Integrated Invasive Plant Management For the Medford District Environmental Assessment (August 2017)

Medford District

(DOI-BLM-ORWA-M000-2017-0002-EA)

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

Medford District
3040 Biddle Road
Medford, OR 97504

Medford District botany team treating *Alyssum murale* in the Illinois Valley.

Japanese knotweed along the Rogue River.

BLM MEDFORD DISTRICT

August 2017

Acronyms and Abbreviations

ACEC	Area of Critical Environmental Concern
A.E.	Acid Equivalent
A.I.	Active Ingredient
ALS	Acetolactate synthase
APHIS	Animal and Plant Health Inspection Service
ARBO II	Aquatic Restoration Biological Opinion (2013)
BEE	With triclopyr, butoxyethyl ester
BLM	Bureau of Land Management
CFR	Code of Federal Regulation
CWMA	Cooperative Weed Management Area
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
FEIS	Final Environmental Impact Statement
FLPMA	Federal Land Policy and Management Act
FMA	Fritillary Management Area
FONSI	Finding of No Significant Impact
FWS	U.S. Fish and Wildlife Service
GIS	Geographic Information System
GUS	Groundwater Ubiquity Score
HUC	Hydrologic Unit Code
IARC	International Agency for Research on Cancer
JMPR	Joint Meeting on Pesticide Residues
K_{oc}	Soil Adsorption Value
LD_{50}	Lethal Dose to 50% of a population
LOC	Level of Concern
NEPA	National Environmental Policy Act
NISIMS	National Invasive Species Information Management System
NMFS	National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
OAR	Oregon Administrative Rule
ODA	Oregon Department of Agriculture
ODEQ	Oregon Department of Environmental Quality
ODFW	Oregon Department of Fish and Wildlife
OHV	Off-Highway Vehicle
Oregon FEIS	Vegetation Treatments Using Herbicides on BLM Lands in Oregon FEIS (2010)
PARP	Pesticide Adsorbed Runoff Potential
PDC	Project Design Criteria
2007 PEIS	Vegetation Treatments Using Herbicides on BLM Lands in 17 Western States Programmatic FEIS (2007)
2016 PEIS	Vegetation Treatments Using Aminopyralid, Fluroxypyr, and Rimsulfuron on BLM Lands in 17 Western States Programmatic FEIS (2016)
pH	potential of Hydrogen (measure of acidity)
PLP	Pesticide Leaching Potential
POEA	Polyoxyethylenamine, a surfactant found in some glyphosate formulations
PSRP	Pesticide Solution Runoff Potential
RMP	Resource Management Plan
RNA	Research Natural Area
SHPO	State Historic Preservation Office
SONCC	Southern Oregon Coast / Northern California Coasts
TEA	With triclopyr, triethylamine salt
TEP	Federally listed as threatened or endangered, or proposed for such listing
TMDL	Total Maximum Daily Load
WQRP	Water Quality Restoration Plan

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Maps
Maps are located in a separate downloadable file available on the ePlanning website or at the end of this printed document.

Chapter 1 – Purpose and Need

The Medford District manages approximately 866,000 acres located primarily in Jackson and Josephine Counties, with smaller portions in Coos, Douglas, and Curry Counties[1] (see Map 1-1; maps are located at the end of this printed document or in a separate downloadable file, available on the Bureau of Land Management (BLM) ePlanning website). The District is proposing to update its existing integrated noxious weed management program on these lands. The District currently controls noxious weeds following existing BLM policy and direction and a District-wide 1998 *Integrated Weed Management Plan and Environmental Assessment (EA)* and Decision Record, using a range of methods including manual (hand-pulling), competitive seeding and planting, and herbicides (primarily 2,4-D and glyphosate, but also limited amounts of dicamba and picloram).
The District proposes to update and expand this program by:

- Broadening the scope of the program to include invasive plants as well as noxious weeds;
- Increasing the herbicide active ingredients[2] available for use; and,
- Using additional non-herbicide direct control methods, including targeted grazing, biological control agents, propane torch spot treatments, and mechanical methods such as chainsaws and string trimmers.

> **Invasive plants** are nonnative 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).

The proposed updates to this plan allow the use of treatment methods that are generally more selective, provide better control, and have fewer adverse environmental effects. The additional herbicides are effective at lower rates, are better suited for controlling an increasing number of species of invasive plants, decrease the potential for herbicide resistance, and can be used to make associated non-herbicide methods more available and more effective (USDI 2010b:19-25). This would better align the program with the principles of integrated pest and vegetation management: protecting, maintaining, and restoring ecologically diverse and properly functioning native plant communities on public land (USDI 2008a).

The additional herbicides, and their use on all invasive plants, were addressed in:

- the 2007 Final Programmatic Environmental Impact Statement (2007 PEIS) and Record of Decision for *Vegetation Treatments Using Herbicides on BLM Lands in 17 Western States* (USDI 2007a, b).
- the 2010 Final Environmental Impact Statement (Oregon FEIS) and Record of Decision for *Vegetation Treatments Using Herbicides on BLM Lands in Oregon* (USDI 2010a, b)
- the 2016 Final Programmatic Environmental Impact Statement (2016 PEIS) and Record of Decision for *Vegetation Treatments Using Aminopyralid, Fluroxypyr, and Rimsulfuron* (USDI 2016a, b).

A 1984 / 87 U.S. District court injunction had limited the BLM to using only four herbicides and restricting their use to noxious weeds only (USDI 2010a:3). This injunction was amended following completion of the 2010 Oregon FEIS and Record of Decision to permit the use of additional herbicides and target additional species once site-specific

[1] Approximately 3,740.5 acres of the Coos Bay District are administered by the Medford District. These acres are included in this analysis.
[2] The herbicide active ingredient (e.g., glyphosate) is the part of an herbicide formulation or product (e.g., RoundUp) that prevents, destroys, repels, desiccates, or otherwise controls the target plant. In this EA, herbicides are referred to by their active ingredient name rather than their product names. A full list of product names that can be used on BLM-managed lands can be found in Appendix B.

National Environmental Policy Act (NEPA) analysis was completed[3]. These analyses must be tiered to the Oregon FEIS, the 2007 PEIS, or subsequent analysis at the National or State level[4].

This EA examines the environmental effects of the proposal at a site-specific scale within the District. It will replace the Medford District's 1998 *Integrated Weed Management Plan and Environmental Assessment* (USDI 1998a).

The Chapter starts with a *Need* section, followed by a *Purposes* section, which briefly specifies the underlying purpose and need to which the agency is responding with its alternatives in Chapter 2. Following that, an *Issues* section presