Noxious weed control would continue to be mitigated on a case-by-case basis by using the BLM required treatment. The cost may be a consideration.

No Action Alternative

Grants and leaseholder's responsibilities would continue, but their ability to meet those responsibilities would continue to be restricted by having access to just four herbicides. Grants and leaseholder employees and others using the rights-of-ways (e.g. ATV operators, horseback riders, hikers) may be exposed to herbicides used along the rights-of-way.

Proposed Action

Grants and leaseholder responsibility for control of noxious weeds would continue, but the additional ten herbicides could be used if allowed under the applicable grant or lease. Holders of long corridor rights-of-way would benefit by being able to use the same herbicides over long expanses rather than changing each time they enter BLM-administered lands. Where grants or leases specify or limit the herbicides to be used, there may be some delay in approving additional herbicides until grants or leases are renewed. Grants and leaseholder employees and others potentially exposed to herbicides used along the rights-of-way would potentially be less at

[68] Fluridone is not approved for use on rights-of-way.

risk, because the additional herbicides as a group have lower human toxicity that the four currently being used, and there would be more herbicides from which to choose the one that best fits the potential human exposure situation.

The addition of invasive plants to the species that can be controlled using herbicides will probably have little or no effect to rights-of-way holders at least in the short term. Grants and leases currently require control only of noxious weeds, and retaining that focus would probably be more enforceable and clear than attempting to add other invasive plants.

Emergency stabilization, Greater Sage-Grouse habitat protection and improvement, and cheatgrass restoration (Treatment Categories 4, 5, and 6) would be expected to remain the responsibility of the BLM unless otherwise described in NEPA documents and resulting rights-of-way grants and/or leases for major rights-of-way such as major transmission lines.

Cumulative Effects

Common to Both Alternatives

Right-of-way holders are accustomed to using the prescribed herbicide to manage invasive plants with in the right-of-way grant area, as are leaseholders. The Proposed Action would provide more alternatives to the authorized officer for management.

Socioeconomics

Issues

- How would the alternatives affect adjacent organic farms or permittees certified organic?
- How would alternatives affect adjacent landowners?

Affected Environment[69]

The Lakeview Resource Area is located predominantly in Lake County, with smaller portions located within Harney County. In 2012, Lake County's population was 7,886, with just over half living in the Lakeview Urban Growth Boundary. This was an increase of about 6 percent since 2000, compared to a 13 percent increase in the State of Oregon population. It is one of the most sparsely populated counties in Oregon, with about one person per square mile compared to about 40 persons per square mile statewide. In 2012, 86 percent of residents were white alone, not Hispanic or Latino, while about 7 percent were Hispanic or Latino.[70] A lower proportion of county residents are younger (18 percent under age 18) than in the State as a whole (22 percent) and a higher proportion are older (22 percent over age 65) than statewide (15 percent).

Its economy differs somewhat from that of the State as a whole, with a lower proportion of jobs in the service sector (45 percent compared to 69 percent statewide) and a higher proportion of non-services related jobs (29 percent compared to 17 percent statewide). Proprietors (people owning their business as opposed to working for others) constituted a much higher proportion of employment in Lake County (40 percent) than in the State (23

[69] Information in this section comes from the Economic Profile System –
Human Dimensions Toolkit database, available at http://headwaterseconomics.org/tools/eps-hdt

[70] The U.S. Census currently measures race and ethnicity independently; race refers to a person's self-identification as white, black, Native Hawaiian/Other Pacific islander, American Indian/Alaska native, or Asian, while ethnicity refers to Hispanic/Latino or non-Hispanic/Latino. Individuals can also identify themselves as belonging to two or more races.

percent). The number of proprietors increased by 22 percent from 2000 to 2012, while the number of wage and salary jobs decreased by 15 percent over the same period.

Of the non-services jobs, over half were in the farm sector, reflecting the continuing importance of farming and ranching activities in the local economy. In 2011, the percent of jobs in the farm sector (15 percent) was higher than any other sector of Lake County's economy except government, which comprised about 23 percent of the jobs in the county (this includes local, State, and Federal government jobs). However, the percentage of employment in the Farm sector decreased 28 percent from 2001.

Like most remote rural counties, Lake County has a higher unemployment rate (11 percent) than the State of Oregon (7.7 percent), a lower per capita income ($33,352 compared to $38,878 statewide) and a higher proportion of individuals in poverty in 2012 (17.2 percent compared to 15.5 percent statewide. About 20 percent have a Bachelor's degree or higher, compared to about 30 percent statewide.

Lake County is experiencing drought conditions, which have an especially strong effect on agriculture and livestock operations. In February 2014, the Lake County Board of Commissioners requested that the Governor approve an emergency drought declaration for the county, citing reservoir storage that was just 16 percent of normal, due to precipitation that was 28 percent of normal for the current water year. The governor declared a drought emergency for Lake County later that same month.

The federal government has a substantial social, economic, and environmental presence in the area; nearly 80 percent of the land in Lake County is Federal, with nearly half of the land in the county, 49 percent, managed by the BLM.

Treatments Planned Relating to the Issues

Two of the issues identified were socioeconomic: the effects of the alternatives on adjacent private lands; and, in particular, effects on adjacent organic farms. These issues overlap closely with those identified for invasive plants and livestock grazing. As a result, conclusions in those sections regarding environmental consequences are relevant to this section.

The effects of the alternatives (including the use of herbicides) on adjacent private lands is a multipronged issue. On one hand, there is a clear benefit to adjacent landowners resulting from the BLM having a broader range of herbicides available for consideration. Many scoping comments on the Oregon FEIS favored the BLM's ability to utilize a wider range of herbicides than the four currently available because it would better match those currently used on private lands. Having more herbicides available would also enhance the BLM's ability to prevent the spread of invasive plants from Federal lands to private lands, a major concern in an area where Federal lands predominate and private lands support grazing and farming, both with the potential to be seriously harmed by invasive plants. To many ranchers and other residents, it makes sense for the BLM to have more tools in the invasive plant -fighting kit to be able to choose the best treatment for a given piece of ground. The Oregon Department of Fish and Wildlife comment during EA scoping, for example, favored the availability of a broader spectrum of herbicides as long as they were considered as part of an integrated invasive plant and pest management program. The Oregon FEIS and other sections of this EA describe some of the benefits to resources of concern to people.

On the other hand, there is a potential for drift onto adjacent lands with the potential to damage crops and other desirable vegetation, and to contaminate domestic water sources (see *Water Resources* section in this Chapter). Various Standard Operating Procedures and Mitigation Measures call for buffers to domestic water sources and notification of residents of planned nearby herbicide use.

Organic farmers and ranchers would be expected to be especially sensitive to potential drift of herbicides because their products depend on very specific conditions and the absence of chemical herbicides. However, organic farms also are negatively affected by adjacent invasive plant infestations. The extent of organic farms in the portions of Lake and Harney Counties affected by the Proposed Action is not known, but web searches indicate there are some organic farms in the Lakeview area. The juxtaposition of these farms to BLM-administered lands and to documented and suspected infestations is not known. Citizens of Lake County can obtain a "No Spray" permit issued by the State of County if they do not wish to have herbicides sprayed next to their property. These permits are not binding on the BLM; they are most commonly used to prevent State or County road maintenance spraying noxious weeds immediately adjacent to private properties, and these crews know where these permits have been issued. Currently only one County-issued permit is near BLM lands, near Fossil Lake. Other people put up such signs without the permit. BLM spray crews would generally respect signs they see; some are intended to protect high-value crops or other things not always apparent at the site. Standard Operating Procedures preclude ground spraying within 100 feet of a residence, and ¼ mile for aerial, without written permission from the owner.

The *Livestock Grazing* section in this EA also reports that some grazing permit holders are seeking, or have, organic certification. There is a potential for invasive plants treatments to negatively affect these plans.

Standard Operating Procedures and Mitigation Measures Relevant to Effects

The potential for adverse herbicide-related effects is minimized for both alternatives by existing Standard Operating Procedures and Mitigation Measures (see Appendix A). These include, but are not limited to:

- Consider the potential for treatments to affect communities from herbicide-contaminated resources originating from the BLM, such as subsistence resources or water used downstream for human or agricultural uses. (Oregon FEIS MM)
- Coordinate with and/or notify neighboring landowners who may want to treat, or are already treating, adjacent lands. (Oregon FEIS MM)
- Areas with potential for groundwater for domestic or municipal use shall be evaluated through the appropriate, validated model(s) to estimate vulnerability to potential groundwater contamination, and appropriate mitigation measures shall be developed if such an area requires the application of herbicides and cannot otherwise be treated with non-herbicide methods. (MM)
- To protect domestic water sources, no herbicide treatments should occur within 100 feet of a well or 200 feet of a spring or known diversion used as a domestic water source unless a written waiver is granted by the user or owner. (Oregon FEIS MM)
- Proposals to boom or aerially spray herbicides within 200 feet of streams that are within 1,000 feet upstream from a public water supply intake, or spot apply herbicides within 100 feet of streams that are within 500 feet upstream from a public water supply intake, will include coordination with the Oregon Department of Environmental Quality and the municipality to whom the intake belongs. (Oregon FEIS MM)
- Consider surrounding land use before selecting aerial spraying as a treatment method, and avoid aerial spraying near agricultural or densely populated areas.
- Establish a buffer between treatment areas and human residences based on guidance given in the HHRA, with a minimum buffer of ¼ mile for aerial applications and 100 feet for ground applications, unless a written waiver is granted.

Goal Adopted for this Analysis

- The BLM will pursue a **Goal** of building working relationships with organic farms that are potentially affected by herbicide treatments.

Environmental Consequences

Effects by Alternative

Common to Both Alternatives

Although having more herbicides available would allow the BLM to better choose herbicides that better balance the control need with adjacent resources to be protected, the potential for herbicides to adversely affect organic farms is probably not much affected by which alternative is selected. Buffers applicable to different application methods, drift reducing adjuvants, and notifications all work to keep BLM herbicides on BLM-administered lands. "No Spray" areas may be registered with the County; none are known to the BLM applicable to the Resource Area.

Existing Mitigation Measure requiring coordination with and notifying neighboring landowners who may want to treat, or are already treating, adjacent lands, and requiring posting access points and notifying the public of planned herbicide treatments (see Appendix A, *Project Design Features, Standard Operating Procedures, Mitigation Measures, Conservation Measures, Prevention Measures, and Best Management Practices*) help explain to adjacent landowners when treatments are being done and why a given treatment was selected.

No-Action Alternative

As described in other sections of this EA, the existing availability of the four herbicides and restricting those herbicides to noxious weeds only,[71] limits the BLM's ability to target specific infestations with the most cost-effective, least-risk treatment, when compared to the Proposed Action and neighbors. Under this alternative, noxious weeds are expected to continue spreading at about 12 percent per year (USDI 2010a:133). In an area where farming is a significant land use and contributor to the local economy, as well as a strong aspect of the local culture and lifestyle, both the use of various pesticides and the control of weeds that negatively affect crops is a priority. Neighboring landowners expect the BLM to control its invasive plants and prevent their spread to private lands, and in fact, State law gives ODA authority to control noxious weeds when landowners do not, and to bill the landowner for the costs. Therefore, the No Action Alternative has the potential to negatively affect adjacent private lands by denying some treatments that would be more effective in limiting the spread of damaging weeds. Even organic farms that would be most sensitive to herbicide impacts could be negatively affected under this alternative because only four herbicides could be used on adjacent BLM-administered lands.

Adjacent landowner resources, and the landowners themselves, have the potential to be affected by the herbicides used in this Alternative. The Risk Assessments indicate some risk to some resources (non-target plants and crops, livestock, human health) under some exposure scenarios. While Standard Operating Procedures and Mitigation Measures are designed to reduce that risk to negligible levels, continuing to limit use to four herbicides would result in a higher risk than would occur under the Proposed Action (see Appendix D. *Herbicide Risk Tables)*.

Proposed Action

As described in other sections of this EA, the addition of 10 herbicides and the ability to treat both noxious weeds and other invasive plants would improve the BLM's ability to select the most cost-effective and lowest-risk treatment from within the integrated invasive plant management system. In many cases, the additional herbicides provide less environmental and human health risk than do the four existing herbicides, decreasing the risk to adjacent private landowners and their resources. For example, applications of 2,4-D are predicted to decrease 30 percent on the Resource Area (see Table C-4, *Estimated Treatment Acres*, in Appendix C, *The Herbicides, Formulations, Adjuvants, and Estimated Use*) from the No Action Alternative to the Proposed Action.

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[71] The four herbicides, 2,4-D, dicamba, glyphosate, and picloram, are the only herbicides used on the Resource Area since a 1984 court injunction limited the number of herbicides available, and limited their use to noxious weeds.

During scoping on the Oregon FEIS, county governments and others expressed frustration with the BLM's inability to use newer herbicides that would allow the agency to more effectively participate in "geographically logical" invasive plant control efforts.

The BLM's ability to more closely match existing private land treatments on adjacent areas would be more effective than the No Action Alternative at meeting EA Purpose c. *Cooperatively control invasive plants so they do not infest or re-infest adjacent non-BLM-administered lands*. Under this alternative, noxious weed spread would be reduced to an estimated seven percent and infest 68,000 fewer acres in 15 years than under the No Action Alternative (see *Invasive Plant* section earlier in this chapter). Lake County currently has a Cooperative Weed Management Area that works with landowners to identify and treat noxious weeds. The CWMA looks at the county as a whole, working on both private and public lands. The Proposed Action would be expected to allow the BLM to be a more effective partner with the CWMA. Organic farms, like other adjacent lands, would benefit from reduced invasive plant populations on BLM-administered lands.

Implementation Costs

Issues

- How would the alternatives affect the cost of invasive plant control?

This section examines the direct costs of the No Action Alternative and the Proposed Action. Examined for each alternative are total direct costs and direct costs per effectively treated acre. Costs are arguably not a potential effect on the human environment and thus the section is not necessarily required by NEPA. However, in this case, it furthers NEPA objectives to display the factors that will be used by the decision-maker to select from among the alternatives, and cost-effectiveness is thus identified as a *Purpose* in Chapter 1. BLM planning policy specifies that management actions having a high likelihood of improving resource conditions for relatively small expenditures of time and money should receive relatively higher priority (USDI 2005a:34). This section helps furthers these decision-making objectives.

Treated Acres and Effectively Treated Acres, by Alternative

Treated Acres

An estimate of the total acres of invasive plants that would be treated over the 10 to 15 year life of the EA with each herbicide and each non-herbicide treatment method for both alternatives is presented in Table C-4, *Estimated Treatment Acres, by Alternative and Category* in Appendix C.

The costs presented in this section are in 2014 dollars. If funding were available, it would be desirable to treat all invasive plant sites analyzed in this EA as quickly as possible. However, it is likely that treatments described will take place over the next 10-15 years. Annual treatment levels could vary based on changes in program emphasis or priorities, fluctuations in budgets, opportunities for cost savings with partnerships, and the availability of external funding. Since project related actions might be implemented through cooperative agreements, multiple partners may bear these costs. State and local governments, adjacent land owners, Cooperative Weed Management Areas, interest groups, and permit holders will contribute to or fully fund some invasive plant treatments, especially where those parties own, or have interests in, a potentially affected area or development.

Effectively Treated Acres

Invasive plant control treatments are not 100 percent effective at controlling invasive plant populations on the first try. Under both alternatives, some level of retreatment would be necessary to achieve complete control. A five-acre treatment, for example, would be monitored to detect additional or remaining plants, and some portion of those acres would likely require retreatment. The amount of retreatment necessary is a function of how effective the prior treatment is.

"Effective" treatments for each alternative are the portion of the treatments that successfully control the invasive plants on the treated site and thus prevent future invasive plant spread. The percentage of treatments meeting this definition varies by alternative and is estimated to be 60 and 80 percent of the Treatment Category 1 invasive plant treatments for the No Action Alternative and the Proposed Action respectively (see Table 3-25)(USDI 2010a:136). It is most appropriate to look at cost per effectively treated acres, because the overarching objective is to control invasive plants and prevent their spread.

Table 3-25. Estimated Acres of Invasive Plant Treatments, Category 1, by Alternative

Method	No Action Alternative	Proposed Action
Total Acres Treated over 10-15 years	38,270	44,090
Total Treated Effectively with 1st Treatment[1]	22,962 (60%)	35,272 (80%)
Total Treated Effectively with 2nd Treatment	32,411 (85%)	42,526 (96%)
Total Treated Effectively with 3rd Treatment	37,895 (94%)	43,777 (99%)

1. See USDI 2010a: 136-137.

Costs by Treatment Method

Costs displayed here include equipment, materials (including herbicides), wages, and contract costs; they do not include program planning (e.g., NEPA) or overhead. The acreage-weighted averages of these estimates are shown in Table 3-26. Herbicide application costs were averaged even though the cost of the herbicides themselves varies. The potential difference the additional calculations would have made was not judged significant[72] to a reasonable comparison of the alternatives. The price of herbicides per acre can be found in Table 3-27.

Table 3-26. Average Direct Cost of Treatment, by Treatment Method, per Acre

Treatment Method	Estimated Cost per Acre[1]
Herbicide	
Spot treatment backpack/wiper/ inject	$300
Spot treatment - ATV/UTV mounted w/handgun	$200
Spot treatment - truck mounted w/handgun	$100
Spot treatment - cut stump	$300
Spot treatment – backpack on roadside or trail	$114[2]
Broadcast treatment - backpack	$300
Broadcast treatment - ATV/UTV boom	$200
Broadcast treatment - truck mounted	$50
Aerial	$45
Manual	
Hand Pulling	$400
Chainsaw and leave trees in place	$236
Chainsaw, pile trees, and burn	$465
Mechanical	
Brushing (roadside)	$174
Vehicle mounted mower (roadside)	$174
Shred trees and shrubs	$340
Fire	
Prescribed fire broadcast burning (depends on size)	$65

[72] Fluridone and hexazinone are both substantially more expensive than the other 12 herbicides available under the No Action Alternative. However, very little (if any) of each would be used overall.

Treatment Method	Estimated Cost per Acre[1]
Machine pile and burn	$285
Slash hand pile and burn	$300
Biological	
Insect, Pathogen, and Nematode	$500

1. Estimated costs for fiscal year 2014.
2. Reported in cost per mile. For purposes of analysis, it is assumed that 1 mile = 1 acre.

Table 3-27. Cost of Herbicides

Active Ingredient	Price/Lb.	Typical Rate		Maximum Rate	
		Lbs./Acre	Price/Acre	Lbs./Acre	Price/Acre
2,4-D[1]	**$3.74**	**1**	**$3.74**	**1.9**	**$7.11**
Chlorsulfuron	$288.94	0.047	$13.58	0.141	$40.74
Clopyralid	$46.24	0.35	$16.18	0.5	$23.12
Dicamba	**$19.39**	**0.3**	**$5.82**	**2**	**$38.78**
Dicamba + diflufenzopyr	$65.00	0.2625	$17.06	0.4375	$28.44
Fluridone	$2,499.93	0.15	$374.99	1.3	$3,249.91
Glyphosate	**$3.68**	**2**	**$7.36**	**7**	**$25.76**
Hexazinone	$32.30	2	$64.60	4	$129.20
Imazapic	$66.88	0.0313	$2.09	0.1875	$12.54
Imazapyr	$30.93	0.45	$13.92	1.25	$38.66
Metsulfuron methyl	$111.47	0.03	$3.34	0.15	$16.72
Picloram	**$22.99**	**0.35**	**$8.05**	**1**	**$22.99**
Sulfometuron methyl	$43.29	0.14	$6.06	0.38	$16.45
Triclopyr	$23.56	1	$23.56	10	$235.60

1. Herbicides available under both alternatives are shown in bold.

Total Cost and Cost per Effectively Treated Acre by Alternative

The portion of the total treatment need that would be treated is predicted to increase under the Proposed Action. Reasons for this increase include:

1. the additional herbicides provide tools to control invasive plants not presently treated or at least not treated effectively;
2. the additional herbicides make control treatments more effective and therefore more treatments can be done within existing funding;
3. additional cooperator and permit-holder funding sources become available as it becomes practical to effectively treat more species; and,
4. approving herbicides currently used on adjacent non-BLM-administered lands would encourage cooperative weed management across ownerships.

Total costs increase as more acres are treated. However, the cost per effectively treated acre decreases as effectiveness increases (see Table 3-28). This decrease is wholly related to the increased efficiency of having more control tools available. It is assumed that treatments would be 60 percent effective under the No Action Alternative and 80 percent effective under the Proposed Action (see Table 3-25, *Estimated Acres of Invasive Plant Treatments, Category 1, by Alternative*)(USDI 2010a:136).

Table 3-28. Cost of Invasive Plant Treatments, Category 1, by Alternative

Method	No Action Alternative	Proposed Action
Non-Herbicide	$418,600	$303,450
Herbicide	$6,590,783	$7,246,422
Total cost	$7,009,383	$7,549,872
Cost per acre	$183	$171
Cost per acre effectively treated[1]	$305	$214

1. It is assumed that treatments would be 60 percent effective under the No Action Alternative and 80 percent effective under the Proposed Action (Table 3-24)(USDI 2010a:136).

Effects by Alternative

No Action Alternative

Category 1 (Existing Documented Sites): The cost of implementing treatments for Category 1 would be $7,009,383 in 2014 dollars, or $183 an acre. Treatments are estimated to be 60 percent effective, so treatment cost per effectively treated acre is $305 (see Table 3-28, *Cost of Invasive Plant Treatments, Category 1, by Alternative*).

Category 2 (Future Spread from Existing Sites): Under the No Action Alternative, invasive plants are estimated to spread 12 percent annually or 4,600 acres in the first year. Assuming that treatment methods and herbicides would be similar to sites in Category 1, the cost of implementing treatments for Category 2 would be $842,000 for the first year of spread. Treatment cost per effectively treated acre would continue to be $305, as under Category 1.

Category 3 (New Invaders): The cost of implementing treatments for Category 3 is unknown, but is likely to be minimal.

Categories 4, 5, and 6 (Post fire emergency stabilization, Greater Sage-Grouse Habitat Protection and Restoration, and Rehabilitation of Invasive Annual Grass Sites): These Categories are unlikely to be treated under the No Action Alternative, as there is no effective herbicide available to treat invasive annual grasses, nor are many invasive annual grasses listed as noxious.

Proposed Action

Category 1 (Existing Documented Sites): The cost of implementing treatments is more than the No Action Alternative at $7,549,872 in 2014 dollars, or $171 an acre. Additional acres treated under the Proposed Action include invasive plants not listed as noxious weeds by the State or County. The price per treatment acre will drop because an herbicide selective to annual grasses will be available, and hence invasive annual grasses can be broadcast treated at a cheaper rate than spot treatments. In addition, increased effectiveness of treatment makes the treatment cost per effectively treated acre lower than the No Action Alternative at $214 (see Table 3-28, *Cost of Invasive Plant Treatments, Category 1, by Alternative*).

Category 2 (Future Spread from Existing Sites): Under the Proposed Action, the annual spread rate would, after 15 years, slow to 7 percent annually (see *Invasive Plants* section earlier in this chapter). The first full year of treatments would have an annual spread rate of 9.87 percent, or 4,352 acres. Assuming that treatment methods and herbicides would be similar to sites in Category 1, the cost of implementing treatments for Category 2 would be $744,138 for the first year of spread. Treatments are estimated to be 80 percent effective (and treatment cost per effective acre would continue to be $214).

Category 3 (New Invaders): The cost of implementing treatments for Category 3 is unknown, but is likely to be minimal, as new invaders are found only a few times a year, and are often less than one acre when discovered. Fluridone, which costs more than 26 times as much at the typical rate as the average price of other herbicides available under the Proposed Action (see Table 3-27, *Cost of Herbicides*), may be used if an aquatic invasive plant is found on the Resource Area.

Category 4 (Post-fire emergency stabilization): The cost of implementing treatments for Category 4 is unknown, but likely to be minimal. Fires on the Resource Area burn an average of 13,669 acres annually. A portion of a late season fire burned area may need treatments of imazapic for emergency stabilization if it seems that the fire will be followed by heavy rain, and invasive annual grasses are competing with desired forbs. These treatments would be funded with post fire emergency stabilization budgets.

Category 5 (Greater Sage-Grouse Habitat Protection and Restoration): The cost of implementing treatments for Category 5 is unknown. Restoration would likely be funded with funds earmarked for this purpose.

Category 6 (Rehabilitation of Invasive Annual Grass Sites): The cost of implementing 300,000 acres of treatments for Category 6 would be $13,500,000[73] in 2014 dollars. Treatment costs per acre would be lower than in other Treatment Categories, as most of the treatments done in Category 6 would be broadcast or aerially applied, and imazapic is a relatively inexpensive herbicide. It should be noted that an effect specific to this alternative would be potentially reducing the risk of wildfire.

Non-Quantified Effects

Management of invasive plants affects the costs of managing BLM-administered lands. Increased operating costs due to invasive plant management may result in direct or indirect transfer of costs to land management programs or users of BLM-administered lands. Invasive plant management may compete with other important land management needs, resulting in cost tradeoffs. However, invasive plant treatments would result in improvements in the condition of BLM resources and would lead to increases in commodity and non-commodity values, improving the goods, services, and uses provided by BLM-administered lands. Treatments would increase the quantity and quality of wildlife forage, reduce fire hazard, and reduce other negative effects from invasive plant spread. Improved recreation opportunities and reductions in risk of wildfires, would benefit the economies of Lake County communities, which are dependent on recreational opportunities and other natural resource-based businesses.

[73] Or $900,000 to treat 20,000 acres per year. Retreatment of these acres may be needed; estimated effectiveness of imazapic to treat invasive annual grasses in currently unknown.

Human Health and Safety

Issues

- What is the risk from possible exposure of the public to herbicides for each alternative?
- How will the public be notified that areas have been sprayed with herbicides?
- How would the alternatives affect worker safety?

Affected Environment

Background Health Risks

People living in Lake and Harney Counties are exposed to a variety of risks common to the U.S. as a whole, including automobile accidents and other injuries; contaminants in the air, water, soil, and food; and risks from smoking, alcohol and various diseases. Risks to workers may differ from those facing the public, depending on the nature of a person's work. Some of these risks may be quantified, but a lack of data allows for only a qualitative description of certain risks.

Risks from Injury and Diseases

Disease Incidence

Despite the difficulties in establishing correlations between work conditions and disease, only certain illnesses have been linked to occupational hazards in National and State-level studies. For example, asbestosis and lung cancer among insulation and shipyard workers has been linked to their exposure to asbestos (NTP 2009). Pneumoconiosis among coal miners has been correlated with the inhalation of coal dust. Occupational exposures to some metals, dusts, and trace elements, carbon monoxide, carbon disulfide, halogenated hydrocarbons, nitroglycerin, and nitrates can result in increased incidence of cardiovascular disease. Neurotoxic disorders can arise from exposure to a wide range of chemicals, including some pesticides.[74] Dermatological conditions like contact dermatitis, infection, trauma, cancer, vitiligo, urticaria, and chloracne have a high occurrence in the agricultural, forestry, and fishing industries.

Injury and Disease Mortality

The five most common causes of death in the U.S., as well as in Oregon, are heart disease, cancer, cerebrovascular disease (stroke), respiratory disease, and accidents. Oregon has lower than average mortality rates for cancer, heart disease, and injuries and higher incidence for stroke and respiratory disease.

Occupational injury, illness, and fatality rates in Oregon (rates are not calculated by County) show the agriculture, forestry, hunting, and fishing industry to have some of highest injury rates (USBLS 2012a, b). Reportable injuries occurred at a rate of 3.45 per 100,000 hours worked, and fatalities occurred at a rate of 0.0063 per 100,000 hours worked (seven times the occupational rate overall).

Cancer Incidence

Nationwide, the chance of developing some form of cancer during one's lifetime is estimated to be about one in three (NCI 2005). There are many causes of cancer development, including genetic, viral, and occupational exposure to carcinogens, environmental contaminants, and substances in food. In the U.S., one-third of all

[74] Pesticides include insecticides, rodenticides, fungicides, herbicides, and other "pest" control materials.

cancers are attributed to tobacco smoking. Work-related cancers are estimated to account for 4 percent to 20 percent of all malignancies. It is difficult to quantify the information because of the long time intervals between exposure and diagnosis, personal behavior patterns, job changes, and exposure to other carcinogens. The National Institute for Occupational Safety and Health (NIOSH) has reported that approximately 20,000 cancer deaths and 40,000 new cases of cancer each year in the U.S. are attributable to occupational hazards. Millions of U.S. workers are exposed to substances that have tested as carcinogens in animal studies (NIOSH 2009b).

Cancer Mortality

Cancer accounted for 23 percent of all deaths in Oregon in 2003 (USDI 2010a:344). Nationwide, cancer accounts for approximately 24 percent of all fatalities (NCHS 2007). Generally, males have higher rates of cancer mortality than females, and African Americans have higher rates than Caucasians.

Treatments Planned Relating to the Issues

Common to Both Alternatives

The full range of treatments envisioned under both of the alternatives bear on the issues identified for this section. The use of manual, mechanical, aerial, and herbicide treatments, as well as activities appurtenant to the use of herbicides including pre-spray burning and post-treatment seeding, all have the potential for injury to workers. In addition, the public may be exposed to herbicides because, in spite of posting known public concentration areas or tribal gathering areas, the public ultimately has access to all treated lands. The spread of invasive plants is primarily facilitated by public activities, so treatment areas necessarily correlate with public use areas including campgrounds, trailheads, roads, and stream corridors. For example, documented invasive plant sites occupy a total of 83 acres on 18 day use or campground recreation sites (see Table E-1 in Appendix E). However, where required by labels or where the BLM determines there will be a real or perceived risk to the public from an herbicide treatment, treatment areas are signed or closed to public access, and/or treatments are scheduled to avoid normal public use periods. Where the Human Health Risk Assessments used for the PEIS and Oregon FEIS for the 14 herbicides indicated a moderate or high risk to the public under modeled exposure scenarios, mitigation measures to reduce the risk have been adopted and made a part of the Alternatives (see Appendix A, *Project Design Features, Standard Operating Procedures, Mitigation Measures, Conservation Measures, Prevention Measures, and Best Management Practices*).

Under the Proposed Action, there is a wider range of herbicides from which an exposure is possible. In addition, there could be up to 20,000 additional acres of invasive annual grasses treated per year with imazapic when compared with the No Action Alternative.

Standard Operating Procedures and Mitigation Measures Relevant to Effects

Standard Operating Procedures, PEIS Mitigation Measures, and Oregon FEIS Mitigation Measures designed to reduce potential unintended effects to human health are listed in Appendix A. Work practices are also dictated by Federal and State OSHA rules, by Oregon Department of Agriculture rules, and by product labels. These work requirements include:

> When conducting treatments, workers would always wear appropriate safety equipment and clothing and use equipment that is properly maintained. For prescribed fire, workers would notify nearby residents who could be affected by smoke. Those involved in fire use treatments would maintain adequate safety buffers between the treatment area and residences/structures.

When cutting vegetation, all brush and tree stumps would be cut flat, where possible, to eliminate sharp points that could injure a worker or the public. Only qualified personnel would be allowed to cut trees near power lines, and any burning of vegetation debris would take place outside of utility rights-of-way to ensure that smoke would not provide a conductive path from transmission lines or electrical equipment to the ground. Spark arrestors would be required on all equipment to reduce the risk of accidental fire.

Workers applying herbicides would minimize application areas where possible, establish appropriate (herbicide-specific) buffer zones, post treated areas with appropriate signs at common public access areas, and notify the public of the potential for exposure. In addition, the BLM would have a copy of Material Safety Data Sheets at work sites, notify local emergency personnel of proposed treatments, contain and clean up spills and request help as needed, and secure containers during transport. The results from the Human Health Risk Assessments (see Appendix D, *Herbicide Risk Tables*) help inform Lakeview Resource Area on the proper application of herbicides to ensure that effects to humans were minimized to the extent practical.

Specific Standard Operating Procedures and Mitigation Measures pertinent to this analysis include:

- Post treated areas with appropriate signs at common public access areas.
- Observe restricted entry intervals specified by the herbicide product label.
- Provide public notification in newspapers or other media where the potential exists for public exposure.
- Consult with Native American tribes to locate any areas of vegetation that are of significance to the tribes and Native groups and that might be affected by herbicide treatments.
- Use the typical application rate, where feasible, when applying 2,4-D, fluridone, hexazinone, and triclopyr to reduce risk to workers and the public. (MM)
- Do not apply hexazinone with an over-the-shoulder broadcast applicator (backpack sprayer). (MM)
- Consideration should be given to herbicides other than 2,4-D; use of 2,4-D should be limited to situations where other herbicides are ineffective or in situations in which the risks posed by 2,4-D can be mitigated. (Oregon FEIS MM)
- Do not apply triclopyr by any broadcast method. (Oregon FEIS MM)

Environmental Consequences

Effects of Treatment Methods to Human Health and Safety

Herbicide and Non-Herbicide Treatments

Manual and mechanical treatments can present health hazards to workers. Adverse weather and terrain commonly create unfavorable working conditions and increased hazards. Hazards associated with adverse weather conditions include extreme heat and cold, which can be exacerbated by very dry and very wet conditions. Other hazards include falling objects (especially when cutting trees), tripping or slipping on hazards on the ground, protruding objects such as branches and twigs, poisonous plants and insects, and dangerous wildlife.

Tools and equipment present inherent hazards, such as sharp edges on the tools themselves, and the hazardous nature of fuels and lubricants used in mechanized equipment. Use of chainsaws and mowers in mechanical treatments can lead to injuries. Manual and mechanical methods present potential ergonomic hazards related to lifting and carrying equipment, and when pulling vegetation. Injuries can vary from minor cuts, sprains, bruises, and abrasions to major arterial bleeding, compound bone fractures, serious brain concussions, and death. Workers are subject to heat-related illness or hypothermia when working in extreme weather conditions, and may incur musculoskeletal injuries related to improper body mechanics.

Equipment operators could be injured from improperly operating the equipment or losing control of equipment on steep or slippery terrain. Operators and nearby workers can suffer hearing damage. Nearby workers and the public can be struck by flying debris around some machinery.

Prescribed fire presents hazards from inhaling particulates. Studies have shown that fine particles are linked (alone or with other pollutants) to increased mortality and aggravation of preexisting respiratory and cardiovascular disease. Particulate matter can also affect immune systems (Ammann et al. 2001). Fatalities have been caused by prescribed fire (NIOSH 2009a).

Use of all-terrain vehicles (ATVs) for herbicide application and prescribed fire has also caused injuries and fatalities. In response to this, BLM has conducted research to evaluate the type of vehicle, load size, slope, and to establish policy and training to make ATV application safer (Morin 2008). This research has been used by Occupational Safety and Health Administration, the Consumer Product Safety Commission, and by the EPA to promulgate regulations for ATV use.

The potential for hazard exposure (risk of injuries) is exacerbated when workers are fatigued, poorly trained, poorly supervised, or do not follow established safety practices. Appropriate training, together with monitoring and intervention to correct unsafe practices, minimizes risk of worker injury and illness. Compliance with Occupational Safety and Health Administration standards, along with agency, industry, and manufacturers' recommendations reduces the potential exposure and risk of injury to workers. Members of the public are usually not at risk from manual and mechanical methods unless they are too close to machinery that is producing flying debris during treatment.

No injuries to herbicide applicators from herbicide exposure have been recorded for at least the past ten years on BLM-administered lands in Oregon (Jeanne Standley, Oregon BLM State Weed Coordinator, pers. com.).

Herbicide Treatments

Appendix D (*Herbicide Risk Tables*) presents summaries of the level of risk that workers and the public would face during the application of a given herbicide, for both maximum and typical application rate scenarios.

BLM-Evaluated Herbicides

Aggregated Risk Indices (ARIs) (see Appendix D, *Herbicide Risk Tables*) are partitioned into no, low, moderate, and high levels of risk for ease of comparison. These designations are strictly for comparison purposes, and do not imply actual risks to people because Standard Operating Procedures, Mitigation Measures, and actual application and exposure scenarios would lessen exposures from Risk Assessment levels (see *Relationship of Effects to the Standard Operating Procedures and Mitigation Measures* near the beginning of this Chapter).

Diflufenzopyr: For workers, routine use ARIs were calculated for inhalation exposures under both typical and maximum application rate scenarios. No dermal toxicity values are available for diflufenzopyr, which, based on laboratory data, is not expected to be toxic through the dermal route. Routine use ARIs are greater than one under both the typical and maximum application rate scenarios, indicating no exceedance of the EPA's LOC (see *Herbicide Risk Tables*, Appendix D). Because the accidental worker scenarios all assume dermal exposure and diflufenzopyr does not have a short-term dermal No Observable Adverse Effects Level, an accidental scenario ARI was not calculated.

For the public, routine use scenario ARIs are greater than one under both the typical and maximum application rate scenarios for the public, indicating no LOC. Under the accidental scenario, it is assumed that the public is exposed directly to maximum herbicide application rates via dermal contact, incidental ingestion of water while swimming, or dietary exposure pathways at the maximum application rate. All accidental scenario ARIs are greater than one, indicating risks are below the LOC.

These results indicate that exposures to diflufenzopyr are not expected to exceed the EPA's LOC for worker or the public under the scenarios evaluated. Risk to aerial and boat workers were not evaluated because diflufenzopyr is not applied aerially or to aquatic sites. Risk to workers for accidental spill was not evaluated because there is no toxicity factor for oral exposure.

Fluridone: Mitigation Measures (Appendix A) limit the use of fluridone to typical application rates, where feasible. Fluridone does not pose a risk to workers or the public when applied at the typical application rate. When fluridone is applied at the maximum application rate, there is low risk to aerial mixer/loaders. For accidental scenarios, fluridone poses a low to high risk to all workers at typical and maximum rates respectively, and a low risk to children and resident publics at the maximum rate. Fluridone causes reversible eye irritation.

Imazapic applications do not present risk to the public or workers when applied in routine use situations at the typical or maximum application rate. Accidental scenarios involving dermal contact with direct spray of vegetation or dietary exposure were not calculated because imazapic has not been shown to have acute dietary or dermal effects in hazard analyses conducted by the EPA (ENSR 2005l). Accidental scenarios involving dermal contact with a sprayed water body or a water body into which herbicide is spilled do not result in risk to swimmers. Risk to workers for accidental spill and to several public scenarios was not evaluated because there is no toxicity factor for oral exposure.

Sulfometuron methyl applications do not present risk to human health when applied in routine use situations at either the typical or maximum application rate. Accidental scenarios involving dermal contact with direct spray of vegetation or dietary exposure were not calculated because sulfometuron methyl has not been shown to have acute dietary or dermal effects in hazard analyses conducted by the EPA (ENSR 2005l). Accidental scenarios involving dermal contact with a sprayed water body or a water body into which sulfometuron methyl is spilled do not present a risk to swimmers. Risk to workers for accidental spill and most public scenarios were not evaluated because there is no toxicity factor for oral exposure. The EPA has not developed any acute toxicity categories for sulfometuron methyl (EPA 2008).

Forest Service-Evaluated Herbicides

The Forest Service Risk Assessments presented the risk results as hazard quotients, which were used to designate a risk level as no, low, moderate or high, for ease of comparison. As with the BLM-evaluated herbicides, these designations are strictly for comparison purposes, and do not imply actual risks to people because Standard Operating Procedures, Mitigation Measures, and actual application and exposure scenarios would lessen exposures from Risk Assessment levels.

2,4-D (common to both alternatives): Mitigation Measures (Appendix A) limit the use of 2,4-D to typical application rates, where feasible, and an Oregon Mitigation Measure says consideration should be given to herbicides other than 2,4-D; use of 2,4-D should be limited to situations where other herbicides are ineffective or in situations in which the risks posed by 2,4-D can be mitigated. At the typical and maximum (1.9 lb.) application rates, workers involved in backpack spray, boom spray, and aerial application face low risk from 2,4-D exposure. Workers also face moderate risk from wearing contaminated gloves for 1 hour and no risk from exposure to a spill on lower legs for one hour or from exposure to spill on the hands for one hour. Based on upper bound hazard quotients that exceed one, adverse health outcomes are possible for workers exposed repeatedly over a longer period. The public faces zero risk from all modeled scenarios except direct spray, child, entire body at maximum application rate poses a low risk. Other exposure scenarios to the public have no risk.

Based on recent studies reviewed by SERA, 2,4-D is toxic to the immune system and developing immune system, especially when used in combination with other herbicides (tank mixes). The mechanism of action of 2,4-D toxicity is cell membrane disruption and cellular metabolic processes. 2,4-D toxicity affects human lymphocytes and nerve tissue. Therefore, interactions are likely to occur when 2,4-D is mixed with other chemicals that affect cell membranes and cell metabolism (SERA 2006).

SERA (2006) suggests that 2,4-D may cause endocrine disruption in male workers applying large amounts of this herbicide; however, the study was inconclusive. Based on currently available toxicity information that demonstrate effects on the thyroid and gonads following exposure to 2,4-D, there are some data supporting its endocrine disruption potential and EPA is studying this further (EPA 2005). In the Human Health Risk Assessment conducted to support the reregistration of 2,4-D (EPA 2004), the EPA concluded that there is not sufficient evidence that 2,4-D is an endocrine disrupting chemical.

Chlorsulfuron: For both workers and the public, most exposures to chlorsulfuron at the typical or maximum application rate would not pose a risk (SERA 2004a). Ground broadcast applications at the maximum application rate would pose a low risk to workers.

Eye and/or skin irritation are likely to be the only overt effects of mishandling chlorsulfuron. Following industrial hygiene practices during the handling of the chlorsulfuron would eliminate or minimize these effects.

Clopyralid: There are no risks to the public or workers associated with most of the anticipated typical and accidental exposure scenarios for clopyralid. Irritation and damage to the skin and eyes can result from direct exposure to relatively high levels of clopyralid; this is likely to be the only overt effect because of mishandling clopyralid (SERA 2004b). Children face low risk from consumption of water contaminated by an accidental spill.

Dicamba (common to both alternatives) applications present low risk to workers during boom spraying. Dicamba may result in reversible eye irritation and severe skin irritation. There is low risk to the public from the consumption of water from a pond contaminated with a spill.

Glyphosate (common to both alternatives): For both workers and members of the public, there are no risks associated with nearly all exposures to glyphosate at the typical or maximum application rate (SERA 2011a). The Risk Assessment calculated no risk for all but one of the tested scenarios. There is low risk to children in the public associated with accidental exposure to glyphosate consumption of contaminated water after an herbicide spill at the maximum rate into a small pond.

Hexazinone: Mitigation Measures (Appendix A) limit the use of hexazinone to typical application rates, where feasible, in addition to not allowing the application of hexazinone with an over-the-shoulder broadcast applicator. At maximum application rates, the three general exposure scenarios for workers, backpack, boom, and aerial, would pose a low risk (SERA 1997). Risk was zero for all modeled public exposure scenarios.

Imazapyr: All modeled exposures to imazapyr (at either the typical or the maximum application rate) do not present a risk to either workers or members of the public, suggesting that workers and the public would generally not be at any substantial risk from longer-term exposure to imazapyr even at the upper range of the application rate considered in the Risk Assessment (SERA 2011b). Eye irritation is likely to be the only overt effect because of mishandling imazapyr. This effect can be minimized or avoided by prudent industrial hygiene practices during the handling of the compound.

Metsulfuron methyl: Typical exposures to metsulfuron methyl at the typical or maximum application rates do not present a risk to workers or the public (SERA 2004e). For workers, there is no risk associated with acute or chronic exposure scenarios, even at the upper ranges of estimated dose. For members of the public, no risks were predicted for any of the exposure scenarios. From a practical perspective, eye and skin irritation are likely to be the only overt effects of mishandling metsulfuron methyl. These effects can be minimized or avoided by prudent industrial hygiene practices during the handling of this compound.

Picloram (common to both alternatives): Typical exposures to picloram at either the typical or maximum application rates do not present a risk to workers or the public (SERA 2011c). From a practical perspective, eye irritation and skin sensitization are likely to be the only overt effects because of mishandling picloram.

Triclopyr: Mitigation Measures (Appendix A) limit the use of triclopyr to typical application rates, where feasible. Workers face low risk from directed and broadcast ground spray and aerial applications at the upper ranges of exposures for both evaluated forms of triclopyr (triclopyr acid and triclopyr BEE) at the maximum application rate (SERA 2011d). At the maximum application rate for triclopyr BEE, workers face low risk from accidental exposure to contaminated gloves (1-hour duration). Thus, for workers who may apply triclopyr repeatedly over a period of several weeks or longer, it is important to ensure that work practices involve reasonably protective procedures to avoid the upper extremes of potential exposure. At higher application rates, measures that limit exposure should be developed on a case-by-case basis depending on the application rate and method.

There is low risk to the public from triclopyr BEE applications at the maximum rate for under several acute or accidental scenarios: 1) direct spray to the lower legs; 2) dermal contact with contaminated vegetation; 4) acute consumption of contaminated fruit; and 4) acute consumption by a child of pond water contaminated by a spill. There is low risk to the public from triclopyr acid applications at the maximum rate for acute consumption by a child of pond water contaminated by a spill, and for chronic consumption of contaminated fruit.

Summary of Herbicide Treatments

Only two of the herbicides pose a measured risk to workers at the typical rate. Fluridone poses a low risk under one scenario, and 2,4-D poses a low risk under three worker scenarios and a moderate risk under one scenario, wearing contaminated gloves for an hour. None of the herbicides pose a risk to the public under any of the modeled scenarios including accidental spill at the typical rate (see Table 3-29).

At the maximum rate, four of the herbicides pose a risk to workers. These include fluridone (high risk for accidental spill, low risk for aerial mixer/loader), 2,4-D (low under three scenarios and high for contaminated gloves), hexazinone (low for three exposure scenarios), and triclopyr acid and BEE (low under three and four scenarios respectively). Four herbicides also pose a risk to the public at maximum rates. These are fluridone (two exposure scenarios), 2,4-D (one scenario, direct spray child, entire body), triclopyr acid and BEE (two and four scenarios respectively), and glyphosate (one scenario, consumption of pond water after an accidental spill). A Mitigation Measures limits application of all of these herbicides except glyphosate to typical rate where feasible (see Table 3-29).

Table 3-29. Risk Summary (number of low and moderate risk scenarios for each herbicide)

Herbicide	Worker		Public		Treatment Category 1 Acres to be Treated in 10 to 15 years[1]	
	Typical rate	**Maximum rate**	**Typical rate**	**Maximum rate**	**No Action Alternative**	**Proposed Action**
Fluridone	L	H, L[2]	-	L, L[2]	-	0
2,4-D	L, L, L, M	L, L, L, M[2]	-	L[2]	23,000	16,100
Hexazinone	-	L, L, L[2]	-	-	-	200
Triclopyr acid	-	L, L, L[2]	-	L, L[2]	-	
Triclopyr BEE	-	L, L, L, L[2]	-	L, L, L, L[2]		100
Glyphosate	-	-	-	L	12,100	3,600

1. See Table C-4, *Estimated Treatment Acres, by Alternative and Category*, in Appendix C, *The Herbicides, Formulations, Adjuvants, and Estimated Use*
2. Limited by Mitigation Measure to typical rate where feasible.

Effects by Alternative

No Action Alternative

Manual treatments are estimated for 800[75] of the 38,268 Treatment Category 1 acres (and likely a much higher percentage of new infestations under Treatments Categories 2 and 3). Physical injury from pulling and cutting can be expected to be within industry norms, but are more likely (on a per acre basis) than herbicide injuries,

Because some invasive plants are treated with two herbicides at the same time (tank mix), an acres-by-herbicide summary of the herbicide portion of treatments on the 38,268 acres in Treatment Category 1 totals approximately 55,100 acres (See Table C-4, *Estimated Treatment Acres, by Alternative and Category*, in Appendix C, *The Herbicides, Formulations, Adjuvants, and Estimated Use*). Nearly 23,000 acres of these would include 2,4-D either alone or in conjunction with one or more other herbicides in a tank mix. Almost of all of these treatments are planned for the typical rate (see Table 2-5, *Treatment Key, No Action Alternative*). There is no measured risk for any of the public exposure scenarios at this rate.[76] However, there are four worker exposure scenarios with low or moderate risk. Handled correctly, this herbicide poses little risk to workers. It is this measured risk, however, that is the reason for the Oregon Mitigation Measure to consider "herbicides other than 2,4-D; use of 2,4-D should be limited to situations where other herbicides are ineffective or in situations in which the risks posed by 2,4-D can be mitigated" (Appendix A, *Project Design Features, Standard Operating Procedures, Mitigation Measures, Conservation Measures, Prevention Measures, and Best Management Practices*). The 12,100 acres planned for glyphosate treatments (over 10-15 years) is almost all below or near typical rate. Glyphosate poses a low risk under one public exposure scenario at the maximum rate, which is currently only envisioned for Reed Canary Grass, a "low priority" aquatic not currently an issue for Lakeview.

Exposure scenarios for 2,4-D at the maximum rate (see Table 3-29, *Risk Summary*) are unlikely because a mitigation measure prohibits this rate "where feasible." In addition, access to recreation and other concentrated public use sites may be restricted for a few hours or days, depending on the requirements of the herbicide label. During site closures, BLM posts signs noting the exclusion area and the duration of the exclusion. Standard Operating Procedures also require providing public notification in newspapers or other media where the potential exists for public exposure, and consulting with Native American tribes to locate any areas of vegetation that are of significance to the tribes and Native groups and that might be affected by herbicide treatments.

Proposed Action

Injuries from 350 acres of estimated manual treatments under this alternative can be expected to be about 50 percent of those under the No Action Alternative because of reduced acreage.

As with the No Action Alternative, there are no public exposure risk scenarios for any of the 14 herbicides at the typical rate. Fluridone poses a low risk under one worker exposure scenario but no use is envisioned unless a new aquatic species is discovered on the Resource Area. Worker 2,4-D exposure risks of low to moderate under four worker exposure scenarios remain under this alternative, but estimated treatment acres decrease by 30 percent when compared to the No Action Alternative. Similarly, glyphosate still poses a low risk under one public exposure scenario, but total glyphosate use under this alternative is estimated to decrease by 70 percent when compared to the No Action Alternative (see Table C-4, *Estimated Treatment Acres, by Alternative and Category*).

Up to 20,000 acres of imazapic could be used annually in Treatment Categories 4, 5, and 6, much of which could be aerially applied. However, imazapic poses no public or worker risk under any of the exposure scenarios studied.

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[75] Table C-4 Estimated Treatment Acres, by Alternative and Category, in Appendix C.
[76] In the case of tank mixes, risk ratings for both materials are considered, and mitigation for both are applied. Risks are not averaged. Herbicides are only used together when one or both are registered for use with the other and it is so stated on the product label.

Exposure scenarios for fluridone, 2,4-D, hexazinone, and triclopyr acid and BEE (see Table 3-29, *Risk Summary*) at the maximum rate are unlikely because Mitigation Measures prohibit this rate “where feasible,” and further limit the application of triclopyr to spot treatments. In addition, access to recreation and other concentrated public use sites may be restricted for a few hours or days, depending on the requirements of the herbicide label. During site closures, BLM posts signs noting the exclusion area and the duration of the exclusion. Standard Operating Procedures also require providing public notification in newspapers or other media where the potential exists for public exposure, and consulting with Native American tribes to locate any areas of vegetation that are of significance to the tribes that might be affected by herbicide treatments.

Cumulative Effects

The pounds of herbicide anticipated to be used under the No Action Alternative and Proposed Action represent about seven and five percent, respectively, of the total pounds of herbicide estimated to be used in the Oregon Closed Basins portion of Oregon, essentially Lake and Harney Counties (see Table 3-2, *Pounds of Herbicides used in Oregon Closed Basins 2008, and BLM Current/Proposed Use*).[77] However, none of the 14 herbicides proposed for use are likely to persist, be blown, transported in water, or moved in soils in ways that would combine them with similar materials to increase human health risk. The Proposed Action would decrease the pounds of herbicide used by 30 percent when compared with the No Action Alternative in spite of application acres being more than doubled.[78] More importantly, the acres to be treated with herbicides showing even low risks under one or more exposure scenarios decrease under the Proposed Action when compared to the No Action Alternative. The newer herbicides themselves pose less risk to the public and workers, and the increased number of herbicides available would facilitate the selection of a treatment most appropriate for the site and surrounding conditions.

The risk from herbicides is only partly cumulative to the risks from other management activities. If BLM personnel are applying herbicides, they are not cutting juniper, mowing invasive plants, or working with cattle. Traveling to and from the worksite has a higher (and cumulative) risk. The analysis indicates risks to public are negligible, but such risks would be cumulative to the risks incurred from traveling to BLM lands to recreate, and interacting with wildland resources, both of which carry a higher risk of injury or death. These latter are risks the public understands and accepts.

[77] The Lakeview Resource Area occupies 31 percent of the Oregon Closed Basins.

[78] As noted on Table 3-2, however, this reduction is primarily because the Proposed Action would add herbicides designed to be applied in ounces, rather than pounds, per acre. This reduction, by itself, does not necessarily mean less risk.

Glossary

Abiotic: Not involving living organisms.

Acetolactate synthase (ALS): A plant enzyme that facilitates the development of amino acids needed for plant growth.

Acetolactate synthase (ALS)-inhibitor: An herbicide that starves plants by reducing ALS. In this EIS, the ALS-inhibitors include three sulfonylureas (chlorsulfuron, metsulfuron methyl, and sulfometuron methyl) and two imidazolinones (imazapic and imazapyr).

Acid soil or acidic soil: A soil material having a pH of less than 7.0.

Active ingredient (a.i.): The ingredient in an herbicide that prevents, destroys, repels, desiccates, or otherwise controls the target plant.

Acute effect: An adverse effect on any living organism in which symptoms develop rapidly and often subside after the exposure stops.

Acute toxicity: The quality or potential of a substance to cause injury or illness shortly after exposure through a single or short-term exposure.

Adjuvant: A chemical that is added to the pesticide formulation to enhance the toxicity of the active ingredient or to make the active ingredient easier to handle.

Adsorption: 1) The adhesion of substances to the surface of solids or liquids. 2) The attraction of ions of compounds to the surface of solids or liquids.

Affected environment: Existing biological, physical, social, and economic conditions of an area subject to change, both directly and indirectly, as the result of a proposed human action.

Air pollutant: Any substance in the air that could, if in high enough concentration, harm humans, animals, vegetation, or material. Air pollutants may include almost any natural or artificial matter capable of being airborne in the form of solid particles, liquid droplets, gases, or a combination of these.

Air quality: The composition of air with respect to quantities of pollution therein. Used most frequently in connection with “standards” of maximum acceptable pollutant concentrations.

Allotment (grazing): Area designated for the use of a certain number and kind of livestock for a prescribed period of time.

Alluvial: Made up of or found in the materials that are left by the water of rivers, floods, etc.

Ambient air: Any unconfined portion of the atmosphere; open air, surrounding air, or “outdoor air.”

Anadromous fish: Fish that mature in the sea and swim up freshwater rivers and streams to spawn. Examples include salmon, steelhead, and sea-run cutthroat trout.

Anaerobic: Life or processes, such as the breakdown of organic contaminants by microorganisms, which take place without oxygen.

Anaerobic: Life or processes, such as the breakdown of organic contaminants by microorganisms, which take place without oxygen.

Area of critical environmental concern (ACEC): Type of special land use designation specified within the Federal Land Policy and Management Act. Used to protect areas with important resource values in need of special management.

Attainment area: A geographic area that is in compliance with the National Ambient Air Quality Standards. An area considered to have air quality as good as or better than the National Ambient Air Quality Standards as defined in the Clean Air Act.

Best management practices (BMPs): Manual-directed standard operating procedures and other standing direction, particularly when they apply to water.

Bioaccumulation: The process of a plant or animal selectively taking in or storing a persistent substance. Over time, a higher concentration of the substance is found in the organism than in the organism's environment.

Biological Assessment (BA): Information prepared by a Federal agency to determine whether a proposed action is likely to: (1) adversely affect listed species or designated critical habitat; (2) jeopardize the continued existence of species that are proposed for listing; or (3) adversely modify proposed critical habitat. Biological assessments must be prepared for "major construction activities" (50 CFR §402.02). A BA may also be recommended for other activities to ensure the agency's early involvement and increase the chances for resolution during informal consultation.

Biological control: The use of non-native agents including invertebrate parasites and predators (usually insects, mites, and nematodes), and plant pathogens to reduce populations of invasive plants.

Biological crust: Thin crust of living organisms on or just below the soil surface; composed of lichens, mosses, algae, fungi, cyanobacteria, and bacteria. Biological crusts are typically found in arid areas.

Biological evaluation (BE): A document prepared by an agency if a proposed action is likely to affect a listed species or critical habitat. The document reports the agencies evaluation of the likely effects of the action. The USFWS uses this information along with any other available information to decide if concurrence with the agency's determination is warranted.

Boom (herbicide spray): A tubular metal device that conducts an herbicide mixture from a tank to a series of spray nozzles. Usually mounted to a truck, or behind a tractor or all-terrain vehicle.

Broadcast application: An application of an herbicide that uniformly covers an entire area.

Buffer: A solution or liquid whose chemical makeup is such that it minimizes changes in pH when acids or bases are added to it; a space or distance left between the application and a non-target area; a strip of vegetation that is left or managed to reduce the impact that a treatment or action on one area might have on another area.

Burn-down: Quickly stopping a plant's progress towards seed ripening.

Candidate species: Plants and animals for which the U.S. Fish and Wildlife Service has sufficient information on their biological status and threats to propose them as endangered or threatened under the Endangered Species Act, but for which development of a proposed listing regulation is precluded by other higher priority listing activities.

Cell: A unique ecosystem type used in the Oregon Natural Heritage Plan to describe and evaluate natural areas. Cells contain one or more ecosystem elements.

Chronic exposure: Exposures that extend over a long period. Chronic exposure studies are used to evaluate the carcinogenic potential of chemicals and other long-term health effects.

Chronic toxicity: The ability of a substance or mixture of substances to cause harmful effects over an extended period, usually upon repeated or continuous exposure sometimes lasting for the entire life of the exposed organism

Clay: In soil, particles smaller than .002 mm in diameter.

Consultation: Exchange of information and interactive discussion; usually refers to consultation mandated by statute or regulation that has prescribed parties, procedures, and timelines (e.g. Consultation under National Environmental Policy Act or Section 7 of the Endangered Species Act, or Consultation with tribes).

Control: Eradicating, suppressing, or reducing vegetation; a population that is not exposed to the potentially toxic agent in toxicology or epidemiology studies.

Cooperator: Leasees, permittees, and others with authorized uses or occupancy on BLM lands.

Critical habitat: 1) Specific areas within a species' habitat that are critically important to its life functions; an area designated by the FWS under rule-making as being critical to the needs of a federally listed species, and which then carries special protection and consultation requirements.

Cultural resources: Nonrenewable evidence of human occupation or activity as seen in any area, site, building, structure, artifact, ruin, object, work of art, architecture, or natural feature, which was important in human history at the national, state, or local level.

Cumulative effect: The effects that results from identified actions when they are added to other past, present, and reasonably foreseeable future actions regardless of who undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time.

Degradates: Compounds resulting from degradation.

Targeted grazing: The careful application of grazing or browsing prescriptions (i.e., specified grazing intensities, seasons, frequencies, livestock species, and degrees of selectivity) to achieve natural resource objectives. Livestock production is a secondary or nonobjective when using prescribed grazing as a natural resource management tool.

Dispersant: A type of inert ingredient added to an herbicide formulation that reduces the cohesive attraction between like particles.

Drift: That part of a sprayed herbicide that is moved from the target area by wind while it is still airborne.

Effect: Environmental change resulting from a proposed action. Direct effects are caused by the action and occur at the same time and place, while indirect effects are caused by the action but are later in time, further removed in distance, or secondary. Effect and impact are synonymous as used in this document.

Endangered species: Any species listed under the Endangered Species Act as being in danger of extinction throughout all or a significant portion of its range.

Endangered Species Act (ESA): A law passed in 1973 to conserve species of wildlife and plants determined by the Director of the Fish and Wildlife Service or the NOAA Fisheries to be endangered or threatened with extinction in all or a significant portion of its range. Among other measures, ESA requires all federal agencies to conserve these species and consult with the Fish and Wildlife Service or NOAA Fisheries on federal actions that may affect these species or their designated critical habitat.

Endocrine: Referring to several glands in higher animals that secrete hormones.

Entisol: A soil developed in unconsolidated parent material with usually no genetic horizons except an A horizon.

Environmental assessment (EA): A concise public document that serves to document an examination of the potential environmental effects of a proposed project, and from that, examination documents whether to prepare an environmental impact statement or a finding of no significant impact.

Environmental justice: Equal protection from environmental hazards for individuals, groups, or communities regardless of race, ethnicity, or economic status. This applies to the development, implementation, and enforcement of environmental laws, regulations, and policies, and implies that no population of people should be forced to shoulder a disproportionate share of negative environmental impacts of pollution or environmental hazard due to a lack of political or economic strength.

Ephemeral Stream: A stream that contain running water only sporadically, such as during and following storm events.

Erosion: The wearing away of the land surface by running water, wind, ice, or other geological agents.

Eutrophication: Excessive nutrients in a lake or other body of water, usually caused by runoff of nutrients (animal waste, fertilizers, sewage) from the land, which causes a dense growth of plant life; the decomposition of the plants depletes the supply of oxygen, leading to the death of animal life.

Facultative: Capable of but not restricted to a particular function or mode of life.

Fate: The course of an applied herbicide in an ecosystem or biological system, including metabolism, microbial degradation, leaching, and photodecomposition.

Federal Land Policy and Management Act of 1976 (FLPMA): Public Law 94-579. October 21, 1976, often referred to as the BLM' s "Organic Act," which provides the majority of the BLM's legislated authority, direction, policy, and basic management guidance.

Federally Listed: Species listed as threatened or endangered under the Endangered Species Act.

Fire return interval: The average time between fires in a given area.

Forb: Small broad-leafed plant; broad-leaved herb other than a grass, especially one growing in a field, prairie, or meadow.

Formulation: The commercial mixture of an herbicide that includes both the active and inactive (inert) ingredients.

Fugitive dust: Small dust particles that travel some distance from their point of origin; the road and trail dust equivalent of drift smoke.

Fungi: Molds, mildews, yeasts, mushrooms, and puffballs, a group of organisms that lack chlorophyll and therefore are not photosynthetic.

Goal: A broad statement of a desired outcome. Goals are usually not quantifiable and may not have established time frames for achievement.

Graminoid: Grasses (family Gramineae or Poaceae) and grass like plants such as sedges (family Cyperaceae) and rushes (family Juncaceae).

Gravel: In soil, particle sizes between 2 and 64 mm in diameter.

Gross infested area or treatment area: An area of land occupied by one or more invasive plant species; the area of land defined by drawing a line around the general perimeter of the infestation, not the canopy cover of the plants; the gross area of a logical treatment unit. May contain significant parcels of land that are not occupied by the weed.

Groundwater: Subsurface water that is in the zone of saturation; the top surface of the groundwater is the "water table"; source of water for wells, seeps, and springs.

Groundwater Contaminant: Chemical detected in ground waters. Does not necessarily infer levels are toxic or harmful.

Habitat: The natural environment of a plant or animal, including all biotic, climatic, and soil conditions, or other environmental influences affecting living conditions; the place where an organism lives.

Half-life: The amount of time required for half of a compound to degrade.

Hazard quotient (HQ): The ratio of the estimated level of exposure to a substance from a specific substance from a specific pesticide application to the reference dose (RfD) for that substance, or to some other index of acceptable exposure or toxicity. An HQ less than or equal to 1 is presumed to indicate an acceptably low level of risk for that specific application. Analogous to BLM risk quotient.

Herbicide: A pesticide used to control, suppress, or kill vegetation, or severely interrupt normal growth processes.

Herbicide resistance: Naturally occurring heritable characteristics that allow individual weeds to survive and reproduce, producing a population, over time, in which the majority of the plants of the weed species have the resistant characteristics.

Invasive plant (Oregon FEIS): A non-native aggressive plant with the potential to cause significant damage to native ecosystems and/or cause significant economic losses. *This Oregon FEIS and Lakeview EA definition differs from the National PEIS definition by not including species native to the ecosystem under consideration.*

Herd Management Area: Public land under the jurisdiction of the BLM that has been designated for special management emphasizing the maintenance of an established wild horse herd.

Hydrologic: The properties, distribution, and effects of water on the earth's surface, in the soil and underlying rocks, and in the atmosphere.

Infested: An area having one or more of the subject invasive species – either plants or plant pathogens. Infested areas are not necessarily 100 percent infested.

Instant Study Area: A BLM primitive or natural area designed before November 1, 1975, subject to wilderness review under section 603(a) of FLPMA.

Integrated vegetation management (IVM): A long-standing, science-based, decision-making process that identifies and reduces risks from vegetation and vegetation management related strategies. It coordinates the use of vegetation biology, environmental information, and available technology to prevent unacceptable levels of damage by the most economical means, while posing the least possible risk to people, property, resources, and the environment. IVM provides an effective strategy for managing vegetation in all arenas from developed agricultural, residential, and public areas to wild lands. IVM serves as an umbrella to provide an effective, all encompassing, low-risk approach to manage problem vegetation. A sustainable approach to managing vegetation by combining biological, cultural, physical, and chemical tools in a way that minimizes economic, health, and environmental risks.

Interagency special status/sensitive species program (ISSSSP): The BLM and FS shared program to coordinate record keeping and other management of the Bureau Special Status and Forest Service Sensitive species programs. Also, see *special status species*.

Intermittent stream: Any non-permanent flowing drainage feature having a definable channel and evidence of annual scour or deposition. This includes what are sometimes referred to as ephemeral streams if they meet these two criteria.

Invasive plants (or weeds): A non-native aggressive plants with the potential to cause significant damage to native ecosystems and/or cause significant economic losses. *This Oregon EIS definition differs from the PEIS definition by not including species native to the ecosystem under consideration.*

Issue: A matter of controversy, dispute, or general concern over resource management activities or land uses.

K Factor: In soils, a relative index of susceptibility of bare cultivated soil to particle detachment and transport by rainfall.

Koc**:** Organic carbon-water partition coefficient.

Label: All printed material attached to or part of the pesticide container, and which contains instructions for the legal application of the pesticide.

LC_{50} (median lethal concentration): A concentration of a chemical in air or water to which exposure for a specific length of time is expected to cause death in 50% of a defined experimental animal population.

LD_{50} (median 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.

Leaching: The movement of chemicals through the soil by water; may also refer to the movement of herbicides out of leaves, stems, or roots into the air or soil.

Lek: An area where male sage-grouse display during the breeding season to attract females (also referred to as strutting-ground).

Lentic systems: Standing waters such as lakes, ponds, and some wetlands.

Level of concern (LOC): The concentration or other estimate of exposure above which there may be effects.

Listed species: Formally listed as a threatened or endangered species under the ESA. Designations are made by the FWS or NMFS.

Lithosols: A group of shallow soils lacking well-defined horizons, especially an entisol consisting of partially weathered rock fragments, usually on steep slopes.

Lotic systems: Flowing water such as rivers and streams.

Lowest observed adverse effect level (LOAEL): The lowest dose of a chemical in a study, or group of studies, that produces statistically or biologically significant increases in frequency or severity of adverse effects between the exposed and control populations.

Marsh: A type of wetland that does not accumulate appreciable peat deposits and is dominated by herbaceous vegetation. Marshes may be either fresh or saltwater, tidal or nontidal.

Material safety data sheet (MSDS): A compilation of information required under the Occupational Safety and Health Administration Communication Standard on the identity of hazardous chemicals, health and physical hazards, exposure limits, and precautions.

Maximum application rate: The maximum application rate included on the label of the formulated product. For example, Plateau, the formulated product that has imazapic as its active ingredient, the label states that no more than 12.0 fluid ounces of product are to be applied on a per acre basis. According to the label there are two pounds of imazapic acid equivalent in a gallon of formulated product, so the maximum amount of active ingredient that may be applied is 0.1875 lb. a.i./acre.

Mechanical control: The use of any mechanized approach to control or eliminate invasive plants (i.e. mowing, weed whipping, or cutting with a chainsaw).

Mesic: Of, characterized by, or adapted to a moderately moist habitat.

Mesophytic: Being or growing in or adapted to a moderately moist environment.

Mitigation: Actions that would: 1) avoid an impact altogether by not taking a certain action or parts of an action; 2) minimize an impact by limiting the degree or magnitude of the action and its implementation; 3) rectify an impact by repairing, rehabilitating, or restoring the affected environment; 4) reduce or eliminate an impact over time by preserving and maintaining operations during the life of the action; and, 5) compensate for an impact by replacing or providing substitute resources or environments.

Monitoring: The orderly collection, analysis, and interpretation of resource data to evaluate progress toward meeting management objectives.

Natural heritage cell: A unique ecosystem type used by the Oregon Natural Heritage Program to inventory, classify, and evaluate natural areas. Cells must contain one or more ecosystem elements such as plant communities or ecosystems (terrestrial, aquatic, or wetland), special species (species of conservation interest because of their rarity, risk of extirpation or extinction, or under representation in the statewide natural area system), or unique geologic features (landforms, outcrops, and other geologic units).

Nematode: Any of a phylum (Nematoda or Nemata) of elongated cylindrical worms parasitic in animals or plants or free-living in soil or water —called also roundworm.

No Action Alternative: The most likely condition to exist in the future if current management direction were to continue unchanged.

No observed adverse effect level (NOAEL): The exposure level at which there are no statistically or biological significant differences in the frequency or severity of any adverse effect between the exposed and control populations.

No observed effect level (NOEL): Exposure level at which there are no statistically or biological significant differences in the frequency or severity of any effect between the exposed and control populations.

Non-selective herbicide: An herbicide that is generally toxic to plants without regard to species or group.

Non-target: Any organism that is not the objective of a control treatment.

Noxious weed: A subset of invasive plants that are county, state, or federally listed as injurious to public health, agriculture, recreation, wildlife, or any public or private property.

Noxious weeds: A subset of invasive plants that are county-, State-, or Federally-listed as injurious to public health, agriculture, recreation, wildlife, or any public or private property (USDI 2010a).

Noxious weed (Lakeview Resource Area Resource Management Plan): According to the "Federal Noxious Weed Act" (Public Law 93-629), a weed that causes disease or has other adverse effects on man or his environment and, therefore, is detrimental to the agriculture and commerce of the United States and to the public health.

Paleontological resources: A work of nature consisting of or containing evidence of extinct multicellular beings and includes those works or classes of works of nature designated by the regulations as paleontological resources.

Paleontology: A science dealing with the life of past geological periods as known from fossil remains.

Parent material: The unconsolidated and more or less chemically weathered mineral or organic matter from which the soil has developed by pedogenic processes.

Particulate matter (PM): A complex mixture consisting of varying combinations of dry solid fragments, solid cores with liquid coatings, and small droplets of liquid. These tiny particles vary greatly in shape, size, and chemical composition, and can be made up of many different materials such as metals, soot, soil, and dust.

Pathogen: Any disease-producing agent, especially a virus, bacterium, or other microorganism.

Perennial: A plant with a life cycle lasting more than two years; a stream that flows year round.

Persistence: The length of time a compound, once introduced into the environment, stays there.

Pesticide: Any substance used for controlling, preventing, destroying, repelling, or mitigating any pest. Includes fungicides, herbicides, fumigants, insecticides, nematicides, rodenticides, desiccants, defoliants, plant growth regulators, and so forth. Any material used in this manner is a pesticide and must be registered as such, even if it has other non-pesticide uses.

Petroglyph: An image recorded on stone, usually by prehistoric peoples, by means of carving, pecking, or otherwise incised on natural rock surfaces.

Pictograph: A symbol that represents an object or a concept by illustration.

pH: A measure of how acidic or alkaline (basic) a solution is on a scale of 0 to 14 with 0 being very acidic, 14 being very alkaline, and 7 being neutral. The abbreviation stands for the potential of hydrogen.

Photo degradation: The photochemical transformation of a molecule into lower molecular weight fragments, usually in an oxidation process. This term is widely used in the destruction (oxidation) of pollutants by ultraviolet-based processes.

Playas: Flat land surfaces underlain by fine sediment or evaporate minerals deposited from a shallow lake on the floor of a topographic depression.

$PM_{2.5}$: Fine particulates that measure 2.5 microns in diameter or less.

PM_{10}: Particulate matter that measures 10 microns in diameter or less.

Post-emergent (herbicide): Herbicide used to kill weeds after they have germinated and are growing.

Pre-emergent (herbicide): A soil applied herbicide used to keep seeds from germinating.

Preliminary Priority Management Area: Areas that have been identified as having the highest conservation value to maintaining sustainable Greater Sage-Grouse populations. These areas include breeding, late broodrearing, and known winter concentration areas (*The Oregon Greater Sage-Grouse Draft Resource Management Plan Amendment and Environmental Impact Statement* referred to this same area as preliminary priority habitat).

Prescribed fire: A wildland fire that burns under specified conditions and in predetermined area, to produce the fire behavior and fire characteristics required to attain resource management objectives.

Prevention: To detect and ameliorate conditions that cause or favor the introduction, establishment, or spread of invasive organisms or conditions.

Propagule: A part of a plant, e.g. a bud, spore, or root fragment, capable of producing a new plant.

Proper functioning condition: The condition of riparian and wetland areas when adequate vegetation, landform, or large woody debris are present to dissipate stream energy associated with high water flows. This reduces erosion and improves water quality; filters sediment, captures bedload, and aids in floodplain development; improves floodwater retention and groundwater recharge; develops root masses that stabilize streambacks against cutting; develops diverse ponding and channel characteristics to provide habitat and water depth, duration, and temperature necessary for fish production, avian breeding habitat, and other uses; and supports greater biodiversity.

Proposed threatened or endangered species: Plant or animal species proposed by the U.S. Fish & Wildlife Service to be biologically appropriate for listing as threatened or endangered and that is published in the Federal Register. It is not a final designation. Proposed species are, at minimum, managed as Bureau Sensitive until a decision is made about federal listing.

Rangeland: Land on which the native vegetation is predominantly grasses, grass-like plants, forbs, or shrubs; not forests.

Research natural areas (RNAs): Parts of a national network of reserved areas under various ownerships, containing important ecological and scientific values and are managed for minimum human disturbance. They are established and managed to protect ecological processes, conserve biological diversity, and provide opportunities for observation for research and education.

Resident fish: Fish that spend their entire life in freshwater (e.g., bull trout) on or near a specific location.

Residue: Herbicide or its metabolites remaining in or on soil, water, plants, animals, or surfaces.

Resource management plan (RMP): Current generation of land use plans developed by BLM under the FLPMA; replaces the older generation management framework plans; provides long-term (up to 20 years) direction for the management of a particular area of land, usually corresponding to a BLM resource area, and its resources.

Revegetation: Establishing or re-establishing desirable plants where desirable plants are absent or of inadequate density, either by controlling site conditions (including the suppression of unwanted competition) so existing vegetation can reseed and spread, or by direct seeding or transplanting.

Right-of-way (ROW): A permit or an easement that authorizes the use of lands for certain specified purposes, such as the construction of forest access roads, gas pipelines, or power lines.

Riparian area (Oregon FEIS): Those terrestrial areas where the vegetation complex and microclimate conditions are products of the combined presence and influence of perennial and/or intermittent water, associated high water tables, and soils that exhibit some wetness characteristics. Normally used to refer to the zone within which plants grow rooted in the water table of these rivers, streams, lakes, ponds, reservoirs, springs, marshes, seeps, bogs, and wet meadows.

Riparian Conservation Area (Lakeview Resource Management Plan): A delineated area that encompasses a riparian ecosystem.

Riparian habitat (Lakeview Resource Management Plan): A specialized form of wetland restricted to areas along, adjacent to, or contiguous with, perennially and intermittently flowing rivers and streams; also, periodically, flooded lake and reservoir shore areas, as well as lakes with stable water levels with characteristic vegetation.

Risk: The likelihood that a given exposure to an item or substance (e.g. herbicide dose) will produce illness or injury.

Risk assessment: The process of gathering data and making assumptions to estimate short- and long-term harmful effects to human health or elements of the environment from particular products or activities. See Appendix 8.

Risk quotient (RQ): The Estimated Environmental Concentration (EEC), as calculated through computer modeling, divided by the LD_{50} (lethal dose where 50% of test population dies) or LC_{50} (lethal concentration for aquatic forms, where 50% of the test population dies). RQs were developed to provide a more realistic scenario of herbicide exposure. Even so, results assume 100 percent exposure and animals confined to the treatment area. For species that are at all mobile, such exposures are unlikely from the applications proposed by the action alternatives. Analogous to Hazard Quotient. An RQ less than or equal to 1 is presumed to indicate an acceptably low level of risk for a specific application.

Risk quotient: The lowest reported acute statistical endpoint (e.g. no observed effect level or lowest observed effect level) or Toxicity reference value (TRV) divided by the estimated exposure concentration (ECC). See Appendix D, *Herbicide Rick Tables*.

Runoff: Overland flow; that part of precipitation, as well as any other flow contributions that does not soak into soil or stay held on the site for evaporation or transpiration, but runs into streams.

Salmonids: Fishes of the family *Salmonidae*, including salmon, trout, chars, whitefish, ciscoes, and grayling.

Sand: In soil, particles 0.05 to 2 mm in diameter.

Satellite Populations: Small populations spatially separated from other existing populations.

Scoping: A process at the beginning of a NEPA analysis whereby the public is asked to provide oral or written comments about the scope of the analysis and the range of alternatives, to help ensure the analysis appropriately addresses potential effects on individuals, communities, and the environment.

Sediments: Unweathered geologic materials generally laid down by or within water bodies; the rocks, sand, mud, silt, and clay at the bottom and along the edge of lakes, streams, and oceans.

Selective herbicide: A chemical designed to affect only certain groups or types of plants, leaving other tolerant plants unharmed.

Sensitive species (Bureau Sensitive): Native species designated by the state director as sensitive because they are found on BLM-administered lands for which the BLM has the capability to significantly affect the conservation status of the species through management, and either: 1. There is information that a species has recently undergone, is undergoing, or is predicted to undergo a downward trend such that the viability of the species or a distinct population segment of the species is at risk across all or a significant portion of the species range, or 2. The species depends on ecological refugia or specialized or unique habitats on BLM-administered lands, and there is evidence that such areas are threatened with alteration such that the continued viability of the species in that area would be at risk.

Significant: The description of an impact that exceeds a certain threshold level. Requires consideration of both context and intensity. The significance of an action must be analyzed in several contexts, such as society as a whole, and the affected region, interests, and locality. Intensity refers to the severity of effects, which should be weighed along with the likelihood of its occurrence. Determination of significance for effects is a management decision considering multiple factors, and not one made by technical specialists to indicate the quantity of effects are above or below some level.

Silt: In soil, particles between .002 and .05 mm in diameter.

Site-specific: At the site, area, or project level.

Socioeconomic: Pertaining to, or signifying the combination or interaction of social and economic factors.

Soil horizon: A layer of soil material approximately parallel to the land surface that differs from adjacent genetically related layers in physical, chemical, and biological properties.

Sodic: Sodic soils are characterized by a disproportionately high concentration of sodium (Na) in their cation exchange complex. They are usually defined as containing an exchangeable sodium percentage greater than 15%.

Special status species: Federally Listed threatened, endangered, proposed, or candidate species, and species managed as sensitive species by the BLM.

Spot treatment: An application of an herbicide to a small selected area such as an individual plant, as opposed to a broadcast application.

Standard operating procedures (SOPs): Procedures that would be followed by the BLM to ensure that risks to human health and the environment from treatment actions were kept to a minimum. See Appendix A. Since they originate from Manual and other direction, they may appear in resource management and other plans under other titles. SOPs specific to water are often referred to as best management practices (BMPs).

Subsistence: Customary and traditional uses of wild renewable resources (plants and animals) for food, shelter, fuel, clothing, tools, etc.

Sulfonylurea: A group of herbicides that interfere with interfere with acetolactate synthase, an enzyme needed for plant cell growth.

Surfactant: A material that improves the emulsifying, dispersing, spreading, wetting, droplet size, or other surface-modifying properties of liquids.

Tank mixture: The mixture of two or more compatible herbicides in a spray tank in order to apply them simultaneously.

Target species: A species (in this EIS, a plant species) that is a target or goal of a treatment or control effort.

Targeted grazing: The carefully controlled grazing of livestock to accomplish specific vegetation management objectives. Unlike conventional grazing management, livestock are used as a tool for improving land health by performing weed control, reducing wildland fire, and aiding in restoration projects.

Threatened species: A plant or animal species federally listed as *threatened* under the Endangered Species Act, and status defined as likely to become an endangered species throughout all or a significant portion of its range within the foreseeable future.

Traditional use areas (Native American plant gathering): Areas where tribes continue to gather plant materials for food, basketry, and other traditional uses. These may or may not be treaty reserved rights and/or areas.

Treaty resources: Resources for which one or more tribes have treaty rights. An exhaustive list does not exist, because Native American tribes maintain confidentiality for names of medicines or spiritual plants and other natural resources.

Treaty rights: Tribal rights or interests reserved in treaties, by Native American tribes for the use and benefit of their members. The uses include such activities as described in the respective treaty document. Only Congress may abolish or modify treaties or treaty rights.

Tribe: Term used to designate any Native American band, nation, or other organized group or community, which is recognized as eligible for the special programs and services provided by the U.S. to Native American because of their status as Native Americans.

Typical rate or typical application rate: One of two application rates considered in many Risk Analyses (the other being Maximum Rate); a rate based upon a general summary of actual applications that have been made of the different formulations of a particular active ingredient on BLM lands. Under some situations, this value may be higher or lower than what is going to be applied for a specific job. The rate of application of any pesticide is based upon several factors, including, but not limited to, the species to be controlled, the environment for which the application is to be made, the timing of the application, and other factors. For example, a typical rate of application for imazapic is about 2.0 fluid ounces of Plateau, which, when taking into the concentration of the formulated product (2.0 pounds acid equivalent/per gallon) equates to 0.0313 lb. a.e./acre. It is known that 2.0 fluid ounces of Plateau will achieve a specific level of control under a specific set of conditions. Rates around 4.0 to 6.0 fluid ounces of imazapic appear to be the more common range for activity, based on the experience of researchers, for downy brome. The rate is based upon what is identified as what is normally considered for application under a normal condition. See *Background for Effects Analysis* in Chapter 3 for table of amounts of a.e./acre.

Uncertainty factor: A multiplier used in risk assessments to compensate for unknown risks due to limitations in the research.

Volatilization: The conversion of a solid or liquid into a gas or vapor; evaporation of herbicide before they are bound to a plant or ground.

Weed: When not preceded by “noxious,” this term generally means invasive plants (including noxious weeds) in this EA. Its use in this EA is avoided except when it is used in citations and paraphrases of other documents, or is part of titles or common phrases. Within such documents, the intent is usually noxious weeds and other invasive plants. In the Lakeview Resource Management Plan (USDI 1993), the term includes invasive plants and even native undesirable plants, the latter being outside the scope of this EA analysis.

Wetlands: Those areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstance do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands include habitats such as swamps, marshes, and bogs.

Wild and scenic rivers: Rivers designated in the National Wild and Scenic Rivers System that are classified in one of three categories (wild, scenic, or recreational), depending on the extent of development and accessibility along each section. In addition to being free flowing, these rivers and their immediate environments must possess at least one outstandingly remarkable value: scenic, recreational, geologic, fish and wildlife, historical, cultural, or other similar values.

Wilderness: Land designated by Congress as a component of the National Wilderness Preservation System. Characteristics qualifying an area for wilderness are: 1) naturalness - lands that are natural and primarily affected by the forces of nature; 2) roadless and having at least 5,000 acres of contiguous public lands; and 3) outstanding opportunities for solitude or primitive and unconfined, non-motorized types of recreation. In addition, areas may contain “supplemental values,” consisting of ecological, geological, or other features of scientific, educational, scenic, or historical importance.

Wilderness Study Area – A roadless area or island under the jurisdiction of the BLM that has been inventoried and found to have wilderness characteristics as described in Section 2(c) of the Wilderness Act of 1964 (78 Stat. 891) and is currently in an interim management status awaiting official wilderness designation or release from further wilderness study by Congress.

Wildfire: An unwanted wildland fire.

Wildland fires: Fires occurring on wildlands, regardless of ignition source, damages, or benefits, and including wildfire and prescribed fire.

Wildland Urban Interface (WUI): An area where structures and other human development intermingle with undeveloped wildlands or vegetative fuels. (USDI 2010a:390)

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Review Opportunity

The EA and FONSI were made available for a 30-day review period (August 2014) on BLM's website. A legal notice was also published in the Lake County Examiner announcing the availability of the documents for review and the comment period end date. Agencies, Native American Tribes, permittees/grantholders/leasees, and interested members of the public were notified of the availability of the EA and FONSI for review. This mailing list is contained in the project record file. Two comment letters were received during the review period.

Appendix A – Project Design Features, Standard Operating Procedures, Mitigation Measures, Conservation Measures, Prevention Measures, and Best Management Practices

Information included in this Appendix is a compilation of information originally presented in the *Vegetation Treatments Using Herbicides on BLM Lands in 17 Western States Programmatic Environmental Impact Statement* (USDI 2007a), *Record of Decision* (USDI 2007c),and *Biological Assessment* (USDI 2007f), as well as the *Vegetation Treatments on BLM Lands in 17 Western States Programmatic Environmental Report* (USDI 2007b), the *Lakeview Resource Area Resource Management Plan* (USDI 2003a), and the Oregon FEIS (USDI 2010a) and Record of Decision (USDI 2010b).

Project Design Features

The following project design features were included in this EA and adopted in the Decision Record.

Water

Fire Use

- Any treatments near perennial streams or major water bodies will be coordinated with an interdisciplinary team to minimize negative impacts to water resources.
- A vegetated buffer between treatment areas and water bodies will be maintained in accordance with direction from an interdisciplinary team.

Targeted Grazing

- All targeted grazing will be included on the Annual (invasive plant) Treatment Plan for discussion by the interdisciplinary team.
- Targeted grazing within the riparian zone along fish-bearing streams will be managed under specific standards, and will generally include stubble height and/or streambank alteration. Grazing standards will be applied on a site specific basis and will depend on the livestock type, stream condition, and stream sensitivity to grazing. Stream sensitivity to grazing will be based on Rosgen channel type (Rosgen 1994) and corresponding sensitivity to grazing (Rosgen 1996). In general, stubble heights of 4-10" on native plants will be used, because on highly sensitive stream channel types these stubble heights should be maintained along the green line to rebuild banks and minimize hoof shear (Clary and Webster 1989, Elmore and Kovalchik 1991, Archer pers. comm. 2014). Streambank alteration standards will generally be set at 15-25% based on recommendations from the PACFISH-INFISH monitoring team (Archer pers. comm. 2014) and the National Riparian Service Team (Wyman pers. comm. 2014). These standards will be used by permittees and BLM personnel to determine when livestock need to be moved to ensure thresholds are not exceeded.

Herbicide Use

- Herbicide treatments will be minimized at locations that pose a high risk for groundwater contamination, i.e., areas with shallow groundwater and areas with groundwater-surface water interaction. High risk locations will be identified during preparation of the Annual Treatment Plans.
- The aquatic buffers specified in the 2013 *U.S. Fish and Wildlife Service Biological Opinion for Fish Habitat Restoration Activities Affecting ESA-listed Animal and Plant Species and their Designated Critical Habitat found in Oregon, Washington and parts of California, Idaho and Nevada, submitted by the U.S. Forest Service, Bureau of Land Management, and Bureau of Indian Affairs* (ARBO II) (see Table 3-16) will be applied to water bodies with Federally Listed fish (see Figure 3-9) until formal Endangered Species Act Section 7 consultation with the U.S. Fish and Wildlife Service results in different buffers (see footnotes 1 and 2 in Table 3-16) and a new Decision Record is signed. These same buffers will also be applied to water bodies containing other Special Status fish.
- Hexazinone may not be applied where there is a potential to enter streams via direct application or drift as determined by an interdisciplinary team.

Cultural Resources and Native American Concerns

- At least one month prior to beginning annual treatments, the Annual Treatment Plan will be presented to the affected tribes. The BLM will coordinate with tribes to identify where treatments may need to be delayed to avoid use conflicts, where cultural features must be avoided or protected, and where posting would help tribe members avoid treatment areas. Maps of known invasive plant infestations (see Figure 2-1, *Documented Invasive Plants*, for example) can also be shared with the tribes at this time.
- Where coordination with a tribe about an Annual Treatment Plan identifies areas where herbicide use would not be consistent with cultural values and uses, alternative treatment methods will be implemented where feasible, consistent with existing law, regulation, and policy.
- An existing mitigation measure requires that "for herbicides with label-specified re-entry intervals, post information at access points to recreation sites or other designated public use or product collection areas notifying the public of planned herbicide treatments…". Similar posting for any herbicide use can be made in traditional gathering areas identified by the tribes. Coordination following receipt of the Annual Treatment Plan will help identify where such posting will occur.
- An infestation map or database can be supplied to the tribes any time, and will be supplied with the Annual Treatment Plan. Discussions about the implications of infestations, treatment and coordination ideas and options, possible effects and conflicts relating to those infestations, and related topics would be welcome as part of coordination with the tribes.

Wilderness Study Areas

- When planning invasive plant treatments, the BLM will consider the feasibility and effectiveness of adopting *Standard Operating Procedures, Mitigation Measures, Prevention Measures, and Best Management Practices* for Wilderness and Special Areas where appropriate.

Lands with Wilderness Characteristics

- In any lands found by the BLM to contain wilderness characteristics, treatments would be designed so that there would be no effects on those values that would diminish the size of, or otherwise cause the inventory unit to not meet the wilderness criteria. This direction applies until BLM has completed an Resource Management Plan Amendment that addresses how to manage lands with wilderness characteristics.
- In any lands which BLM has not yet updated its inventory for wilderness characteristics, treatments will be limited to methods (biological control, spot-spraying herbicides, etc.) that do not incur ground

disturbance, until such time as BLM has completed its wilderness inventory updates. This direction applies until BLM has completed a Resource Management Plan Amendment that addresses how to manage lands with wilderness characteristics.

Organic Farms

The BLM will pursue a **Goal** of building working relationships with organic farms that are potentially affected by herbicide treatments.

Standard Operating Procedures and Mitigation Measures

In the following section, Standard Operating Procedures applicable to non-herbicide treatments are listed first under each resource, followed by the Standard Operating Procedures, Mitigation Measures, and Oregon FEIS Mitigation Measures applicable to herbicide applications.

Standard Operating Procedures have been identified to reduce adverse effects to environmental and human resources from vegetation treatment activities based on guidance in BLM manuals and handbooks, regulations, and standard BLM and industry practices.[1] The list is not all encompassing, but is designed to give an overview of practices that would be considered when designing and implementing a vegetation treatment project on public lands (USDI 2007b:2-29). Effects described in this EA are predicated on application of the Standard Operating Procedures or equivalent, unless an on-site determination is made that their application is unnecessary to achieve their intended purpose or protection. For example, the Standard Operating Procedure to "complete vegetation treatments seasonally before pollinator foraging plants bloom" would not be applied to treatments not likely to have a significant effect on pollinators.

PEIS Mitigation Measures (marked as MMs in the list below) were identified for all potential adverse effects identified for herbicide applications in the *Vegetation Treatments Using Herbicides on Bureau of Land Management Lands in 17 Western States Programmatic Environmental Impact Statement* (17-States PEIS; BLM 2007a), and adopted by its Record of Decision. In other words, NO potentially significant adverse effect identified in the 17 States analysis remained at the programmatic scale after the PEIS Mitigation Measures were adopted. Like the Standard Operating Procedures, application of the mitigation measures is assumed in the analysis in this EA, and on-site determinations can decide if their application is unnecessary to achieve the intended purpose or protection.

Oregon FEIS Mitigation Measures (marked as Oregon FEIS MMs in the list below) were identified and adopted for adverse effects identified in the *Final Vegetation Treatments Using Herbicides on BLM Lands in Oregon Environmental Impact Statement* (Oregon Final EIS; BLM 2010a). Application of these measures is also assumed in the analysis in this EA unless on-site determinations are made that they are not needed, or there are alternative ways, to meet the intended purpose or protection. Again, no potentially significant adverse effect was identified at the programmatic scale in the Oregon FEIS with the Standard Operating Procedures and Mitigation Measures assumed.

BLM manuals and handbooks are available online at http://www.blm.gov/wo/st/en/info/blm-library/publications/blm_publications/manuals.html

[1] Manual-directed standard operating procedures and other standing direction may be referred to as best management practices in resource management and other plans, particularly when they apply to water.

Guidance Documents

Fire Use

BLM handbooks H-9211-1 (*Fire Management Activity Planning Procedures*) and H-9214-1 (*Prescribed Fire Management*), and manuals 1112 (*Safety*), 9210 (*Fire Management*), 9211 (*Fire Planning*), 9214 (*Prescribed Fire*), and 9215 (*Fire Training and Qualifications*).

Mechanical

BLM Handbook H-5000-1 (*Public Domain Forest Management*), and manuals 1112 (*Safety*) and 9015 (*Integrated Weed Management*).

Manual

BLM Domain Forest Management, and manuals 1112 (Safety), and 9015 (Integrated Weed Management).

Biological

BLM manuals 1112 (*Safety*), 4100 (*Grazing Administration*), 9014 (*Use of Biological Control Agents on Public Lands*), and 9015 (*Integrated Weed Management)* and Handbook H-4400-1 (*Rangeland Health Standards*).

Chemical

BLM Handbook H-9011-1 (Chemical Pest Control), and manuals 1112 (Safety), 9011 (Chemical Pest Control), 9015 (Integrated Weed Management), and 9220 (Integrated Pest Management).

General

Fire Use

- Prepare fire management plan.
- Use trained personnel with adequate equipment.
- Minimize frequent burning in arid environments.
- Avoid burning herbicide-treated vegetation for at least 6 months.

Mechanical

- Ensure that power cutting tools have approved spark arresters.
- Ensure that crews have proper fire-suppression tools during the fire season.
- Wash vehicles and equipment before leaving weed infested areas to avoid infecting weed-free areas.
- Keep equipment in good operating condition.

Manual

- Ensure that crews have proper fire-suppression tools during fire season.
- Minimize soil disturbance, which may encourage new weeds to develop.

Biological

- Use only biological control agents that have been tested and approved to ensure they are host specific.
- If using domestic animals, select sites with weeds that are palatable and non-toxic to the animals.
- Manage the intensity and duration of containment by domestic animals to minimize overutilization of desirable plant species.
- Utilize domestic animals to contain the target species in the treatment areas prior to weed seed set. Or if seed set has occurred, do not move the domestic animals to uninfested areas for a period of 7 days.

Chemical

- Prepare an operational and spill contingency plan in advance of treatment.
- Conduct a pretreatment survey before applying herbicides.
- Select the herbicide that is least damaging to the environment while providing the desired results.
- Select herbicide products carefully to minimize additional impacts from degradates, adjuvants, other ingredients, and tank mixtures.
- Apply the least amount of herbicide needed to achieve the desired result.
- Follow herbicide product label for use and storage.

- Have licensed or certified applicators or State-licensed “trainees” apply herbicides, or they can be applied by BLM employees under the direct supervision of a BLM-certified applicator.
- Use only USEPA-approved herbicides and follow product label directions and “advisory” statements.
- Review, understand, and conform to the “Environmental Hazards” section on the herbicide product label. This section warns of known herbicide risks to the environment and provides practical ways to avoid harm to organisms or to the environment.
- Consider surrounding land use before assigning aerial spraying as a treatment method and avoid aerial spraying near agricultural or densely populated areas.
- Minimize the size of application area, when feasible.
- Comply with herbicide-free buffer zones to ensure that drift will not affect crops or nearby residents/ landowners.
- Post treated areas and specify reentry or rest times, if appropriate.
- Notify adjacent landowners prior to treatment, if appropriate.
- Keep a copy of Material Safety Data Sheets (MSDSs) at work sites. MSDSs are available for review at http:// www.cdms.net/.
- Keep records of each application, including the active ingredient, formulation, application rate, date, time, and location.
- Avoid accidental direct spray and spill conditions to minimize risks to resources.
- Avoid aerial spraying during periods of adverse weather conditions (snow or rain imminent, fog, or air turbulence).
- Make helicopter applications at a target airspeed of 40 to 50 miles per hour (mph), and at about 30 to 45 feet above ground.
- Take precautions to minimize drift by not applying herbicides when winds exceed >10 mph (>6 mph for aerial applications), or a serious rainfall event is imminent.
- Use drift control agents and low volatile formulations.
- Conduct pre-treatment surveys for sensitive habitat and Special Status species within or adjacent to proposed treatment areas.
- Consider site characteristics, environmental conditions, and application equipment in order to minimize damage to non-target vegetation.
- Use drift reduction agents, as appropriate, to reduce the drift hazard to non-target species.
- Turn off application equipment at the completion of spray runs and during turns to start another spray run.
- Refer to the herbicide product label when planning revegetation to ensure that subsequent vegetation would not be injured following application of the herbicide.
- Clean OHVs to remove plant material.

The BLM has suspended the use of the adjuvant R-11.

Land Use

Fire Use

- Carefully plan fires in the WUI to avoid or minimize loss of structures and property.
- Notify nearby residents and landowners who could be affected by smoke intrusions or other fire effects.

Mechanical

- Collaborate on project development with nearby landowners and agencies.

Manual

- Collaborate on project development with nearby landowners and agencies.

Biological

- Notify nearby residents and landowners who could be affected by biological control agents.

Chemical

- Consider surrounding land uses before aerial spraying.

- Comply with herbicide-free buffer zones to ensure that drift will not affect crops or nearby residents and landowners.
- Post treated areas and specify reentry times, if appropriate

Air Quality

See Manual 7000 (Soil, Water, and Air Management).

Fire Use

- Have clear smoke management objectives.
- Evaluate weather conditions, including wind speed and atmospheric stability, to predict effects of burn and impacts from smoke.
- Burn when weather conditions favor rapid combustion and dispersion.
- Burn under favorable moisture conditions.
- Use backfires, when applicable.
- Burn small vegetation blocks, when appropriate.
- Manage smoke to prevent air quality violations and minimize impacts to smoke-sensitive areas.
- Coordinate with air pollution and fire control officials, and obtain all applicable smoke management permits, to ensure that burn plans comply with federal, state, and local regulations.

Mechanical

- Maintain equipment in optimal working order.
- Conduct treatment activities during the wetter seasons.
- Use heavy equipment under adequate soil moisture conditions to minimize soil erosion.
- Minimize vehicle speeds on unpaved roads.
- Minimize dust impacts to the extent practicable.

Manual

- Maintain equipment in optimal working order.
- Conduct treatment activities during the wetter seasons.
- Minimize vehicle speeds on unpaved roads.
- Minimize dust impacts to the extent practicable.

Chemical

- Consider the effects of wind, humidity, temperature inversions, and heavy rainfall on herbicide effectiveness and risks.
- Apply herbicides in favorable weather conditions to minimize drift. For example, do not treat when winds exceed 10 mph (>6 mph for aerial applications) or rainfall is imminent.
- Use drift reduction agents, as appropriate, to reduce the drift hazard.
- Select proper application equipment (e.g., spray equipment that produces 200- to 800-micron diameter droplets [spray droplets of 100 microns and less are most prone to drift]).
- Select proper application methods (e.g., set maximum spray heights, use appropriate buffer distances between spray sites and non-target resources).

Soil Resources

See Manual 7000 (Soil, Water, and Air Management).

General

- Assess the susceptibility of the treatment site to soil damage and erosion prior to treatment.

Fire Use

- Prescribe broadcast and other burns that are consistent with soil management activities.
- Plan burns so as to minimize damage to soil resources.
- Conduct burns when moisture content of large fuels, surface organic matter, and soil is high to limit the amount of heat penetration into lower soil surfaces and protect surface organic matter.
- Time treatments to encourage rapid recovery of vegetation.

- Further facilitate revegetation by seeding or planting following treatment.
- When appropriate, reseed following burning to re- introduce species, or to convert a site to a less flammable plant association, rather than to specifically minimize erosion.

Mechanical
- Time treatments to avoid intense rainstorms.
- Time treatments to encourage rapid recovery of vegetation.
- Further facilitate revegetation by seeding or planting following treatment.
- Use equipment that minimizes soil disturbance and compaction.
- Minimize use of heavy equipment on slopes >20%.
- Conduct treatments when the ground is sufficiently dry to support heavy equipment.
- Implement erosion control measures in areas where heavy equipment use occurs.
- Minimize disturbances to biological soil crusts (e.g., by timing treatments when crusts are moist).
- Reinoculate biological crust organisms to aid in their recovery, if possible.
- Conduct mechanical treatments along topographic contours to minimize runoff and erosion.
- When appropriate, leave plant debris on site to retain moisture, supply nutrients, and reduce erosion.
- Consider chaining when soils are frozen and plants are brittle to minimize soil disturbance.

Manual
- Time treatments to avoid intense rainstorms.
- Time treatments to encourage rapid recovery of vegetation.
- Further facilitate revegetation by seeding or planting following treatment.
- Minimize soil disturbance and compaction.
- Minimize disturbance to biological soil crusts (e.g., by timing treatments when crusts are moist).
- Reinoculate biological crust organisms to aid in their recovery, if possible.
- When appropriate, leave plant debris on site to retain moisture, supply nutrients, and reduce erosion.
- Prevent oil and gas sspills to minimize damage to soil.

Biological
- Minimize use of domestic animals if removal of vegetation may cause significant soil erosion or impact biological soil crusts.
- Closely monitor timing and intensity of biological control with domestic animals.
- Avoid grazing on wet soil to minimize compaction and shearing.

Chemical
- Minimize treatments in areas where herbicide runoff is likely, such as steep slopes when heavy rainfall is expected.
- Minimize use of herbicides that have high soil mobility, particularly in areas where soil properties increase the potential for mobility.
- Do not apply granular herbicides on slopes of more than 15% where there is the possibility of runoff carrying the granules into non-target areas.
- To avoid the loss of finer-sized soil particles and avoid having herbicide-treated soils blown or washed off-site, avoid exposing large areas of wind-erosion group 1 or 2 soils (see Figure 1) when a combination of dry soil and seasonal winds are expected. Mitigation measures could include the use of selective herbicides to retain some vegetation on site; reseeding so cover is present before the windy season affects dry soils; staggering treatment of strips until stubble regrows enough to provide an acceptable filter strip; rescheduling treatments away from the windy season; or, other measures to prevent wind erosion on these soil groups. (Oregon FEIS MM)

Water Resources

See Manual 7000 (Soil, Water, and Air Management).

Fire Use
- Prescribe burns that are consistent with water management objectives.

- Plan burns to minimize negative impacts to water resources.
- Minimize burning on hillslopes, or revegetate hillslopes shortly after burning.
- Maintain a vegetated buffer between treatment areas and water bodies.

Mechanical

- Minimize removal of desirable vegetation near residential and domestic water sources.
- Do not wash equipment or vehicles in water bodies.
- Maintain minimum 25- foot wide vegetated buffer near streams and wetlands.

Manual

- Maintain vegetated buffer near residential and domestic water sources.
- Minimize removal of desirable vegetation near residential and domestic water sources.
- Minimize removal of desirable vegetation near water bodies.
- Minimize use of domestic animals near residential or domestic water sources.
- Minimize use of domestic animals adjacent to water bodies if trampling or other activities are likely to cause soil erosion or impact water quality.

Chemical

- Consider climate, soil type, slope, and vegetation type when developing herbicide treatment programs.
- Select herbicide products to minimize impacts to water. This is especially important for application scenarios that involve risk from active ingredients in a particular herbicide, as predicted by risk assessments.
- Use local historical weather data to choose the month of treatment.
- Considering the phenology of target aquatic species, schedule treatments based on the condition of the water body and existing water quality conditions.
- Plan to treat between weather fronts (calms) and at appropriate time of day to avoid high winds that increase water movements, and to avoid potential stormwater runoff and water turbidity.
- Review hydrogeologic maps of proposed treatment areas. Note depths to groundwater and areas of shallow groundwater and areas of surface water and groundwater interaction. Minimize treating areas with high risk for groundwater contamination.
- Conduct mixing and loading operations in an area where an accidental spill would not contaminate an aquatic body.
- Do not rinse spray tanks in or near water bodies.
- Do not broadcast pellets where there is danger of contaminating water supplies.
- Minimize the potential effects to surface water quality and quantity by stabilizing terrestrial areas as quickly as possible following treatment.
- Establish appropriate (herbicide-specific) buffer zones for species/populations (Tables A-1 and A-2). (MM)
- Areas with potential for groundwater for domestic or municipal use shall be evaluated through the appropriate, validated model(s) to estimate vulnerability to potential groundwater contamination, and appropriate mitigation measures shall be developed if such an area requires the application of herbicides and cannot otherwise be treated with non-herbicide methods. (MM)
- Use appropriate herbicide-free buffer zones for herbicides not labeled for aquatic use based on risk assessment guidance, with minimum widths from water of 100 feet for aerial, 25 feet for vehicle, and 10 feet for hand spray applications.
- Maintain buffers between treatment areas and water bodies. Buffer widths should be developed based on herbicide and site-specific conditions to minimize impacts to water bodies.
- To protect domestic water sources, no herbicide treatments should occur within 100 feet of a well or 200 feet of a spring or known diversion used as a domestic water source unless a written waiver is granted by the user or owner. (Oregon FEIS MM)
- Site-specific analyses for roadside treatments should specifically consider that drainage *ditches and* structures lead to streams and that normal buffer distances, herbicide selection, and treatment method selection may need to be changed accordingly, particularly where those ditches are connected to streams with Federally Listed or other Special Status species. (Oregon FEIS MM)

- Buffer intermittent stream channels when there is a prediction of rain (including thunderstorms) within 48 hours. (Oregon FEIS MM)
- Proposals to boom or aerially spray herbicides within 200 feet of streams that are within 1,000 feet upstream from a public water supply intake, or spot apply herbicides within 100 feet of streams that are within 500 feet upstream from a public water supply intake, will include coordination with the Oregon Department of Environmental Quality and the municipality to whom the intake belongs. (Oregon FEIS MM)

Wetlands and Riparian Areas

Fire Use
- Following treatment, reseed or replant with native vegetation if the native plant community cannot recover and occupy the site sufficiently.

Mechanical
- Manage riparian areas to provide adequate shade, sediment control, bank stability, and recruitment of wood into stream channels.
- Following treatment, reseed or replant with native vegetation if the native plant community cannot recover and occupy the site sufficiently.

Manual
- Following treatment, reseed or replant with native vegetation if the native plant community cannot recover and occupy the site sufficiently.

Biological
- Manage animals to prevent overgrazing and minimize damage to wetlands.
- Following treatment, reseed or replant with native vegetation if the native plant community cannot recover and occupy the site sufficiently.

Chemical
- Use a selective herbicide and a wick or backpack sprayer.
- Use appropriate herbicide-free buffer zones for herbicides not labeled for aquatic use based on risk assessment guidance, with minimum widths from water of 100 feet for aerial, 25 feet for vehicle, and 10 feet for hand spray applications.
- See mitigation for Water Resources and Vegetation. (MM)

Vegetation

See Handbook H-4410-1 (National Range Handbook), and manuals 5000 (Forest Management) and 9015 (Integrated Weed Management).

Fire Use
- Keep fires as small as possible to meet the treatment objectives.
- Conduct low intensity burns to minimize adverse impacts to large vegetation.
- Limit area cleared for fire breaks and clearings to reduce potential for weed infestations.
- Where appropriate, use mechanical treatments to prepare forests for the reintroduction of fire.
- Identify and implement any temporary domestic livestock grazing and/or supplemental feeding restrictions needed to enhance desirable vegetation recovery following treatment.
- Consider adjustments in the existing grazing permit, including the application of state or regional grazing administration guidelines, needed to maintain desirable vegetation on the treatment site.
- Use plant stock or seed from the same seed zone and from sites of similar elevation when conducting revegetation activities.

Mechanical
- Power wash vehicles and equipment to prevent the introduction and spread of weed and exotic species.
- Remove damaged trees and treat woody residue to limit subsequent mortality by bark beetles.

- Use plant stock or seed from the same seed zone and from sites of similar elevation when conducting revegetation activities.
- Use lighter chains with 40 to 60 pound links where the objective is to minimize disturbance to the understory species.
- As appropriate, use two chainings to reduce tree competition and prepare the seedbed. Carry out the second chaining at the most advantageous time for seeding (late fall or early winter, in most cases).
- Do not chain in areas where annual rainfall is less than 6-9 inches, especially if downy brome is present.
- Identify and implement any temporary domestic livestock grazing and/or supplemental feeding restrictions needed to enhance desirable vegetation recovery following treatment.
- Consider adjustments in the existing grazing permit, including the application of state or regional grazing administration guidelines, needed to maintain desirable vegetation on the treatment site.

Manual

- Remove damaged trees and treat woody residue to limit subsequent mortality by bark beetles.
- Identify and implement any temporary domestic livestock grazing and/or supplemental feeding restrictions needed to enhance desirable vegetation recovery following treatment.
- Consider adjustments in the existing grazing permit, including the application of state or regional grazing administration guidelines, needed to maintain desirable vegetation on the treatment site.
- Use plant stock or seed from the same seed zone and from sites of similar elevation when conducting revegetation activities.

Biological

- Use domestic animals at the time they are most likely to damage invasive species.
- Manage animals to prevent overgrazing and minimize damage to sensitive areas.
- Identify and implement any temporary domestic livestock grazing and/or supplemental feeding restrictions needed to enhance desirable vegetation recovery following treatment.
- Consider adjustments in the existing grazing permit, including the application of state or regional grazing administration guidelines, needed to maintain desirable vegetation on the treatment site.
- Use plant stock or seed from the same seed zone and from sites of similar elevation when conducting revegetation activities.

Chemical

- Refer to the herbicide label when planning revegetation to ensure that subsequent vegetation would not be injured following application of the herbicide.
- Use native or sterile plants for revegetation and restoration projects to compete with invasive plants until desired vegetation establishes.
- Use weed-free feed for horses and pack animals. Use weed-free straw and mulch for revegetation and other activities.
- Identify and implement any temporary domestic livestock grazing and/or supplemental feeding restrictions needed to enhance desirable vegetation recovery following treatment. Consider adjustments in the existing grazing permit, to maintain desirable vegetation on the treatment site.
- Minimize the use of terrestrial herbicides (especially sulfometuron methyl) in watersheds with downgradient ponds and streams if potential impacts to aquatic plants are identified. (MM)
- Establish appropriate (herbicide-specific) buffer zones (Tables A-1 and A-2) around downstream water bodies, habitats, and species/populations of interest. Consult the ecological risk assessments (ERAs) prepared for the PEIS for more specific information on appropriate buffer distances under different soil, moisture, vegetation, and application scenarios. (MM)
- Limit the aerial application of chlorsulfuron and metsulfuron methyl to areas with difficult land access, where no other means of application are possible. (MM)
- Do not apply sulfometuron methyl aerially. (MM)
- When necessary to protect Special Status plant species, implement all conservation measures for plants presented in the Vegetation Treatments on Bureau of Land Management Lands in 17 Western States Programmatic Biological Assessment (see Appendix 5). (MM)

Pollinators

Chemical

- Complete vegetation treatments seasonally before pollinator foraging plants bloom.
- Time vegetation treatments to take place when foraging pollinators are least active both seasonally and daily.
- Design vegetation treatment projects so that nectar and pollen sources for important pollinators and resources are treated in patches rather than in one single treatment.
- Minimize herbicide application rates. Use typical rather than maximum rates where there are important pollinator resources.
- Maintain herbicide free buffer zones around patches of important pollinator nectar and pollen sources.
- Maintain herbicide free buffer zones around patches of important pollinator nesting habitat and hibernacula.
- Make special note of pollinators that have single host plant species, and minimize herbicide spraying on those plants and in their habitats.

Fish and Other Aquatic Resources

See manuals 6500 (Wildlife and Fisheries Management) and 6780 (Habitat Management Plans)

Fire Use

- Maintain vegetated buffers near fish-bearing streams to minimize soil erosion and soil runoff into streams.
- Minimize treatments near fish-bearing streams during periods when fish are in sensitive life stages (e.g., embryo).

Mechanical

- Minimize treatments adjacent to fish-bearing waters.
- Do not wash vehicles in streams or wetlands.
- Refuel and service equipment at least 100 feet from water bodies to reduce the chance for pollutants to enter water.
- Maintain adequate vegetated buffer between treatment area and water body to reduce the potential for sediments and other pollutants to enter the water body.

Manual

- Refuel and service equipment at least 100 feet from water bodies to reduce the chance for pollutants to enter water.
- Minimize removal of desirable vegetation near fish-bearing streams and wetlands.

Biological

- Limit access of domestic animals to streams and other water bodies to minimize sediments entering water and potential for damage to fish habitat.

Chemical

- Use appropriate buffer zones based on label and risk assessment guidance.
- Minimize treatments near fish-bearing water bodies during periods when fish are in life stages most sensitive to the herbicide(s) used, and use spot rather than broadcast or aerial treatments.
- Use appropriate application equipment/method near water bodies if the potential for off-site drift exists.
- For treatment of aquatic vegetation, 1) treat only that portion of the aquatic system necessary to meet vegetation management objectives, 2) use the appropriate application method to minimize the potential for injury to desirable vegetation and aquatic organisms, and 3) follow water use restrictions presented on the herbicide label.
- Limit the use of terrestrial herbicides in watersheds with characteristics suitable for potential surface runoff that have fish-bearing streams during periods when fish are in life stages most sensitive to the herbicide(s) used. (MM)

- To protect Special Status fish and other aquatic organisms, implement all conservation measures for aquatic animals presented in the Vegetation Treatments on Bureau of Land Management Lands in 17 Western States Programmatic Biological Assessment (see Appendix 5). (MM)
- Establish appropriate herbicide-specific buffer zones for water bodies, habitats, or fish or other aquatic species of interest (Tables A-3 and A-4, and recommendations in individual ERAs). (MM)
- Consider the proximity of application areas to salmonid habitat and the possible effects of herbicides on riparian and aquatic vegetation. Maintain appropriate buffer zones around salmonid-bearing streams. (MM)
- At the local level, consider effects to Special Status fish and other aquatic organisms when designing treatment programs. (MM)
- Use of adjuvants with limited toxicity and low volumes is recommended for applications near aquatic habitats. (Oregon FEIS MM)

Wildlife Resources

See manuals 6500 (Wildlife and Fisheries Management) and 6780 (Habitat Management Plans)

Fire Use

- Minimize treatments during nesting and other important periods for birds and other wildlife.
- Minimize treatments of important forage areas immediately prior to important use period(s), unless the burn is designed to stimulate forage growth.

Mechanical

- Minimize treatments during nesting and other important periods for birds and other wildlife.
- Retain wildlife trees and other unique habitat features where practical.
- Design chaining treatments to provide a mosaic of treated and nontreated sites. No more than 50% of an area should be chained at one time. Provide natural travel lanes, resting and thermal cover areas, snags, and corridors (>30 feet wide) connecting non-chained areas. Size of clearing should not exceed 100 yards at its widest point.

Manual

- Minimize treatments during nesting and other important periods for birds and other wildlife.
- Retain wildlife trees and other unique habitat features where practical.

Biological

- Minimize the use of livestock grazing as a vegetation control measure where and/or when it could impact nesting and/or other important periods for birds and other wildlife.
- Consider and minimize potential adverse impacts to wildlife habitat and minimize the use of livestock grazing as a vegetation control measure where it is likely to result in removal or physical damage to vegetation that provides a critical source of food or cover for wildlife.

Chemical

- Use herbicides of low toxicity to wildlife, where feasible.
- Use spot applications or low-boom broadcast operations where possible to limit the probability of contaminating non-target food and water sources, especially non-target vegetation over areas larger than the treatment area.
- Use timing restrictions (e.g., do not treat during critical wildlife breeding or staging periods) to minimize impacts to wildlife.
- To minimize risks to terrestrial wildlife, do not exceed the typical application rate for applications of dicamba, glyphosate, hexazinone, or triclopyr, where feasible. (MM)
- Minimize the size of application areas, where practical, when applying 2,4-D and Overdrive® to limit impacts to wildlife, particularly through contamination of food items. (MM)
- Where practical, limit glyphosate and hexazinone to spot applications in grazing land and wildlife habitat areas to avoid contamination of wildlife food items. (MM)
- Do not use the adjuvant R-11 (MM)
- Either avoid using glyphosate formulations containing POEA, or seek to use formulations with the least amount of POEA, to reduce risks to amphibians. (MM)

- To protect Special Status wildlife species, implement conservation measures for terrestrial animals presented in the Vegetation Treatments on Bureau of Land Management Lands in 17 Western States Programmatic Biological Assessment (See Appendix 5) (MM)
- Impacts to wildlife from herbicide applications can be reduced by treating habitat during times when the animals are not present or are not breeding, migrating or confined to localized areas (such as crucial winter range). (Oregon FEIS MM)
- When treating native plants in areas where herbivores are likely to congregate, choose herbicides with lower risks due to ingestion. This mitigation measure is applicable if large areas of the herbivores' feeding range would be treated, either because the treatment areas are large or the feeding area for an individual animal is small. (Oregon FEIS MM)
- Where there is a potential for herbivore consumption of treated vegetation, apply dicamba, imazapyr, and metsulfuron methyl at the typical, rather than maximum, application rate to minimize risks. (Oregon FEIS MM)
- Where possible, design native vegetation treatment areas to mimic natural disturbance mosaics. Patchiness is usually beneficial to most wildlife, and patchiness is usually tolerated by species that prefer contiguous habitat. (Oregon FEIS MM)
- Use of adjuvants with limited toxicity and low volumes is recommended for applications near aquatic habitats. (Oregon FEIS MM)

Threatened and Endangered Species

See Manual 6840 (Special Status Species) and Vegetation Treatments Using Herbicides on BLM Lands in 17 Western States Programmatic Biological Assessment.

Fire Use

- Survey for special status species of concern if project may impact federally- and state-listed species.
- Minimize direct impacts to species of concern, unless studies show that species will benefit from fire.

Mechanical

- Minimize use of ground- disturbing equipment near special status species of concern.
- Survey for species of concern if project could impact these species.
- Use temporary roads when long-term access is not required.

Manual

- Survey for special status species of concern if project could impact these species.

Biological

- Survey for special status species of concern if project could impact these species.

Chemical

- Provide clearances for Special Status species before treating an area as required by Special Status Species Program policy. Consider effects to Special Status species when designing herbicide treatment programs.
- Use a selective herbicide and a wick or backpack sprayer to minimize risks to Special Status plants.
- Avoid treating vegetation during time-sensitive periods (e.g., nesting and migration, sensitive life stages) for Special Status species in area to be treated.

Livestock

See Handbook H-4120-1 (Grazing Management).

Fire Use

- Notify permittees of proposed treatments and identify any needed livestock grazing, feeding, or slaughter restrictions.
- Design treatments to take advantage of normal livestock grazing rest periods, when possible, and minimize impacts to livestock grazing permits.

- Provide alternative forage sites for livestock, if possible.
- Notify permittees of the project to improve coordination and avoid potential conflicts and safety concerns during implementation of the treatment.

Mechanical

- Notify permittees of proposed treatments and identify any needed livestock grazing, feeding, or slaughter restrictions.
- Design treatments to take advantage of normal livestock grazing rest periods, when possible, and minimize impacts to livestock grazing permits.
- Provide alternative forage sites for livestock, if possible.
- Notify permittees of the project to improve coordination and avoid potential conflicts and safety concerns during implementation of the treatment.

Manual

- Notify permittees of proposed treatments and identify any needed livestock grazing, feeding, or slaughter restrictions.
- Design treatments to take advantage of normal livestock grazing rest periods, when possible, and minimize impacts to livestock grazing permits.
- Provide alternative forage sites for livestock, if possible.
- Notify permittees of the project to improve coordination and avoid potential conflicts and safety concerns during implementation of the treatment.

Biological

- Notify permittees of proposed treatments and identify any needed livestock grazing, feeding, or slaughter restrictions.
- Design treatments to take advantage of normal livestock grazing rest periods, when possible, and minimize impacts to livestock grazing permits.
- Provide alternative forage sites for livestock, if possible.
- Notify permittees of the project to improve coordination and avoid potential conflicts and safety concerns during implementation of the treatment.

Chemical

- Whenever possible and whenever needed, schedule treatments when livestock are not present in the treatment area. Design treatments to take advantage of normal livestock grazing rest periods, when possible.
- As directed by the herbicide product label, remove livestock from treatment sites prior to herbicide application, where applicable.
- Use herbicides of low toxicity to livestock, where feasible.
- Take into account the different types of application equipment and methods, where possible, to reduce the probability of contamination of non-target food and water sources.
- Notify permittees of the herbicide treatment project to improve coordination and avoid potential conflicts and safety concerns during implementation of the treatment.
- Notify permittees of livestock grazing, feeding, or slaughter restrictions, if necessary.
- Provide alternative forage sites for livestock, if possible.
- Minimize potential risks to livestock by applying glyphosate, hexazinone, or triclopyr at the typical application rate where feasible. (MM)
- Do not apply 2,4-D, dicamba, Overdrive®, picloram, or triclopyr across large application areas, where feasible, to limit impacts to livestock, particularly through contamination of food items. (MM)
- Where feasible, limit glyphosate and hexazinone to spot applications in rangeland. (MM)
- Where there is a potential for livestock consumption of treated vegetation, apply dicamba, imazapyr, and metsulfuron methyl at the typical, rather than maximum, application rate to minimize risks to livestock. (Oregon FEIS MM)

Wild Horses and Burros

Fire Use

- Minimize potential hazards to horses and burros by ensuring adequate escape opportunities.
- Avoid critical periods and minimize impacts to critical habitat that could adversely affect wild horse or burro populations.

Mechanical

- Avoid critical periods and minimize impacts to habitat that could adversely affect wild horse or burro populations.

Manual

- Avoid critical periods and minimize impacts to habitat that could adversely affect wild horse or burro populations.

Biological

- Avoid critical periods and minimize impacts to habitat that could adversely affect wild horse or burro populations.

Chemical

- Minimize using herbicides in areas grazed by wild horses and burros.
- Use herbicides of low toxicity to wild horses and burros, where feasible.
- Remove wild horses and burros from identified treatment areas prior to herbicide application, in accordance with herbicide product label directions for livestock.
- Take into account the different types of application equipment and methods, where possible, to reduce the probability of contaminating non-target food and water sources.
- Minimize potential risks to wild horses and burros by applying glyphosate, hexazinone, and triclopyr at the typical application rate, where feasible, in areas associated with wild horse and burro use. (MM)
- Consider the size of the application area when making applications of 2,4-D, dicamba, Overdrive®, picloram, and triclopyr in order to reduce potential impacts to wild horses and burros. (MM)
- Apply herbicide label grazing restrictions for livestock to herbicide treatment areas that support populations of wild horses and burros. (MM)
- Where practical, limit glyphosate and hexazinone to spot applications in rangeland. (MM)
- Do not apply 2,4-D in HMAs during peak foaling season. (MM)
- Do not exceed the typical application rate of Overdrive® or hexazinone in HMAs during the peak foaling season in areas where foaling is known to take place. (MM)
- Where there is a potential for wild horse or burro consumption of treated vegetation, apply dicamba, imazapyr, and metsulfuron methyl at the typical, rather than maximum, application rate to minimize risks. (Oregon FEIS MM)
- Do not broadcast spray 2,4-D, clopyralid, diflufenzopyr + dicamba, glyphosate, hexazinone, picloram, or triclopyr where wild horses have unrestricted access to treated areas, or reduce risks to wild horses from these herbicides by herding wild horses out of treatment areas. (Oregon FEIS MM)
- To limit adverse effects to wild horses and burros, particularly through the contamination of food items, treatments should not exceed 15 percent of any Herd Management Area at any given time. (Oregon FEIS MM)

Paleontological and Cultural Resources

See handbooks H-8120-1 (Guidelines for Conducting Tribal Consultation) and H-8270-1 (General Procedural Guidance for Paleontological Resource Management), and manuals 8100 (The Foundations for Managing Cultural Resources), 8120 (Tribal Consultation Under Cultural Resource Authorities), and 8270 (Paleontological Resource Management). See also: Programmatic Agreement among the Bureau of Land Management, the Advisory Council on Historic Preservation, and the National Conference of State Historic Preservation Officers Regarding the Manner in Which BLM Will Meet Its Responsibilities Under the National Historic Preservation Act (1997).

Fire Use

- Follow standard procedures for compliance with Section 106 of the National Historic Preservation Act as implemented through the National Programmatic Agreement and state protocols or 36 CFR Part 800, including necessary consultations with the State Historic Preservation Officers and affected tribes.
- Follow BLM Handbook H-8270-1 to determine known Condition 1 and Condition 2 paleontological areas, or collect information through inventory to establish Condition 1 and Condition 2 areas, determine resource types at risk from the proposed treatment, and develop appropriate measures to minimize or mitigate adverse impacts.
- Identify cultural resource types at risk from fire use and design inventories that are sufficient to locate these resources. Provide measures to minimize impacts.
- Identify opportunities to meet tribal cultural use plant objectives for projects on public lands.
- Monitor significant paleontological and cultural resources for potential looting of materials where they have been exposed by fire.

Mechanical

- Follow standard procedures for compliance with Section 106 of the National Historic Preservation Act as implemented through the National Programmatic Agreement and state protocols or 36 CFR Part 800, including necessary consultations with the State Historic Preservation Officers and interested tribes.
- Follow BLM Handbook H-8270-1 to determine known Condition 1 and Condition 2 paleontological areas, or collect information through inventory to establish Condition 1 and Condition 2 areas, determine resource types at risk from the proposed treatment, and develop appropriate measures to minimize or mitigate adverse impacts.
- Identify cultural resource types at risk from mechanical treatments and design inventories that are sufficient to locate these resources. Provide measures to minimize impacts.
- Identify opportunities to meet tribal cultural use plant objectives for projects on public lands.
- Consult with tribes to locate any areas of vegetation that are of significance to the tribe and that might be affected, adversely or beneficially, by mechanical treatments.

Manual

- Follow standard procedures for compliance with Section 106 of the National Historic Preservation Act as implemented through the National Programmatic Agreement and state protocols or 36 CFR Part 800, including necessary consultations with the State Historic Preservation Officers and interested tribes.
- Follow BLM Handbook H-8270-1 to determine known Condition 1 and Condition 2 paleontological areas, or collect information through inventory to establish Condition 1 and Condition 2 areas, determine resource types at risk from the proposed treatment, and develop appropriate measures to minimize or mitigate adverse impacts.
- Identify cultural resource types at risk from manual treatments and design inventories that are sufficient to locate these resources. Provide measures to minimize impacts.
- Identify opportunities to meet tribal cultural use plant objectives for projects on public lands.
- Consult with tribes to locate any areas of vegetation that are of significance to the tribe and that might be affected, adversely or beneficially, by manual treatments.

Biological

- Follow standard procedures for compliance with Section 106 of the National Historic Preservation Act as implemented through the National Programmatic Agreement and state protocols or 36 CFR Part 800, including necessary consultations with the State Historic Preservation Officers and interested tribes.
- Follow BLM Handbook H-8270-1 to determine known Condition 1 and Condition 2 paleontological areas, or collect information through inventory to establish Condition 1 and Condition 2 areas, determine resource types at risk from the proposed treatment, and develop appropriate measures to minimize or mitigate adverse impacts.
- Identify opportunities to meet tribal cultural use plant objectives for projects on public lands.

- Consult with tribes to locate any areas of vegetation that are of significance to the tribe and that might be affected, adversely or beneficially, by biological treatments.

Chemical

- Follow standard procedures for compliance with Section 106 of the National Historic Preservation Act as implemented through the Programmatic Agreement among the Bureau of Land Management, the Advisory Council on Historic Preservation, and the National Conference of State Historic Preservation Officers Regarding the Manner in Which BLM Will Meet Its Responsibilities Under the National Historic Preservation Act and State protocols or 36 Code of Federal Regulations Part 800, including necessary consultations with State Historic Preservation Officers and interested tribes.
- Follow BLM Handbook H-8270-1 (General Procedural Guidance for Paleontological Resource Management) to determine known Condition I and Condition 2 paleontological areas, or collect information through inventory to establish Condition 1 and Condition 2 areas, determine resource types at risk from the proposed treatment, and develop appropriate measures to minimize or mitigate adverse impacts.
- Consult with tribes to locate any areas of vegetation that are of significance to the tribe and that might be affected by herbicide treatments; work with tribes to minimize impacts to these resources.
- Follow guidance under Human Health and Safety in the PEIS in areas that may be visited by Native peoples after treatments.
- Do not exceed the typical application rate when applying 2,4-D, fluridone, hexazinone, and triclopyr in known traditional use areas. (MM)

Visual Resources

See handbooks H-8410-1 (Visual Resource Inventory) and H-8431-1 (Visual Resource Contrast Rating), and Manual 8400 (Visual Resource Management).

Fire Use

- Minimize use of fire in sensitive watersheds to reduce the creation of large areas of browned vegetation.
- Consider the surrounding land use before assigning fire as a treatment method.
- At areas such as visual overlooks, leave sufficient vegetation in place, where possible, to screen views of vegetation treatments.
- Avoid use of fire near agricultural or densely populated areas, where feasible.
- Lessen visual effects in Class I and Class II visual resource areas.
- Design activities to repeat the form, line, color, texture of the natural landscape conditions to meet established Visual Resource Management (VRM) objectives.

Mechanical

- Minimize dust drift, especially near recreational or other public use areas.
- Minimize loss of desirable vegetation near high public use areas.
- At areas such as visual overlooks, leave sufficient vegetation in place, where possible, to screen views of vegetation treatments.
- Minimize earthwork and locate away from prominent topographic features.
- Revegetate treated sites.
- Lessen visual effects in Class I and Class II visual resource areas.
- Design activities to repeat the form, line, color, and texture of the natural landscape character conditions to meet established VRM objectives.

Manual

- Minimize dust drift, especially near recreational or other public use areas.
- Minimize loss of desirable vegetation near high public use areas.
- At areas such as visual overlooks, leave sufficient vegetation in place, where possible, to screen views of vegetation treatments.
- Lessen visual effects in Class I and Class II visual resource areas.

- Design activities to repeat the form, line, color, and texture of the natural landscape character conditions to meet established VRM objectives.

Biological

- At areas such as visual overlooks, leave sufficient vegetation in place, where possible, to screen views of vegetation treatments.
- Lessen visual effects in Class I and Class II visual resource areas.
- Design activities to repeat the form, line, color, and texture of the natural landscape character

Chemical

- Minimize the use of broadcast foliar applications in sensitive watersheds to avoid creating large areas of browned vegetation.
- Consider the surrounding land use before assigning aerial spraying as an application method.
- Minimize off-site drift and mobility of herbicides (e.g., do not treat when winds exceed 10 mph; minimize treatment in areas where herbicide runoff is likely; establish appropriate buffer widths between treatment areas and residences) to contain visual changes to the intended treatment area.
- If the area is a Class I or II visual resource, ensure that the change to the characteristic landscape is low and does not attract attention (Class I), or if seen, does not attract the attention of the casual viewer (Class II).
- Lessen visual impacts by: 1) designing projects to blend in with topographic forms; 2) leaving some low growing trees or planting some low-growing tree seedlings adjacent to the treatment area to screen short-term effects; and 3) revegetating the site following treatment.
- When restoring treated areas, design activities to repeat the form, line, color, and texture of the natural landscape character conditions to meet established Visual Resource Management (VRM) objectives.

Wilderness and Other Special Areas

See handbooks H-8550-1 (Management of Wilderness Study Areas (WSAs)), and H-8560-1 (Management of Designated Wilderness Study Areas), and Manual 8351 (Wild and Scenic Rivers).

General

- Encourage backcountry pack and saddle stock users to feed their livestock only weed-free feed for several days before entering a wilderness area, and to bring only weed-free hay and straw onto BLM lands.
- Encourage stock users to tie and/or hold stock in such a way as to minimize soil disturbance and loss of native vegetation.
- Revegetate disturbed sites with native species if there is no reasonable expectation of natural regeneration.
- Provide educational materials at trailheads and other wilderness entry points to educate the public on the need to prevent the spread of weeds.

Fire Use

- Minimize soil-disturbing activities during fire control or prescribed fire activities.
- Revegetate sites with native species if there is no reasonable expectation of natural regeneration.
- Maintain adequate buffers for Wild and Scenic Rivers.

Mechanical

- Use the least intrusive methods possible to achieve objectives, and use non-motorized equipment in wilderness and off existing routes in wilderness study areas, and where possible in other areas.
- If mechanized equipment is required, use the minimum amount of equipment needed.
- Time the work for weekdays or off-season.
- Require shut down of work before evening if work is located near campsites.
- If aircraft are used, plan flight paths to minimize impacts on visitors and wildlife.
- Revegetate sites with native species if there is no reasonable expectation of natural regeneration.
- Maintain adequate buffers for Wild and Scenic Rivers.

Manual

- Use the least intrusive methods possible to achieve objectives, and use non-motorized equipment in wilderness and off existing routes in wilderness study areas, and where possible in other areas.
- Revegetate sites with native species if there is no reasonable expectation of natural regeneration.
- Maintain adequate buffers for Wild and Scenic Rivers.

Biological

- Use the least intrusive methods possible to achieve objectives, and use non-motorized equipment in wilderness and off existing routes in wilderness study areas, and where possible in other areas.
- Maintain adequate buffers for Wild and Scenic Rivers.

Chemical

- Use the “minimum tool” to treat noxious weeds and other invasive plants, relying primarily on the use of ground based tools, including backpack pumps, hand sprayers, and pumps mounted on pack and saddle stock.
- Use herbicides only when they are the minimum treatment method necessary to control weeds that are spreading within the wilderness or threaten lands outside the wilderness.
- Give preference to herbicides that have the least impact on non-target species and the wilderness environment.
- Implement herbicide treatments during periods of low human use, where feasible.
- Address wilderness and special areas in management plans.
- Control of weed infestations shall be carried out in a manner compatible with the intent of Wild and Scenic River management objectives.
- Mitigation measures that may apply to wilderness and other special area resources are associated with human and ecological health and recreation (see mitigation measures for Vegetation, Fish and Other Aquatic Resources, Wildlife Resources, Recreation, and Human Health and Safety). (MM)

Recreation

See Handbook H-1601-1 (Land Use Planning Handbook).

Fire Use

- Control public access to potential burn areas.
- Schedule treatments to avoid peak recreational use times, unless treatments must be timed during peak times to maximize effectiveness.
- Notify the public of treatment methods, hazards, times, and nearby alternative recreation areas.

Mechanical

- Control public access until potential treatment hazards no longer exist.
- Schedule treatments to avoid peak recreational use times, unless treatments must be timed during peak times to maximize effectiveness.
- Notify the public of treatment methods, hazards, times, and nearby alternative recreation areas.

Manual

- Control public access until potential treatment hazards no longer exist.
- Schedule treatments to avoid peak recreational use times, unless treatments must be timed during peak times to maximize effectiveness.
- Notify the public of treatment methods, hazards, times, and nearby alternative recreation areas.

Biological

- Control public access in areas with control agents to ensure that agents are effective.
- Schedule treatments to avoid peak recreational use times, unless treatments must be timed during peak times to maximize effectiveness.
- Notify the public of treatment methods, hazards, times, and nearby alternative recreation areas.

Chemical

- Schedule treatments to avoid peak recreational use times, while taking into account the optimum management period for the targeted species.
- Notify the public of treatment methods, hazards, times, and nearby alternative recreation areas.

- Adhere to entry restrictions identified on the herbicide product label for public and worker access.
- Post signs noting exclusion areas and the duration of exclusion, if necessary.
- Mitigation measures that may apply to recreational resources are associated with human and ecological health (see mitigation measures for Vegetation, Fish and Other Aquatic Resources, Wildlife Resources, and Human Health and Safety). (MM)

Social and Economic Values

Fire Use
- Post treatment areas.
- Notify adjacent landowners, grazing permittees, the public, and emergency personnel of treatments.
- Control public access to treatment areas.
- Consult with Native American tribes and Alaska Natives whose health and economies might be affected by the project.
- To the extent feasible, hire local contractors and purchase supplies locally.

Mechanical
- Post treatment areas.
- Notify adjacent landowners, grazing permittees, the public, and emergency personnel of treatments.
- Control public access to treatment areas.
- Consult with Native American tribes and Alaska Natives whose health and economies might be affected by the project.
- To the extent feasible, hire local contractors and purchase supplies locally.

Manual
- Post treatment areas.
- Notify adjacent landowners, grazing permittees, the public, and emergency personnel of treatments.
- Control public access to treatment areas.
- Consult with Native American tribes and Alaska Natives whose health and economies might be affected by the project.
- To the extent feasible, hire local contractors and purchase supplies locally.

Biological
- Post treatment areas.
- Notify adjacent landowners, grazing permittees, the public, and emergency personnel of treatments.
- Control public access to treatment areas.
- Consult with Native American tribes and Alaska Natives whose health and economies might be affected by the project.
- To the extent feasible, hire local contractors and purchase supplies locally.

Chemical
- Consider surrounding land use before selecting aerial spraying as a treatment method, and avoid aerial spraying near agricultural or densely-populated areas.
- Post treated areas and specify reentry or rest times, if appropriate.
- Notify grazing permittees of livestock feeding restrictions in treated areas, if necessary, as per herbicide product label instructions.
- Notify the public of the project to improve coordination and avoid potential conflicts and safety concerns during implementation of the treatment.
- Control public access until potential treatment hazards no longer exist, per herbicide product label instructions.
- Observe restricted entry intervals specified by the herbicide product label.
- Notify local emergency personnel of proposed treatments.
- Use spot applications or low-boom broadcast applications where possible to limit the probability of contaminating non-target food and water sources.
- Consult with Native American tribes to locate any areas of vegetation that are of significance to the tribes and Native groups and that might be affected by herbicide treatments.

- To the degree possible within the law, hire local contractors and workers to assist with herbicide application projects and purchase materials and supplies for herbicide treatment projects (including the herbicides) through local suppliers.
- To minimize fears based on lack of information, provide public educational information on the need for vegetation treatments and the use of herbicides in an integrated vegetation management program for projects proposing local use of herbicides.
- For herbicides with label-specified re-entry intervals, post information at access points to recreation sites or other designated public use or product collection areas notifying the public of planned herbicide treatments in languages known to be used by persons likely to be using the area to be treated. Posting should include the date(s) of treatment, the herbicide to be used, the date or time the posting expires, and a name and phone number of who to call for more information. (Oregon FEIS MM)
- Consider the potential for treatments to affect communities from herbicide-contaminated resources originating from the BLM, such as subsistence resources or water used downstream for human or agricultural uses. (Oregon FEIS MM)
- Coordinate with and/or notify neighboring landowners who may want to treat, or are already treating, adjacent lands. (Oregon FEIS MM)
- To the extent permitted by normal contracting authority, ensure materials safety data sheets and other informational or precautionary materials are available in languages spoken by the work crews implementing treatments. This includes but is not limited to material such as Occupational Safety and Health Administration standards along with agency, industry and manufacturers' recommendations and Human Health and Safety Standard Operating Procedures and mitigation measures or equivalent. (Oregon FEIS MM)

Rights-of-way

Fire Use

- Coordinate vegetation management activities where joint or multiple use of a ROW exists.
- Notify other public land users within or adjacent to the ROW proposed for treatment.
- Manage burns under powerlines so as to avoid negative impacts to the powerline.

Mechanical

- Coordinate vegetation management activities where joint or multiple use of a ROW exists.
- Notify other public land users within or adjacent to the ROW proposed for treatment.
- Apply appropriate safety measures when operating equipment within utility ROW corridors.
- Minimize exposed soil areas during treatment.
- Keep operations within prescribed ROW.

Manual

- Coordinate vegetation management activities where joint or multiple use of a ROW exists.
- Notify other public land users within or adjacent to the ROW proposed for treatment.
- Always use appropriate safety equipment and operating procedures.
- Utilize methods for disposal of vegetation that prevent spreading or reinfestation of unwanted vegetation.

Biological

- Coordinate vegetation management activities where joint or multiple use of a ROW exists.
- Notify other public land users within or adjacent to the ROW proposed for treatment.

Chemical

- Coordinate vegetation treatment activities where joint or multiple use of a ROW exists.
- Notify other public land users within or adjacent to the ROW proposed for treatment.
- Use only herbicides that are approved for use in ROW areas.

Human Health and Safety

Fire Use

- Use some form of pretreatment, such as mechanical or manual treatment, in areas where fire cannot be safely introduced because of hazardous fuel buildup.
- Wear appropriate safety equipment and clothing, and use equipment that is properly maintained.
- Notify nearby residents who could be affected by smoke.
- Maintain adequate safety buffers between treatment area and residences/structures.
- Burn vegetation debris off ROWs to ensure that smoke does not provide a conductive path from the transmission line or electrical equipment to the ground.

Mechanical

- Wear appropriate safety equipment and clothing, and use equipment that is properly maintained.
- Cut all brush and tree stumps flat, where possible, to eliminate sharp points that could injure a worker or the public.
- Ensure that only qualified personnel cut trees near powerlines.

Manual

- Wear appropriate safety equipment and clothing, and use equipment that is properly maintained.
- Cut all brush and tree stumps flat, where possible, to eliminate sharp points that could injure a worker or the public.

Biological

- Wear appropriate safety equipment and clothing, and use equipment that is properly maintained.

Chemical

- Establish a buffer between treatment areas and human residences based on guidance given in the HHRA, with a minimum buffer of ¼ mile for aerial applications and 100 feet for ground applications, unless a written waiver is granted.
- Use protective equipment as directed by the herbicide product label.
- Post treated areas with appropriate signs at common public access areas.
- Observe restricted entry intervals specified by the herbicide product label.
- Provide public notification in newspapers or other media where the potential exists for public exposure.
- Store herbicides in secure, herbicide-approved storage.
- Have a copy of MSDSs at work site.
- Notify local emergency personnel of proposed treatments.
- Contain and clean up spills and request help as needed.
- Secure containers during transport.
- Follow label directions for use and storage.
- Dispose of unwanted herbicides promptly and correctly.
- Use the typical application rate, where feasible, when applying 2,4-D, fluridone, hexazinone, and triclopyr to reduce risk to workers and the public. (MM)
- Do not apply sulfometuron methyl aerially. (MM)
- Limit application of chlorsulfuron via ground broadcast applications at the maximum application rate. (MM)
- Do not apply hexazinone with an over-the-shoulder broadcast applicator (backpack sprayer). (MM)
- Consideration should be given to herbicides other than 2,4-D; use of 2,4-D should be limited to situations where other herbicides are ineffective or in situations in which the risks posed by 2,4-D can be mitigated (Oregon FEIS MM).
- Do not apply triclopyr by any broadcast method (Oregon FEIS MM).

Table A-1. Buffer Distances to Minimize Risk to Vegetation from Off-Site Drift of BLM-Evaluated Herbicides

Application Scenario	Chlorsulfuron	Fluridone	Imazapic	Overdrive	Sulfometuron methyl
Buffer Distance (feet) from Non-target Aquatic Plants					
Typical Application Rate					
Aerial	0	NE	0	NA	1,300
Low Boom[2]	0	NE	0	IOO	900
High Boom[2]	0	NE	0	900	900
Maximum Application Rate					
Aerial	300	NE	300	NA	1,500
Low Boom[2]	0	NE	0	900	900
High Boom[2]	0	NE	0	900	900
Buffer Distance (feet) from Non-target Terrestrial Plants					
Typical Application Rate					
Aerial	1,350	NE	0	NA	0
Low Boom[2]	900	NE	0	0	0
High Boom[2]	900	NE	0	100	0
Maximum Application Rate					
Aerial	1,350	NE	900	NA	0
Low Boom[2]	1,000	NE	0	100	0
High Boom[2]	1,000	NE	0	100	0
Buffer Distance (feet) from Threatened, Endangered, and Sensitive Plants					
Typical Application Rate					
Aerial	1,400	NE	0	NA	1,500
Low Boom[2]	1,000	NE	0	100	1,100
High Boom[2]	1,000	NE	0	900	1,000
Maximum Application Rate					
Aerial	1,400	NE	900	NA	1,500
Low Boom[2]	1,050	NE	0	900	1,100
High Boom[2]	1,000	NE	0	900	1,000

2 High boom is 50 inches above ground and low boom is 20 inches above ground.
NE =Not evaluated and NA =not applicable.
Buffer distances are the smallest modeled distance at which no risk was predicted. In some cases, buffer distances were extrapolated if the largest distance modeled still resulted in risk, or interpolated if greater precision was required.

Table A-2. Buffer Distances to Minimize Risk to Vegetation from Off-Site Drift of Forest Service-Evaluated Herbicides

Application Scenario	2,4-D	Dicamba	Clopyralid	Glyphosate	Hexazinone	Imazapyr	Metsulfuron methyl	Picloram	Triclopyr
Buffer Distance (feet) from Susceptible Plants[1]									
Typical Application Rate									
Aerial	NE	>900	900	300	300	900	900	>900	500
Low Boom	NE	300	900	50	NE	900	900	>900	300
Maximum Application Rate									
Aerial	NE	>900	1,000	300	900	>900	>900	>900	>900
Low Boom	NE	900	1 000	300	NE	>900	>900	>900	>900
Buffer Distance (feet) from Tolerant Terrestrial Plants									
Typical Application Rate									
Aerial	NE	0	0	25	NE	100	50	25	NE
Low Boom	NE	0	0	25	0	25	25	25	NE
Maximum Application Rate									
Aerial	NE	0	25	50	NE	300	100	50	NE
Low Boom	NE	0	25	25	100	50	25	25	NE

NE = Not evaluated.
Buffer distances are the smallest modeled distance at which no risk was predicted. In some cases, buffer distances were extrapolated if the largest distance modeled still resulted in risk, or interpolated if greater precision was required.
1 Mitigation measures for Bureau Sensitive or Federally Listed species use these buffer distances

Table A-3. Buffer Distances To Minimize Risk to Non-Special Status Fish and Aquatic Invertebrates From Off-Site Drift of BLM-Evaluated Herbicides From Broadcast and Aerial Treatments

Application Scenario	Chlorsulfuron	Fluridone	Imazapic	Overdrive	Sulfometuron methyl
Minimum Buffer Distance (feet) from Fish and Aquatic Invertebrates					
Typical Application Rate					
Aerial	0	NA	0	NA	0
Low boom	0	NA	0	0	0
High boom	0	NA	0	0	0
Maximum Application Rate					
Aerial	0	NA	0	NA	0
Low boom	0	NA	0	0	0
High boom	0	NA	0	0	0

NA Not applicable.
Boom height= The Tier I ground application model allows selection of a low (20 inches) or a high (50 inches) boom height.

Table A-4. Buffer Distances To Minimize Risk to Special Status Fish and Aquatic Invertebrates From Off-Site Drift of BLM-Evaluated Herbicides From Broadcast and Aerial Treatments

Application Scenario	Chlorsulfuron	Fluridone	Imazapic	Overdrive	Sulfometuron methyl
Minimum Buffer Distance (feet) from Fish and Aquatic Invertebrates					
Typical Application Rate					
Aerial	0	NA	0	NA	0
Low boom	0	NA	0	0	0
High boom	0	NA	0	0	0
Maximum Application Rate					
Aerial	0	NA	0	NA	0
Low boom	0	NA	0	0	0
High boom	0	NA	0	0	0

NA Not applicable.
Boom height= The Tier I ground application model allows selection of a low (20 inches) or a high (50 inches) boom height.

Best Management Practices for Noxious Weed Management

Best Management Practices are designed to maximize beneficial results and minimize negative impacts of management actions, primarily with regards to water quality (USDI 2003a:Appendix D). They are included in the *Lakeview Resource Area Resource Management Plan* under a variety of resource headings. The ones specific to noxious weed management are provided below.

1) All contractors and land-use operators moving surface-disturbing equipment in or out of weed-infested areas should clean their equipment before and after use on public land.
2) Control weeds annually in areas frequently disturbed such as gravel pits, recreation sites, road sides, live-stock concentration areas.
3) Consider livestock quarantine, removal, or timing limitations in weed-infested areas.
4) All seed, hay, straw, mulch, or other vegetation material transported and used on public land weed-free zones for site stability, rehabilitation, or project facilitation should be certified by a qualified Federal, state or county officer as free of noxious weeds and noxious weed seed. All baled feed, pelletized feed,

and grain transported into weed-free zones and used to feed livestock should also be certified as free of noxious weed seed.

5) It is recommended that all vehicles, including off-road and all-terrain, traveling in or out of weed-infested areas should clean their equipment before and after use on public land.

Invasive Plant Prevention Measures

Measures designed to prevent the spread of invasive plants by minimizing the amount of existing non-target vegetation that is disturbed or destroyed during project or vegetation treatment actions (USDI 2007a:2-20 and Table 2-4). They are designed to work in conjunction with BLM's policy requiring that planning for ground-disturbing projects in the Resource Area, or those that have the potential to alter plant communities, include an assessment of the risk of introducing noxious weeds, and if there is a moderate or high risk of spread, actions to reduce the risk must be implemented and monitoring of the site must be conducted to prevent establishment of new infestations.

Project Planning

- Incorporate prevention measures into project layout and design, alternative evaluation, and project decisions to prevent the introduction or spread of weeds.
- Determine prevention and maintenance needs, including the use of herbicides, at the onset of project planning.
- Before ground-disturbing activities begin, inventory weed infestations and prioritize areas for treatment in project operating areas and along access routes.
- Remove sources of weed seed and propagules to prevent the spread of existing weeds and new weed infestations.
- Pre-treat high-risk sites for weed establishment and spread before implementing projects.
- Post weed awareness messages and prevention practices at strategic locations such as trailheads, roads, boat launches, and public land kiosks.
- Coordinate project activities with nearby herbicide applications to maximize the cost-effectiveness of weed treatments.

Project Development

- Minimize soil disturbance to the extent practical, consistent with project objectives.
- Avoid creating soil conditions that promote weed germination and establishment.
- To prevent weed germination and establishment, retain native vegetation in and around project activity areas and keep soil disturbance to a minimum, consistent with project objectives.
- Locate and use weed-free project staging areas. Avoid or minimize all types of travel through weed-infested areas, or restrict travel to periods when the spread of seeds or propagules is least likely.
- Prevent the introduction and spread of weeds caused by moving weed-infested sand, gravel, borrow, and fill material.
- Inspect material sources on site, and ensure that they are weed-free before use and transport. Treat weed-infested sources to eradicate weed seed and plant parts, and strip and stockpile contaminated material before any use of pit material.
- Survey the area where material from treated weed-infested sources is used for at least 3 years after project completion to ensure that any weeds transported to the site are promptly detected and controlled.
- Prevent weed establishment by not driving through weed-infested areas.

- Inspect and document weed establishment at access roads, cleaning sites, and all disturbed areas; control infestations to prevent spread within the project area.
- Avoid acquiring water for dust abatement where access to the water is through weed-infested sites.
- Identify sites where equipment can be cleaned. Clean equipment before entering public lands.
- Clean all equipment before leaving the project site if operating in areas infested with weeds.
- Inspect and treat weeds that establish at equipment cleaning sites.
- Ensure that rental equipment is free of weed seed.
- Inspect, remove, and properly dispose of weed seed and plant parts found on workers' clothing and equipment. Proper disposal entails bagging the seeds and plant parts and incinerating them.

Revegetation

- Include weed prevention measures, including project inspection and documentation, in operation and reclamation plans.
- Retain bonds until reclamation requirements, including weed treatments, are completed, based on inspection and documentation.
- To prevent conditions favoring weed establishment, re-establish vegetation on bare ground caused by project disturbance as soon as possible using either natural recovery or artificial techniques.
- Maintain stockpiled, uninfested material in a weed-free condition.
- Revegetate disturbed soil (except travel ways on surfaced projects) in a manner that optimizes plant establishment for each specific project site. For each project, define what constitutes disturbed soil and objectives for plant cover revegetation. Revegetation may include topsoil replacement, planting, seeding, fertilization, liming, and weed-free mulching, as necessary.
- Where practical, stockpile weed-seed-free topsoil and replace it on disturbed areas (e.g., road embankments or landings).
- Inspect seed and straw mulch to be used for site rehabilitation (for wattles, straw bales, dams, etc.) and certify that they are free of weed seed and propagules.
- Inspect and document all limited term ground-disturbing operations in noxious weed infested areas for at least 3 growing seasons following completion of the project.
- Use native material where appropriate and feasible. Use certified weed-free or weed-seed-free hay or straw where certified materials are required and/or are reasonably available.
- Provide briefings that identify operational practices to reduce weed spread (for example, avoiding known weed infestation areas when locating fire lines).
- Evaluate options, including closure, to regulate the flow of traffic on sites where desired vegetation needs to be established. Sites could include road and trail ROW, and other areas of disturbed soils.

Conservation Measures from the PEIS Biological Assessment

Mitigation Measures (above) include "when necessary to protect Special Status [plant/fish/wildlife species], implement all conservation measures for [plant/fish/wildlife species] presented in the *Vegetation Treatments on Bureau of Land Management Lands in 17 Western States Programmatic Biological Assessment*" (USDI 2007f). Those Conservation Measures are presented here for use with Special Status species as needed. These are not the conservation measures applicable to listed fish on the Lakeview Resource Area; those fish are the subject of site-specific consultation being conducted for this EA.

Plant Conservation Measures

As dictated in BLM Manual 6840 (*Special Status Species Management*), local BLM offices are required to develop and implement management plans and programs that will conserve listed species and their habitats. In addition, NEPA documentation related to treatment activities (i.e., projects) will be prepared that identify any TEP plant species or their critical habitat that are present in the proposed treatment areas, and that list the measures that will be taken to protect them.

Many local BLM offices already have management plans in place that ensure the protection of these plant species during activities on public land. However, a discussion of these existing plans is outside the scope of this programmatic BA. The following general guidance applies to all management plans developed at the local level.

Required steps include the following:

- A survey of all proposed action areas within potential habitat by a botanically qualified biologist, botanist, or ecologist to determine the presence/absence of the species.
- Establishment of site-specific no activity buffers by a qualified botanist, biologist, or ecologist in areas of occupied habitat within the proposed project area. To protect occupied habitat, treatment activities would not occur within these buffers.
- Collection of baseline information on the existing condition of TEP plant species and their habitats in the proposed project area.
- Establishment of pre-treatment monitoring programs to track the size and vigor of TEP populations and the state of their habitats. These monitoring programs would help in anticipating the future effects of vegetation treatments on TEP plant species.
- Assessment of the need for site revegetation post treatment to minimize the opportunity for noxious weed invasion and establishment.

At a minimum, the following must be included in all management plans:

- Given the high risk for damage to TEP plants and their habitat from burning, mechanical treatments, and use of domestic animals to contain weeds, none of these treatment methods should be utilized within 330 feet of sensitive plant populations UNLESS the treatments are specifically designed to maintain or improve the existing population.
- Off-highway use of motorized vehicles associated with treatments should be avoided in suitable or occupied habitat.
- Biological control agents (except for domestic animals) that affect target plants in the same genus as TEP species must not be used to control target species occurring within the dispersal distance of the agent.
- Prior to use of biological control agents that affect target plants in the same family as TEP species, the specificity of the agent with respect to factors such as physiology and morphology should be evaluated, and a determination as to risks to the TEP species made.
- Post-treatment monitoring should be conducted to determine the effectiveness of the project.

In addition, the following guidance must be considered in all management plans in which herbicide treatments are proposed to minimize or avoid risks to TEP species. The exact conservation measures to be included in management plans would depend on the herbicide that would be used, the desired mode of application, and the conditions of the site. Given the potential for off-site drift and surface runoff, populations of TEP species on lands not administered by the BLM would need to be considered if they are located near proposed herbicide treatment sites.

- Herbicide treatments should not be conducted in areas where TEP plant species may be subject to direct spray by herbicides during treatments.
- Applicators should review, understand, and conform to the “Environmental Hazards” section on herbicide labels (this section warns of known pesticide risks and provides practical ways to avoid harm to organisms or the environment).

- To avoid negative effects to TEP plant species from off-site drift, surface runoff, and/or wind erosion, suitable buffer zones should be established between treatment sites and populations (confirmed or suspected) of TEP plant species, and site-specific precautions should be taken (refer to the guidance provided below).
- Follow all instructions and Standard Operating Procedures to avoid spill and direct spray scenarios into aquatic habitats that support TEP plant species.
- Follow all BLM operating procedures for avoiding herbicide treatments during climatic conditions that would increase the likelihood of spray drift or surface runoff.

The following conservation measures refer to sites where broadcast spraying of herbicides, either by ground or aerial methods, is desired. Manual spot treatment of undesirable vegetation can occur within the listed buffer zones if it is determined by local biologists that this method of herbicide application would not pose risks to TEP plant species in the vicinity. Additional precautions during spot treatments of vegetation within habitats where TEP plant species occur should be considered while planning local treatment programs, and should be included as conservation measures in local-level NEPA documentation.

The buffer distances provided below are conservative estimates, based on the information provided by ERAs, and are designed to provide protection to TEP plants. Some ERAs used regression analysis to predict the smallest buffer distance to ensure no risks to TEP plants. In most cases, where regression analyses were not performed, suggested buffers extend out to the first modeled distance from the application site for which no risks were predicted. In some instances the jump between modeled distances was quite large (e.g., 100 feet to 900 feet). Regression analyses could be completed at the local level using the interactive spreadsheets developed for the ERAs, using information in ERAs and for local site conditions (e.g., soil type, annual precipitation, vegetation type, and treatment method), to calculate more precise, and possibly smaller buffers for some herbicides.

2,4-D

- Because the risks associated with this herbicide were not assessed, do not spray within ½ mile of terrestrial plant species or aquatic habitats where TEP aquatic plant species occur.
- Do not use aquatic formulations in aquatic habitats where TEP aquatic plant species occur.
- Assess local site conditions when evaluating the risks from surface water runoff to TEP plants located within ½ mile downgradient from the treatment area.
- In areas where wind erosion is likely, do not apply within ½ mile of TEP plant species.

Chlorsulfuron

- Do not apply by ground methods within 1,200 feet of terrestrial TEP species.
- Do not apply by aerial methods within 1,500 feet of terrestrial TEP species.
- Do not apply by ground methods within 25 feet of aquatic habitats where TEP plant species occur.
- Do not apply by aerial methods at the maximum application rate within 300 feet of aquatic habitats where TEP plant species occur.
- Do not apply by aerial methods at the typical application rate within 100 feet of aquatic habitats where TEP plant species occur.
- In areas where wind erosion is likely, do not apply within ½ mile of TEP plant species.

Clopyralid

- Since the risks associated with using a high boom are unknown, use only a low boom during ground applications of this herbicide within ½ mile of terrestrial TEP plant species or aquatic habitats in which TEP plant species occur.
- Do not apply by ground methods at the typical application rate within 900 of terrestrial TEP species.
- Do not apply by ground methods at the typical application rate within ½ mile of terrestrial TEP species.
- Do not apply by aerial methods within ½ mile of terrestrial TEP species.
- In areas where wind erosion is likely, do not apply within ½ mile of TEP plant species.

Dicamba

- If using a low boom at the typical application rate, do not apply within 1,050 feet of terrestrial TEP plant species.
- If using a low boom at the maximum application rate, do not apply within 1,050 feet of terrestrial TEP plant species.
- If using a high boom, do not apply within 1,050 feet of terrestrial TEP plant species.
- Do not apply within 25 feet of aquatic habitats where TEP plant species occur.
- In areas where wind erosion is likely, do not apply within ½ mile of TEP plant species.

Diflufenzopyr

- If using a low boom at the typical application rate, do not apply within 100 feet of terrestrial TEP plant species.
- If using a high boom, or a low boom at the maximum application rate, do not apply within 900 feet of terrestrial TEP plant species.
- If using a high boom, do not apply within 500 feet of terrestrial TEP plant species.
- Do not apply within 25 feet of aquatic habitats where TEP plant species occur.
- In areas where wind erosion is likely, do not apply within ½ mile of TEP plant species.

Fluridone

- Since effects on terrestrial TEP plant species are unknown, do not apply within ½ mile of terrestrial TEP species.

Glyphosate

- Since the risks associated with using a high boom are unknown, use only a low boom during ground applications of this herbicide within ½ mile of terrestrial TEP plant species.
- Do not apply by ground methods at the typical application rate within 50 feet of terrestrial TEP plant species.
- Do not apply by ground methods at the maximum application rate within 300 feet of terrestrial TEP plant species.
- Do not apply by aerial methods within 300 feet of terrestrial TEP plant species.

Hexazinone

- Since the risks associated with using a high boom or an aerial application are unknown, only apply this herbicide by ground methods using a low boom within ½ mile of terrestrial TEP plant species and aquatic habitats that support aquatic TEP species.
- Do not apply by ground methods at the typical application rate within 300 feet of terrestrial TEP plant species or aquatic habitats that support aquatic TEP plant species.
- Do not apply by ground methods at the maximum application rate within 900 feet of terrestrial TEP plant species or aquatic habitats that support aquatic TEP plant species.
- In areas where wind erosion is likely, do not apply within ½ mile of TEP plant species.

Imazapic

- Do not apply by ground methods within 25 feet of terrestrial TEP species or aquatic habitats where TEP plant species occur.
- Do not apply by helicopter at the typical application rate within 25 feet of terrestrial TEP plant species.
- Do not apply by helicopter at the maximum application rate, or by plane at the typical application rate, within 300 feet of terrestrial TEP plant species.
- Do not apply by plane at the maximum application rate within 900 feet of terrestrial TEP species.
- Do not apply by aerial methods at the maximum application rate within 300 feet of aquatic TEP species.
- Do not apply by aerial methods at the typical application rate within 100 feet of aquatic TEP species.
- In areas where wind erosion is likely, do not apply within ½ mile of TEP plant species.

Imazapyr

- Since the risks associated with using a high boom are unknown, use only a low boom for ground applications of this herbicide within ½ mile of terrestrial TEP plant species or aquatic habitats in which TEP plant species occur.
- Do not apply at the typical application rate, by ground or aerial methods, within 900 feet of terrestrial TEP plant species or aquatic habitats in which aquatic TEP species occur.
- Do not apply at the maximum application rate, by ground or aerial methods, within ½ mile of terrestrial TEP plant species or aquatic habitats in which aquatic TEP species occur.
- Do not use aquatic formulations in aquatic habitats where TEP aquatic plant species occur.
- In areas where wind erosion is likely, do not apply within ½ mile of TEP plant species.

Metsulfuron Methyl

- Since the risks associated with using a high boom are unknown, use only a low boom for ground applications of this herbicide within ½ mile of terrestrial TEP plant species or aquatic habitats in which TEP plant species occur.
- Do not apply at the typical application rate, by ground or aerial methods, within 900 feet of terrestrial TEP plant species or aquatic habitats in which aquatic TEP species occur.
- Do not apply at the maximum application rate, by ground or aerial methods, within ½ mile of terrestrial TEP plant species or aquatic habitats in which aquatic TEP species occur.
- In areas where wind erosion is likely, do not apply within ½ mile of TEP plant species.

Overdrive®

- If using a low boom at the typical application rate, do not apply within 100 feet of terrestrial TEP plant species.
- If using a low boom at the maximum application rate, do not apply within 900 feet of terrestrial TEP plant species.
- If using a high boom, do not apply within 900 feet of terrestrial TEP plant species.
- Do not apply within 25 feet of aquatic habitats where TEP plant species occur.
- In areas where wind erosion is likely, do not apply within ½ mile of TEP plant species.

Picloram

- Do not apply by ground or aerial methods, at any application rate, within ½ mile of terrestrial TEP plant species.
- Assess local site conditions when evaluating the risks from surface water runoff to TEP plants located within ½ mile downgradient from the treatment area.
- In areas where wind erosion is likely, do not apply within ½ mile of TEP plant species.

Sulfometuron Methyl

- Do not apply by ground or aerial methods within 1,500 feet of terrestrial TEP species.
- Do not apply by ground methods within 900 feet of aquatic habitats where TEP plant species occur, or by aerial methods within 1,500 feet of aquatic habitats where TEP plant species occur.
- In areas where wind erosion is likely, do not apply within ½ mile of TEP plant species.

Triclopyr Acid

- Since the risks associated with using a high boom are unknown, use only a low boom during ground applications of this herbicide within ½ mile of terrestrial TEP plant species.
- Since the risks associated with using a high boom are unknown, use only a low boom during ground applications at the maximum application rate of this herbicide within ½ mile of aquatic habitats in which TEP plant species occur.
- Do not apply by ground methods at the typical application rate within 300 feet of terrestrial TEP plant species.
- Do not apply by aerial methods at the typical application rate within 500 feet of terrestrial TEP plant species.

- Do not apply by ground or aerial methods at the maximum application rate within ½ mile of terrestrial TEP plant species or aquatic habitats in which TEP plant species occur.
- If applying to aquatic habitats in which aquatic TEP plant species occur, do not exceed the targeted water concentration on the product label.
- In areas where wind erosion is likely, do not apply within ½ mile of TEP plant species.

Triclopyr BEE

- Since the risks associated with using a high boom are unknown, use only a low boom for ground applications of this herbicide within ½ mile of terrestrial TEP plant species or aquatic habitats in which TEP plant species occur.
- Do not apply by ground methods at the typical application rate within 300 feet of terrestrial TEP plant species or aquatic habitats in which TEP plant species occur.
- Do not apply by aerial methods at the typical application rate within 500 feet of terrestrial TEP plant species or aquatic habitats in which TEP plant species occur.
- Do not apply by ground or aerial methods at the maximum application rate within ½ mile of terrestrial TEP plant species or aquatic habitats in which TEP plant species occur.
- Do not use aquatic formulations in aquatic habitats where TEP aquatic plant species occur.
- In areas where wind erosion is likely, do not apply within ½ mile of TEP plant species.

The information provided in Table 4-4 provides a general guideline as to the types of habitats in which treatments (particularly fire) may be utilized to improve growing conditions for TEP plant species. However, at the local level, the BLM must make a further determination as to the suitability of vegetation treatments for the populations of TEP species that are managed by local offices. The following information should be considered: the timing of the treatment in relation to the phenology of the TEP plant species; the intensity of the treatment; the duration of the treatment; and the tolerance of the TEP species to the particular type of treatment to be used. When information about species tolerance is unavailable or is inconclusive, local offices must assume a negative effect to plant populations, and protect those populations from direct exposure to the treatment in question.

Treatment plans must also address the presence of and expected impacts on noxious weeds on the project site. These plans must be coordinated with BLM weed experts and/or appropriate county weed supervisors to minimize the spread of weeds. In order to prevent the spread of noxious weeds and other unwanted vegetation in occupied or suitable habitat, the following precautions should be taken:

- Cleared areas that are prone to downy brome or other noxious weed invasions should be seeded with an appropriate seed mixture to reduce the probability of noxious weeds or other undesirable plants becoming established on the site.
- Where seeding is warranted, bare sites should be seeded as soon as appropriate after treatment, and at a time of year when it is likely to be successful.
- In suitable habitat for TEP species, non-native species should not be used for revegetation.
- Certified noxious weed seed free seed must be used in suitable habitat, and preference should be given to seeding appropriate plant species when rehabilitation is appropriate.
- Straw and hay bales used for erosion control in suitable habitat must be certified weed- and seed-free.
- Vehicles and heavy equipment used during treatment activities should be washed prior to arriving at a new location to avoid the transfer of noxious weeds.

When BAs are drafted at the local level for treatment programs, additional conservation measures may be added to this list. Where BLM plans that consider the effects of vegetation treatments on TEP plant species already exist, these plans should be consulted, and incorporated (e.g., any guidance or conservation measures they provide) into local level BAs for vegetation treatments.

Aquatic Animals Conservation Measures

Many local BLM offices already have management plans in place that ensure the protection of these species, and have completed formal or informal consultations on similar treatment activities. These consultations have identified protection zones alongside aquatic habitats that support these species. The conservation measures discussed below are probable steps required of the BLM to ensure that vegetation treatments would minimize impacts to TEP species. These conservation measures are intended as broad guidance at the programmatic level; further analysis of treatment programs and species habitats at the local level is required to better reduce potential impacts from proposed vegetation treatments. Completion of consultation at the local level will fine-tune conservation measures associated with treatment activities and ensure consistency of the treatments with ESA requirements.

The aquatic TEP species considered in this programmatic BA occur in varied habitats, over a large geographic area. The conservation measures guidance presented below is intended to apply broadly to aquatic species and habitats over the entire region covered by this BA, based on the common features found in nearly all aquatic and riparian habitats. Some species with alternate or unusual habitat requirements may require additional conservation measures to ensure a Not Likely to Adversely Affect determination at the local level. Such additional conservation measure are outside the scope of this BA, and will be completed at the local level.

Some local BLM plans have delineated protected riparian areas, or portions of watersheds where riparian-dependent resources receive primary emphasis, and management activities are subject to specific standards and guidelines (USDA Forest Service 1995). These protected riparian areas include traditional riparian corridors, wetlands, intermittent streams, and other areas that help maintain the integrity of aquatic ecosystems by 1) influencing the delivery of coarse sediment, organic matter, and woody debris to streams; 2) providing root strength for channel stability; 3) shading the stream; and 4) protecting water quality. Examples of protected riparian areas are the BLM's Riparian Reserves of the Pacific Northwest and the Interior Columbia Basin, as described in the Aquatic Conservation Strategy (USDA Forest Service and USDI BLM 1994). The term "riparian areas," as used in the conservation measures guidance below, refers to riparian protected areas, wherever such designations apply. However, since not all local BLM plans have made such designations, "riparian areas," when the above-mentioned use is not applicable, generally refers to: 1) for streams, the stream channel and the extent of the 100-year floodplain; and 2) for wetlands, ponds, and lakes, and other aquatic habitats, the area extending to the edges of the riparian vegetation, provided it is no less than the minimum buffer distance for a given site established by local BLM biologists.

<u>Conservation Measures for Site Access and Fueling/Equipment Maintenance</u>

For treatments occurring in watersheds with TEP species or designated or undesignated critical habitat (i.e., unoccupied habitat critical to species recovery):

- Where feasible, access work site only on existing roads, and limit all travel on roads when damage to the road surface will result or is occurring.
- Where TEP aquatic species occur, consider ground-disturbing activities on a case by case basis, and implement Standard Operating Procedures to ensure minimal erosion or impact to the aquatic habitat.
- Within riparian areas, do not use vehicle equipment off of established roads.
- Outside of riparian areas, allow driving off of established roads only on slopes of 20% or less.
- Except in emergencies, land helicopters outside of riparian areas.
- Within 150 feet of wetlands or riparian areas, do not fuel/refuel equipment, store fuel, or perform equipment maintenance (locate all fueling and fuel storage areas, as well as service landings outside of protected riparian areas).
- Prior to helicopter fueling operations prepare a transportation, storage, and emergency spill plan and obtain the appropriate approvals; for other heavy equipment fueling operations use a slip-tank not greater than 250 gallons; Prepare spill containment and cleanup provisions for maintenance operations.

- Do not conduct biomass removal (harvest) activities that will alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows outside the range of natural variability.

Conservation Measures Related to Revegetation Treatments

- Outside riparian areas, avoid hydro-mulching within buffer zones established at the local level. This precaution will limit adding sediments and nutrients and increasing water turbidity.
- Within riparian areas, engage in consultation at the local level to ensure that revegetation activities incorporate knowledge of site-specific conditions and project design.

Conservation Measures Related to Herbicide Treatments

The complexity of this action within riparian areas requires local consultation, which will be based on herbicide risk assessments.

Possible Conservation Measures:

- Maintain equipment used for transportation, storage, or application of chemicals in a leak proof condition.
- Do not store or mix herbicides, or conduct post-application cleaning within riparian areas.
- Ensure that trained personnel monitor weather conditions at spray times during application.
- Strictly enforce all herbicide labels.
- Do not broadcast spray within 100 feet of open water when wind velocity exceeds 5 mph.
- Do not broadcast spray when wind velocity exceeds 10 mph.
- Do not spray if precipitation is occurring or is imminent (within 24 hours).
- Do not spray if air turbulence is sufficient to affect the normal spray pattern.
- Do not broadcast spray herbicides in riparian areas that provide habitat for TEP aquatic species. Appropriate buffer distances should be determined at the local level to ensure that overhanging vegetation that provides habitat for TEP species is not removed from the site. Buffer distances provided as conservation measures in the assessment of effects to plants (Chapter 4 of this BA) and fish and aquatic invertebrates should be consulted as guidance (Table 5-5). (Note: the Forest Service did not determine appropriate buffer distances for TEP fish and aquatic invertebrates when evaluating herbicides in Forest Service ERAs; buffer distances were only determined for non-TEP species.)
- Do not use fluridone, terrestrial formulations of glyphosate, or triclopyr BEE, to treat aquatic vegetation in habitats where aquatic TEP species occur or may potentially occur.
- Avoid using glyphosate formulations that include R-11 in the future, and either avoid using any formulations with POEA, or seek to use the formulation with the lowest amount of POEA available, to reduce risks to aquatic organisms.
- Follow all instructions and Standard Operating Procedures to avoid spill and direct spray scenarios into aquatic habitats. Special care should be followed when transporting and applying 2,4-D, clopyralid, glyphosate, hexazinone, imazapyr, metsulfuron methyl, picloram, and triclopyr.
- Do not broadcast spray glyphosate, picloram, or triclopyr BEE in upland habitats adjacent to aquatic habitats that support (or may potentially support) aquatic TEP species under conditions that would likely result in off-site drift.
- In watersheds that support TEP species or their habitat, do not apply triclopyr BEE in upland habitats within ½ mile upslope of aquatic habitats that support aquatic TEP species under conditions that would likely result in surface runoff.

Numerous conservation measures were developed from information provided in ERAs. The measures listed below would apply to TEP fish and other aquatic species at the programmatic level in all 17 western states. However, local BLM field offices could use interactive spreadsheets and other information contained in the ERAs to develop more site-specific conservation measures and management plans based on local conditions (soil type, rainfall, vegetation type, and herbicide treatment method). It is possible that conservation measures would be less restrictive than those listed below if local site conditions were evaluated using the ERAs when developing project-level conservation measures.

<u>Conservation Measures Related to Prescribed Fire</u>

Within riparian areas, in watersheds with TEP species or their habitats:

- Conduct prescribed burning only when long-term maintenance of the riparian area is the primary objective, and where low intensity fires can be maintained.
- Do not construct black lines, except by non-mechanized methods.
- Utilize/create only the following firelines: natural barriers; hand-built lines parallel to the stream channel and outside of buffer zones established at the local level; or hand built lines perpendicular to the stream channel with waterbars and the same distance requirement.
- Do not ignite fires using aerial methods.
- In forested riparian areas, keep fires to low severity levels to ensure that excessive vegetation removal does not occur.
- Do not camp, unless allowed by local consultation.
- Have a fisheries biologist determine whether pumping activity can occur in streams with TEP species.
- During water drafting/pumping, maintain a continuous surface flow of the stream that does not alter original wetted stream width.
- Do not alter dams or channels in order to pump in streams occupied by TEP species.
- Do not allow helicopter dipping from waters occupied by TEP species, except in lakes outside of the spawning period.
- Consult with a local fisheries biologist prior to helicopter dipping in order to avoid entrainment and harassment of TEP species.

<u>Conservation Measures Related to Mechanical Treatments</u>

Note: these measures apply only to treatments occurring in watersheds that support TEP species or in unoccupied habitat critical to species recovery (including but not limited to critical habitat, as designated by USFWS).

Outside riparian areas in watersheds with TEP species or designated or undesignated critical habitat (i.e., unoccupied habitat critical to species recovery):

- Conduct soil-disturbing treatments only on slopes of 20% or less, where feasible.
- Do not conduct log hauling activities on native surface roads prone to erosion, where feasible.

Within riparian areas in these watersheds, more protective measures will be required to avoid negatively affecting TEP species or their habitat:

- Do not use vehicles or heavy equipment, except when crossing at established crossings.
- Do not remove large woody debris or snags during mechanical treatment activities.
- Do not conduct ground disturbing activities (e.g., disking, drilling, chaining, and plowing).
- Ensure that all mowing follows guidance to avoid negative effects to streambanks and riparian vegetation and major effects to streamside shade.
- Do not use equipment in perennial channels or in intermittent channels with water, except at crossings that already exist.
- Leave suitable quantities (to be determined at the local level) of excess vegetation and slash on site.
- Do not apply fertilizers or seed mixtures that contain chemicals by aerial methods.
- Do not apply fertilizer within 25 feet of streams and supersaturated soils; apply fertilizer following labeling instructions.
- Do not apply fertilizer in desert habitats.
- Do not completely remove trees and shrubs.

Conservation Measures Related to Biological Control Treatments using Livestock

For treatments occurring in watersheds that support TEP species or in critical habitat:

- Where terrain permits, locate stock handling facilities, camp facilities, and improvements at least 300 feet from lakes, streams, and springs.
- Educate stock handlers about at-risk fish species and how to minimize negative effects to the species and their associated habitat.
- Employ appropriate dispersion techniques to range management, including judicial placement of saltblocks, troughs, and fencing, to prevent damage to riparian areas but increase weed control.
- Equip each watering trough with a float valve.

Within riparian areas of these watersheds, more protective measures are required.

- Do not conduct weed treatments involving domestic animals, except where it is determined that these treatments will not damage the riparian system, or will provide long-term benefits to riparian and adjacent aquatic habitats.
- Do not locate troughs, storage tanks, or guzzlers near streams with TEP species, unless their placement will enhance weed-control effectiveness without damaging the riparian system.

Local BLM offices should design conservation measures for treatment plans using the above conservation measures as guidance, but altering it as needed based on local conditions and the habitat needs of the particular TEP aquatic species that could be affected by the treatments. Locally-focused conservation measures would be necessary to reduce or avoid potential impacts such that a Not Likely to Adversely Affect determination would be reached during the local-level NEPA process. BLM offices that are responsible for the protection of Northwest salmonids are directed to the guidance document: Criteria for At-Risk Salmonids: National Fire Plan Activities, Version 2.1 (National Fire Plan Technical Team 2002), which contains detailed instructions for developing suitable conservation measures for these TEP species in conjunction with vegetation treatment programs, and from which many of the above-listed conservation measures were taken.

Butterfly or Moth Conservation Measures

Many local BLM offices already have management plans in place that ensure the protection of these species during activities on public lands. The following conservation measures are the minimum steps required of the BLM to ensure that treatment methods would be unlikely to negatively affect TEP species.
Each local BLM office is required to draw up management plans related to treatment activities that identify any TEP butterfly or moth species or their critical habitat that are present in the proposed treatment areas, as well as the measures that will be taken to protect these species.
Management plans should, at a minimum, follow this general guidance:

- Use an integrated pest management approach when designing programs for managing pest outbreaks.
- Survey treatment areas for TEP butterflies/moths and their host/nectar plants (suitable habitat) at the appropriate times of year.
- Minimize the disturbance area with a pre-treatment survey to determine the best access routes. Areas with butterfly/moth host plants and/or nectar plants should be avoided.
- Minimize mechanical treatments and OHV activities on sites that support host and/or nectar plants.
- Carry out vegetation removal in small areas, creating openings of 5 acres or less in size.
- Avoid burning all of a species' habitat in any 1 year. Limit area burned in butterfly/moth habitat in such a manner that the unburned units are of sufficient size to provide a refuge for the population until the burned unit is suitable for recolonization. Burn only a small portion of the habitat at any one time, and stagger timing so that there is a minimum 2-year recovery period before an adjacent parcel is burned. BLM Vegetation Treatments Programmatic EIS 6-15 June 2007
- Where feasible, mow or wet around patches of larval host plants within the burn unit to reduce impacts to larvae.

- In TEP butterfly/moth habitat, burn while butterflies and/or moths of concern are in the larval stage, when the organisms would receive some thermal protection.
- Wash equipment before it is brought into the treatment area.
- Use a seed mix that contains host and/or nectar plant seeds for road/site reclamation.
- To protect host and nectar plants from herbicide treatments, follow recommended buffer zones and other conservation measures for TEP plants species when conducting herbicide treatments in areas where populations of host and nectar plants occur.
- Do not broadcast spray herbicides in habitats occupied by TEP butterflies or moths; do not broadcast spray herbicides in areas adjacent to TEP butterfly/moth habitat under conditions when spray drift onto the habitat is likely.
- Do not use 2,4-D in TEP butterfly/moth habitat.
- When conducting herbicide treatments in or near habitat used by TEP butterflies or moths, avoid use of the following herbicides, where feasible: clopyralid, glyphosate, hexazinone, imazapyr, picloram, and triclopyr.
- If conducting manual spot applications of glyphosate, hexazinone, or triclopyr to vegetation in TEP butterfly or moth habitat, utilize the typical, rather than the maximum, application rate.

Amphibians and Reptiles Conservation Measures

Many local BLM offices already have management plans in place that ensure the protection of these species during activities on public lands. In addition, the following conservation measures are the minimum steps required of the BLM to ensure that treatment methods would be unlikely to negatively affect TEP species.

Conservation measures:

- Survey all areas that may support TEP amphibians and/or reptiles prior to treatments.
- Conduct burns during periods when the animals are in aquatic habitats or are hibernating in burrows.
- For species with extremely limited habitat, such as the desert slender salamander, avoid prescribed burning in known habitat.
- Do not use water from aquatic habitats that support TEP amphibians and/or reptiles for fire abatement.
- Install sediment traps upstream of aquatic habitats to minimize the amount of ash and sediment entering aquatic habitats that support TEP species.
- Do not conduct prescribed burns in desert tortoise habitat.
- In habitats where aquatic herpetofauna occur, implement all conservation measures identified for aquatic organisms in Chapter 4.
- Within riparian areas, wetlands, and aquatic habitats, conduct herbicide treatments only with herbicides that are approved for use in those areas.
- Do not broadcast spray herbicides in riparian areas or wetlands that provide habitat for TEP herpetofauna.
- Do not use fluridone, glyphosate, or triclopyr BEE to treat aquatic vegetation in habitats where TEP amphibians occur or may potentially occur.
- In desert tortoise habitat, conduct herbicide treatments during the period when desert tortoises are less active.
- To the greatest extent possible, avoid desert tortoise burrows during herbicide treatments.
- When conducting herbicide treatments in upland areas adjacent to aquatic or wetland habitats that support TEP herpetofauna, do not broadcast spray during conditions under which off-site drift is likely.
- In watersheds where TEP amphibians occur, do not apply triclopyr BEE in upland habitats upslope of aquatic habitats that support (or may potentially support) TEP amphibians under conditions that would likely result in surface runoff.
- Follow all instructions and Standard Operating Procedures to avoid spill and direct spray scenarios into aquatic habitats that support TEP herpetofauna.
- Do not use 2,4-D in terrestrial habitats occupied by TEP herpetofauna; do not broadcast spray 2,4-D within ¼ mile of terrestrial habitat occupied by TEP herpetofauna.

- When conducting herbicide treatments in or near terrestrial habitat occupied by TEP herpetofauna, avoid using the following herbicides, where feasible: clopyralid, glyphosate, hexazinone, imazapyr, metsulfuron methyl, picloram, and triclopyr.
- When conducting herbicide treatments in upland habitats occupied by TEP herpetofauna, do not broadcast spray 2,4-D, clopyralid, glyphosate, hexazinone, picloram or triclopyr; do not broadcast spray these herbicides in areas adjacent to habitats occupied by TEP herpetofauna under conditions when spray drift onto the habitat is likely.
- If conducting manual spot applications of glyphosate, hexazinone, or triclopyr to vegetation in upland habitats occupied by TEP herpetofauna, utilize the typical, rather than the maximum, application rate.
- If spraying imazapyr or metsulfuron methyl in or adjacent to upland habitats occupied by TEP herpetofauna, apply at the typical, rather than the maximum, application rate.
- If conducting herbicide treatments in or near upland habitats occupied by TEP herpetofauna, consult Table 6-3 on a species by species basis to determine additional conservation measures that should be enacted to avoid negative effects via ingestion of contaminated prey.

Fish Conservation Measures

Conservation measures have been incorporated into the proposed action to reduce negative effects to the point where they do not reduce the quantity or quality of EFH. For the purposes of developing conservation measures for salmon, riparian areas include traditional riparian corridors, wetlands, intermittent streams, and other areas that help maintain the integrity of aquatic ecosystems by 1) influencing the delivery of coarse sediment, organic matter, and woody debris to streams, 2) providing root strength for channel stability, 3) shading the stream, and 4) protecting water quality. Estuarine and coastal marine EFH of particular concern is described above for groundfish, pelagic fish, crabs, and scallops.

Activities associated with the proposed vegetation treatments would have the potential to negatively affect salmonids, pelagic fish and groundfish, and Alaskan crabs and scallops and their habitat. Implementation of the measures listed below would minimize these potential impacts to a negligible level such that the quantity and quality of EFH is not reduced.

<u>General Measures</u>

- Establish riparian, estuarine, and coastal buffer strips adjacent to salmonid, groundfish and pelagic fish, and Alaskan crab and scallop habitats to reduce direct impacts to the various life stages of these species. Buffers widths should depend on the specific ecological function for which protection is desired (e.g., streambanks stabilization, control of sediment inputs from surface erosion, or maintenance of shade to stream channels). Local BLM field offices would consult BLM and Forest Service ERAs prepared for the BA and PEIS to obtain programmatic guidance on appropriate buffer distances. Field offices can also input information on local site conditions (e.g., soil type, vegetation type, precipitation, treatment method) into interactive spreadsheets developed for the ERAs to develop more site-specific, and in most cases less restrictive, buffers for individual projects.
- Implement Standard Operating Procedures to minimize sedimentation and disturbance of riparian, estuarine, and coastal vegetation.
- To avoid erosion and future recreational uses within close vicinity of aquatic areas, limit or exclude construction of new permanent or temporary roads within the boundary of treatment riparian areas.
- Where possible, to avoid increased instream sedimentation, choose low-intensity burns and manual treatment methods over mechanical treatment methods and use of domestic animals.

<u>Prescribed Burning Treatments</u>

- Where feasible, avoid ignition of fires within buffer strips.

Mechanical Treatments

- Minimize the use of mechanical treatment methods (including timber harvest and timber salvage) within buffer strips.
- To avoid damaging potential spawning areas, do not use mechanical equipment in perennial channels, or in intermittent channels with water, except at crossings that already exist. Do not use mechanical equipment in estuaries.
- Minimize log hauling during wet weather, and on non-paved roads.
- Minimize skidding or ground-based yarding within buffer strips.
- Do not remove large woody debris from buffer strips

Herbicide Treatments

- Where feasible, minimize spray operations around aquatic habitats to days when winds are > 10 miles per hour for ground applications, and > 6 miles per hours for aerial applications, to avoid wind drift or direct application of herbicides into these habitats.
- Where feasible, minimize the use of terrestrial herbicides (especially bromacil, diuron, and tebuthiuron) in watersheds with downgradient ponds and streams if potential impacts to salmonids are of concern.
- Time herbicide applications near salmonid-bearing streams, and estuaries and coastal/marine habitats used by salmon and FMP species so that they do not overlap with sensitive life-history stages of these fish (would vary at the local level).

Biological Treatments

- In watersheds that support salmonids or that flow into watersheds where salmonids occur, to minimize the cumulative effect of grazing in areas that have been burned, do not conduct weed control by domestic animals in burned areas until they have recovered enough to control ash and sediment produced by the treatment.
- Prohibit livestock grazing in estuaries.

Appendix B – Additional Information about Lands with Wilderness Characteristics

This information supplements the Chapter 3 *Lands with Wilderness Characteristics* section.

Initial and Intensive Inventories

Section 603 of the *Federal Land Policy and Management Act* of 1976 required the BLM to complete a wilderness review of all public lands within 15 years of passage of the act. The initial and intensive inventory processes that occurred between 1978 and 1980 ultimately resulted in the designation of 1 instant study area (ISA) and 14 WSAs in 1991 (see *Wilderness Study Areas* portion of *Special Management Areas* section in Chapter 3).

Inventory Updates

Section 201 of the *Federal Land Policy and Management Act* requires the BLM to prepare and maintain an inventory of the public lands on a continuing basis and the courts have interpreted this to include a requirement to maintaining its wilderness inventories. Since 1992, approximately 3,139 acres of land adjacent to or within three existing WSAs (Fish Creek Rim, Abert Rim, and Guano Creek) were acquired through land exchanges and donations. The BLM evaluated the wilderness characteristics of these acquired lands in 2001. Approximately 1,194 acres of these lands were found to contain wilderness characteristics (see Appendix J4, USDI 2001a).

In 2005 a citizen group provided the BLM with a wilderness inventory report proposing 18 new WSAs covering over 1.7 million acres in the Lakeview Resource Area (ONDA 2005). The group submitted two supplemental sets of digital photos and photo logs in 2007 regarding two of these proposals. The group also submitted a separate inventory report covering public lands in the Three Rivers Resource Area on the adjacent Burns District (ONDA 2007). Two of the proposals presented in that document covered lands in both the Burns and Lakeview Districts.

Since 2007, the BLM has been conducting wilderness inventory updates for public lands outside of designated WSAs, following current inventory guidance (USDI 2007g, 2008e, 2012d, 2012e). The BLM reviewed the existing wilderness inventory information contained in BLM's wilderness inventory files, previously published inventory findings (USDI 1979a, 1979b, 1979c, 1979d, 1980a, and 1980b), and citizen-provided wilderness information. The Resource Area reviewed all of this existing information to determine if additional data updates or field inventory were needed. Where data updates were necessary, they were completed prior to conducting the wilderness inventory update for a given area. At a minimum, route inventory updates were completed. This included field inventory, updating route data attributes, and capturing additional route photos.

BLM compiled existing photos or took additional photos of field conditions and prepared a photo log to supplement the photos provided by citizens/groups. All of this information was compiled into inventory files organized by geographic area. The Resource Area then completed route analysis forms, made inventory unit boundary determinations, and subsequently evaluated wilderness characteristics within each inventory unit. The wilderness characteristics inventory updates have been published or made available to the public on the Lakeview District's website at http://www.blm.gov/or/districts/lakeview/plans/inventas.php.

Pursuant to 40 C.F.R. Section 1502.21, the BLM hereby incorporates, by reference, the entirety of its wilderness inventory update documentation files into the analysis contained within this environmental assessment. BLM's findings are summarized in Table B-1, and shown on Figure B-1.

Table B-1. Wilderness Characteristics Inventory Update Summary

Area Name	Current Inventory Unit Number	Original Inventory Unit Number(s)	Acreage	Wilderness Character Found?	Comments
Abert Rim Highway Acquisition					
Abert Rim Parcel 1	OR-015-101	None	190	yes	contiguous with Abert Rim WSA; managed as ACEC
Abert Rim Addition					
Binkie Lake	OR-015-102	1-102	14,211	no	
Synder Creek 1	OR-015-101A	1-1101	26	yes	contiguous with Abert Rim WSA
Synder Creek 2	OR-015-101B	1-101	834	yes	contiguous with Abert Rim WSA
Colvin Lake	OR-015-104	1-104	13,525	no	
29 small units	OR-015-0000	none	<5,000 each	no	failed to meet size criteria
Bald Mountain					
Bald Mountain	OR-015-144	1-144	13,758	no	
1 small unit	OR-015-0000	None	4,731	no	failed to meet size criteria
Basque Hills South - Sagehen					
Hawk Mountain North Addition	OR-015-146C	1-146A	57	yes	contiguous with Hawk Mountain WSA
Hawk Mountain Northeast	OR-015-146D	1-146	3,194	no	contiguous with WSA, but unnatural
Basque Hills Southeast Addition	OR-015-084G	2-84A	1,375	yes	contiguous with Basque Hills WSA
Rincon Southwest	OR-015-082P	2-82H	2,773	yes	contiguous with Rincon WSA
2 small units	OR-015-0000	none	<5,000 each	no	failed to meet size criteria
Bell Rim					
19 small units	OR-015-0000	1-18	<5,000 each	no	failed to meet size criteria
Black Hills					
Squaw Lake	OR-015-041	1-41 / 1-42	28,370	no	
Post Lake	OR-015-044	1-44	9,600	no	
4 small units	OR-015-045A, OR-015-045B, OR-015-043B	1-43 / 1-45	<5,000 each	no	failed to meet size criteria
Breezy					
Breezy East	OR-015-58B	1-58	606	yes	contiguous to Sheldon WSA
Breezy	OR-015-58A	1-58	4,189	yes	contiguous to Sheldon WSA
2 small units	OR-015-0000	1-58	<5,000 each	no	failed to meet size criteria
Bridge Creek					
15 small units	OR-015-0000	none	<5,000	no	failed to meet size

Area Name	Current Inventory Unit Number	Original Inventory Unit Number(s)	Acreage	Wilderness Character Found?	Comments
			each		criteria
Burma Rim					
Sheep Rock	OR-015-047	1-47 / 1-61	48,999	no	
Burma Rim	OR-015-048	1-48	36,362	no	
3 small units	OR-015-0000	1-46/ 1-47/ 1-65	<5,000 each	no	failed to meet size criteria
Checkerboard					
Checkerboard North	OR-015-0000	none	36,212	no	land base not contiguous
Checkerboard Southeast	OR-015-0000	none	8,918	no	land base not contiguous
10 small units	OR-015-0000	none	<5,000 each	no	failed to meet size criteria
Christmas Lake Valley & Sand Dunes South					
South Sand Dunes	OR-015-209	none	4,474	yes	contiguous to Sand Dunes WSA
Fossil Lake	OR-015-023	1-23	5,052	no	
Vaughn Well	OR-015-026	1-26	5,519	no	
Christmas Valley East	OR-015-027	1-27	5,078	no	
Fandango North	OR-015-046	1-46	14,402	no	
13 small units	OR-015-0000	none	<5,000 each	no	failed to meet size criteria
Coglan Buttes					
Coglan Buttes East	OR-015-096A	1-96	11,029	no	
Coglan Buttes West	OR-015-096B	1-96	22,006	no	
Abert Burn North	OR-015-098A	1-98	9,004	no	
Abert Burn South	OR-015-098B	1-98	9,247	no	
12 small units	OR-015-0000	none	<5,000 each	no	failed to meet size criteria
Coleman Rim					
Coleman Valley-Macy Flat	OR-015-126	1-126	29,924	no	shared with Surprise FO
8 small units	OR-015-0000	1-126	<5000 each	no	failed to meet size criteria
Coleman Valley West					
Coleman Valley West/Coleman Ranch	OR-015-157	1-157 / CA-020-1005	27,315	no	shared with Surprise FO
2 small units	OR-015-0000	none	<5,000 each	no	failed to meet size criteria
Commodore Ridge					
Skokum Lake	OR-015-105	1-105	17,357	no	
4 small units	OR-015-0000, OR-015-105B, and OR-015-105C	1-100 / 1-105	<5,000 each	no	failed to meet size criteria
Cox Canyon					
Rehart Canyon	OR-015-037	1-37	31,398	no	
Cox Butte North	OR-015-038A	1-38	17,835	no	
Cox Butte South	OR-015-038B	1-38	13,357	no	
Mack Cabin	OR-015-052	1-52	20,141	no	
Rawhide Creek	OR-015-053A	1-53	15,021	no	
Packsaddle Draw West	OR-015-073A	1-73	10,365	no	

Area Name	Current Inventory Unit Number	Original Inventory Unit Number(s)	Acreage	Wilderness Character Found?	Comments
Packsaddle Draw East	OR-015-073B	1-73	6,833	no	
Juniper Creek	OR-015-074	1-74	16,441	no	
23 small units	OR-015-0000	none / 1-36	<5,000 each	no	failed to meet size criteria
Coyote Hills					
Coyote Hills	OR-015-110	1-110	20,662	no	
East Coyote Hills	OR-015-111	1-111	15,785	no	
6 small units	OR-015-0000		<5,000	no	failed to meet size criteria
Diablo Mountain East Addition					
Whiskey Mountain	OR-015-059	1-59	7,772	no	
Coffee Lake	OR-015-060	1-60	6,576	no	
Whiskey Lake West	OR-015-062	1-62	16,457	no	
Wiskey Lake East	OR-015-063	1-62	29,537	no	
1 small unit	OR-015-0000	1-62	<5,000 each	no	failed to meet size criteria
Diablo Mountain South Addition					
ZX Ranch	OR-015-095	1-95	18,679	yes	contiguous with Diablo Mountain WSA
5 small units	OR-015-0000	none	<5,000 each	no	failed to meet size criteria
Diablo Mountain North Addition					
Squaw Lake South	OR-015-041B	1-41	8,939	no	
St. Patrick South	OR-015-043C	1-43 / 1-45	10,935	no	
Diablo Mountain West					
Diablo West	OR-015-206	none	4,418	yes	contiguous with Diablo Mountain WSA
11 small units	OR-015-0000	none	<5,000 each	no	failed to meet size criteria
Drake Creek					
Drake Creek	OR-015-210	none	5,040	no	
13 small units	OR-015-0000	none	<5,000 each	no	failed to meet size criteria
Green Mountain					
Green Mountain	OR-015-021C	1-21B	5,474	no	
18 small units	OR-015-0000	1-21	<5,000 each	no	failed to meet size criteria
East Rabbit Hills					
Rabbit Hills Northeast	OR-015-091	1-91	10,565	no	
Sunstone	OR-015-161	1-161	5,179	no	
Horseshoe Rim	OR-015-087	1-87	19,000	no	
Sunstone Mine North	OR-015-088	1-88 / 1-161	35,375	no	
Bacon Camp	OR-015-089	1-89	5,478	no	
5 small units	OR-015-0000	1-91/1-161	<5,000 each	no	failed to meet size criteria
Fish Creek					

Area Name	Current Inventory Unit Number	Original Inventory Unit Number(s)	Acreage	Wilderness Character Found?	Comments
Acquisitions					
Lynch's Rim A	OR-015-117D	none	160	no	unnatural
Lynch's Rim B	OR-015-117B	none	40	yes	contiguous with Fish Creek Rim WSA
Lynch's Rim C	OR-015-117F	none	365	yes	contiguous with Fish Creek Rim WSA; managed as ACEC
Lynch's Rim D	OR-015-117G	none	8	yes	contiguous with Fish Creek Rim WSA
Fish Creek Rim Addition					
Monument Flat	OR-015-117A	1-117A	17,417	no	
Monument Flat North	OR-015-117C	1-117A	1,799	no	failed to meet size criteria
Fish Creek North	OR-015-117D	1-117B	2,207	no	unnatural
Fish Creek Parcel East	OR-015-117E	none	40	yes	contiguous with Fish Creek Rim WSA
Guano Creek Acquisition					
Shirk Ranch Parcel 1	OR-015-132A	none	64	yes	contiguous with Guano Creek WSA; managed as ACEC
Shirk Ranch Parcel 2	OR-015-132B	none	41	yes	contiguous with Guano Creek WSA; managed as ACEC
Billy Burr Parcel	OR-015-132C	none	510	yes	contiguous with Guano Creek WSA; managed as ACEC
Hart Mountain Southeast					
Lone Grave Butte North	OR-015-134B	1-134B	19,587	no	
Lone Grave Butte South	OR-015-134C	1-134B	11,831	no	
Guano Lake	OR-015-135	1-135	15,035	no	
6 small units	OR-015-0000	1-134 / 1-135	<5,000 each	no	failed to meet size criteria
Hart Mountain South					
Calderwood Reservoir	OR-015-123	1-123	7,335	no	
Fisher Canyon	OR-015-124	1-124	11,772	no	
Long Lake	OR-015-128	1-128	7,552	no	
Jack Lake	OR-015-129	1-129	11,475	no	
Little Reservoir	OR-015-130	1-130	25,559	no	
Shirk Rim	OR-015-133A	1-133	5,324	no	
Guano Lake West	OR-015-133B	1-133	5,998	no	
20 small units	OR-015-0000		<5,000 each	no	failed to meet size criteria
Hager Mountain, Duncan Reservoir, & Egli Rim					
Egli Rim	OR-015-040	1-40	6,308	no	

Area Name	Current Inventory Unit Number	Original Inventory Unit Number(s)	Acreage	Wilderness Character Found?	Comments
Duncan Reservoir	OR-015-208	none	7,315	no	
6 small units	OR-015-0000	none / 1-39	<5,000 each	no	failed to meet size criteria
Hayes Butte					
Hayes Butte North	OR-015-019	1-19	6,306	no	
Hayes Butte South	OR-015-020	1-20	6,795	no	
3 small units	OR-015-0000	none	<5,000	no	failed to meet size criteria
Juniper Mountain					
Gray's Butte	OR-015-071	1-71	11,603	no	
Juniper Mountain	OR-015-072	1-72	11,760	no	
Eagle Butte	OR-015-085	1-85	13,850	no	
Natural Corral Draw	OR-015-086	1-86	14,088	no	
2 small units	OR-015-0000	none	<5,000 each	no	failed to meet size criteria
Lake Abert					
Lake Abert	OR-015-099	1-99	40,594	no	
Lake Abert Northwest	OR-015-097	1-97	18,555	no	
3 small units	OR-015-0000	none	<5,000 each	no	failed to meet size criteria
Moonlight Butte					
Little Benjamin Lake	OR-015-006	1-6	13,843	no	
Painter Ranch	OR-015-007	1-7	8,781	no	
Wardell Well	OR-015-008	1-8	10,246	no	
Bull Lake	OR-015-009	1-9	31,720	no	
Monument Rock					
Monument Rock	OR-015-210	none	5,977	no	
7 small units	OR-015-0000	none	<5,000 each	no	failed to meet size criteria
Northwest Resource Area					
32 small units	OR-015-0000	1-1	<5,000 each	no	failed to meet size criteria
Oatman Flat					
Oatman Flat	OR-015-205	none	7,238	no	
7 small units	OR-015-0000		<5,000 each	no	failed to meet size criteria
Poverty Basin					
Dog Leg South	OR-015-28A	1-28	6,209	no	
Goodrich Well South	OR-015-30B	1-30	5,098	no	
Chase	OR-015-032A	1-32	8,064	no	
Alkali Valley	OR-015-035A	1-35	9,530	no	
Alkali Buttes	OR-015-035B	1-35	6,464	no	
Horse Mountain	OR-015-049A	1-49	15,687	no	
Horse Mountain Southeast	OR-015-050	1-50	7,711	no	
Doughnut Mountain	OR-015-051	1-51	10,808	no	
Alkali Lake West	OR-015-069A	1-69	11,795	no	
Venator Butte	OR-015-070A	1-70	8,978	no	
Jug Mountain	OR-015-083A	1-83	11,808	no	
Jug Mountain North	OR-015-083B	1-83	5,262	no	

Area Name	Current Inventory Unit Number	Original Inventory Unit Number(s)	Acreage	Wilderness Character Found?	Comments
31 small units	OR-015-0000	none	<5,000 each	no	failed to meet size criteria
Rabbit Hills					
Flint Hills	OR-015-106	1-106	20,642	no	
Rabbit Basin	OR-015-107	1-107	12,094	no	
Rabbit Hills North	OR-015-108F	1-108F	7,367	no	
Rabbit Hills South	OR-015-108G	1-108F	6,207	no	
3 small units	OR-015-0000	1-108	<5,000 each	no	failed to meet size criteria
Sand Dunes Addition					
Lost Forest	OR-015-012	1-12	6,472	no	
Juniper Island	OR-015-025	1-25	16,633	no	
South Plateau West	OR-015-029A	1-29	8,416	no	
Saunders Rim					
Twin Buttes	OR-015-064	1-064	23,273	no	
Saunders Rim	OR-015-065	1-065/ 1-66	25,868	no	
Nub	OR-015-067	1-067	6,910	no	
3 small units	OR-015-0000	none	<5,000 each	no	failed to meet size criteria
Sheldon Rim					
Sheldon Rim Contiguous	OR-015-190	none	475	no	failed to meet size criteria
Snuff-Twelvemile Creek					
Snuff-Twelvemile Creek	OR-015-164	1-164 / CA-020-1004	15,980	no	shared with Surprise Field Office
South Warner Rim					
Wakefield Cabin	OR-015-118	1-118	24,333	no	
South Warner Rim	OR-015-119	1-119	10,403	no	
12 small units	OR-015-118B, OR-015-118C, OR-015-118D, OR-015-119B, OR-015-0000	none / 1-118 / 1-119	<5,000 each	no	failed to meet size criteria
Spaulding 1 Addition					
Spaulding Reservoir East	OR-015-139A	1-139A	5,410	no	
Sagehen Flat East	OR-015-145A	1-145A	7,593	no	
Sagehen Flat West	OR-015-145B	1-145B	8,964	no	
Sagehen Spring North	OR-015-140B	1-140B	9,580	no	
1 small unit	OR-015-140A	1-140A	4,732	no	failed to meet size criteria
Spaulding 2 Addition					
Wilson Spring	OR-015-142	1-142	16,839	no	
Ryegrass Valley	OR-015143B	1-143	35,402	no	
Beaty's Butte	OR-015-136	1-136	6,301	no	
Mahogany Butte	OR-015-137	1-137	7,568	no	
Buckaroo Pass	OR-015-138	1-138	13,330	no	
Basque Hills Addition	OR-026-84F	2-84	400	yes	contiguous with Basque Hills WSA
1 small unit	OR-015-143A	1-143	1,400	no	failed to meet size criteria

Area Name	Current Inventory Unit Number	Original Inventory Unit Number(s)	Acreage	Wilderness Character Found?	Comments
Sucker Creek					
Coleman Rim South	OR-015-120A	1-120A	7,143	yes	
Coleman Rim North	OR-015-120B	1-120B	5,032	no	
2 small units	OR-015-0000		<5,000	no	failed to meet size criteria
Tucker Hill					
Tucker Hill	OR-015-116	1-116	8,320	no	
23 small units	OR-015-0000	none	<5,000 each	no	failed to meet size criteria
Twin Lakes - Euchre Butte					
Twin Lakes	OR-015-080	1-80	20,357	no	
Bisquit Point	OR-015-081	1-81	8,494	no	
Euchre Butte Southwest	OR-015-082B	1-82	14,090	no	
Euchre Butte Northeast	OR-015-082A	1-82	9,773	no	
1 small unit	OR-015-0000	1-82	1,300	no	failed to meet size criteria
Walker Butte					
Walker Butte East	OR-015-004B	1-4	9,268	no	
Walker Butte North	OR-015-004A	1-4	9,344	no	
Walker Butte Southwest	OR-015-004C	1-4	6,970	no	
17 small units	OR-015-0000	none	<5,000 each	no	failed to meet size criteria
Warner Wetlands (Poker Jim)					
Swamp Lake	OR-015-112B	1-112	8,615	no	
Warner Wetlands	OR-015-114	1-114	33,783	yes	adjacent to Poker Jim Ridge WSA (USFWS)
Poker Jim A	OR-015-114A	none	141	yes	contiguous with Poker Jim Ridge WSA (USFWS)
Poker Jim B	OR-015-114B	Poker Jim Ridge WSA	89	yes	portion of Poker Jim Ridge WSA (USFWS) transferred to BLM
Poker Jim Addition C	OR-015-114C	none	37	yes	contiguous with Poker Jim Ridge WSA (USFWS)
Poker Jim Addition D	OR-015-114D	none	23	yes	contiguous with Poker Jim Ridge WSA (USFWS)
Poker Jim Addition E	OR-015-114E	none	243	yes	contiguous with Poker Jim Ridge WSA (USFWS)
14 small units	OR-015-0000	1-112 / none	<5000 each	no	failed to meet size criteria
West Benjamin Lake					
West Benjamin Lake	OR-015-005	1-5	10,618	no	
8 small units	OR-015-000	none	<5,000 ea	no	failed to meet size criteria
West Orejana					

Area Name	Current Inventory Unit Number	Original Inventory Unit Number(s)	Acreage	Wilderness Character Found?	Comments
Monohan Lake	OR-015-054	1-54	8,655	no	
Pickett Spring	OR-015-055B	1-55	5,193	no	
Egan Cabin	OR-015-075	1-75	6,114	yes	
Steamboat Point	OR-015-076	1-76	20,674	no	
Juniper Canyon	OR-015-077	1-77	13,533	no	
Sunrise Cabin	OR-015-090	1-90	5,541	no	
Northwest Warner Valley	OR-015-091D	1-91	5,841	no	
Northeast Warner Valley	OR-015-092	1-92	6,493	no	
13 small units	OR-015-0000	1-54 / 1-55 / 1-57B / 1-76 / 1-91 / 1-92 / 1-94 / 2-92A	<5,000 each	no	failed to meet size criteria
West Warm Springs					shared with Burns District
Unit 16	OR-025-024P	2-114	11,332	no	
Unit 18	OR-025-024A	2-92A	31,000	no	
Unit 19	OR-025-024J	2-69	14,220	no	
Unit 20	OR-025-024H	2-64A	14,944	no	
Unit 21	OR-025-024E	2-61E	17,083	no	
Unit 22	OR-025-024W	2-61F	7,389	no	
Unit 23	OR-025-024G	1-57B	15,315	no	
Unit 24	OR-025-024W	1-53	6,290	no	
20 small units	NI	1-53 / 1-57B / 2-92B	<5,000 each	no	failed to meet size criteria
Crane Mountain and South Resource Area					
15 small units	OR-015-0000	None	<5,000 each	no	Scattered parcels; all failed to meet size criteria
Hart Mountain East					Shared with Burns District; not evaluated yet
Lonesome Lakes West					not evaluated yet
Poker Jim Addition North					not evaluated yet
Yreka Butte					Shared with Prineville District; not evaluated yet

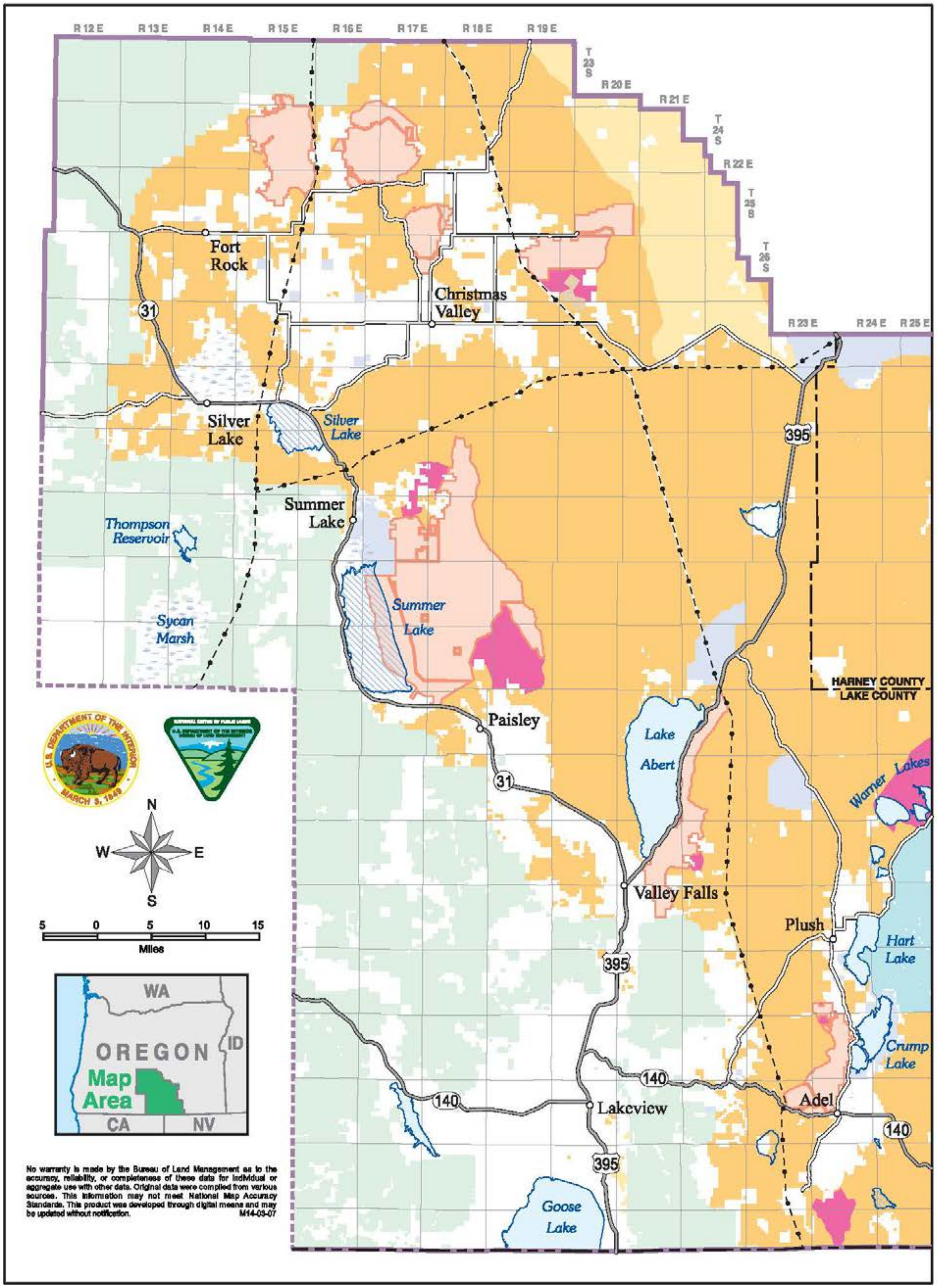
Supplemental Wilderness Inventory Information

BLM received a supplemental report from ONDA that consists of narrative text, maps, and additional photos of areas that the group believes possess wilderness characteristics. The report was not presented specifically as a formal comment on this environmental analysis and was received after the close of the public comment period. Nonetheless, BLM reviews and determines whether this type of submittal meets the definition of “significant new information” that would require additional NEPA analysis. Under 50 CFR 1502.9(c) significant new information is defined as, new information that is relevant to environmental concerns and bearing on the actions or their impacts.

The new ONDA report addresses wilderness characteristics inventory updates that BLM previously completed, augmenting information relative to previous disagreements between ONDA and the BLM regarding roads and naturalness. BLM will address the report in detail as it continues to update and maintain its wilderness characteristics inventory.

But the report is not significant new information because it is not relevant to environmental concerns and does not bear on the Proposed Action in this EA or its impacts. The information would not substantially alter the impact analyses and conclusions in this EA, nor would it lead to substantial changes in proposed Action or decisions that are relevant to environmental concerns. This is due to the fact that the actions proposed and analyzed in this EA would not reduce the size of any inventory unit or eliminate wilderness characteristics from any unit. Any areas which BLM found to possess wilderness characteristics will be protected, pursuant to the settlement agreement and until a Resource Management Plan Amendment is completed. Units for which BLM has not yet completed an inventory update will also be protected from surface disturbances and permanent developments, pursuant to the settlement agreement and until a Resource Management Plan Amendment is completed. BLM had completed an inventory update for all the units at issue in the recent supplemental report submitted by ONDA and found none of them to possess wilderness characteristics. While the protections of the settlement agreement would no longer apply to those lands, the EA analysis shows no major impacts will occur to lands that are subjected to the full array of treatments (see Tables 2-5 and 2-7) and BLM does not believe that any of the actions analyzed in this EA would affect wilderness characteristics that ONDA believes may be present in the those areas. In other words, if a subsequent BLM review finds additional areas possessing wilderness characteristics, the effects of the alternatives on these characteristics would be similar to what is described for areas currently deemed to possess wilderness characteristics in this analysis.

Figure B-1. Lands with Wilderness Characteristics



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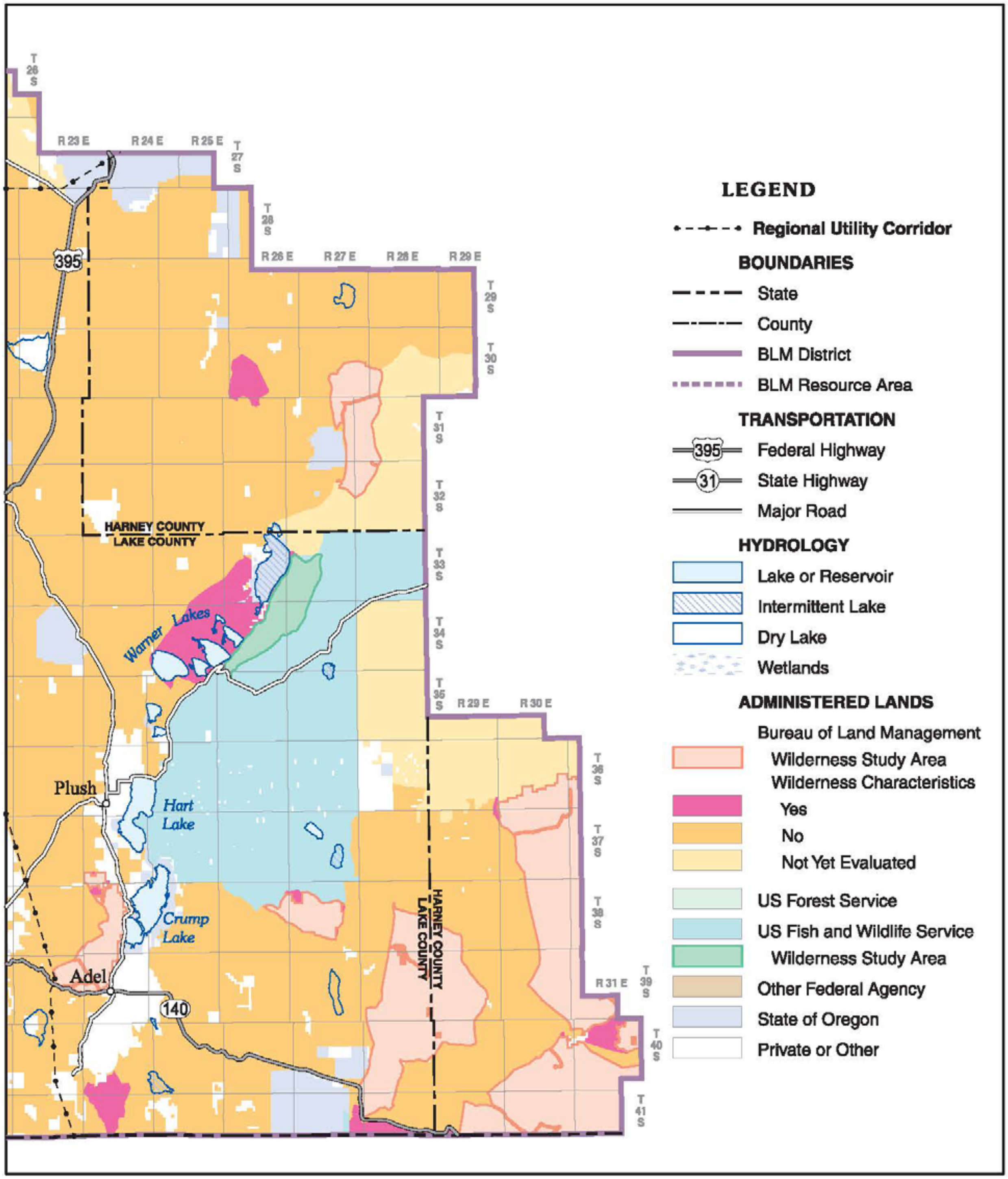
Bureau of Land Management
Integrated Invasive Plant Management Environmental Assessment
Lakeview Resource Area
2014

Figure B-1. Lands with Wilderness Characteristics



Appendix C – The Herbicides, Formulations, Adjuvants, and Estimated Use

The Herbicides - The 14 herbicides proposed for use on the Lakeview Resource Area are a subset of the hundreds of herbicides registered for use in the U.S. They were chosen by the BLM nationally for maximum effectiveness against wildland weeds and least environmental and non-target species' risks. Table 2-7 in Chapter 2 shows the 14 herbicides with some sample trade names, common plant targets, plant types its selective for, how it is used, land types it is registered for, typical and maximum rates, and whether it can be applied aerially.

Table C-1 - *Summary of Herbicides by Registered Site-Types, Application Methods, and General Constraints from the Labels* supplements the Table 2-7 information by listing potential application methods and a summary of general label constraints.

Herbicides can be categorized as selective or non-selective (see Table 2-7). Selective herbicides kill only a specific type of plant. For example, an herbicide selective for broadleaved plants can be used to manage such species while maintaining desirable grass species in rangeland communities. Non-selective herbicides kill all types of plants, and thus must be applied only to the target species. Herbicides can be used selectively to control specific types of vegetation (e.g., killing a specific invasive species), or non-selectively in monocultures of invasive plants where there is no objective to retain some plants. Some herbicides are post-emergent, which means they can be used to kill existing vegetation; others are pre-emergent, which stops vegetation before it grows (e.g., prohibiting seeds from germinating) (Table 2-7).

Table C-2 – *Herbicide Formulations Approved for use on BLM Lands* displays the BLM National list of approved herbicides, which is reviewed and updated at least annually. This list identifies herbicides that are known to be consistent with the formulations analyzed in the Risk Assessments (see Appendix D) and otherwise suitable for wildland use.

Table C-3 – *Adjuvants Approved for Use on BLM Administered Lands* displays the adjuvants approved for use on BLM lands nationally. This list is also reviewed at least annually. This list identifies adjuvants known not to contain R-11, petroleum, and other products prohibited by mitigation measures (see Appendix A), or that are otherwise considered unsuitable for wildland use. Table C-3 also identifies those adjuvants identified by the US Fish and Wildlife Service in their 2013 *Biological Opinion for Fish Habitat Restoration Activities Affecting ESA-listed Animal and Plant Species and their Designated Critical Habitat found in Oregon, Washington and parts of California, Idaho and Nevada* (USFWS 2013) as appropriate for use near streams with listed fish. These adjuvants are designated under the column "ARBO II", for the second programmatic Aquatic Restoration Biological Opinion.

Table C-4 - *Estimated Treatment Acres, by Alternative and Category* provides an estimate *by treatment method* (and each herbicide) of the acres to be treated and the pounds to be used to treat all 44,090 acres in Treatment Category 1. These numbers were generated by multiplying the summary of acres for each of the 30 invasive plants on Table 2-1 by the treatment method percentages shown on Tables 2-5 and 2-8, all in Chapter 2. They are estimates only, based on what is known about the current plant populations and their locations, and based on the current experience with and study of the herbicides and other treatment methods. Where used in the analysis in Chapter 3, the numbers are treated as indicators, not limits. This table serves as the basis for certain comparisons within chapter 3 such as the expected 30 percent reduction in the use of 2,4-D with the adoption of the Proposed Action when compared to the No Action Alternative.

Table C-1. Summary of Herbicides by Registered Site-Types, Application Methods, and General Constraints from the Labels

Herbicides	Registered for: Programs/Treatment Areas	Application Method	General Constraints from Label *(follow all label requirements)*
2,4-D	Rangeland Public domain forestland Energy and mineral sites Rights-of-way Recreation ESR Riparian (specific formulations)	Plane, helicopter backpack, horseback, ATV, and truck (spot, boom/broadcast)	• Toxic to aquatic invertebrates. • Only use approved formulations for streamside applications. • Drift or runoff may adversely affect aquatic invertebrates and non-target plants. • For terrestrial uses, do not apply directly to water, or to areas where surface water is present or to intertidal areas below the mean high water mark. Do not contaminate water when disposing of equipment washwaters.
Chlorsulfuron	Rangeland Energy and mineral sites Rights-of-way Recreation ESR Riparian/wetland	Plane, helicopter backpack, horseback, ATV, and truck (spot, boom/broadcast)	• Do not apply more than 1.33 oz/acre per year in pasture, range, and CRP treatments. • Do not treat frozen soil. • Applications to powdery, dry soil when there is low likelihood of rain soon may result in off-site damage by wind-borne soil particles.
Clopyralid	Rangeland Public domain forestland Energy and mineral sites Rights-of-way Recreation ESR	Plane, helicopter backpack, horseback, ATV, and truck (spot, boom/broadcast)	• Do not apply where soils have a rapid to very rapid permeability close to aquafers. • Do not contaminate irrigation ditches or water used for irrigation or domestic uses. • Do not apply directly to water, or to areas where surface water is present, or to intertidal areas below the mean high water mark. • Do not contaminate water when disposing of equipment wash-water. • Avoid spray drift.
Dicamba	Rangeland Public domain forestland Energy Mineral sites Rights-of-way Recreation ESR	Plane, helicopter backpack, horseback, ATV, and truck (spot, boom/broadcast)	• To prevent point source contamination, do not mix or load this pesticide within 50 feet of wells (including abandoned wells and drainage wells), sink holes, perennial or intermittent streams and rivers, and natural or impounded lakes and reservoirs. Do not apply this pesticide within 50 feet of wells. • Do not apply under conditions which favor runoff. Do not apply to impervious substrates such as paved or highly compacted surfaces in areas with high potential for ground water contamination. Ground water contamination may occur in areas where soils are permeable or coarse and ground water is near the surface.
Dicamba + Diflufenzopyr	Rangeland Energy Mineral sites Rights-of-way Industrial Pipeline	Backpack, horseback, ATV, and truck (spot, boom/broadcast)	• No aerial application of this mix (BLM Nat'l EIS). • Do not load, mix, or apply within 50 ft of wells. • Do not apply directly to water, where surface water is present, or to intertidal areas. Do not contaminate water when disposing of equipment washwaters. • Do not apply to impervious substrates or under conditions which favor runoff. Do not apply to soils which classify as sand. • Be cognizant of leaching where soils are permeable or where water table is shallow.

Herbicides	Registered for: Programs/Treatment Areas	Application Method	General Constraints from Label *(follow all label requirements)*
Fluridone	Aquatic	Helicopter , boat, backpack, horseback, ATV, and truck (spot, boom/broadcast)	• Consult local state fish and game agency and water control authorities before applying this product to public water. Permits may be required. • Do not apply in tidewater/brackish water.
Glyphosate	Aquatic Riparian/wetland Rangeland Public domain forestland Energy Mineral sites Rights-of-way Recreation ESR	Plane, helicopter backpack, horseback, ATV, and truck (spot, boom/broadcast)	• Only use approved aquatic formulations for aquatic applications. • Do not contaminate water when cleaning equipment or disposing of equipment washwaters. • Consult local state fish and game agency and water control authorities before applying this product to public water. • Treatment of aquatic weeds can result in oxygen depletion or loss due to decomposition of plants which can cause fish suffocation. • This is a non-selective herbicide. • Avoid drift.
Hexazinone	Rangeland Public domain forestland Energy and mineral sites Rights-of-way Recreation	Plane, helicopter backpack, horseback, ATV, and truck (spot, boom/broadcast)	• Do not apply directly to water, or to areas where surface water is present, or to intertidal areas below the mean high water mark. Do not contaminate water when disposing of equipment wash-water. • Use care where soils are permeable to avoid groundwater contamination. • Will kill grasses.
Imazapic	Rangeland Public domain forestland Energy and mineral sites Rights-of-way Recreation ESR	Plane, helicopter backpack, horseback, ATV, and truck (spot, boom/broadcast)	• Do not apply directly to water, or to areas where surface water is present, or to intertidal areas below the mean high water mark. • Do not contaminate water when disposing of equipment wash-water. • To reduce run-off, avoid applications when rain is forecast w/in 48 hours.
Imazapyr	Riparian/wetland Rights-of-way	Helicopter, backpack, horseback, ATV, and truck (spot, boom/broadcast)	• Aquatic applications (with approved products) can only be made within the restrictions outlined on the label. • Otherwise, do not apply directly to water, or to areas where surface water is present, or to intertidal areas below the mean high water mark. • Do not contaminate water when disposing of equipment wash-water.
Metsulfuron methyl	Rangeland Public domain forestland Energy and mineral sites Rights-of-way Recreation ESR	Plane, helicopter backpack, horseback, ATV, and truck (spot, boom/broadcast)	• Do not apply directly to water, or to areas where surface water is present, or to intertidal areas below the mean high water mark. • Do not contaminate water when disposing of equipment wash-water. • This herbicide is injurious to plants at extremely low concentrations. Nontarget plants may be adversely effected from drift and run-off.
Picloram	Rangeland Public domain forestland Energy and mineral sites Rights-of-way	Plane, helicopter backpack, horseback, ATV, and truck (spot, boom/broadcast)	• Restricted use. May injure susceptible, non-target plants. This herbicide is injurious to plants at extremely low concentrations. Nontarget plants may be adversely affected from drift and run-off. • Do not apply directly to water, or to areas where surface water is present, or

Herbicides	Registered for: Programs/Treatment Areas	Application Method	General Constraints from Label *(follow all label requirements)*
	Recreation ESR		to intertidal areas below the mean high water mark. • Do not make application when circumstances favor movement from treatment site. Do not contaminate water or water sources when mixing, loading, or disposing of equipment wash-water. • May leach thru soil and contaminate ground water where soils are permeable, particularly where water table is shallow.
Sulfometuron methyl	Public domain forestland Energy and mineral sites Rights-of-way Recreation	Helicopter Backpack, horseback, ATV, and truck (spot, boom/broadcast)	• Do not apply directly to water, or to areas where surface water is present, or to intertidal areas below the mean high water mark. Do not contaminate water when disposing of equipment wash-water. • Applications to powdery, dry soil when there is low likelihood of rain soon may result in off-site damage by wind-borne soil particles. • Do not treat frozen soil. • Do not apply in or on irrigation ditches or canals, including their outer banks.
Triclopyr	Riparian/wetland Rangeland Public domain forestland Energy and mineral sites Rights-of-way Recreation	Plane, helicopter backpack, horseback, ATV, and truck (spot, boom/broadcast)	• Consult local state fish and game agency and water control authorities before applying this product to public water to determine if a permit is needed. • Treatment of aquatic weeds can result in oxygen depletion or loss due to decomposition of plants in certain situations, which can cause fish suffocation.. • Certain approved products can be used in and around standing water sites. Minimize overspray to open water (streams, lakes, etc) when treating vegetation growing at water edge. Do not contaminate water when disposing of equipment wash-water.

Table C-2. Herbicide Formulations Approved for use on BLM Lands[1]

Common Name	Trade Name	Manufacturer	EPA Reg. Number	Concentration	Units of Concentration
2, 4-D	Agrisolution 2,4-D LV6	Agriliance, L.L.C.	1381-101	5.6	Lbs. a.e[2]. / gal.
2, 4-D	Agrisolution 2,4-D Amine 4	Agriliance, L.L.C.	1381-103	3.8	Lbs. a.e. / gal.
2, 4-D	Agrisolution 2,4-D LV4	Agriliance, L.L.C.	1381-102	3.8	Lbs. a.e. / gal.
2, 4-D	2,4-D Amine 4	Albaugh, Inc./Agri Star	42750-19	3.8	Lbs. a.e. / gal.
2, 4-D	2,4-D LV 4	Albaugh, Inc./Agri Star	42750-15	3.8	Lbs. a.e. / gal.
2, 4-D	Solve 2,4-D	Albaugh, Inc./Agri Star	42750-22	3.76	Lbs. a.e. / gal.
2, 4-D	2,4-D LV 6	Albaugh, Inc./Agri Star	42750-20	5.5	Lbs. a.e. / gal.
2, 4-D	Five Star	Albaugh, Inc./Agri Star	42750-49	5.0	Lbs. a.e. / gal.
2, 4-D	D-638	Albaugh, Inc./Agri Star	42750-36	2.8	Lbs. a.e. / gal.
2, 4-D	Alliagre 2,4-D Amine	Alligare, LLC	81927-38	3.8	Lbs. a.e. / gal.
2, 4-D	2,4-D LV6	Helena Chemical Company	42750-20-5905	5.5	Lbs. a.e. / gal.
2, 4-D	2,4-D Amine	Helena Chemical Company	5905-72	3.76	Lbs. a.e. / gal.
2, 4-D	2,4-D Amine 4	Helena Chemical Company	42750-19-5905	3.8	Lbs. a.e. / gal.

Common Name	Trade Name	Manufacturer	EPA Reg. Number	Concentration	Units of Concentration
2, 4-D	Opti-Amine	Helena Chemical Company	5905-501	3.8	Lbs. a.e. / gal.
2, 4-D	Barrage HF	Helena Chemical Company	5905-529	4.7	Lbs. a.e. / gal.
2, 4-D	HardBall	Helena Chemical Company	5905-549	1.74	Lbs. a.e. / gal.
2, 4-D	Unison	Helena Chemical Company	5905-542	1.74	Lbs. a.e. / gal.
2, 4-D	Clean Amine	Loveland Products Inc.	34704-120	3.74	Lbs. a.e. / gal.
2, 4-D	Low Vol 4 Ester Weed Killer	Loveland Products Inc.	34704-124	3.8	Lbs. a.e. / gal.
2, 4-D	Low Vol 6 Ester Weed Killer	Loveland Products Inc.	34704-125	5.6	Lbs. a.e. / gal.
2, 4-D	Saber	Loveland Products Inc.	34704-803	3.8	Lbs. a.e. / gal.
2, 4-D	Salvo	Loveland Products Inc.	34704-609	5	Lbs. a.e. / gal.
2, 4-D	Savage DS	Loveland Products Inc.	34704-606	78.9	% a.e.
2, 4-D	Aqua-Kleen	Nufarm Americas Inc.	71368-4	19	% a.e.
2, 4-D	Aqua-Kleen	Nufarm Americas Inc.	228-378	19	% a.e.
2, 4-D	Esteron 99C	Nufarm Americas Inc.	62719-9-71368	3.8	Lbs. a.e. / gal.
2, 4-D	Weedar 64	Nufarm Americas Inc.	71368-1	3.8	Lbs. a.e. / gal.
2, 4-D	Weedone LV-4	Nufarm Americas Inc.	228-139-71368	3.84	Lbs. a.e. / gal.
2, 4-D	Weedone LV-4 Solventless	Nufarm Americas Inc.	71368-14	3.8	Lbs. a.e. / gal.
2, 4-D	Weedone LV-6	Nufarm Americas Inc.	71368-11	5.4	Lbs. a.e. / gal.
2, 4-D	Formula 40	Nufarm Americas Inc.	228-357	3.67	Lbs. a.e. / gal.
2, 4-D	2,4-D LV 6 Ester	Nufarm Americas Inc.	228-95	5.5	Lbs. a.e. / gal.
2, 4-D	Platoon	Nufarm Americas Inc.	228-145	3.8	Lbs. a.e. / gal.
2, 4-D	WEEDstroy AM-40	Nufarm Americas Inc.	228-145	3.8	Lbs. a.e. / gal.
2, 4-D	Hi-Dep	PBI Gordon Corp.	2217-703	3.8	Lbs. a.e. / gal.
2, 4-D	2,4-D Amine	Setre (Helena)	5905-72	3.76	Lbs. a.e. / gal.
2, 4-D	Barrage LV Ester	Setre (Helena)	5905-504	4.7	Lbs. a.e. / gal.
2, 4-D	2,4-D LV4	Setre (Helena)	5905-90	3.8	Lbs. a.e. / gal.
2, 4-D	2,4-D LV6	Setre (Helena)	5905-93	5.8	Lbs. a.e. / gal.
2, 4-D	Clean Crop Amine 4	UAP-Platte Chem. Co.	34704-5 CA	3.8	Lbs. a.e. / gal.
2, 4-D	Clean Crop Low Vol 6 Ester	UAP-Platte Chem. Co.	34704-125	5.6	Lbs. a.e. / gal.
2, 4-D	Salvo LV Ester	UAP-Platte Chem. Co.	34704-609	5.0	Lbs. a.e. / gal.
2, 4-D	2,4-D 4# Amine Weed Killer	UAP-Platte Chem. Co.	34704-120	3.74	Lbs. a.e. / gal.
2, 4-D	Clean Crop LV-4 ES	UAP-Platte Chem. Co.	34704-124	3.8	Lbs. a.e. / gal.
2, 4-D	Savage DS	UAP-Platte Chem. Co.	34704-606	78.9	% a.e.
2, 4-D	Cornbelt 4 lb. Amine	Van Diest Supply Co.	11773-2	3.8	Lbs. a.e. / gal.
2, 4-D	Cornbelt 4# LoVol Ester	Van Diest Supply Co.	11773-3	3.8	Lbs. a.e. / gal.
2, 4-D	Cornbelt 6# LoVol Ester	Van Diest Supply Co.	11773-4	5.6	Lbs. a.e. / gal.
2, 4-D	Amine 4	Wilbur-Ellis Co.	2935-512	3.8	Lbs. a.e. / gal.
2, 4-D	Base Camp Amine 4	Wilbur-Ellis Co.	71368-1-2935	3.8	Lbs. a.e. / gal.

Common Name	Trade Name	Manufacturer	EPA Reg. Number	Concentration	Units of Concentration
2, 4-D	Base Camp LV6	Wilbur-Ellis Co.	2935-553	5.5	Lbs. a.e. / gal.
2, 4-D	Broadrange 55	Wilbur-Ellis Co.	2217-813-2935	5.03	Lbs. a.e. / gal.
2, 4-D	Lo Vol-4	Wilbur-Ellis Co.	228-139-2935	3.8	Lbs. a.e. / gal.
2, 4-D	Lo Vol-6 Ester	Wilbur-Ellis Co.	228-95-2935	5.5	Lbs. a.e. / gal.
2, 4-D	Agrisolution 2,4-D LV6	Winflied Solutions, LLC	1381-101	5.6	Lbs. a.e. / gal.
2, 4-D	Agrisolution 2,4-D Amine 4	Winfield Solutions, LLC	1381-103	3.8	Lbs. a.e. / gal.
2, 4-D	Agrisolution 2,4-D LV4	Winfield Solutions, LLC	1381-102	3.8	Lbs. a.e. / gal.
2, 4-D	Phenoxy 088	Winfield Solutions, LLC	42750-36-9779	2.8	Lbs. a.e. / gal.
2,4-D	Alligare 2,4-D LV 6	Alligare, LLC	81927-39	5.5	Lbs. a.e. / gal.
2,4-D	Rugged	Winfield Solutions, LLC	1381-247	3.5	Lbs. a.e. / gal.
2,4-D	Shredder	Winfield Solutions, LLC	1381-195	6.0	Lbs. a.e. / gal.
Chlorsulfuron	Alligare Chlorsulfuron	Alligare, LLC	81927-43	75	% a.i[3].
Chlorsulfuron	Chlorsulfuron	Alligare, LLC	81927-43	75	% a.i.
Chlorsulfuron	Telar DF	DuPont Crop Protection	352-522	75	% a.i.
Chlorsulfuron	Telar XP	DuPont Crop Protection	352-654	75	% a.i.
Chlorsulfuron	Nufarm Chlorsulf SPC 75 WDG Herbicide	Nufarm Americas Inc.	228-672	75	% a.i.
Chlorsulfuron	Chlorsulfuron E-Pro 75 WDG	Nufarm Americas Inc.	79676-72	75	% a.i.
Clopyralid	Spur	Albaugh, Inc.	42750-89	3.0	Lbs. a.e. / gal.
Clopyralid	Pyramid R&P	Albaugh, Inc.	42750-94	3.0	Lbs. a.e. / gal.
Clopyralid	Clopyralid	Alligare, LLC	81927-14	3.0	Lbs. a.e. / gal.
Clopyralid	Clopyralid 3	Alligare, LLC	42750-94-81927	3.0	Lbs. a.e. / gal.
Clopyralid	Cody Herbicide	Alligare, LLC	81927-28	3.0	Lbs. a.e. / gal.
Clopyralid	Reclaim	Dow AgroSciences	62719-83	3.0	Lbs. a.e. / gal.
Clopyralid	Stinger	Dow AgroSciences	62719-73	3.0	Lbs. a.e. / gal.
Clopyralid	Transline	Dow AgroSciences	62719-259	3.0	Lbs. a.e. / gal.
Clopyralid	CleanSlate	Nufarm Americas Inc.	228-491	3.0	Lbs. a.e. / gal.
Clopyralid + 2, 4-D	Commando	Albaugh, Inc.	42750-92	0.38 + 2.0	Lbs. a.e. / gal., respectively
Clopyralid + 2, 4-D	Curtail	Dow AgroSciences	62719-48	0.38 + 2.0	Lbs. a.e. / gal., respectively
Clopyralid + 2, 4-D	Cutback	Nufarm Americas Inc.	71368-72	0.38 + 2.0	Lbs. a.e. / gal., respectively
Dicamba	Dicamba DMA	Albaugh, Inc./Agri Star	42750-40	4.0	Lbs. a.e. / gal.
Dicamba	Vision	Albaugh, Inc.	42750-98	3.8	Lbs. a.e. / gal.
Dicamba	Cruise Control	Alligare, LLC	42750-40-81927	4.0	Lbs. a.e. / gal.
Dicamba	Banvel	Arysta LifeScience N.A. Corp.	66330-276	4.0	Lbs. a.e. / gal.
Dicamba	Clarity	BASF Corporation	7969-137	4.0	Lbs. a.e. / gal.
Dicamba	Vision	Helena Chemical Company	5905-576	4.0	Lbs. a.e. / gal.
Dicamba	Rifle	Loveland Products Inc.	34704-861	4.0	Lbs. a.e. / gal.
Dicamba	Banvel	Micro Flo Company	51036-289	4.0	Lbs. a.e. / gal.

Common Name	Trade Name	Manufacturer	EPA Reg. Number	Concentration	Units of Concentration
Dicamba	Diablo	Nufarm Americas Inc.	228-379	4.0	Lbs. a.e. / gal.
Dicamba	Vanquish Herbicide	Nufarm Americas Inc.	228-397	4.0	Lbs. a.e. / gal.
Dicamba	Vanquish	Syngenta	100-884	4.0	Lbs. a.e. / gal.
Dicamba	Sterling Blue	Winfield Solutions, LLC	7969-137-1381	4.0	Lbs. a.e. / gal.
Dicamba + 2, 4-D	Range Star	Albaugh, Inc./Agri Star	42750-55	1.0 + 2.87	Lbs. a.e. / gal., respectively
Dicamba + 2, 4-D	Dicamba + 2,4-D DMA	Alligare, LLC	81927-42	1.0 + 2.87	Lbs. a.e. / gal., respectively
Dicamba + 2, 4-D	Weedmaster	BASF Corporation	7969-133	1.0 + 2.87	Lbs. a.e. / gal., respectively
Dicamba + 2, 4-D	Brush-Rhap	Helena Chemical Company	5905-568	1.8 + 2.4	Lbs. a.e. / gal., respectively
Dicamba + 2, 4-D	Latigo	Helena Chemical Company	5905-564	1.8 + 2.4	Lbs. a.e. / gal., respectively
Dicamba + 2, 4-D	Outlaw	Helena Chemical Company	5905-574	1.09 + 1.45	Lbs. a.e. / gal., respectively
Dicamba + 2, 4-D	Rifle-D	Loveland Products Inc.	34704-869	1.0 + 2.88	Lbs. a.e. / gal., respectively
Dicamba + 2, 4-D	KambaMaster	Nufarm Americas Inc.	71368-34	1.0 + 2.87	Lbs. a.e. / gal., respectively
Dicamba + 2, 4-D	Weedmaster	Nufarm Americas Inc.	71368-34	1.0 + 2.87	Lbs. a.e. / gal., respectively
Dicamba + 2, 4-D	Veteran 720	Nufarm Americas Inc.	228-295	1.0 + 1.9	Lbs. a.e. / gal., respectively
Dicamba + 2, 4-D	Brash	Winfield Solutions, LLC	1381-202	1.0 + 2.87	Lbs. a.e. / gal., respectively
Dicamba + Diflufenzopyr	Distinct	BASF Corporation	7969-150	50 + 20	% a.e., respectively
Dicamba + Diflufenzopyr	Overdrive	BASF Corporation	7969-150	50 + 20	% a.e., respectively
Fluridone	Avast!	SePRO	67690-30	4.0	Lbs. a.i. / gal.
Fluridone	Sonar AS	SePRO	67690-4	4.0	Lbs. a.i. / gal.
Fluridone	Sonar Precision Release	SePRO	67690-12	5	% a.i.
Fluridone	Sonar Q	SePRO	67690-3	5	% a.i.
Fluridone	Sonar SRP	SePRO	67690-3	5	% a.i.
Glyphosate	Aqua Star	Albaugh, Inc./Agri Star	42750-59	4.0	Lbs. a.e. / gal.
Glyphosate	Forest Star	Albaugh, Inc./Agri Star	42570-61	3.0	Lbs. a.e. / gal.
Glyphosate	GlyStar Gold	Albaugh, Inc./Agri Star	42750-61	3.0	Lbs. a.e. / gal.
Glyphosate	Gly Star Original	Albaugh, Inc./Agri Star	42750-60	3.0	Lbs. a.e. / gal.
Glyphosate	Gly Star Plus	Albaugh, Inc./Agri Star	42750-61	3.0	Lbs. a.e. / gal.
Glyphosate	Gly Star Pro	Albaugh, Inc./Agri Star	42750-61	3.0	Lbs. a.e. / gal.
Glyphosate	Glyphosate 4 PLUS	Alligare, LLC	81927-9	3.0	Lbs. a.e. / gal.
Glyphosate	Glyphosate 4 +	Alligare, LLC	81927-9	3.0	Lbs. a.e. / gal.
Glyphosate	Glyphosate 5.4	Alligare, LLC	81927-8	4.0	Lbs. a.e. / gal.
Glyphosate	Glyfos	Cheminova	4787-31	3.0	Lbs. a.e. / gal.
Glyphosate	Glyfos PRO	Cheminova	67760-57	3.0	Lbs. a.e. / gal.
Glyphosate	Glyfos Aquatic	Cheminova	4787-34	4.0	Lbs. a.e. / gal.
Glyphosate	ClearOut 41 Plus	Agrisel USA, Inc.	70829-3	3.0	Lbs. a.e. / gal.
Glyphosate	Accord Concentrate	Dow AgroSciences	62719-324	4.0	Lbs. a.e. / gal.
Glyphosate	Accord SP	Dow AgroSciences	62719-322	3.0	Lbs. a.e. / gal.

Common Name	Trade Name	Manufacturer	EPA Reg. Number	Concentration	Units of Concentration
Glyphosate	Accord XRT	Dow AgroSciences	62719-517	4.0	Lbs. a.e. / gal.
Glyphosate	Accord XRT II	Dow AgroSciences	62719-556	4.0	Lbs. a.e. / gal.
Glyphosate	Glypro	Dow AgroSciences	62719-324	4.0	Lbs. a.e. / gal.
Glyphosate	Glypro Plus	Dow AgroSciences	62719-322	3.0	Lbs. a.e. / gal.
Glyphosate	Rodeo	Dow AgroSciences	62719-324	4.0	Lbs. a.e. / gal.
Glyphosate	Showdown	Helena Chemical Company	71368-25-5905	3.0	Lbs. a.e. / gal.
Glyphosate	Mirage	Loveland Products Inc.	34704-889	3.0	Lbs. a.e. / gal.
Glyphosate	Mirage Plus	Loveland Products Inc.	34704-890	3.0	Lbs. a.e. / gal.
Glyphosate	Aquamaster	Monsanto	524-343	4.0	Lbs. a.e. / gal.
Glyphosate	Roundup Custom	Monsanto	524-343	4.0	Lbs. a.e. / gal.
Glyphosate	Roundup Original	Monsanto	524-445	3.0	Lbs. a.e. / gal.
Glyphosate	Roundup Original II	Monsanto	524-454	3.0	Lbs. a.e. / gal.
Glyphosate	Roundup Original II CA	Monsanto	524-475	3.0	Lbs. a.e. / gal.
Glyphosate	Honcho	Monsanto	524-445	3.0	Lbs. a.e. / gal.
Glyphosate	Honcho Plus	Monsanto	524-454	3.0	Lbs. a.e. / gal.
Glyphosate	Roundup PRO	Monsanto	524-475	3.0	Lbs. a.e. / gal.
Glyphosate	Roundup PRO Concentrate	Monsanto	524-529	3.7	Lbs. a.e. / gal.
Glyphosate	Roundup PRO Dry	Monsanto	524-505	64.9	% a.e.
Glyphosate	Roundup PROMAX	Monsanto	524-579	4.5	Lbs. a.e. / gal.
Glyphosate	Aqua Neat	Nufarm Americas Inc.	228-365	4.0	Lbs. a.e. / gal.
Glyphosate	Credit Xtreme	Nufarm Americas Inc.	71368-81	4.5	Lbs. a.e. / gal.
Glyphosate	Foresters	Nufarm Americas Inc.	228-381	4.0	Lbs. a.e. / gal.
Glyphosate	Razor	Nufarm Americas Inc.	228-366	3.0	Lbs. a.e. / gal.
Glyphosate	Razor Pro	Nufarm Americas Inc.	228-366	3.0	Lbs. a.e. / gal.
Glyphosate	GlyphoMate 41	PBI/Gordon Corporation	2217-847	2.8	Lbs. a.e. / gal.
Glyphosate	AquaPro Aquatic Herbicide	SePRO Corporation	62719-324-67690	4.0	Lbs. a.e. / gal.
Glyphosate	Rattler	Setre (Helena)	524-445-5905	3.0	Lbs. a.e. / gal.
Glyphosate	Buccaneer	Tenkoz	55467-10	3.0	Lbs. a.e. / gal.
Glyphosate	Buccaneer Plus	Tenkoz	55467-9	3.0	Lbs. a.e. / gal.
Glyphosate	Mirage Herbicide	UAP-Platte Chem. Co.	524-445-34704	3.0	Lbs. a.e. / gal.
Glyphosate	Mirage Plus Herbicide	UAP-Platte Chem. Co.	524-454-34704	3.0	Lbs. a.e. / gal.
Glyphosate	Gly-4 Plus	Universal Crop Protection Alliance	72693-1	3.0	Lbs. a.e. / gal.
Glyphosate	Gly-4 Plus	Universal Crop Protection Alliance	42750-61-72693	3.0	Lbs. a.e. / gal.
Glyphosate	Gly-4	Universal Crop Protection Alliance	42750-60-72693	3.0	Lbs. a.e. / gal.
Glyphosate	Glyphosate 4	Vegetation Man., LLC	73220-6-74477	3.0	Lbs. a.e. / gal.

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Glyphosate	Agrisolutions Cornerstone	Winfield Solutions, LLC	1381-191	3.0	Lbs. a.e. / gal.
Glyphosate	Agrisolutions Cornerstone Plus	Winfield Solutions, LLC	1381-192	3.0	Lbs. a.e. / gal.
Glyphosate	Agrisolutions Rascal	Winfield Solutions, LLC	1381-191	3.0	Lbs. a.e. / gal.
Glyphosate	Agrisolutions Rascal Plus	Winfield Solutions, LLC	1381-192	3.0	Lbs. a.e. / gal.
Glyphosate	Cornerstone 5 Plus	Winfield Solutions, LLC	1381-241	4.0	Lbs. a.e. / gal.
Glyphosate + 2, 4-D	Landmaster BW	Albaugh, Inc./Agri Star	42570-62	0.9 + 1.5	Lbs. a.e. / gal., respectively
Glyphosate + 2, 4-D	Campaign	Monsanto	524-351	0.9 + 1.5	Lbs. a.e. / gal., respectively
Glyphosate + 2, 4-D	Landmaster BW	Monsanto	524-351	0.9 + 1.5	Lbs. a.e. / gal., respectively
Hexazinone	Velpar ULW	DuPont Crop Protection	352-450	75	% a.i.
Hexazinone	Velpar L	DuPont Crop Protection	352-392	2.0	Lbs. a.i. / gal.
Hexazinone	Velpar DF	DuPont Crop Protection	352-581	75	% a.i.
Hexazinone	Velosa	Helena Chemical Company	5905-579	2.4	Lbs. a.i. / gal.
Hexazinone	Pronone MG	Pro-Serve	33560-21	10	% a.i.
Hexazinone	Pronone 10G	Pro-Serve	33560-21	10	% a.i.
Hexazinone	Pronone 25G	Pro-Serve	33560-45	25	% a.i.
Hexazinone	Pronone Power Pellet	Pro-Serve	33560-41	75	% a.i.
Hexazinone + Sulfometuron methyl	Oustar	DuPont Crop Protection	352-603	63.2 + 11.8	% a.i., respectively
Hexazinone + Sulfometuron methyl	Westar	DuPont Crop Protection	352-626	68.6 + 6.5	% a.i., respectively
Imazapic	Panoramic 2SL	Alligare, LLC	66222-141-81927	2.0	Lbs. a.e. / gal.
Imazapic	Plateau	BASF Corporation	241-365	2.0	Lbs. a.e. / gal.
Imazapic	Nufarm Imazapic 2SL	Nufarm Americas Inc.	71368-99	2.0	Lbs. a.e. / gal.
Imazapic + Glyphosate	Journey	BASF Corporation	241-417	0.75 + 1.5	Lbs. a.e. / gal., respectively
Imazapyr	Imazapyr 2SL	Alligare, LLC	81927-23	2.0	Lbs. a.e. / gal.
Imazapyr	Imazapyr 4SL	Alligare, LLC	81927-24	4.0	Lbs. a.e. / gal.
Imazapyr	Ecomazapyr 2SL	Alligare, LLC	81927-22	2.0	Lbs. a.e. / gal.
Imazapyr	Rotary 2 SL	Alligare, LLC	81927-6	2.0	Lbs. a.e. / gal.
Imazapyr	Arsenal Railroad Herbicide	BASF Corporation	241-273	2.0	Lbs. a.e. / gal.
Imazapyr	Chopper	BASF Corporation	241-296	2.0	Lbs. a.e. / gal.
Imazapyr	Arsenal Applicators Conc.	BASF Corporation	241-299	4.0	Lbs. a.e. / gal.
Imazapyr	Arsenal	BASF Corporation	241-346	2.0	Lbs. a.e. / gal.
Imazapyr	Arsenal PowerLine	BASF Corporation	241-431	2.0	Lbs. a.e. / gal.
Imazapyr	Stalker	BASF Corporation	241-398	2.0	Lbs. a.e. / gal.
Imazapyr	Habitat	BASF Corporation	241-426	2.0	Lbs. a.e. / gal.
Imazapyr	Polaris	Nufarm Americas Inc.	228-534	2.0	Lbs. a.e. / gal.
Imazapyr	Polaris AC	Nufarm Americas Inc.	241-299-228	4.0	Lbs. a.e. / gal.
Imazapyr	Polaris AC	Nufarm Americas Inc.	228-480	4.0	Lbs. a.e. / gal.

Common Name	Trade Name	Manufacturer	EPA Reg. Number	Concentration	Units of Concentration
Imazapyr	Polaris AC Complete	Nufarm Americas Inc.	228-570	4.0	Lbs. a.e. / gal.
Imazapyr	Polaris AQ	Nufarm Americas Inc.	241-426-228	2.0	Lbs. a.e. / gal.
Imazapyr	Polaris RR	Nufarm Americas Inc.	241-273-228	2.0	Lbs. a.e. / gal.
Imazapyr	Polaris SP	Nufarm Americas Inc.	228-536	2.0	Lbs. a.e. / gal.
Imazapyr	Polaris SP	Nufarm Americas Inc.	241-296-228	2.0	Lbs. a.e. / gal.
Imazapyr	Polaris Herbicide	Nufarm Americas Inc.	241-346-228	2.0	Lbs. a.e. / gal.
Imazapyr	Habitat Herbicide	SePRO	241-426-67690	2.0	Lbs. a.e. / gal.
Imazapyr	SSI Maxim Arsenal 0.5G	SSI Maxim Co., Inc.	34913-23	0.5	% a.e.
Imazapyr	SSI Maxim Arsenal 5.0 G	SSI Maxim Co., Inc.	34913-24	5	% a.e.
Imazapyr	Ecomazapyr 2 SL	Vegetation Man., LLC	74477-6	2.0	Lbs. a.e. / gal.
Imazapyr	Imazapyr 2 SL	Vegetation Man., LLC	74477-4	2.0	Lbs. a.e. / gal.
Imazapyr	Imazapyr 4 SL	Vegetation Man., LLC	74477-5	4.0	Lbs. a.e. / gal.
Imazapyr + Metsulfuron methyl	Lineage Clearstand	DuPont Crop Protection	352-766	63.2 + 9.5	% a.i., respectively
Imazapyr + Sulfometuron methyl + Metsulfuron methyl	Lineage HWC	DuPont Crop Protection	352-765	37.5 + 28.1 + 7.5	% a.i., respectively
Imazapyr + Sulfometuron methyl + Metsulfuron methyl	Lineage Prep	DuPont Crop Protection	352-767	54.5 + 15.3 + 4.1	% a.i., respectively
Metsulfuron methyl	MSM 60	Alligare, LLC	81927-7	60	% a.i.
Metsulfuron methyl	AmTide MSM 60DF Herbicide	AmTide, LLC	83851-3	60	% a.i.
Metsulfuron methyl	Escort DF	DuPont Crop Protection	352-439	60	% a.i.
Metsulfuron methyl	Escort XP	DuPont Crop Protection	352-439	60	% a.i.
Metsulfuron methyl	MSM E-Pro 60 EG Herbicide	Etigra, LLC	81959-14	60	% a.i.
Metsulfuron methyl	MSM E-AG 60 EG Herbicide	Etigra, LLC	81959-14	60	% a.i.
Metsulfuron methyl	Patriot	Nufarm Americas Inc.	228-391	60	% a.i.
Metsulfuron methyl	PureStand	Nufarm Americas Inc.	71368-38	60	% a.i.
Metsulfuron methyl	Metsulfuron Methyl DF	Vegetation Man., LLC	74477-2	60	% a.i.
Metsulfuron methyl + Chlorsulfuron	Cimarron X-tra	DuPont Crop Protection	352-669	30 + 37.5	% a.i., respectively
Metsulfuron methyl + Chlorsulfuron	Cimarron Plus	DuPont Crop Protection	352-670	48 + 15	% a.i., respectively
Metsulfuron methyl + Dicamba + 2, 4-D	Cimarron MAX	DuPont Crop Protection	352-615	60 and 1.0 + 2.87	% a.i. and lbs. a.e., respectively
Picloram	Triumph K	Albaugh, Inc.	42750-81	2.0	Lbs. a.e. / gal.
Picloram	Triumph 22K	Albaugh, Inc.	42750-79	2.0	Lbs. a.e. / gal.
Picloram	Picloram K	Alligare, LLC	81927-17	2.0	Lbs. a.e. / gal.

Common Name	Trade Name	Manufacturer	EPA Reg. Number	Concentration	Units of Concentration
Picloram	Picloram 22K	Alligare, LLC	81927-18	2.0	Lbs. a.e. / gal.
Picloram	Grazon PC	Dow AgroSciences	62719-181	2.0	Lbs. a.e. / gal.
Picloram	OutPost 22K	Dow AgroSciences	62719-6	2.0	Lbs. a.e. / gal.
Picloram	Tordon K	Dow AgroSciences	62719-17	2.0	Lbs. a.e. / gal.
Picloram	Tordon 22K	Dow AgroSciences	62719-6	2.0	Lbs. a.e. / gal.
Picloram	Trooper 22K	Nufarm Americas Inc.	228-535	2.0	Lbs. a.e. / gal.
Picloram + 2, 4-D	GunSlinger	Albaugh, Inc.	42750-80	0.54 + 2.0	Lbs. a.e. / gal., respectively
Picloram + 2, 4-D	Picloram + D	Alligare, LLC	81927-16	0.54 + 2.0	Lbs. a.e. / gal., respectively
Picloram + 2, 4-D	Tordon 101 Mixture	Dow AgroSciences	62719-5	0.54 + 2.0	Lbs. a.e. / gal., respectively
Picloram + 2, 4-D	Tordon 101 R Forestry	Dow AgroSciences	62719-31	0.28 + 1.057	Lbs. a.e. / gal., respectively
Picloram + 2, 4-D	Tordon RTU	Dow AgroSciences	62719-31	0.28 + 1.057	Lbs. a.e. / gal., respectively
Picloram + 2, 4-D	Grazon P+D	Dow AgroSciences	62719-182	0.54 + 2.0	Lbs. a.e. / gal., respectively
Picloram + 2, 4-D	HiredHand P+D	Dow AgroSciences	62719-182	0.54 + 2.0	Lbs. a.e. / gal., respectively
Picloram + 2, 4-D	Pathway	Dow AgroSciences	62719-31	0.28 + 1.057	Lbs. a.e. / gal., respectively
Picloram + 2, 4-D	Trooper 101	Nufarm Americas Inc.	228-561	0.54 + 2.0	Lbs. a.e. / gal., respectively
Picloram + 2, 4-D	Trooper P + D	Nufarm Americas Inc.	228-530	0.54 + 2.0	Lbs. a.e. / gal., respectively
Picloram + 2, 4-D + Dicamba	Trooper Extra	Nufarm Americas Inc.	228-586	0.5 + 2.0 + 0.5	Lbs. a.e. / gal., respectively
Sulfometuron methyl	SFM 75	Alligare, LLC	81927-26	75	% a.i.
Sulfometuron methyl	Oust DF	DuPont Crop Protection	352-401	75	% a.i.
Sulfometuron methyl	Oust XP	DuPont Crop Protection	352-601	75	% a.i.
Sulfometuron methyl	SFM E-Pro 75EG	Etigra, LLC	79676-16	75	% a.i.
Sulfometuron methyl	Spyder	Nufarm Americas Inc.	228-408	75	% a.i.
Sulfometuron methyl	SFM 75	Vegetation Man., L.L.C.	72167-11-74477	75	% a.i.
Sulfometuron methyl + Chlorsulfuron	Landmark XP	DuPont Crop Protection	352-645	50 + 25	% a.i., respectively
Sulfometuron methyl + Metsulfuron methyl	Oust Extra	DuPont Crop Protection	352-622	56.25 + 15	% a.i., respectively
Sulfometuron methyl + Metsulfuron methyl	SFM Extra	DuPont Crop Protection	81927-5	56.25 + 15	% a.i., respectively
Triclopyr	Triclopry 4	Alligare, LLC	81927-11	4.0	Lbs. a.e. / gal.
Triclopyr	Triclopyr 3	Alligare, LLC	81927-13	3.0	Lbs. a.e. / gal.
Triclopyr	Triclopyr RTU	Alligare, LLC	81927-33	0.8	Lbs. a.e. / gal.
Triclopyr	Element 3A	Dow AgroSciences	62719-37	3.0	Lbs. a.e. / gal.
Triclopyr	Element 4	Dow AgroSciences	62719-40	4.0	Lbs. a.e. / gal.
Triclopyr	Forestry Garlon XRT	Dow AgroSciences	62719-553	6.3	Lbs. a.e. / gal.
Triclopyr	Garlon 3A	Dow AgroSciences	62719-37	3.0	Lbs. a.e. / gal.
Triclopyr	Garlon 4	Dow AgroSciences	62719-40	4.0	Lbs. a.e. / gal.

Common Name	Trade Name	Manufacturer	EPA Reg. Number	Concentration	Units of Concentration
Triclopyr	Garlon 4 Ultra	Dow AgroSciences	62719-527	4.0	Lbs. a.e. / gal.
Triclopyr	Remedy	Dow AgroSciences	62719-70	4.0	Lbs. a.e. / gal.
Triclopyr	Remedy Ultra	Dow AgroSciences	62719-552	4.0	Lbs. a.e. / gal.
Triclopyr	Pathfinder II	Dow AgroSciences	62719-176	0.75	Lbs. a.e. / gal.
Triclopyr	Trycera	Helena Chemical Company	5906-580	2.87	Lbs. a.e. / gal.
Triclopyr	Relegate	Nufarm Americas Inc.	228-521	4.0	Lbs. a.e. / gal.
Triclopyr	Relegate RTU	Nufarm Americas Inc.	228-522	0.75	Lbs. a.e. / gal.
Triclopyr	Tahoe 3A	Nufarm Americas Inc.	228-384	3.0	Lbs. a.e. / gal.
Triclopyr	Tahoe 3A	Nufarm Americas Inc.	228-518	3.0	Lbs. a.e. / gal.
Triclopyr	Tahoe 3A	Nufarm Americas Inc.	228-520	3.0	Lbs. a.e. / gal.
Triclopyr	Tahoe 4E	Nufarm Americas Inc.	228-385	4.0	Lbs. a.e. / gal.
Triclopyr	Tahoe 4E Herbicide	Nufarm Americas Inc.	228-517	4.0	Lbs. a.e. / gal.
Triclopyr	Renovate 3	SePRO Corporation	62719-37-67690	3.0	Lbs. a.e. / gal.
Triclopyr	Renovate OTF	SePRO Corporation	67690-42	10	% a.e.
Triclopyr	Ecotriclopyr 3 SL	Vegetation Man., LLC	72167-49-74477	3.0	Lbs. a.e. / gal.
Triclopyr	Triclopyr 3 SL	Vegetation Man., LLC	72167-53-74477	3.0	Lbs. a.e. / gal.
Triclopyr + 2, 4-D	Everett	Alligare, LLC	81927-29	1.0 + 2.0	Lbs. a.e. / gal., respectively
Triclopyr + 2, 4-D	Crossbow	Dow AgroSciences	62719-260	1.0 + 2.0	Lbs. a.e. / gal., respectively
Triclopyr + 2, 4-D	Aquasweep	Nufarm Americas Inc.	228-316	1.07 + 2.78	Lbs. a.e. / gal., respectively
Triclopyr + 2, 4-D	Candor	Nufarm Americas Inc.	228-565	1.0 + 2.0	Lbs. a.e. / gal., respectively
Triclopyr + Clopyralid	Prescott Herbicide	Alligare, LLC	81927-30	2.25 + 0.75	Lbs. a.e. / gal., respectively
Triclopyr + Clopyralid	Redeem R&P	Dow AgroSciences	62719-337	2.25 + 0.75	Lbs. a.e. / gal., respectively
Triclopyr + Clopyralid	Brazen	Nufarm Americas Inc.	228-564	2.25 + 0.75	Lbs. a.e. / gal., respectively

1. Updated May 14, 2014.
2. a.e.= acid equivalent
3. a.i. = active ingredient

Table C-3. Adjuvants Approved for Use on BLM Administered Lands[1]

Adjuvant Type	Trade Name	Manufacturer	ARBO II[2]
Surfactants			
Non-ionic	Agrisolutions Preference	Agriliance, LLC.	
Non-ionic	A-90	Alligare, LLC	
Non-ionic	Alligare Surface	Alligare, LLC	
Non-ionic	Alligare Surface West	Alligare, LLC	
Non-ionic	Aqufact	Aqumix, Inc.	
Non-ionic	Brewer 90-10	Brewer International	
Non-ionic	No Foam A	Creative Marketing & Research, Inc.	
Non-ionic	Aquafact	Crop Production Services	
Non-ionic	Baron	Crown (Estes Incorporated)	
Non-ionic	Audible 80	Exacto, Inc.	
Non-ionic	Audible 90	Exacto, Inc.	
Non-ionic	N.I.S. 80	Estes Incorporated	
Non-ionic	Ad Spray 90	Helena Chemical Company	
Non-ionic	Inlet	Helena Chemical Company	
Non-ionic	Spec 90/10	Helena Chemical Company	
Non-ionic	Spret	Helena Chemical Company	
Non-ionic	Optima	Helena Chemical Company	
Non-ionic	Induce	Setre (Helena)	
Non-ionic	Induce	Helena Chemical Company	
Non-ionic	Induce pH	Helena Chemical Company	
Non-ionic	Activator 90	Loveland Products Inc.	
Non-ionic	LI-700	Loveland Products Inc.	√
Non-ionic	Scanner	Loveland Products Inc.	
Non-ionic	Spreader 90	Loveland Products Inc.	
Non-ionic	UAP Surfactant 80/20	Loveland Products Inc.	
Non-ionic	X-77	Loveland Products Inc.	
Non-ionic	Magnify	Monterey AgResources	√
Non-ionic	Range Master	ORO Agri Inc.	
Non-ionic	NIS 90:10	Precision Laboratories, LLC	
Non-ionic	Elite Platinum	Red River Specialties, Inc.	
Non-ionic	Red River 90	Red River Specialties, Inc.	
Non-ionic	Red River NIS	Red River Specialties, Inc.	
Non-ionic	Cornbelt Premier 90	Van Diest Supply Co.	
Non-ionic	Cornbelt Trophy Gold	Van Diest Supply Co.	
Non-ionic	Spray Activator 85	Van Diest Supply Co.	
Non-ionic	NIS-EA	Wilbur-Ellis	
Non-ionic	R-900	Wilbur-Ellis	
Non-ionic	Super Spread 90	Wilbur-Ellis	
Non-ionic	Super Spread 7000	Wilbur-Ellis	
Non-ionic	Agrisolutions Activate Plus	Winfield Solutions, LLC	
Non-ionic	Agrisolutions Preference	Winfield Solutions, LLC	
Spreader/Sticker	Agri-Trend Spreader	Agri-Trend	
Spreader/Sticker	TopFilm	Biosorb, Inc.	
Spreader/Sticker	Onside Kick	Exacto, Inc.	
Spreader/Sticker	Bind-It	Estes Incorporated	
Spreader/Sticker	Surf-King PLUS	Crown (Estes Incorporated)	
Spreader/Sticker	CWC 90	CWC Chemical, Inc.	
Spreader/Sticker	Cohere	Helena Chemical Company	
Spreader/Sticker	Attach	Loveland Products Inc.	
Spreader/Sticker	Bond	Loveland Products Inc.	√

Adjuvant Type	Trade Name	Manufacturer	ARBO II[2]
Spreader/Sticker	Bond Max	Loveland Products Inc.	
Spreader/Sticker	Tactic	Loveland Products Inc.	√
Spreader/Sticker	Widespread Max	Loveland Products Inc.	
Spreader/Sticker	Rocket DL	Monterey AgResources	
Spreader/Sticker	Nu-Film-IR	Miller Chem. & Fert. Corp.	
Spreader/Sticker	Nu Film 17	Miller Chem. & Fert. Corp.	
Spreader/Sticker	Nu Film P	Miller Chem. & Fert. Corp.	
Spreader/Sticker	Protyx	Precision Laboratories, LLC	
Spreader/Sticker	Lastick	Setre (Helena)	
Spreader/Sticker	Insist 90	Wilbur-Ellis	
Spreader/Sticker	R-56	Wilbur-Ellis	
Spreader/Sticker	Aqua-King Plus	Winfield Solutions, LLC	
Spreader/Sticker	Surf-King Plus	Winfield Solutions, LLC	
Silicone-based	Alligare OSS/NIS	Alligare, LLC	
Silicone-based	SilEnergy	Brewer International	
Silicone-based	Silnet 200	Brewer International	
Silicone-based	Scrimmage	Exacto, Inc.	
Silicone-based	Bind-It MAX	Estes Incorporated	
Silicone-based	Thoroughbred	Estes Incorporated	
Silicone-based	Aero Dyne-Amic	Helena Chemical Company	
Silicone-based	Dyne-Amic	Helena Chemical Company	√
Silicone-based	Kinetic	Setre (Helena)	√
Silicone-based	Freeway	Loveland Products Inc.	
Silicone-based	Phase	Loveland Products Inc.	
Silicone-based	Phase II	Loveland Products Inc.	
Silicone-based	Silwet L-77	Loveland Products Inc.	
Silicone-based	Speed	Precision Laboratories, LLC	
Silicone-based	Elite Marvel	Red River Specialties, Inc.	
Silicone-based	Sun Spreader	Red River Specialties, Inc.	
Silicone-based	Syl-coat	Wilbur-Ellis	
Silicone-based	Sylgard 309	Wilbur-Ellis	
Silicone-based	Syl-Tac	Wilbur-Ellis	
Silicone-based	Thoroughbred	Winfield Solutions, LLC.	
Oil-based			
Crop Oil Concentrate	Alligare Forestry Oil	Alligare, LLC	
Crop Oil Concentrate	Brewer 83-17	Brewer International	
Crop Oil Concentrate	CWR Herbicide Activator	Creative Marketing & Research, Inc.	
Crop Oil Concentrate	Majestic	Crown (Estes Incorporated)	
Crop Oil Concentrate	Agri-Dex	Helena Chemical Company	√
Crop Oil Concentrate	Crop Oil Concentrate	Helena Chemical Company	
Crop Oil Concentrate	Power-Line Crop Oil	Land View Inc.	
Crop Oil Concentrate	Crop Oil Concentrate	Loveland Products Inc.	
Crop Oil Concentrate	Maximizer Crop Oil Conc.	Loveland Products Inc.	
Crop Oil Concentrate	Herbimax	Loveland Products Inc.	
Crop Oil Concentrate	Monterey M.S.O.	Monterey AgResources	
Crop Oil Concentrate	Exchange	Precision Laboratories, LLC	
Crop Oil Concentrate	Red River Forestry Oil	Red River Specialties, Inc.	
Crop Oil Concentrate	Red River Pacer Crop Oil	Red River Specialties, Inc.	
Crop Oil Concentrate	Cornbelt Crop Oil Concentrate	Van Diest Supply Co.	
Crop Oil Concentrate	Cornbelt Premium Crop Oil Concentrate	Van Diest Supply Co.	
Crop Oil Concentrate	R.O.C. Rigo Oil Conc.	Wilbur-Ellis	

Adjuvant Type	Trade Name	Manufacturer	ARBO II[2]
Crop Oil Concentrate	Mor-Act	Wilbur-Ellis	
Crop Oil Concentrate	Agrisolutions Prime Oil	Winfield Solutions, LLC	
Crop Oil Concentrate	Agrisolutions Superb HC	Winfield Solutions, LLC	√
Methylated Seed Oil	Alligare MSO	Alligare, LLC	
Methylated Seed Oil	Alligare MSO West	Alligare, LLC	
Methylated Seed Oil	MSO Concentrate	Alligare, LLC	
Methylated Seed Oil	SunEnergy	Brewer International	
Methylated Seed Oil	Sun Wet	Brewer International	
Methylated Seed Oil	Premium MSO	Helena Chemical Company	
Methylated Seed Oil	Methylated Spray Oil Conc.	Helena Chemical Company	
Methylated Seed Oil	MSO Concentrate	Loveland Products Inc.	
Methylated Seed Oil	Kixyt	Precision Laboratories, LLC.	
Methylated Seed Oil	Persist Ultra	Precision Laboratories, LLC.	
Methylated Seed Oil	Elite Supreme	Red River Specialties, Inc.	
Methylated Seed Oil	Red River Supreme	Red River Specialties, Inc.	
Methylated Seed Oil	Sunburn	Red River Specialties, Inc.	
Methylated Seed Oil	Sunset	Red River Specialties, Inc.	
Methylated Seed Oil	Cornbelt Base	Van Diest Supply Co.	
Methylated Seed Oil	Cornbelt Methylates Soy-Stik	Van Diest Supply Co.	
Methylated Seed Oil	Hasten	Wilbur-Ellis	
Methylated Seed Oil	Renegade 2.0	Wilbur-Ellis	
Methylated Seed Oil	Super Kix	Wilbur-Ellis	
Methylated Seed Oil	Super Spread MSO	Wilbur-Ellis	
Methylated Seed Oil	Agrisolutions Destiny HC	Winfield Solutions, LLC	√
Methylated Seed Oil	Atmos	Winfield Solutions, LLC	
Methylated Seed Oil + Organosilicone	Alligare MVO Plus	Alligare, LLC	
Methylated Seed Oil + Organosilicone	Inergy	Crown (Estes Incorporated)	
Methylated Seed Oil + Organosilicone	Inergy	Winfield Solutions, LLC	
Vegetable Oil	Motion	Exacto, Inc.	
Vegetable Oil	Noble	Estes Incorporated	
Vegetable Oil	Amigo	Loveland Products Inc.	
Vegetable Oil	Elite Natural	Red River Specialities	
Vegetable Oil	Competitor	Wilbur-Ellis	√
Fertilizer-based			
Nitrogen-based	Quest	Setre (Helena)	
Nitrogen-based	Quest	Helena Chemical Company	
Nitrogen-based	TransActive HC	Helena Chemical Company	
Nitrogen-based	Actamaster Spray Adjuvant	Loveland Products Inc.	
Nitrogen-based	Actamaster Soluble Spray Adjuvant	Loveland Products Inc.	
Nitrogen-based	Dispatch	Loveland Products Inc.	
Nitrogen-based	Dispatch 111	Loveland Products Inc.	
Nitrogen-based	Dispatch 2N	Loveland Products Inc.	
Nitrogen-based	Dispatch AMS	Loveland Products Inc.	
Nitrogen-based	Flame	Loveland Products Inc.	
Nitrogen-based	Cornbelt Gardian	Van Diest Supply Co.	
Nitrogen-based	Cornbelt Gardian Plus	Van Diest Supply Co.	
Nitrogen-based	Bronc	Wilbur-Ellis	
Nitrogen-based	Bronc Max	Wilbur-Ellis	√
Nitrogen-based	Bronc Max EDT	Wilbur-Ellis	
Nitrogen-based	Bronc Plus Dry	Wilbur-Ellis	

Adjuvant Type	Trade Name	Manufacturer	ARBO II[2]
Nitrogen-based	Bronc Plus Dry EDT	Wilbur-Ellis	√
Nitrogen-based	Bronc Total	Wilbur-Ellis	
Nitrogen-based	Cayuse Plus	Wilbur-Ellis	
Nitrogen-based	Agrisolutions Alliance	Winfield Solutions, LLC	
Nitrogen-based	Agrisolutions Class Act NG	Winfield Solutions, LLC	√
Nitrogen-based	Agrisolutions Corral AMS Liquid	Winfield Solutions, LLC	
Special Purpose or Utility			
Buffering Agent	Yardage	Exacto, Inc.	
Buffering Agent	Buffers P.S.	Helena Chemical Company	
Buffering Agent	Spray-Aide	Miller Chem. & Fert. Corp.	
Buffering Agent	Oblique	Red River Specialties, Inc.	
Buffering Agent	Brimstone	Wilbur-Ellis	
Buffering Agent	Tri-Fol	Wilbur-Ellis	
Colorants/Dyes	Hi-Light	Becker-Underwood	
Colorants/Dyes	Hi-Light WSP	Becker-Underwood	
Colorants/Dyes	Hash Mark Green Powder	Exacto, Inc.	
Colorants/Dyes	Hash Mark Green Liquid	Exacto, Inc.	
Colorants/Dyes	Hash Mark Blue Powder	Exacto, Inc.	
Colorants/Dyes	Hash Mark Blue Liquid HC	Exacto, Inc.	
Colorants/Dyes	Hash Mark Blue Liquid	Exacto, Inc.	
Colorants/Dyes	Spray Indicator XL	Helena Chemical Company	
Colorants/Dyes	Marker Dye	Loveland Products Inc.	
Colorants/Dyes	TurfTrax	Loveland Products Inc.	
Colorants/Dyes	TurfTrax Blue Spray Indicator	Loveland Products Inc.	
Colorants/Dyes	BullsEye	Milliken Chemical	
Colorants/Dyes	Mark-It Blue	Monterey AgResources	
Colorants/Dyes	Mark-It Red	Monterey AgResources	
Colorants/Dyes	Signal	Precision	
Colorants/Dyes	SPI-Max Blue Spray Marker	PROKoZ	
Colorants/Dyes	Elite Splendor	Red River Specialities, Inc.	
Colorants/Dyes	Mystic HC	Winfield Solutions, LLC	
Compatibility/Suspension Agent	E Z MIX	Loveland Products Inc.	
Compatibility/Suspension Agent	Support	Loveland Products Inc.	
Compatibility/Suspension Agent	Convert	Precision Laboratories, LLC	
Compatibility/Suspension Agent	Blendex VHC	Setre (Helena)	
Deposition Aid	Alligare Pattern	Alligare, LLC	
Deposition Aid	Cygnet Plus	Brewer International	√
Deposition Aid	Poly Control 2	Brewer International	
Deposition Aid	CWC Sharpshooter	CWC Chemical, Inc.	
Deposition Aid	Offside	Exacto, Inc.	
Deposition Aid	Clasp	Helena Chemical Company	
Deposition Aid	Grounded	Helena Chemical Company	
Deposition Aid	Grounded - CA	Helena Chemical Company	
Deposition Aid	ProMate Impel	Helena Chemical Company	
Deposition Aid	Pointblank	Helena Chemical Company	
Deposition Aid	Strike Zone DF	Helena Chemical Company	
Deposition Aid	Compadre	Loveland Products Inc.	
Deposition Aid	Intac Plus	Loveland Products Inc.	
Deposition Aid	Liberate	Loveland Products Inc.	√
Deposition Aid	Reign	Loveland Products Inc.	
Deposition Aid	Reign LC	Loveland Products Inc.	
Deposition Aid	Weather Gard	Loveland Products Inc.	

Adjuvant Type	Trade Name	Manufacturer	ARBO II[2]
Deposition Aid	Mist-Control	Miller Chem. & Fert. Corp.	
Deposition Aid	Sustain	Miller Chem. & Fert. Corp.	
Deposition Aid	Exit	Miller Chem. & Fert. Corp.	
Deposition Aid	Border AQ	Precision Laboratories, LLC	
Deposition Aid	Direct	Precision Laboratories, LLC	
Deposition Aid	Volare DC	Precision Laboratories, LLC	
Deposition Aid	Elite Secure Ultra	Red River Specialties, Inc.	
Deposition Aid	Secure Ultra	Red River Specialties, Inc.	
Deposition Aid	Sta Put	Setre (Helena)	
Deposition Aid	Agripharm Drift Control	Walco International	
Deposition Aid	Bivert	Wilbur-Ellis	
Deposition Aid	Coverage G-20	Wilbur-Ellis	
Deposition Aid	Crosshair	Wilbur-Ellis	
Deposition Aid	EDT Concentrate	Wilbur-Ellis	
Deposition Aid	Droplex	Winfield Solution, LLC.	
Deposition Aid	Agrisolutions Interlock	Winfield Solutions, LLC	√
Defoaming Agent	Fast Break	Agrisolutions	
Defoaming Agent	Alligare Anti-Foamer	Alligare, LLC	
Defoaming Agent	Defoamer	Brewer International	
Defoaming Agent	Tripleline	Creative Marketing & Research, Inc.	
Defoaming Agent	Reverse	Exacto, Inc.	
Defoaming Agent	Foambuster Max	Helena Chemical Company	
Defoaming Agent	Fighter-F 10	Loveland Products Inc.	
Defoaming Agent	Fighter-F Dry	Loveland Products Inc.	
Defoaming Agent	Unfoamer	Loveland Products Inc.	
Defoaming Agent	Foam Fighter	Miller Chem. & Fert. Corp.	
Defoaming Agent	Gundown Max	Precision Laboratories, LLC	
Defoaming Agent	Red River Defoamer	Red River Specialities, Inc.	
Defoaming Agent	Foam Buster	Setre (Helena)	
Defoaming Agent	Cornbelt Defoamer	Van Diest Supply Co	
Defoaming Agent	FTF Defoamer	Wilbur-Ellis	
Defoaming Agent	No Foam	Wilbur-Ellis	
Diluent/Deposition Agent	Improved JLB Oil Plus	Brewer International	
Diluent/Deposition Agent	JLB Oil Plus	Brewer International	
Diluent/Deposition Agent	Bark Oil EC	Crop Production Services	
Diluent/Deposition Agent	Bark Oil	Crop Production Services	
Diluent/Deposition Agent	Hy-Grade I	CWC Chemical, Inc	
Diluent/Deposition Agent	Hy-Grade EC	CWC Chemical, Inc	
Diluent/Deposition Agent	Elite Premier	Red River Specialties, Inc.	
Diluent/Deposition Agent	Elite Premier Blue	Red River Specialties, Inc.	
Diluent/Deposition Agent	Red River Basal Oil	Red River Specialties, Inc.	
Diluent/Deposition Agent	Thinvert TRU	Waldrum Specialities, Inc.	
Diluent/Deposition Agent	Thinvert Concentrate	Waldrum Specialities, Inc.	
Diluent/Deposition Agent	In-Place	Wilbur-Ellis	
Diluent/Deposition Agent	W.E.B. Oil	Wilbur-Ellis	
Foam Marker	Align	Helena Chemical Company	
Foam Marker	Tuff Trax Foam Concentrate	Loveland Products, Inc.	
Foam Marker	Trekker Trax	Loveland Products, Inc.	
Foam Marker	Red River Foam Marker	Red River Specialties, Inc.	
Foam Marker	R-160	Wilbur-Ellis	
Invert Emulsion Agent	Redi-vert II	Wilbur-Ellis	
Tank Cleaner	Wipe Out	Helena Chemical Company	

Adjuvant Type	Trade Name	Manufacturer	ARBO II[2]
Tank Cleaner	All Clear	Loveland Products Inc.	
Tank Cleaner	Back Field	Exacto, Inc.	
Tank Cleaner	Tank and Equipment Cleaner	Loveland Products Inc.	
Tank Cleaner	Red River Tank Cleaner	Red River Specialties, Inc.	
Tank Cleaner	Elite Vigor	Red River Specialties, Inc.	
Tank Cleaner	Kutter	Wilbur-Ellis	
Tank Cleaner	Neutral-Clean	Wilbur-Ellis	
Tank Cleaner	Cornbelt Tank-Aid	Van Diest Supply Co.	
Water Conditioning	Alligare Water Conditioner	Alligare, LLC	
Water Conditioning	Rush	Crown (Estes Incorporated)	
Water Conditioning	Completion	Exacto, Inc.	
Water Conditioning	AccuQuest WM	Helena Chemical Company	
Water Conditioning	Hel-Fire	Helena Chemical Company	
Water Conditioning	Smoke	Helena Chemical Company	
Water Conditioning	Blendmaster	Loveland Products Inc.	
Water Conditioning	Choice	Loveland Products Inc.	
Water Conditioning	Choice Xtra	Loveland Products Inc.	
Water Conditioning	Choice Weather Master	Loveland Products Inc.	
Water Conditioning	Import	Precision Laboratories, LLC	
Water Conditioning	Transport LpH	Precision Laboratories, LLC	
Water Conditioning	Transport Plus	Precision Laboratories, LLC	
Water Conditioning	Elite Imperial	Red River Specialities, Inc.	
Water Conditioning	Cornbelt N-Tense	Van Diest Supply Co.	
Water Conditioning	Climb	Wilbur-Ellis	
Water Conditioning	Cut-Rate	Wilbur-Ellis	√

1. Updated May 14, 2014.
2. Approved for use near water under ARBO II

Table C-4. Estimated[1] Treatment Acres, by Alternative and Category[2]

	Category 1 Acres[3]		Category 2 Acres		Category 3 Acres		Category 4		Category 5		Category 6	
	Documented sites		Estimated 1st year Future Spread from Existing Sites[4]		New Invaders		Post fire emergency stabilization		Sage-Grouse habitat protection and restoration		Rehabilitation of invasive annual grass sites	
	No Action	Proposed Action	No Action	Proposed Action	No Action	Proposed Action	No Action	Proposed Action	No Action	Proposed Action	No Action	Proposed Action
2,4-D	23,000	16,100	*2,760*	*1,589*	Unknown	Unknown	None	None	None	None	None	None
Chlorsulfuron	None	8,200	*None*	*809*	None			Possibly used		None		Possibly used
Clopyralid	None	3,300	*None*	*326*	None			Possibly used		None		Possibly used
Dicamba	14,000	1,700	*1,680*	*168*	Unknown			None		None		None
Dicamba + diflufenzopyr	None	12	*None*	*1*	None			None		None		None
Fluridone	None	None	*None*	*None*	None			None		None		None
Glyphosate	12,100	3,600	*1,452*	*355*	Unknown			None		None		None
Hexazinone	None	200	*None*	*20*	None			None		None		None
Imazapic	None	17,000	*None*	*1,678*	None			As needed[5]		As needed[6]		300,000 acres
Imazapyr	None	6	*None*	*1*	None			None		None		None
Metsulfuron methyl	None	8,100	*None*	*799*	None			None		None		None
Picloram	6,000	2,200	*720*	*217*	Unknown			None		None		None
Sulfometuron methyl	None	1,500	*None*	*148*	None			None		None		None
Triclopyr	None	100	*None*	*10*	None			None		None		None
Manual	800	350	*96*	*35*	Unknown			None		None		None
Biocontrols	250	350	*30*	*35*	Unknown			None		None		None

1 Acres estimates for Categories 1 and 6 include total total acres that need treatment and could be treated over the 10 to 15 year life of the plan. Category 2 acres are the first year estimate; treatment estimates after the first year would depend on the acres of existing sites. The size of Categories 4, 5, and 6 are unknown.
2 Does not include 1,300 acres per year of mowing invasive annual grasses in fuel breaks under both alternatives.
3 Acres total more than total treatment acres because some sites are treated with more than one herbicide (tank mix)(see Tables 2-5 and 2-8).
4 Estimated first year based on a 12% (No Action Alternative) or 9.87% (Proposed Action) spread rate (USDI 2010a:596) of the Category 1 sites.
5 An average of 13,669 acres burn in wildfires per year. A portion of these are expected to need emergency stabilization treatments.
6 As needed within 4 miles of leks.

Appendix D – Herbicide Risk Tables

Introduction

EPA terms
LD50 Lethal Dose to 50% of the population
LOC Level of Concern
NOAEL No Observed Adverse Effect Level
LOAEL Lowest Observed Adverse Effect Level

BLM terms
RQ Risk Quotient
ECC Estimated Exposure Concentration
TRV Toxicity Reference Value
ARI Aggregated Risk Index

Forest Service Terms
HQ Hazard Quotient
RfD Reference Dose
TI Toxicity Index

See the *Human Health and Ecological Risk Assessments* section early in Chapter 3 for an introduction to the Risk Assessments, and to the risk tables presented in this Appendix and used in the individual resource effects sections in Chapter 3.

Risk[2]

EPA Labels

The Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) establishes procedures for the registration, classification, and regulation of all herbicides. Before any herbicides may be sold legally, the EPA must register it. The EPA may classify an herbicide for general use if it determines that the herbicide is not likely to cause unreasonable adverse effects to applicators or the environment, or it may be classified for restricted use if the herbicide must be applied by a certified applicator and in accordance with other restrictions. The herbicide label is a legal document specifying allowable uses; all applicators that apply herbicides on public lands must comply with the application rates, uses, handling, and all other instructions on the herbicide label, and where more restrictive, the rates, uses, and handling instructions developed by the BLM.

Acute toxicity: The quality or potential of a substance to cause injury or illness shortly after exposure through a single or short-term exposure.

Chronic toxicity: The ability of a substance or mixture of substances to cause harmful effects over an extended period, usually upon repeated or continuous exposure sometimes lasting for the entire life of the exposed organism.

In addition to sub-chronic and chronic toxicity, EPA herbicide registration looks at the acute toxicity of an herbicide. Acute toxicity is the most common basis for comparing the relative toxicities of herbicides. Acute toxicity can be measured by LD_{50}[3]. LD_{50} (LD = lethal dose) represents the amount of herbicide that results in the death of 50 percent of a test population. Therefore, the lower the LD_{50}, the more toxic the herbicide. Table D-1 shows the three categories that the EPA uses for classifying herbicides (USDI 1992a).

Table D-1. Herbicide Label Categories

Categories	Signal Word Required on Label	Oral LD_{50} (mg/ kg)	Dermal LD_{50} (mg/kg)	Inhalation LD_{50} (mg/kg)	Probable Oral Lethal Dose for 150 lb. Human
I – Highly Toxic	DANGER, POISON, skull & crossbones	Up to and including 50	Up to and including 200	Up to and including 0.2	A few drops to a teaspoonful
II – Moderately Toxic	WARNING	From 50 to 500	From 200 to 2000	From 0.2 to 2	Over one teaspoonful to one ounce
III – Slightly Toxic	CAUTION	From 500 to 5000	From 2000 to 20,000	From 2 to 20	Over one ounce to one pint or one pound.

[2] Adapted from the Oregon FEIS pp. 85-91 (USDI 2010a).
[3] or LC_{50} (lethal concentration) in the case of aquatic organisms.

In addition, the EPA has established Levels of Concern (LOC) for herbicides, which is the dose of the herbicide above which effects would be expected. The LOCs are used by EPA for registration, and to indicate potential risk to non-target organisms and the need to consider regulatory action (EPA 2007b). In the absence of information indicating otherwise, the LOC is generally 1/10th of the Lowest Observed Adverse Effect Level (LOAEL); that is, the lowest dose level where there was a statistically significant increase in frequency or severity of adverse effects[4] to the test organism. In some cases, no adverse reaction happens at any dose (or at any reasonable dose), and the LOC is the No Observed Adverse Effect Level (NOAEL). LOCs include uncertainty factors based on the amount and nature of the toxicity testing on which they are based.

Risk Assessments

One of the *Purposes* identified in Chapter 1 of this EA is: *d. Prevent control treatments from having unacceptable adverse effects to applicators and the public, to desirable flora and fauna, and to soil, air, and water.* To help address this *Purpose*, this EA relies on BLM and/or Forest Service-prepared Human Health and Ecological Risk Assessments for the 14 herbicides analyzed in this EA. These complete Risk Assessments are included in the Oregon FEIS as *Appendix 8: Risk Assessments* (uncirculated). The Risk Assessments are used to quantitatively evaluate the probability (i.e., risk) that herbicide use in wildland settings might pose harm to humans or other species in the environment. As such, they address many of the risks that would be faced by humans, plants, and animals, including Federally Listed and other Special Status species, from the use of the herbicides. The level of detail in the Risk Assessments far exceeds that normally found in EPA's registration examination.

Risk is defined as the likelihood that an effect (injury, disease, death, or environmental damage) may result from a specific set of circumstances. It can be expressed in quantitative or qualitative terms. While all human activities carry some degree of risk, some risks are known with a relatively high degree of accuracy because data have been collected on the historical occurrence of related problems (e.g., lung cancer caused by smoking, auto accidents caused by alcohol impairment, and fatalities resulting from airplane travel). For several reasons, risks associated with exposure to herbicides (at least in wildland settings) cannot be so readily determined. The Risk Assessments help evaluate the risks resulting from these situations.

Risk Assessments are necessarily done on a surrogate species in laboratory conditions, identified to represent a species group, as toxicological data does not exist for most native non-target species. Survival, growth, reproduction, and other important sub-lethal processes of both terrestrial and aquatic non-target species were considered. Assessments considered acute and chronic toxicity data. Exposures of receptors[5] to direct spray, surface runoff, wind erosion, and accidental spills were analyzed.

Most of the Human Health and Ecological Risk Assessments were developed by the BLM for the 2007 PEIS, or by the Forest Service (FS) for the 2005 *Pacific Northwest Region Invasive Plant Program EIS* (see Table D-2). The Risk Assessments, related separate analyses, and the PEIS includes analysis of degradates and other ingredients for which information is available and not constrained by confidential business information (CBI) restrictions. Preparing a risk assessment for every conceivable combination of herbicide, tank mix, adjuvants (including surfactants), and other possible mixtures is not feasible, as the BLM cannot prepare hundreds of risk assessments, and the cost would be exorbitant. To the degree a toxic substance is known to pose a significant human or ecological risk, the BLM has undertaken analysis to assess its impacts through Risk Assessments. More detailed information about uncertainty in the Risk Assessment process is included in Appendix 13 of the Oregon FEIS.

[4] Lethal or sub-lethal.
[5] An ecological entity such as a human, fish, plant, or slug.

Table D-2. *Human Health and Ecological Risk Assessment Sources*

	Human Health	Ecological
2,4-D	Forest Service	
Chlorsulfuron	FS	BLM
Clopyralid	Forest Service	
Dicamba	Forest Service	
Dicamba + diflufenzopyr	NA	BLM
Diflufenzopyr	BLM	NA
Fluridone	BLM	
Glyphosate	Forest Service	
Hexazinone	Forest Service	
Imazapic	BLM	
Imazapyr	Forest Service	
Metsulfuron methyl	Forest Service	
Picloram	Forest Service	
Sulfometuron methyl	BLM	
Triclopyr	Forest Service	

When evaluating risks from the use of herbicides proposed in a NEPA planning document, reliance on EPA's herbicide registration process as the sole demonstration of safety is insufficient. The U.S. Forest Service and BLM were involved in court cases in the early 1980s that specifically addressed this question (principally *Save Our Ecosystems v. Clark*, 747 F.2d 1240, 1248 (9th Cir. 1984) and *Southern Oregon Citizens v. Clark*, 720 F. 2d 1475, 1480 (9th Cir. 1983)). These court decisions and others affirmed that although the BLM can use EPA toxicology data, it is still required to do an independent assessment of the potential risks of using herbicides rather than relying on FIFRA registration alone. The Courts have also found that FIFRA does not require the same examination of impacts that the BLM is required to undertake under NEPA. Further, Risk Assessments consider data collected from both published scientific literature and data submitted to EPA to support FIFRA product registration, whereas EPA utilizes the latter data only. The EPA also considers many wildland herbicide uses to be minor. Thus, the project-specific application rates, spectrum of target and non-target organisms, and specialized exposure scenarios evaluated by the BLM are frequently not evaluated by EPA in its generalized registration assessments.

The Risk Assessments and their distillation in the Oregon FEIS are the source for much of the individual herbicide information presented in each of the resource sections in this EA, including the high-moderate-low risk categories shown in the tables in this Appendix.

Drift

Assuming non-target animals and plants are not directly sprayed, drift is the process most likely to result in herbicides getting onto non-target plants and animals, as well as getting onto non-target areas such as stream channels. Drift, defined as that part of a sprayed herbicide that is moved from the target area by wind while it is still airborne, is primarily dependent upon the elevation of the spray nozzle, droplet size and air movement. The smaller the droplet, the longer it stays suspended and the farther it can travel. Drift is one exposure scenario examined in the Risk Assessments and summarized on the risk tables at the end of this Chapter.

Spray drift can be reduced by increasing droplet size since wind will move large droplets less than small droplets (Table 4-18). Droplet size can be increased by: 1) reducing spray pressure; 2) increasing nozzle orifice size; 3) using special drift reduction nozzles; 4) using additives that increase spray viscosity; and, 5) using rearward orientation in aircraft. Commercial drift reduction agents are available that are designed to reduce drift beyond the capabilities of the determinants described above. These products create larger and more cohesive droplets that are less apt to break into small particles as they fall through the air. They reduce the percentage of smaller, lighter particles, which are most apt to drift. Standard Operating Procedures for air quality provide techniques for controlling drift, including specifying selection of equipment that produces 200-800-micron diameter droplets.

Drift includes droplets and vapor. In general, however, herbicides have very low vapor pressures and BLM spray mixtures do not produce much vapor. One study showed that with more volatile insecticides, little or no vapor drift was detected 9-27 meters downwind for insecticides with vapor pressures less than $1x10^{-4}$ mm Hg (Woodward et al. 1997). All of the herbicides covered by the EIS have very low vapor pressures (maximum is $4x10^{-6}$ mm Hg and they range to as low as $5.5x10^{-16}$ mm Hg; Vencill et al. 2002).

High, Moderate, and Low Risk in BLM and Forest Service Risk Assessments

The Risk Assessments attempt to measure both acute toxicity and chronic toxicity. Chronic toxicity is difficult to measure, especially in humans, but shows the results of sub-lethal doses that could result in cumulative deposits that could cause long-term problems in a vital body function. There is no standard measure for chronic toxicity.

BLM Ecological Risk Assessments

The BLM Ecological Risk Assessments established a Risk Quotient (RQ) for every herbicide and defined risk categories as follows:

0	No Risk	RQ < most conservative LOC for the species
L	Low Risk	RQ = 1 to 10 times the most conservative LOC for the species
M	Moderate Risk	RQ = 10 to 100 times the most conservative LOC for the species (generally equal to LOAEL to 10-times LOAEL)
H	High Risk	RQ > 100 times the most conservative LOC for the species

The RQ is calculated using the Estimated Exposure Concentration (EEC) and the Toxicity Reference Value (TRV). The EEC is the dose that an organism would be exposed to under the test scenario; e.g., *consumption* would indicate the amount of herbicide eaten on a sprayed material (a cow eating only sprayed grass for a day, for example), and *direct spray* indicates that the organism was sprayed directly with a wand or was in a flight path (a non-target plant species, for example). The TRV is the toxicity of the herbicide – usually the LOAEL or NOAEL. The RQ is the EEC divided by the TRV. An uncertainty factor can be brought in if it is thought that a species (or a particular individual within the species) is particularly susceptible to herbicide use, or that the single dose does not represent long-term exposure.

For example, the TRV (the dose that can be consumed with a potentially adverse effect) for a mule deer consuming vegetation contaminated with bromacil is 170 milligrams per kilogram of body weight per day (a mule deer weighs an estimated 70 kg). Assuming a daily consumption rate of 6.2 kg of forage, all contaminated with bromacil sprayed at the typical application rate (4 lbs/acre), the EEC (the amount of herbicide that the mule deer will be exposed to by eating the contaminated vegetation) is 33.7 milligrams per kilograms of body weight per day. Therefore, the RQ is 33.7 mg/kg divided by 170 mg/kg, or 0.198, which is a risk category of 0 (or no risk).

Tank Mixes **-** The BLM evaluated risks from mixing two herbicides together in a tank mix. The BLM assumed that products in a tank mix act in an additive manner. Therefore, to simulate a tank mix of two herbicides RQs for those two herbicides were combined (see Appendix 8 in the Oregon FEIS; fluridone is not generally tank mixed by the BLM and was not included in the analysis). The application rates within the tank mix are not necessarily the same as those of each individual active ingredient applied alone. The percent of RQs exceeding LOCs for each of the ten BLM herbicide active ingredients was compared to the percent of RQs exceeding LOCs for tank mixes, to determine whether additional risks were predicted for tank mixes.

BLM Human Health Risk Assessments

The BLM Human Health Risk Assessments used the Aggregated Risk Index (ARI) and defined risk categories as follows:

0	No Risk	Majority of ARIs > 1
L	Low Risk	Majority of ARIs < 1 but > 0.1
M	Moderate Risk	Majority of ARIs < 0.1 but > 0.01
H	High Risk	Majority of ARIs < 0.01

The ARI is a formula for combining LOCs for all exposure avenues (oral, dermal, inhalation), each with different uncertainty factors, and comparing them with the exposure levels that would occur in the scenarios in the Risk Assessments. ARIs less than 1 indicate a concern from at least one of the exposure avenues (EPA 2001b:51-55).

Forest Service Risk Assessments

The Forest Service Risk Assessments are very similar to the BLM's. The Forest Service Risk Assessments established a Hazard Quotient (HQ) for every herbicide and established risk categories as follows:

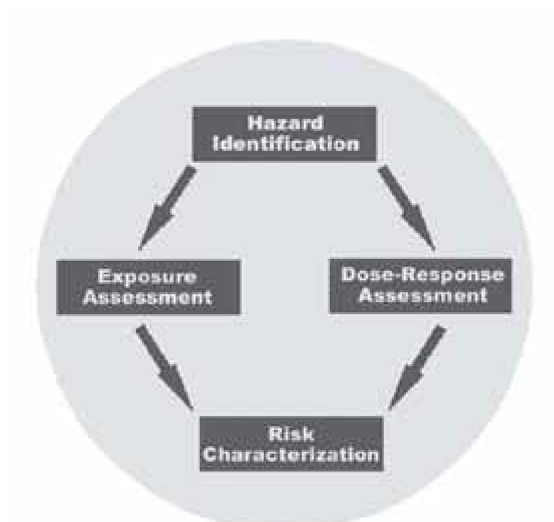
0	No Risk	HQ < LOC for the species
L	Low Risk	HQ = 1 to 10 times the LOC[6] for the species
M	Moderate Risk	HQ = 10 to 100 times the LOC for the species
H	High Risk	HQ > 100 times the LOC for the species

The HQ is calculated using the Reference Dose (RfD) and the Toxicity Index (TI). The RfD is the dose that an organism would be exposed to under the test scenario; the TI is the toxicity of the herbicide and the HQ is the RfD divided by the TI. An uncertainty factor can be brought in if it is thought that a species (or a particular individual within the species) is particularly susceptible to herbicide use, or that the single dose does not represent long-term exposure.

Figure D-1 shows the basis for Risk Assessments, which consists of the following parts:

- *Hazard Identification*: what are the dangers inherent with the herbicide? (e.g., endocrine disruption, cancer causing, etc.)
- *Exposure Assessment*: who could come into contact and how much? (specific exposure scenarios)
- *Dose Response Assessment*: how much is too much? At what dose are observable effects observed?
- *Risk Characterization*: indicates whether or not there is a plausible basis for concern (HQ or RQ).

Figure D-1. Basis for Risk Assessments



Stated another way, the lower range for the L, or low, risk category is theoretically the level at which an effect began to be discernable in testing or modeling (theoretically, because uncertainty factors have the effect of reducing the dose identified as having the adverse effect). The minimum identified effect may have been skin or eye irritation, leaf damage, and so forth. Uncertainty factors are added to address hypersensitive individuals, or accommodate uncertainties in the measurements, such as inferring effects to one species based on actual tests on other species. Uncertainty factors are typically multiples of 10, so the assumed Lowest Observable Effects (LOAEL) dose could have been inflated 10, 100, or even 1,000 times for uncertainties. Thus, exposure of the average individual to the dose identified as having an effect, probably would not. Nevertheless, the L or low rating indicates risks start at that point. Moderate risk categories indicate risk starts at doses one-tenth those of the low ratings; high is one-hundredth of the testing scenario dose. Testing scenarios are severe – e.g., soaking the test animal – so

[6] As noted in the previous discussion, LOCs are generally set at 1/10th of the LOAEL. Thus, an HQ of 1 to 10 times LOC is equivalent to an HQ of 0.1 to 1 in the 2005 Forest Service Invasive Plant EIS (USDA 2005a:4-73). The Forest Service EIS goes on to explain "The threshold is intended to help reviewers distinguish moderate risks (HQ=2 to 10 [HQ = 20-100 in this EIS]), which could in most cases be mitigated through exposure-reducing project design criteria from significant health risks (HQ>10 [HQ>100 in this EIS]) that could be difficult to mitigate if Worst-Case situations occur at the project level. For specific situations where a HQ>10 [HQ>100 in this EIS] is identified, the specific physiologic effect and the relationship between the NOAEL and the LOAEL may be evaluated to more precisely determine whether a toxic effect is actually likely to occur (Durkin, personal communication)." (USDA 2005a:4-73)

Standard Operating Procedures and PEIS Mitigation Measures such as buffers, wind speed limits, and so forth, as well as required safety equipment, limit exposure to substantially less than tested doses. For herbicides with moderate and high risk categories for a particular receptor, special cautions are implemented. For example, buffers for Special Status plant species are as large as 1,500 feet for some herbicides (Table A2-1). The low, moderate, or high human health risk categories shown on Tables D-3 through D-8 are more conservative than the EPA ratings used to apply the Caution, Warning, or Danger/Poison signal words to herbicide labels.

The Risk Assessments are summarized on tables showing herbicide risk categories at BLM maximum and typical application rates to vegetation, wildlife, and humans, in a variety of application scenarios. Tables D-3 and D-6 show herbicide risks to vegetation, from BLM and Forest Service Risk Assessments respectively. Tables D-4 and D-7 show herbicide risks to wildlife, fish, and aquatic invertebrates and Tables D-5 and D-8 show the risks to human health. Further information about the Human Health Risk Assessments can be found in the *Human Health and Safety* section of Chapter 4 of the Oregon FEIS.

Uncertainty in the Risk Assessment Process

The Risk Assessments conducted by the BLM and Forest Service incorporate various conservative assumptions to compensate for uncertainties in the risk assessment process. Within any of the steps of the human health risk evaluation process, assumptions were made due to a lack of absolute scientific knowledge. Some of the assumptions are supported by considerable scientific evidence, while others have less support. Every assumption introduces some degree of uncertainty into the risk evaluation process. Regulatory risk evaluation methodology requires that conservative assumptions be made throughout the risk assessment process to ensure that public health is protected. This conservatism, both in estimating exposures and in setting toxicity levels likely led to an exaggeration of the real risks of the vegetation management program to err on the side of protecting human health and other species.

Cumulative effects of long-term use of herbicides may have different outcomes than risk assessments can anticipate. Although identification of adverse effects from chronic exposures is one of the parameters examined in the risk assessment process, it is possible there are long-term sub-lethal effects on reproductive or migratory behavior from low concentrations of herbicides or additives that are not documented in the Risk Assessments.

See additional information about uncertainty near the end of Appendix 13 of the Oregon FEIS.

Table D-3. BLM-Evaluated Herbicide Risk Categories for Vegetation

Application Scenario	Chlorsulfuron		Fluridone		Imazapic		Overdrive		Sulfometuron	
	Typ[1]	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max
Direct Spray										
Terrestrial plants	H[2] [1:1]	H [1:1]	NE	NE	L [1:1]	M [1:1]	M [1:1]	H [1:1]	0 [1:1]	L [1:1]
Special status terrestrial plants	H [1:1]	H [1:1]	NE	NE	L [1:1]	M [1:1]	H [1:1]	H [1:1]	H [1:1]	H [1:1]
Aquatic plants pond	M [1:2]	M [2:2]	0 [2:2]	0 [2:2]	L [1:2]	L [2:2]	M [1:2]	M [1:2]	H [2:2]	H [2:2]
Aquatic plants stream	M [2:2]	M [2:2]	0 [2:2]	0 [2:2]	L [2:2]	M [2:2]	M [1:2]	H [1:2]	H [2:2]	H [2:2]
Accidental Spill to a Pond										
Aquatic plants pond	NE	H [1:2]	NE	L [2:2]	NE	H [2:2]	NE	M [1:1]	NE	H [2:2]
Off-Site Drift										
Terrestrial plants	M [5:12]	M [8:12]	NE	NE	0 [18:18]	0 [13:18]	0 [5:6]	0 [4:6]	0 [12:12]	0 [12:12]
Special status terrestrial plants	M [7:12]	M [7:12]	NE	NE	0 [17:18]	0 [13:18]	L [3:6]	L [4:6]	H [5:12]	H [8:12]

Application Scenario	Chlorsulfuron		Fluridone		Imazapic		Overdrive		Sulfometuron	
	Typ[1]	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max
Aquatic plants pond	0 [24:24]	0 [24:24]	NE	NE	0 [36:36]	0 [34:36]	0 [12:12]	0 [12:12]	L [13:24]	L [12:24]
Aquatic plants stream	0 [24:24]	0 [22:24]	NE	NE	0 [36:36]	0 [33:36]	0 [8:12]	0 [6:12]	L [14:24]	L [10:24]
Surface Runoff										
Terrestrial plants	0 [42:42]	0 [42:42]	NE	NE	0 [42:42]	0 [42:42]	0 [42:42]	0 [42:42]	0 [42:42]	0 [42:42]
Special status terrestrial plants	0 [42:42]	0 [42:42]	NE	NE	0 [42:42]	0 [42:42]	0 [34:42]	0 [33:42]	0 [32:42]	0 [28:42]
Aquatic plants pond	0 [64:84]	0 [53:84]	NE	NE	0 [80:84]	0 [62:84]	0 [70:84]	0 [67:84]	L [42:84]	L [38:84]
Aquatic plants stream	0 [80:84]	0 [77:84]	NE	NE	0 [84:84]	0 [83:84]	0 [84:84]	0 [84:84]	0 [69:84]	0 [60:84]
Wind Erosion										
Terrestrial plants	0 [9:9]	0 [9:9]	NE	NE	0 [9:9]	0 [9:9]	0 [9:9]	0 [9:9]	0 [9:9]	0 [9:9]
Special status terrestrial plants	0 [9:9]	0 [9:9]	NE	NE	0 [9:9]	0 [9:9]	0 [9:9]	0 [9:9]	0 [9:9]	0 [9:9]
Aquatic plants pond	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
Aquatic plants stream	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE

Shading denotes herbicides that are limited by PEIS Mitigation Measures to typical application rates where feasible.
1 Typ = Typical application rate; and Max = Maximum application rate.
2 Risk categories: = 0 = No risk (majority of RQs < most conservative LOC for non-Special Status species); L = Low risk (majority of RQs 1-10x most conservative LOC for non-Special Status species); M = Moderate risk (majority of RQs 10-100x most conservative LOC for non-Special Status species); H = High risk (majority of RQs >100 most conservative LOC for non-Special Status species); and NE = Not evaluated. The Risk Category is based on the risk level of the majority of risk quotients observed in any of the scenarios for a given exposure group and receptor type. See more information at the risk tables in Chapter 4 of the Ecological Risk Assessments (ENSR 2005b-k) to determine the specific scenarios that result in the displayed level of risk for a given receptor group. The number in brackets represents the number of RQs in the indicated risk category: number of scenarios evaluated.

Table D-4. BLM-Evaluated Herbicide Risk Categories for Wildlife, Fish, and Aquatic Species

Application Scenario	Chlorsulfuron		Fluridone		Imazapic		Diflufenzopyr + Dicamba		Sulfometuron	
	Typ.[1]	Max[1]	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max
Direct Spray										
Non Special Status Species										
Small mammal – 100% absorption	0[2]	0	0	0	0	0	0	0	0	0
Pollinating insect – 100% absorption	0	0	0	0	0	0	0	0	0	0
Small mammal – 1st order dermal absorption	0	0	0	0	0	0	0	0	0	0
Fish pond	0	0	0	0	0	0	0	0	0	0
Fish stream	0	0	0	L	0	0	0	0	0	0
Aquatic invertebrates pond	0	0	0	L	0	0	0	0	0	0
Aquatic invertebrates stream	0	0	0	L	0	0	0	0	0	0
Special Status Species										
Small mammal – 100% absorption	0	0	0	0	0	0	0	0	0	0
Pollinating insect – 100% absorption	0	0	0	0	0	0	0	0	0	0
Small mammal – 1st order dermal absorption	0	0	0	0	0	0	0	0	0	0
Fish pond	0	0	0	M	0	0	0	0	0	0
Fish stream	0	0	0	L	0	0	0	0	0	0
Aquatic invertebrates pond	0	0	0	H	0	0	0	0	0	0
Aquatic invertebrates stream	0	0	0	L	0	0	0	0	0	0

Application Scenario	Chlorsulfuron		Fluridone		Imazapic		Diflufenzopyr + Dicamba		Sulfometuron	
	Typ.[1]	Max[1]	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max
Indirect Contact with Foliage After Direct Spray										
Non Special Status Species										
Small mammal – 100% absorption	0	0	0	0	0	0	0	0	0	0
Pollinating insect – 100% absorption	0	0	0	0	0	0	0	0	0	0
Small mammal – 1st order dermal absorption	0	0	0	0	0	0	0	0	0	0
Special Status Species										
Small mammal – 100% absorption	0	0	0	0	0	0	0	0	0	0
Pollinating insect – 100% absorption	0	0	0	0	0	0	0	0	0	0
Small mammal – 1st order dermal absorption	0	0	0	0	0	0	0	0	0	0
Ingestion of Food Items Contaminated by Direct Spray										
Non Special Status Species										
Small mammalian herbivore – acute	0	0	0	0	0	0	0	0	0	0
Small mammalian herbivore – chronic	0	0	0	0	0	0	0	0	0	0
Large mammalian herbivore – acute	0	0	0	0	0	0	0	0	0	0
Large mammalian herbivore – chronic	0	0	0	0	0	0	L	M	0	0
Small avian insectivore – acute	0	0	0	0	0	0	0	0	0	0
Small avian insectivore – chronic	0	0	0	0	0	0	0	0	0	0
Large avian herbivore – acute	0	0	0	0	0	0	0	0	0	0
Large avian herbivore – chronic	0	0	0	0	0	0	0	0	0	0
Large mammalian carnivore – acute	0	0	0	0	0	0	0	0	0	0
Large mammalian carnivore – chronic	0	0	0	0	0	0	0	0	0	0
Special Status Species										
Small mammalian herbivore – acute	0	0	0	0	0	0	0	0	0	0
Small mammalian herbivore – chronic	0	0	0	L	0	0	0	0	0	0
Large mammalian herbivore – acute	0	0	0	0	0	0	0	0	0	0
Large mammalian herbivore – chronic	0	0	0	0	0	0	L	M	0	0
Small avian insectivore – acute	0	0	0	0	0	0	0	0	0	0
Small avian insectivore – chronic	0	0	0	0	0	0	0	0	0	0
Large avian herbivore – acute	0	0	0	0	0	0	0	0	0	0
Large avian herbivore – chronic	0	0	0	0	0	0	0	0	0	0
Large mammalian carnivore – acute	0	0	0	0	0	0	0	0	0	0
Large mammalian carnivore – chronic	0	0	0	0	0	0	0	0	0	0
Accidental Spill to Pond										
Non Special Status Species										
Fish pond	NE	0	NE	M	NE	0	NE	0	NE	0
Aquatic invertebrates pond	NE	0	NE	H	NE	0	NE	0	NE	0
Special Status Species										
Fish pond	NE	0	NE	M	NE	0	NE	0	NE	0
Aquatic invertebrates pond	NE	0	NE	H	NE	0	NE	0	NE	0
Off-Site Drift										
Non Special Status Species										
Fish pond	0	0	NE	NE	0	0	0	0	0	0
Fish stream	0	0	NE	NE	0	0	0	0	0	0
Aquatic invertebrates pond	0	0	NE	NE	0	0	0	0	0	0
Aquatic invertebrates stream	0	0	NE	NE	0	0	0	0	0	0

Application Scenario	Chlorsulfuron		Fluridone		Imazapic		Diflufenzopyr + Dicamba		Sulfometuron	
	Typ.[1]	Max[1]	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max
Special Status Species										
Fish pond	0	0	NE	NE	0	0	0	0	0	0
Fish stream	0	0	NE	NE	0	0	0	0	0	0
Aquatic invertebrates pond	0	0	NE	NE	0	0	0	0	0	0
Aquatic invertebrates stream	0	0	NE	NE	0	0	0	0	0	0
Surface Runoff										
Non Special Status Species										
Fish pond	0	0	NE	NE	0	0	0	0	0	0
Fish stream	0	0	NE	NE	0	0	0	0	0	0
Aquatic invertebrates pond	0	0	NE	NE	0	0	0	0	0	0
Aquatic invertebrates stream	0	0	NE	NE	0	0	0	0	0	0
Special Status Species										
Fish pond	0	0	NE	NE	0	0	0	0	0	0
Fish stream	0	0	NE	NE	0	0	0	0	0	0
Aquatic invertebrates pond	0	0	NE	NE	0	0	0	0	0	0
Aquatic invertebrates stream	0	0	NE	NE	0	0	0	0	0	0

Shading denotes herbicides that are limited by PEIS Mitigation Measures to typical application rates where feasible.
1 Typ = Typical application rate; and Max = Maximum application rate.
2 Risk categories: 0 = No risk (majority of RQs < most conservative LOC for non-Special Status species); L = Low risk (majority of RQs 1-10x most conservative LOC for non-Special Status species); M = Moderate risk (majority of RQs 10-100x most conservative LOC for non-Special Status species); H = High risk (majority of RQs >100 most conservative LOC for non-Special Status species); and NE = Not evaluated.
The risk category is based on the risk level of the majority of risk quotients observed in any of the scenarios for a given exposure group and receptor type. See the risk tables in Chapter 4 of the Ecological Risk Assessments (ENSR 2005b-k) to determine the specific scenarios that result in the displayed level of risk for a given receptor group.

Table D-5. BLM-Evaluated Herbicide Risk Categories for Human Health

Receptor	Diflufenzopyr			Fluridone[2]			Imazapic			Sulfometuron		
	Typ[1]	Max[1]	Accid	Typ	Max	Accid	Typ	Max	Accid	Typ	Max	Accid
Hiker/hunter (adult)	0[3]	0	0	0	0	0	NE	NE	NE	NE	NE	NE
Berry picker (child)	0	0	0	0	0	L	NE	NE	NE	NE	NE	NE
Berry picker (adult)	0	0	0	0	0	0	NE	NE	NE	NE	NE	NE
Angler (adult)	0	0	0	0	0	0	NE	NE	NE	NE	NE	NE
Residential – contaminated water (child)	0	0	0	0	0	L	NE	NE	NE	NE	NE	NE
Residential – contaminated water (adult)	0	0	0	0	0	L	NE	NE	NE	NE	NE	NE
Native American (child)	0	0	0	0	0	0	0	0	0	0	0	0
Native American (adult)	0	0	0	0	0	0	0	0	0	0	0	0
Swimmer (child)	0	0	0	0	0	0	0	0	0	0	0	0
Swimmer (adult)	0	0	0	0	0	0	0	0	0	0	0	0
Plane - pilot	NE	NE	NE	0	0	L-H	0	0	NE	0	0	NE
Plane - mixer/loader	NE	NE	NE	0	L	L-H	0	0	NE	0	0	NE
Helicopter - pilot	NE	NE	NE	0	0	L-H	0	0	NE	0	0	NE
Helicopter - mixer/loader	NE	NE	NE	0	L	L-H	0	0	NE	0	0	NE
Human/backpack - applicator/mixer/loader	0	0	NE	0	0	L-H	0	0	NE	0	0	NE
Human/horseback - applicator	0	0	NE	0	0	L-H	0	0	NE	0	0	NE
Human/horseback - mixer/loader	0	0	NE	0	0	L-H	0	0	NE	0	0	NE

Receptor	Diflufenzopyr			Fluridone[2]			Imazapic			Sulfometuron		
	Typ[1]	Max[1]	Accid	Typ	Max	Accid	Typ	Max	Accid	Typ	Max	Accid
Human/horseback - applicator/mixer/loader	0	0	NE	0	0	L-H	0	0	NE	0	0	NE
ATV – applicator[4]	0	0	NE	0	0	L-H	0	0	NE	0	0	NE
ATV - mixer/loader	0	0	NE	0	0	L-H	0	0	NE	0	0	NE
ATV - applicator/mixer/loader	0	0	NE	0	0	L-H	0	0	NE	0	0	NE
Truck - applicator	0	0	NE	0	0	L-H	0	0	NE	0	0	NE
Truck - mixer/loader	0	0	NE	0	0	L-H	0	0	NE	0	0	NE
Truck - applicator/mixer/loader	0	0	NE	0	0	L-H	0	0	NE	0	0	NE
Boat - applicator	NE	NE	NE	0	0	L-H	NE	NE	NE	NE	NE	NE
Boat - mixer/loader	NE	NE	NE	0	0	L-H	NE	NE	NE	NE	NE	NE
Boat - applicator/mixer/loader	NE	NE	NE	0	0	L-H	NE	NE	NE	NE	NE	NE

Shading denotes herbicides that are limited by PEIS Mitigation Measures to typical application rates where feasible.
1 Typ = Typical application rate; Max = Maximum application rate; and Accid = Accidental rate. Typical and maximum application rate categories include short-, intermediate-, and long-term exposures. Accidental scenario category includes accidents with herbicide mixed at both the typical and maximum application rates and with a concentrated herbicide.
2 For all worker receptors accidentally exposed to fluridone, there is low risk from exposure to solutions mixed with water to the typical application rate, moderate risk from exposure to solutions mixed with water to the maximum application rate, and high risk from exposure to concentrated solutions (prior to mixing with water).
3 Risk categories: 0 = No risk (majority of ARIs > 1); L = Low risk (majority of ARIs >1 but < 0.1); M = Moderate risk (majority of ARIs > 0.1 but < 0.01); H = High risk (majority of ARIs < 0.01); and NE = Not evaluated. The reported risk category represents the typical/most common risk level for estimated risks from various time periods. See the Vegetation Treatments Programmatic EIS Human Health Risk Assessment Final Report (ENSR 2005l) for the range of risk levels for each scenario.
4 ATV and Truck categories include spot and boom/broadcast application scenarios.

Table D-6. Forest Service-Evaluated Herbicide Risk Categories for Vegetation

	2,4-D[1]		Clopyralid		Dicamba		Glyphosate[1]		Hexazinone		Imazapyr		Metsulfuron		Picloram		Triclopyr[1]	
	Typ.[2]	Max[2]	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max
Terrestrial Plants																		
Direct spray, susceptible plants	H[3]	H	H	H	H	H	H	H	NE	NE	H	H	H	H	H	H	H	H
Direct spray, tolerant plants	L	L	0	L	0	0	L	M	NE	NE	L	L	L	M	L	M	0	L
Off-site drift, low boom, susceptible plants	L [3:6]	L [3:6]	L [4:6]	M [3:6]	L [3:6]	H [3:6]	M [3:6]	M [4:6]	L [3:6]	L [4:6]	M [3:6]	H [3:6]	L [4:6]	M [4:6]	H [3:6]	H [4:6]	L [3:6]	M [3:6]
Off-site drift, low boom, tolerant plants	0 [6:6]	0 [6:6]	0 [6:6]	0 [6:6]	0 [6:6]	0 [6:6]	0 [6:6]	0 [6:6]	0 [6:6]	0 [4:6]	0 [6:6]	0 [6:6]	0 [6:6]	0 [6:6]	0 [6:6]	0 [6:6]	0 [6:6]	0 [6:6]
Off-site drift, aerial, susceptible plants	NE	NE	M [2:6]	H [2:6]	M [3:6]	H [3:6]	H [3:6]	H [5:6]	NE	NE	H [5:6]	H [6:6]	M [2:6]	H [2:6]	H [6:6]	H [6:6]	M [4:6]	H [4:6]
Off-site drift, aerial, tolerant plants	NE	NE	0 [6:6]	0 [6:6]	0 [6:6]	0 [6:6]	0 [5:6]	L [3:6]	NE	NE	0 [6:6]	0 [6:6]	0 [5:6]	0 [4:6]	0 [4:6]	L [3:6]	0 [6:6]	0 [5:6]
Off-site drift, backpack directed foliar, susceptible plants	0 [5:6]	0 [4:6]	NE	NE	NE	NE	L [3:6]	M [3:6]	NE	NE	M [3:6]	M [4:6]	NE	NE	M [3:6]	M [4:6]	0 [4:6]	0 [4:6]
Off-site drift, backpack directed foliar, tolerant plants	0 [6:6]	0 [6:6]	NE	NE	NE	NE	0 [6:6]	0 [6:6]	NE	NE	0 [6:6]	0 [6:6]	NE	NE	0 [6:6]	0 [6:6]	0 [6:6]	0 [6:6]
Surface runoff, susceptible plants	0 [22:30]	0 [21:30]	0 [23:30]	0 [22:30]	0 [22:30]	0 [22:30]	0	0	NE	NE	H	H	0 [21:30]	0 [18:30]	H	H	L	M
Surface runoff, tolerant plants	0 [30:30]	0 [29:30]	0 [30:30]	0 [28:30]	0 [30:30]	0 [30:30]	0	0	NE	NE	L	M	0 [25:30]	0 [22:30]	0	0	0	0
Aquatic Plants																		
Accidental spill, susceptible macrophytes	H	H	H	H	NE	NE	H	H	NE	NE	H	H	H	H	NE	NE	H	H
Accidental spill, susceptible algae	H	H	L	L	H	H	H	H	NE	NE	L	L	M	H	H	H	H	H
Accidental spill, tolerant algae	L	M	0	0	0	L	M	M	NE	NE	0	0	L	M	0	0	M	H

	2,4-D[1]		Clopyralid		Dicamba		Glyphosate[1]		Hexazinone		Imazapyr		Metsulfuron		Picloram		Triclopyr[1]	
	Typ.[2]	Max[2]	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max
Acute exposure, susceptible macrophytes	M	M	0	0	NE	NE	L	L	H	H	M	H	L	L	NE	NE	0	L
Acute exposure, susceptible algae	L	L	0	0	0	L	L	L	NE	NE	0	0	0	0	L	L	M	H
Acute exposure, tolerant algae	0	0	0	0	0	0	0	0	NE	NE	0	0	0	0	0	0	0	0
Chronic exposure, susceptible macrophytes	0	L	0	0	NE	NE	0	0	M	H	M	M	0	0	NE	NE	H	H
Chronic exposure, susceptible algae	0	0	0	0	0	0	0	0	NE	NE	0	0	0	0	0	0	0	0
Chronic exposure, tolerant algae	0	0	0	0	0	0	0	0	NE	NE	0	0	0	0	0	0	0	0

Shading denotes herbicides that are limited by PEIS Mitigation Measures to typical application rates where feasible.
1 Risk categories for the more toxic formulations are presented here.
2 Typ = Typical application rate; and Max = Maximum application rate.
3 0 = No risk (HQ < LOC); L = Low risk (HQ = 1 to 10 x LOC); M = Moderate Risk (HQ = 10 to 100 x LOC); H = High risk (HQ > 100 LOC); and NE = Not evaluated. Risk categories are based on upper estimates of hazard quotients and the LOC of 1.0. If more than one scenario is involved in an exposure pathway (i.e., off-site drift and surface runoff), then the number of scenarios with the given risk category (out of the total number of evaluated scenarios) is displayed in parentheses. The reported risk category is that of the majority of the HQs for all the scenarios. As a result, risk may be higher than the reported risk category for some scenarios within each category. For more information, see the individual Forest Service Risk Assessments.

Table D-7. Forest Service-Evaluated Herbicide Risk Categories for Wildlife, Fish, and Aquatic Species

	2,4-D[1]		Clopyralid		Dicamba		Glyphosate[1]		Hexazinone		Imazapyr		Metsulfuron methyl		Picloram		Triclopyr[1]	
	Typ[2]	Max[2]	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max
Mammals																		
Acute/Accidental Exposures																		
Direct spray, small mammal, 1st order absorption	0[3]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Direct spray, small animal, 100% absorption	L	L	L	L	0	0	0	L	L	L	0	0	0	L	0	0	0	L
Consumption of contaminated fruit, small mammal	L	L	0	0	0	L	0	L	0	0	0	0	0	0	0	0	0	L
Consumption of contaminated grass, large mammal	L	L	L	L	L	M	L	L	L	L	0	0	0	L	0	0	M	H
Consumption of contaminated water, small mammal, spill	0	0	0	0	0	L	0	0	0	0	0	0	0	0	0	0	0	0

	2,4-D[1]		**Clopyralid**		**Dicamba**		**Glyphosate**[1]		**Hexazinone**		**Imazapyr**		**Metsulfuron methyl**		**Picloram**		**Triclopyr**[1]	
	Typ[2]	Max[2]	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max
Consumption of contaminated water, small mammal, stream	NE	NE	0	0	0	0	NE	NE	0	0	NE	NE	0	0	NE	NE	NE	NE
Consumption of contaminated insects, small mammal	L	L	L	L	L	M	L	L	L	L	0	0	0	L	0	0	0	L
Consumption of contaminated small mammal, predatory mammal	L	L	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	L
Chronic Exposures																		
Consumption of contaminated vegetation, small mammal, on- site	M	M	0	0	0	0	L	L	0	0	0	0	0	0	L	M	L	M
Consumption of contaminated vegetation, small mammal, off- site	NE	NE	0	0	0	0	NE	NE	0	0	NE	NE	0	0	NE	NE	NE	NE
Consumption of contaminated vegetation, large mammal, on- site	L	L	0	L	0	0	0	0	L	M	0	0	0	0	0	L	M	H
Consumption of contaminated vegetation, large mammal, off -site	NE	NE	0	0	0	0	NE	NE	0	0	NE	NE	0	0	NE	NE	NE	NE
Consumption of contaminated water, small mammal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Birds																		
Acute/Accidental Exposures																		
Consumption of contaminated grass, large bird	0	0	0	L	L	M	0	L	L	L	0	0	0	0	0	0	L	M
Consumption of contaminated insects, small bird	0	L	0	L	L	M	0	L	L	L	0	0	0	0	0	0	L	M
Consumption of contaminated small mammal, predatory bird	0	0	0	0	0	0	0	L	0	0	0	0	0	0	0	0	0	0
Consumption of contaminated fish, predatory bird, spill	0	0	0	0	0	0	0	L	0	0	0	0	0	0	0	0	0	0
Chronic Exposures																		
Consumption of contaminated vegetation, large bird, on-site	0	0	0	L	0	0	L	L	0	0	0	0	0	0	0	L	L	M
Consumption of contaminated vegetation, large bird, off-site	NE	NE	0	0	0	0	NE	NE	0	0	NE	NE	0	0	NE	NE	NE	NE
Consumption of contaminated fish, predatory bird	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aquatic Species																		
Acute/Accidental Exposures																		
Fish (susceptible species) – accidental spill	H	H	L	L	0	L	H	H	L	L	0	L	0	L	M	M	H	H
Fish (tolerant species) – accidental spill	L	L	0	0	0	0	M	H	0	L	NE	NE	0	0	0	L	M	H

	2,4-D[1]		Clopyralid		Dicamba		Glyphosate[1]		Hexazinone		Imazapyr		Metsulfuron methyl		Picloram		Triclopyr[1]	
	Typ[2]	Max[2]	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max
Fish (susceptible species) – acute exposure, peak EEC	L	L	0	0	0	0	L	M	0	0	0	0	0	0	0	0	0	L
Fish (tolerant species) – acute exposure, peak EEC	0	0	0	0	0	0	0	L	0	0	NE	NE	0	0	0	0	0	0
Aquatic Invertebrates – accidental spill	0	0	L	M	L	M	M	M	L	L	0	0	0	0	0	0	L	M
Aquatic Invertebrates – acute exposure, peak EEC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chronic Exposures																		
Fish – chronic exposure	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aquatic invertebrates – chronic exposure	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insects																		
Acute Exposures																		
Direct spray, bee, 100% absorption	NE	NE	0	L	NE	NE	NE	NE	L	L	NE	NE	0	0	NE	NE	NE	NE
Consumption of Fruit by a Herbivorous Insect	NE	NE	NE	NE	NE	NE	0	0	NE	NE	0	0	NE	NE	0	0	0	0
Consumption of Broadleaf/Small Insects by a Herbivorous Insect	NE	NE	NE	NE	NE	NE	L	L	NE	NE	0	0	NE	NE	0	0	0	L
Consumption of Short grass by a Herbivorous Insect	NE	NE	NE	NE	NE	NE	L	L	NE	NE	0	0	NE	NE	0	0	0	L
Consumption of Tall Grass by a Herbivorous Insect	NE	NE	NE	NE	NE	NE	L	L	NE	NE	0	0	NE	NE	0	0	0	L

Shading denotes herbicides that are limited by PEIS Mitigation Measures to typical application rates where feasible.
1 Risk levels for the more toxic formulations are presented here.
2 Typ = typical application rate; and Max = maximum application rate.
3 Risk categories: 0 = No risk (HQ < LOC); L = Low risk (HQ = 1 to 10 x LOC); M = Moderate risk (HQ = 10 to 100 x LOC); H = High risk (HQ > 100 LOC); and NE = Not evaluated. Risk categories are based on upper estimates of hazard quotients and the BLM LOCs of 0.1 for acute scenarios and 1.0 for chronic scenarios. The reader should consult the text of this section of the individual Forest Service Risk Assessments to evaluate risks at central estimates of hazard quotients.
Fish susceptible species include coldwater fish, such as trout, salmon, and Federally Listed species. Fish tolerant species include warm water fish, such as fathead minnows.

Table D-8. Forest Service-Evaluated Herbicide Risk Categories for Human Health

	2,4-D[1]		Chlorsulfuron		Clopyralid		Dicamba		Glyphosate[1]		Hexazinone		Imazapyr		Metsulfuron		Picloram		Triclopyr BEE[1]	
	Typ[2]	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max
Workers																				
General Exposures																				
Directed foliar and spot treatments (backpack)	L[3]	L	0	0	0	0	0	0	0	0	0	L	0	0	0	0	0	0	0	L

	2,4-D[1]		Chlorsulfuron		Clopyralid		Dicamba		Glyphosate[1]		Hexazinone		Imazapyr		Metsulfuron		Picloram		Triclopyr BEE[1]	
	Typ[2]	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max
Broadcast ground spray (boom spray)	L	L	0	L	0	0	0	L	0	0	0	L	0	0	0	0	0	0	0	L
Aerial applications (pilots and mixer/loaders)	NE	NE	0	0	0	0	0	0	0	0	0	L	0	0	0	0	0	0	0	L
Aquatic applications	L	L	NE	NE	NE	NE	NE	NE	0	0	NE	NE	0	0	NE	NE	NE	NE	NE	NE
Accidental/Incidental Exposures																				
Immersion of hands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wearing contaminated gloves	M	M	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	L
Spill on hands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spill on lower legs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Public																				
Acute/Accidental Exposures																				
Direct spray - child, entire body	0	L	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Direct spray - woman, lower legs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	L
Dermal - contaminated vegetation, woman	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	L
Consumption of contaminated fruit	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	L
Consumption of contaminated water - pond, spill	NE	NE	0	0	0	L	0	L	NE	NE	0	0	NE	NE	0	0	NE	NE	NE	NE
Consumption of contaminated water - stream, ambient	NE	NE	0	0	0	0	0	0	NE	NE	0	0	NE	NE	0	0	NE	NE	NE	NE
Consumption of contaminated water - child	0	0	NE	NE	NE	NE	NE	NE	0	L	NE	NE	0	0	NE	NE	0	0	0	L
Consumption of contaminated fish - general public	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Consumption of contaminated fish - subsistence populations	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chronic/Longer-term Exposures																				
Consumption of contaminated fruit	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	L

	2,4-D[1]		Chlorsulfuron		Clopyralid		Dicamba		Glyphosate[1]		Hexazinone		Imazapyr		Metsulfuron		Picloram		Triclopyr BEE[1]	
	Typ[2]	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max
Consumption of contaminated water	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Consumption of contaminated fish - general public	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Consumption of contaminated fish - subsistence populations	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Shading denotes herbicides that are limited by PEIS Mitigation Measures to typical application rates where feasible.

1 Where different formulations exist, risks reported are the most conservative.

2 Typ = Typical application rate; and Max = Maximum application rate.

3 Risk categories: 0 = No risk (majority of HQs < 1); L = Low risk (majority of HQs >1 but < 10); M = Moderate risk (majority of HQs > 10 but < 100); H = High risk (majority of HQs > 100); and NE = Not evaluated. Risk categories are based on central HQ estimates. To determine risk for lower or upper HQ estimates, see the individual herbicide Risk Assessments (SERA 2005b). Risk categories are based on comparison to the HQ of 1 for typical and maximum application rates.

Appendix E – Invasive Plant List and Locations, Wildfires, and Treatment Summary

Information included in this Appendix:

Table E-1. ***Documented Invasive Plant Sites.*** This is a list of all documented invasive plant sites on the Lakeview Resource Area, by plant species and location. This (and its GIS map counterpart) contains the site-specific data used in the effects analysis, and to be used in the creation of the Annual Treatment Plan. These sites are summarized on Table 2-1, *Summary of Documented Invasive Plant Sites, Lakeview Resource Area* in Chapter 2. (Some "sites", for example along roads, contain multiple locations.)

Table E-2. ***Wildfires 45 Acres or Larger, 1968-2012, Lakeview Resource Area.*** This is a list by fire name, year, and size of the wildfires that appear on Figure 2-3, *Recent Wildfires and Cheatgrass Dominated Plant Communities from Ecological Site Inventory* and that are included in Table 2-3, *Summary of Recent Wildfires and ESI Cheatgrass Sites, Lakeview Resource Area.*

Table E-3. ***Summary of Treatments by Species.*** This table summarizes the planned treatment options for each species from Table 2-5, *Treatment Key, No Action Alternative* and Table 2-8, *Treatment Key, Proposed Action.*

Table E-1: Documented Invasive Plant Sites[1]

Site Name	Species Code[2]	Treatment Acres	Actual Acres Treated in 2013	Treatment Methods[3]			Herbicide Application Method[4]	
				No Action Herbicides	Proposed Action Herbicides	Other Treatments	No Action	Proposed Action
Recreation: Campgrounds								
Duncan Reservoir Campground (Developed)	SAAE	1		Mediterranean sage			S[3]	S
Duncan Reservoir Campground (Developed)	various	1		4D, DI, GL, PC	CL, DI,GL, IC, IR	Manual	S	S
Green Mountain Campground (Developed)	various	2		4D, DI, GL, PC	DI, IC	Manual	S	S
Recreation: Primitive Campgrounds								
Sand Dunes Campsites	various	1		4D, DI, GL, PC	CL	Manual	S	S
Lost Forest Campsites	various	1		4D, DI, GL, PC	4D, CS, CL, GL, HZ, IC, IR	Manual	S	S
Sunstone Campground	CETE5	5		Not treated	Annual Broadleaves			B
Sunstone Campground	BRTE	15		Not treated	Annual Grasses			B
Sunstone Campground	various	5		4D, DI, GL, PC	CS, CL, GL, IC	Manual	S	S
Recreation: Day-Use Areas								
Crack in the Ground	various	5		4D, DI, GL, PC	4D, CS, CL, GL, IC, IR		S	S
Crack in the Ground	BRTE	5		Not treated	Annual Grasses			B
Doherty Slide Hang Gliding Launch	CADR[5]	5		Perennial Mustards			S	B
Doherty Slide Hang Gliding Launch	HAGL	5		Halogeton			B	B
Doherty Slide Hang Gliding Launch	various	1		4D, DI, GL, PC	4D, CS, CL, IC, MM	Manual	S	S
Derrick Cave Day Use Area	various	1		4D, DI, GL, PC	4D, CS, CL, GL, IC	Manual	S	S
Black Hills Day Use Area	various	1		4D, DI, GL, PC	CL, IC	Manual	S	S
Highway Well Rest Area	SAAE	1	1	Mediterranean sage			S	S, B
Highway Well Rest Area	various	1		4D, DI, GL, PC	IC	Manual	S	S
Public Sunstone Collection Area	various	1		4D, DI, GL, PC	CS, IC, MM		S	S
Buck Creek Watchable Wildlife Area	various	1		4D, DI, GL, PC	CS, CL, GL, IC	Manual	S	S
Abert Lake Wildlife Viewing Area	various	3		4D, DI, GL, PC	4D, CS, CL, IC	Manual	S	S
Warner Wetlands Wildlife Viewing	various	1		4D, DI, GL, PC	4D, CS, IC, IR	Manual	S	S
Warner Wetlands Wildlife Viewing	CIAR4	5	5	Thistle			S, B	S, B
Warner Wetlands Wildlife Viewing	CADR[5]	5	5	Perennial Mustards			B	S
Warner Wetlands Wildlife Viewing	LELA2	5	5	Perennial Mustards			B	S
Hart Bar- Warner Wetland Rest Area	various	3		4D, DI, GL, PC	CS, CL, IC, IR		S	S
Campbell Lake Canoe Launch	various	1		4D, GL	4D, CL, GL, MM, TR		S	S
Turpin Lake Canoe Launch	various	1		4D, GL	4D, CL, GL, MM, TR		S	S
Alkali Flat Canoe Launch	various	1		4D, GL	4D, CL, GL, MM, TR		S	S
Special Management Areas								

Site Name	Species Code[2]	Treatment Acres	Actual Acres Treated in 2013	Treatment Methods[3]			Herbicide Application Method[4]	
				No Action Herbicides	Proposed Action Herbicides	Other Treatments	No Action	Proposed Action
Black Hills ACEC/RNA	various	1		4D, DI, GL, PC	CS, CL, IC		S	S
Connley Hills ACEC/RNA	various	1		4D, DI, GL, PC	CL, GL, IC, MM		S	S
Devil's Garden Lava Beds ACEC/WSA	various	1		4D, DI, GL, PC	CL, GL, IC, MM		S	S
Devil's Garden Lava Bed ACEC/WSA	BRTE	50		Not treated	Annual Grasses			S, B, A
Diablo Mountains WSA	SAAE	1000	5	Mediterranean sage			B, A	B, A
Diablo Mountains WSA	CANU4	250	5	Thistle			B	B, A
Foley Lake ACEC/RNA	CADR[5]	10		Perennial Mustards			B	B
Foley Lake ACEC/RNA	XASP2	10		Annual Broadleaves			B	B
Fish Creek Rim ACEC/RNA	SAAE	20	1	Mediterranean sage			B, A	B
Fish Creek Rim ACEC/RNA	CADR[5]	40	1	Perennial Mustards			S, B	S, B
Fish Creek Rim WSA	various	1		4D, DI, GL, PC	CL, IC		S	S
Fish Creek Rim WSA	CADR[5]	5	0.1	Perennial Mustards			B	S, B
Guano Creek-Sink Lakes ACEC/RNA - Guano Creek WSA	various	5		4D, DI, GL, PC	4D, CS, CS, DI, GL, IC, IR, MM	Manual	S	S
Hawksie-Walksie ACEC/RNA	various	5		4D, DI, GL	4D, CS, CS, DI, GL, IC, IR, MM	MA	S	S
Hawk Mountain WSA	various	5	0.1	4D, DI, GL	CL, IC		S	S
High Lakes ACEC	ACRE4	10	5	Russian Knapweed & Canada thistle			B	B
High Lakes ACEC	CIAR4	10		Thistle			S	S
High Lakes ACEC	CIVU	10		Thistle			S	S
Juniper Mountain ACEC/RNA	CANU4	500	250	Thistle			B	S, B, A
Juniper Mountain ACEC/RNA	CIAR4	50		Thistle			S, B	S, B, A
Juniper Mountain ACEC/RNA	CIVU	50		Thistle			S, B	S, B, A
Juniper Mountain ACEC/RNA	CADR[5]	25		Perennial Mustards			B	S, B, A
Abert Rim ACEC/WSA - Lake Abert ACEC	SAAE	1000		Mediterranean sage			B, A	B, A
Lake Abert ACEC	CIAR4	15		Thistle			S, B	S, B
Lake Abert ACEC	LELA2	20		Perennial Mustards			B	B
Lake Abert ACEC	CANU4	15		Thistle			S, B, A	S, B, A
Lake Abert ACEC	BRTE	100		Not treated	Annual Grasses			B
Lost Forest -Sand Dunes- Fossil Lake ACEC	various	1		4D, DI, GL, PC	CL, GL, IC, MM		S	S
Lost Forest RNA/ISA	various	1		4D, DI, GL, PC	CL, GL, IC, MM		S	S
Lost Forest ISA	various	5		4D, DI, GL, PC	CL, IC		S	S
Sand Dune WSA	various	5		4D, DI, GL, PC	CL, IC		S	S
Orejana Canyon WSA	various	5		4D, DI, GL, PC	CS, CL, IC	Manual	S	S
Red Knoll ACEC	TACA8	5000		Annual Grasses			S	B

Site Name	Species Code[2]	Treatment Acres	Actual Acres Treated in 2013	Treatment Methods[3]			Herbicide Application Method[4]	
				No Action Herbicides	Proposed Action Herbicides	Other Treatments	No Action	Proposed Action
Red Knoll ACEC	CADR[5]	40		Perennial Mustards			B	B
Red Knoll ACEC	SAAE	40		Mediterranean sage			B, A	B, A
Red Knoll ACEC	CIAR4	20	1	Thistle			S, B	S, B
Rahilly-Gravelly ACEC/RNA	CIVU	5		Thistle			S	S
Rahilly-Gravelly ACEC/RNA	XASP2	5		Annual Broadleaves			S	S
Rahilly-Gravelly ACEC/RNA	SAAE	5	1	Mediterranean sage			B, A	B, A
Rahilly-Gravelly ACEC/RNA	CIAR4	5	5	Thistle			S, B	S, B
Rahilly-Gravelly ACEC/RNA	HAGL	15		Halogeton			B	B
Rahilly-Gravelly ACEC/RNA	ONAC	5	1	Thistle			S	S
Rahilly-Gravelly ACEC/RNA	LELA2	15	5	Perennial Mustards			S, B	S, B
Rahilly-Gravelly ACEC/RNA	CADR[5]	15	5	Perennial Mustards			S, B	S, B
Sage Hen Hills WSA	SAAE	50		Mediterranean sage			S, B	B
Sage Hen Hills WSA	CADR[5]	50		Perennial Mustards			S	S
Sage Hen Hills WSA	CANU4	50		Thistle			S	S
Squaw Ridge Lavabed WSA	various	5		4D, DI, GL, PC	IC	Manual	S	S
Spaulding WSA	various	5		4D, DI, GL, PC	CL, IC	Manual	S	S
Spanish Lake ACEC/RNA	HAGL	15		Halogeton			B	B
Table Rock ACEC	various	1		4D, DI, GL, PC	CL, GL, IC, MM		S	S
Warner Wetlands ACEC	ACRE4	100	25	Russian Knapweed & Canada thistle			S	S
Warner Wetlands ACEC	LELA2	10000	1500	Perennial Mustards			B	S, B
Warner Wetlands ACEC	CADR[5]	300	200	Perennial Mustards			B	S, B
Warner Wetlands ACEC	CIAR4	1000	200	Thistle			B	S
Fire / Fuels / Juniper Treatment Areas								
Fire Rehabilitation (multiple sites)	BRTE	1000		Not treated	Annual Grasses			S, B
Fire Rehabilitation (multiple sites)	TACA8	1000		Annual Grasses			S	S, B
Fire Rehabilitation (multiple sites)	CANU4	25		Thistle			S	S, B
Fire Rehabilitation (multiple sites)	CIVU	25		Thistle			S	S, B
Fire Rehabilitation (multiple sites)	CIAR4	25		Thistle			S	S, B
Invasive plant control after Juniper removal projects	BRTE	1500		Not treated	Annual Grasses			S, B
Invasive plant control after Juniper removal projects	TACA8	1000		Annual Grasses			S	S, B
South Warner	BRTE	1000		Not treated	Annual Grasses			S, B
Water Developments								
Spring and Spring Exclosures (multiple sites)	CIAR4	150	10	Thistle			S	S
Spring and Spring Exclosures (multiple sites)	CIVU	25		Thistle			S	S
Spring and Spring Exclosures (multiple sites)	CADR[5]	50	1	Perennial Mustards			S	S

Site Name	Species Code[2]	Treatment Acres	Actual Acres Treated in 2013	Treatment Methods[3]			Herbicide Application Method[4]	
				No Action Herbicides	Proposed Action Herbicides	Other Treatments	No Action	Proposed Action
Waterholes and Reservoirs (multiple sites)	CIAR4	200	5	Thistle			S	S
Waterholes and Reservoirs (multiple sites)	HAGL	200		Halogeton			S	S
Waterholes and Reservoirs (multiple sites)	CIVU	200		Thistle			S	S
Waterholes and Reservoirs (multiple sites)	CADR[5]	200	20	Perennial Mustards			B	S
Waterholes and Reservoirs (multiple sites)	CANU4	75	10	Thistle			S	S
Check Dams	CIAR4	15	1	Thistle			S	S
Check Dams	HAGL	15		Halogeton			S	S
Check Dams	CIVU	15		Thistle			S	S
Check Dams	CANU4	5	1	Thistle			S	S
Pipeline	CIAR4	50	5	Thistle			S	S
Pipeline	HAGL	50		Halogeton			B	B
Wildlife Habitat Improvement								
Riparian Areas (multiple sites)	SAAE	50		Mediterranean sage			S, B	S
Riparian Areas (multiple sites)	CIAR4	50		Thistle			S, B	S
Riparian Areas (multiple sites)	CADR[5]	50		Perennial Mustards			S, B	S
Warner Annual Grass Control (multiple sites)	VEDU	500		Not treated	Annual Grasses			B, A
Warner Annual Grass Control (multiple sites)	TACA8	1500		Annual Grasses			S	B, A
Warner Annual Grass Control (multiple sites)	BRTE	500		Not treated	Annual Grasses			B, A
Mill Creek Annual Grass Control (multiple sites)	TACA8	150		Annual Grasses			S	B, A
Warner Valley	LELA2	5000	1500	Perennial Mustards			B, A	B, A
Picture Rock Pass (Duncan & Ana Restoration Projects)	TACA8	500		Annual Grasses			S	B, A
Picture Rock Pass (Duncan & Ana Restoration Projects)	CANU4	50	1	Thistle			S, B	B, A
Picture Rock Pass (Duncan & Ana Restoration Projects)	CIAR4	10	1	Thistle			S, B, A	B, A
Dry Valley	CADR[5]	5		Perennial Mustards			S	S
Caulder	SAAE	400	25	Mediterranean sage			S, B	S, B, A
Westside of Abert Lake	SAAE	500		Mediterranean sage			B, A	S, B, A
Dick's Creek	TACA8	100		Annual Grasses			S	B
Dick's Creek	SAAE	50		Mediterranean sage			S	S, B
Poverty Basin	LELA2	25	5	Perennial Mustards			B	S
Murdock	TACA8	1000		Annual Grasses			S	B, A
Egli Rim	TACA8	500		Annual Grasses			S	B, A
BeeCraft	TACA8	120		Annual Grasses			S	B, A
Honey Creek	TACA8	500		Annual Grasses			S	B, A
Snider Creek	TACA8	500		Annual Grasses			S	B, A

Site Name	Species Code[2]	Treatment Acres	Actual Acres Treated in 2013	Treatment Methods[3]			Herbicide Application Method[4]	
				No Action Herbicides	Proposed Action Herbicides	Other Treatments	No Action	Proposed Action
BLM Road System								
Lakeview RA Roads (multiple sites)	ACRE4	50		Russian Knapweed & Canada thistle			S, B	B
Lakeview RA Roads (multiple sites)	CADR[5]	400	5	Perennial Mustards			S, B	S, B
Lakeview RA Roads (multiple sites)	CANU4	50	1	Thistle			S, B	S, B
Lakeview RA Roads (multiple sites)	CEDI3	50		Knapweed (Diffuse and Spotted)			B	B
Lakeview RA Roads (multiple sites)	CESO3	30		Starthistles			S	S, B
Lakeview RA Roads (multiple sites)	CEST8	50	4	Knapweed (Diffuse and Spotted)			S	S
Lakeview RA Roads (multiple sites)	CIAR4	250	1	Thistle			S	S, B
Lakeview RA Roads (multiple sites)	CIVU	150	1	Thistle			S	S
Lakeview RA Roads (multiple sites)	COAR4	30	1	Field Bindweed			S	S, B
Lakeview RA Roads (multiple sites)	DIFU2	30		Not treated	Teasel			S
Lakeview RA Roads (multiple sites)	HAGL	250		Halogeton			S	S
Lakeview RA Roads (multiple sites)	HYPE	25		St John's wort			S	S
Lakeview RA Roads (multiple sites)	ISTI	10	1	Perennial Mustards			S	S
Lakeview RA Roads	LIDA	5		Toadflax			S	S
Lakeview RA Roads	LIVU2	5		Toadflax			S, B	S, B
Lakeview RA Roads (multiple sites)	ONAC	30	10	Thistle			S	S
Lakeview RA Roads (multiple sites)	SAAE	1500	10	Mediterranean sage			S	S
Lakeview RA Roads (multiple sites)	TACA8	1000	5	Annual Grasses			S	S, B
Lakeview RA Roads (multiple sites)	TRTE	10		Annual Broadleaves			S, B	S, B
Lakeview RA Roads (multiple sites)	XASP2	40		Annual Broadleaves			S	S
Lakeview RA Roads (multiple sites)	VEDU	1000		Not treated	Annual Grasses			B
Lands: Major Utility Line ROWs								
Ruby Pipeline ROW	ISTI	5		Perennial Mustards			B	S, B
Ruby Pipeline ROW	CIVU	5		Thistle			S, B	S, B
Ruby Pipeline ROW	ONAC	5		Thistle			S, B	S, B
Ruby Pipeline ROW	CANU4	5		Thistle			S, B	S, B
Ruby Pipeline ROW (multiple sites)	BRTE	10		Not treated	Annual Grasses			S, B
Ruby Pipeline ROW (multiple sites)	TACA8	10		Annual Grasses			S	S, B
BPA Direct Intertie ROW (multiple sites)	TACA8	10		Annual Grasses			S	S, B
BPA Direct Intertie ROW	ONAC	5		Thistle			S, B	S, B
BPA Direct Intertie ROW	CADR[5]	5		Perennial Mustards			B	S, B
BPA Direct Intertie ROW (multiple sites)	SAAE	10		Mediterranean sage			B	S, B
BPA Direct Intertie ROW	LIDA	5		Toadflax			S, B	S, B
BPA Direct Intertie ROW	ACRE4	5		Russian Knapweed & Canada thistle			B	S, B

Site Name	Species Code[2]	Treatment Acres	Actual Acres Treated in 2013	Treatment Methods[3]			Herbicide Application Method[4]	
				No Action Herbicides	Proposed Action Herbicides	Other Treatments	No Action	Proposed Action
BPA Direct Intertie ROW	SAKA	5		Not treated	Thistle			S, B
Pacific Power and Light ROW (multiple sites)	BRTE	100		Not treated	Annual Grasses			S, B

1. See also Figure 2-1 (*Documented Invasive Plant Sites*) and Table 2-1 (*Summary of Documented Invasive Plants Sites, Lakeview Resource Area*) in Chapter 2.
2. See Table 2-1 (*Summary of Documented Invasive Plants Sites, Lakeview Resource Area*) for common and scientific names.
3. See Tables 2-5 and 2-8, *Treatment Key*, in Chapter 2 for treatments applicable to each species group. If various invasive plants are present at a single site, chemicals that will be used are abbreviated as follows:

4d: 2,4-D	CL: clopyralid	HZ: hexazinone	IR: imazapyr	PC: picloram	TR: triclopyr
CS: chlorsulfuron	DI: dicamba	IC: imazapic	MM: metsulfuron methyl	SM: sulfometuron methyl	GL: glyphosate

4. S: Spot, B: Broadcast, A: Aerial
5. Species code CADR indicates whitetop. Species at the site may include hoary cress (CADR), hairy whitetop (CAPU6), and/or lens-podded whitetop (CACH42).

Table E-2. Wildfires 45 Acres or Larger, 1968-2012, Lakeview Resource Area[1]

Year	Fire Name	Acres
1968	Skeletion	1,500
1968	Horse Mountain	2,500
1968	Goodrick well	7,300
1968	Euchre Butte	600
1969	Horse Mountain	7,500
1969	Horsehead Mountain	5,500
1969	Cox Butte	3,000
1970	Boilout Basin	1,970
1971	Abert Lake	2,700
1971	Stunkel Mountain	2,000
1972	Gerkin well	250
1973	Stormx	400
1973	Sprague Well	3,113
1974	Coyote Hills	2,000
1974	Sandy Seed	250
1974	Hill Camp	1,500
1978	Hogback	300
1980	Plush	80
1981	Elk Butte	500
1981	Plush	1,600
1981	Cyote	300
1981	Poverty	250

Year	Fire Name	Acres
1981	Venator	7,000
1982	Orejanna	250
1983	Little Juniper	3,600
1983	4Corners	2,700
1983	MCBroom	140
1983	Sharptop	8,000
1983	Peterck	150
1983	Horse Mountain	6,000
1984	Sharptop	8,000
1984	Coyote	11,000
1984	Saunders	2,700
1984	L. Juniper	5,500
1984	Bunchy	13,000
1984	Babbit2	32,000
1984	Burma	6,500
1984	Abert	8,000
1984	Caulderwooed	3,000
1984	CalderII	1,300
1985	BigRock	20,000
1985	Rattlesnake	2,000
1985	Orejanna	2,000
1985	Willow	300

Year	Fire Name	Acres
1985	Drycreek	300
1986	Bacon Camp	4,800
1986	Schieldcres	250
1986	Eaglebutte	250
1986	Elkbutte	200
1986	Dickerson	2,500
1986	Abert	10,000
1986	RIM	80
1985	Terry	170
1987	Horse Mountain	4,500
1987	Swamp	425
1987	Sinkeast 1	750
1988	Southhart	3,300
1989	Dragon	60
1984	Eglirin	4,000
1984	Gerkinrim	100
1984	Buffalo	1,700
1986	Abert	10,000
1986	Ugly	8,500
1986	Lavabed	200
1986	Rogerwell	775
1986	X-Masdump	150

Year	Fire Name	Acres
1987	Holdingrnd	500
1989	Ennis	1,500
1990	Swamp	300
1992	Johnspring	1,500
1992	Blackhawk	750
1992	Swan Lake	250
1992	Ludi2	500
1983	Alkali Butte	5,500
1984	Sheep Camp	10,000
1968	Saddle Butte	750
1983	Elk Butte	2,500
1994	Spaulding	2,000
1995	Jeep	200
1996	Fishcreek	300
1995	Sprague	300
1996	Dingo	500
1996	Squirrel	60
1996	Leman	70
1996	Flat	250
1996	Lowerlake2	600
1996	Hotchkiss	100

Year	Fire Name	Acres
1987	Elk Butte	108
1998	Wetlands	350
1998	Valley	70
1999	Crump	3,500
1999	Lynch	2,000
2000	Walker Butte	45
2000	Beaty Butte	35,500
2000	Abert	10,000
2000	Juniper	100
2000	Lugnut	2,000
2001	South Warner	1,800
2001	Big Juniper	83,000
2001	Mustang	5,000
2001	Jump	2,000
2001	Christmas	350
2001	Crump	95
2001	Johnson	2,500
A2002	Lava	23,000
2002	Silver	25,000
2002	Tucker	1,800
2002	Toolbox	60,000

Year	Fire Name	Acres
2002	Winter	34,000
2003	Flat Top	85
2003	Marsh (Warner Wetland ACEC)	60
2004	Sagehen	500
2004	Steamboat	55
2005	Benjamin Lake	400
2009	Well	300
2010	Poker Jim	30,000
2011	Buffalo	1,400
2011	Garden	6,000
2012	Lava	21,000
2012	Crack in the Ground	850
2012	Blue Joint	3,400
2012	Hickey	2,800

1. See also Figure 2-3 (*Recent Wildfires and ESI Cheatgrass Sites, Lakeview Resource Area*) and Table 2-3 (*Summary of Recent Wildfires and ESI Cheatgrass Sites, Lakeview Resource Area*).

Table E-3. Summary of Treatments by Species[1].

Species Name	Documented acres	No Action				Proposed Action														Both Alternatives						Species Group *Treat as (See Tables 2-5 and 2-8, Treatment Key)*
		2,4-D	Dicamba	Glyphosate	Picloram	2,4-D	Chlorsulfuron	Clopyralid	Dicamba	Diflufenzopyr +	Fluridone	Glyphosate	Hexazinone	Imazapic	Imazapyr	Metsulfuron	Picloram	Sulfometuron	Triclopyr	Manual	Mechanical	Biocontrols	Prescribed fire	Seeding / planting	Grazing	
Black Henbane	NA	Not Treated				√	√	√	√							√	√		√	√		√				Thistles
Buffalobur	<1	√	√			√	√		√	√						√				√						Annual Broadleaves
Bull Thistle	485	√	√		√	√	√	√	√							√	√		√	√		√				Thistles
Bur Buttercup	5	Not Treated				√	√		√	√						√				√			√			Annual Broadleaves
Canada Thistle	1,855	√		√	√	√	√	√				√					√			√		√			√	Russian Knapweed and Canada Thistle
Cheatgrass	4,280	Not Treated					√					√	√	√				√					√	√	√	Annual Grasses
Climbing nightshade	NA	Not Treated				√	√		√	√						√				√						Annual Broadleaves
Common mullein	NA	Not Treated				√	√	√	√							√	√		√	√		√				Thistles
Common tansy	NA	Not Treated				√	√		√			√				√	√			√	√					Common Tansy
Common teasel	30	Not Treated					√	√								√				√						Teasel
Curly Dock	NA	Not Treated				√	√			√						√				Not effective						Curly Dock
Dalmatian Toadflax	10	√			√	√	√							√	√	√	√			√		√				Toadflax
Diffuse Knapweed	50				√	√		√				√			√		√			√		√				Knapweed (Diffuse and Spotted)
Dyers woad	15	√	√	√		√	√		√			√				√				Not effective						Perennial Mustards
Field bindweed	30	√	√	√	√	√			√	√		√				√	√			√						Field Bindweed
Field Mustard	NA	Not Treated				√	√		√			√				√				Not effective						Perennial Mustards
Field Sow Thistle	NA	Not Treated				√	√	√	√							√	√		√	√		√				Thistles
Halogeton	550	√	√			√	√		√	√						√				√						Halogeton
Horehound	NA	Not Treated				√										√	√		√	√						Horehound
Kochia	<1	√	√			√	√		√	√						√				√						Annual Broadleaves
Malta starthistle	NA	Not Treated				√		√							√		√			√						Starthistles
Mediterranean sage	4,627	√		√	√	√	√	√				√				√	√			√		√				Mediterranean sage
Medusahead rye	12,890			√			√					√	√	√				√					√	√		Annual Grasses
Musk Thistle	1,025	√	√		√	√	√	√	√							√	√		√	√		√				Thistles
North Africa grass	1,500	Not Treated					√					√	√	√				√					√	√	√	Annual Grasses

Species Name	Documented acres	No Action				Proposed Action														Both Alternatives						Species Group *Treat as (See Tables 2-5 and 2-8, Treatment Key)*
		2,4-D	Dicamba	Glyphosate	Picloram	2,4-D	Chlorsulfuron	Clopyralid	Dicamba	Diflufenzopyr +	Fluridone	Glyphosate	Hexazinone	Imazapic	Imazapyr	Metsulfuron	Picloram	Sulfometuron	Triclopyr	Manual	Mechanical	Biocontrols	Prescribed fire	Seeding / planting	Grazing	
Oxeye daisy	NA	Not Treated															√			√						NA
Perennial pepperweed	15,065	√	√	√		√	√		√			√				√				Not effective						Perennial Mustards
Perennial ryegrass	NA	Not Treated										√			√			√		√						Perennial Grasses
Poison hemlock	<1	√	√	√		√			√			√			√	√				√						Hemlock (Poison and Water)
Poverty brome	NA	Not Treated					√					√	√	√				√					√	√	√	Annual Grasses
Prickly lettuce	NA	Not Treated				√	√		√	√						√				√						Annual Broadleaves
Prickly Sow Thistle	NA	Not Treated				√	√	√	√							√	√		√	√		√				Thistles
Puncturevine	10	√	√			√	√		√	√						√				√						Annual Broadleaves
Red brome	NA	Not Treated					√					√	√	√				√					√	√	√	Annual Grasses
Reed canary grass	NA	Not Treated									√	√			√				√	Not effective						Aquatic Plants
Ripgut brome	NA	Not Treated					√					√	√	√				√					√	√	√	Annual Grasses
Russian Knapweed	165	√		√	√	√	√	√				√					√			√						Russian Knapweed and Canada Thistle
Russian olive	<1	Not Treated										√			√				√	√						Tamarisk and Russian Olive
Russian thistle	5	Not Treated				√	√	√	√							√	√		√	√		√				Thistles
Saltcedar	<1	Not Treated										√			√				√	√						Tamarisk and Russian Olive
Scotch Broom	<1			√								√			√				√	√		√				Tamarisk and Russian Olive
Scotch Thistle	45	√	√		√	√	√	√	√							√	√		√	√		√				Thistles
Soft brome	NA	Not Treated					√					√	√	√				√					√	√	√	Annual Grasses
Spiny cocklebur	55	√	√			√	√		√	√						√				√						Annual Broadleaves
Spotted Knapweed	50				√	√		√				√			√		√			√		√				Knapweed (Diffuse and Spotted)
St. John's wort	25			√	√	√				√		√				√	√			√						St. John's wort
Sulfur cinquefoil	<1		√		√				√								√			√						NA
Tamarisk	<1	Not Treated										√			√				√	√						Tamarisk and Russian Olive
Whitetop (Hairy)		√	√	√		√	√		√			√				√				Not effective						Perennial Mustards
Whitetop (Hoary Cress)		√	√	√		√	√		√			√				√				Not effective						Perennial Mustards
Whitetop (Lens-Podded)	1,205	√	√	√		√	√		√			√				√				Not effective						Perennial Mustards
Wild oat	NA	Not Treated					√					√	√	√				√					√	√	√	Annual Grasses

Species Name	Documented acres	No Action				Proposed Action														Both Alternatives						Species Group *Treat as (See Tables 2-5 and 2-8, Treatment Key)*
		2,4-D	Dicamba	Glyphosate	Picloram	2,4-D	Chlorsulfuron	Clopyralid	Dicamba	Diflufenzopyr +	Fluridone	Glyphosate	Hexazinone	Imazapic	Imazapyr	Metsulfuron	Picloram	Sulfometuron	Triclopyr	Manual	Mechanical	Biocontrols	Prescribed fire	Seeding / planting	Grazing	
Yellow starthistle	30	√			√	√		√							√		√			√						Starthistles
Yellow Toadflax	5	√			√	√	√							√	√	√	√			√		√				Toadflax

1. Dark gray cells indicate treatment methods that will be used more than 50% of the time. Light gray cells indicate treatment methods that will be used 20%-50% of the time, and white cells show methods that will be used less than 20% of the time. Herbicides could be used as part of a tank mix (for example, perennial pepperweed will be treated with chlorsulfuron + 2,4-D 30% of the time and metsulfuron methyl + 2,4-D 30% of the time) or could happen in conjunction with other treatment methods (for example, cheatgrass could be burned, treated with imazapic, and then seeded). See Tables 2-5 and 2-8, *Treatment Key*, in Chapter 2 for information about why a particular treatment method would be chosen.

Appendix F: Lakeview District 2015-2016 Weed Prevention Schedule

General Prevention Activity	Description	When (season)	Who
	Equipment / Operations		
Clean off-road equipment (power or high-pressure cleaning) of all mud, dirt, and plant parts before moving into relatively weed-free areas.	All projects in the resource area involving off-road equipment: • Backhoes for waterhole clean out. • Road construction equipment. • Rangeland drills. • Herbicide Application Equipment. • Mowers/brush beaters	All Year	Maintenance Manager Engineering Equipment Operator Maintenance Workers Fire Crews Contractors Permittees
Check body and undercarriage of off-road vehicles for plant material and clean with best available method before leaving weed-infested areas.	All activities occurring in weed-infested areas.	All Year	All Field Personnel (Including Seasonal Crews)
Ensure that Force Account and Fire personnel high-pressure wash plant parts, mud, etc., from fire vehicles, road graders, and heavy equipment before leaving infested sites. Assure that permits or contracts with soil-disturbing activities have provision for sanitizing equipment prior to entering BLM sites or release from jobsites.	All activities occurring in weed-infested areas. All projects involving dirt work, road work, or off-road travel.	All Year	Weed Coordinator Engineering Technician Maintenance Manager) Engineering Equipment Operator Maintenance Workers Fire Personnel Contracting Officers and Inspectors Chief of Operation Force Account Personnel

General Prevention Activity	Description	When (season)	Who
Ensure that the BLM compounds are kept free of noxious weeds.	Inventory and treat BLM yards where noxious weeds may be present. • Interagency Office • LIFC • Fire Guard Stations • Communication Sites • Lookouts	Spring/Summer	Weed Coordinator Lakeview Station Manager Fort Rock Station Manager Administrative Officer
Road Construction / Maintenance			
Re-establish vegetation on all disturbed soil from construction, reconstruction, and maintenance activities.	Any project involving surface disturbance.	Spring/Fall	Weed Coordinator Engineering Technician
Inspect gravel pits and fill sources to identify weed-free sources. Gravel and fill to be used in relatively weed-free areas must come from weed-free sources.	Utilize NAWMA gravel pit inspection forms to ensure pits are free of noxious weeds. Develop spreadsheet listing noxious weed-free pits and pits of concern.	Spring/Summer	Weed Coordinator Engineering Technician Maintenance Manager Engineering Equipment Operator Contractors
Address weed issues during annual construction and road maintenance planning. Mitigate spreading weeds from known sites.	Discuss weed prevention strategies during pre-construction meetings.	All Year	Weed Coordinator Engineering Technician Procurement Officer
Recreation			
Ensure that areas under recreation permit have on-site weed control and minimize spread to other areas.	Survey any Special Recreation Permits areas prior to permit being issued to ensure activities do not contribute to noxious weed spread.	All Year	Outdoor Recreation Planner Park Ranger Weed Coordinator
Sign trailheads and all developed and semi-developed recreation and camping sites for weed awareness, identification and weed prevention techniques.	All developed recreation and camping sites in the Lakeview Resource Area will be signed with appropriate materials.	Spring/Summer/ Fall	Outdoor Recreation Planner Park Ranger Weed Coordinator
Encourage weed-free feed for horses and pack animals and promote weed-free trails and campgrounds.	All opportunities – Sign horse camping areas and major known horse recreation areas.	Spring/Summer/ Fall	Outdoor Recreation Planner Park Ranger Weed Coordinator

General Prevention Activity	Description	When (season)	Who
Ensure all developed and semi-developed recreation and camping sites have on-site weed control and annual weed inventory.	Complete yearly inventory and treatment of recreation and campsites within the Lakeview Resource Area.	Spring/Summer/ Fall	Outdoor Recreation Planner Park Ranger Weed Coordinator
Consider off-road vehicle closures in areas of known noxious weed infestations.	Survey Sand Dunes and Clover Flat area for weed infestations and institute closures where appropriate.	All Year	Field Manager Weed Coordinator
Livestock Management			
Regularly inspect handling facilities and turn-out areas for noxious and invasive weeds.	Coordinate with permittees to ensure they're aware of noxious weed concerns. Coordinate with Range Cons to report any new infestations of noxious weeds. Encourage permittees to feed weed free forage prior to grazing on BLM lands.	Spring/Summer	Range Management Specialist
Consider timing of livestock movement from infested to noninfested areas to minimize weed seed transport in areas of moderate to high ecological risk.	In areas of concern, such as pastures infested with medusahead, make sure cattle are moved to appropriate pastures and inventories are conducted in high risk areas.	All Year	Range Management Specialist
Encourage weed-free feed for horses and cattle.	If cattle are moving from areas with weed infestations they should be feed weed free forage prior to moving onto BLM lands or other allotments.	All Year	Range Management Specialist
Timber Management			
Prefer winter skidding on high weed-risk sites for timber management.		Winter	Forester
Include weed prevention in timber management project design.		All Year	Forester
Consider winter logging to prevent noxious weed spread.		Winter	Forester
Minerals Management			
Include weed prevention and treatment in all mining plans, oil and gas activity plans, and sand and gravel plans.	Include contract language to require weed-free fill and other appropriate materials. Include language to require equipment is cleaned prior to being used on site.	All Year	Mineral Specialist Weed Coordinator
For mineral activity, retain bonds for weed control until the site is returned to desired vegetative conditions.		All Year	Mineral Specialist
Wildlife Management			
Environmental analysis for habitat improvement projects will include weed-risk considerations.	Ensure all plans (such as South Warner) include weed prevention guidelines.	All Year	Wildlife Biologist Weed Coordinator
Fire and Fuels Management			

General Prevention Activity	Description	When (season)	Who
Include weed risk factors and weed prevention considerations in Resource Advisor (Environmental Specialist) duties on all Incidental Overhead Teams and Fire Rehab Teams.	Ensure Resource Advisors have maps of noxious weed areas and are aware of resource area concerns.	Summer/Fall	Resource Advisor GIS
Include prevention measures in all activities; i.e., washing fire trucks, minimize crews walking through infested areas, etc.	Make sure IMT's are aware of infested areas and set up base camps and staging areas away from infested sites.	Fire Season	Fire Season Resource Advisor Fire Crews Weed Coordinator
Lands & Realty			
Include assessment for weed control in all land tenure adjustments. Include weed prevention stipulations in all rights-of-way authorizations.	Include language in ROW agreements stating weed control will be completed within the ROW.	All Year	Realty Specialist Weed Coordinator
Employee Awareness			
Conduct weed awareness training for field-going employees and managers.	Provide weed packets to all field crews consisting of weed identification books and weed report forms.	Winter/Summer	Weed Coordinator
Report all new noxious weed sitings during formal/informal field surveys.	Utilize noxious weed sighting form to allow employees an efficient way to report new infestations.	All Year	All Field Personnel
Systematically inventory the District to detect new invaders and expansions of established noxious weeds.	Inventory areas of the resource area considered high risk for invasion and plan surveys to maximize efficiency and coverage.	Spring/Summer	Weed Coordinator Weed and Botany Crews
Ground Disturbing Activities			
Monitor all vegetation manipulation and revegetation projects, i.e., prescribed fire areas, timber harvest activities, ROWs, seedings, juniper control areas, OHV areas, etc., for weed infestations and initiate control efforts as needed.	Coordinate with all specialists to ensure they are monitoring their project areas for weed infestations and work with the weed coordinator to ensure proper treatment is conducted. Ensure restoration materials such as seed are on hand to ensure restoration activities take place on projects at the proper time.	Spring/Summer/ Fall	Fire Crews Lands Specialist Range Management Specialists Wildlife Biologists Recreation Specialists Weed Coordinators
Re-establish desirable vegetation in areas of soil disturbance from management activities (such as road construction/maintenance, timber harvest, mining, etc.)	Ensure restoration materials such as seed are on hand to ensure restoration activities take place on projects at the proper time.	Fall	OPS/MEO Fire Crew Weed Coordinator

General Prevention Activity	Description	When (season)	Who
Use only certified weed-free seed and mulch for rangeland, habitat improvement and reclamation seeding.	Utilize ODA certified weed-free materials are available for project restoration. Utilize local source-identified seed for reclamation and restoration projects.	All Year	Project Coordinator Fire crews Range Management Specialist Weed Coordinator Contracting Officer
Public Awareness & Outreach			
Distribute public information/brochures	Work with Lake County CWMA and BLM PAO to ensure the public is aware of weed prevention and treatments that are occurring on BLM lands. Continue public education campaigns through the CWMA such as the Weed Corner, Fair and Expo Booths, EDRR weed packets and public weed tours.	Spring/Summer	Public Affairs Officer Weed Coordinator
Work closely with Oregon Department of Agriculture, Oregon Department of Transportation, and County Weed Board to coordinate cooperative weed control efforts.	Maintain close working relationship with ODA that is already well established.	All Year	Weed Coordinator
Work with adjacent landowners on weed awareness and control strategies.	Continue to support the Lake County CWMA financially and ensure its continued growth and existence. Utilize the Lake County CWMA to facilitate communication between the Lakeview Resource Area and landowners.	All Year	Weed Coordinator
Planning Documents			
Assess weed potential/risk when developing project proposals. Ensure that all NEPA and planning documents include a noxious weed element for analysis. Consider degree of physical disturbance and likelihood of invasion for any proposed management action.	Utilize risk assessment to gauge the likelihood of invasion and utilize appropriate prevention and treatment language in planning documents.	All Year	Weed Coordinator NEPA Coordinator Project Proponents Interdisciplinary Teams

For additional examples of prevention activities see Appendices 3 & 4 in *Partners Against Weeds, An Action Plan for the Bureau of Land Management* (USDI 1996a).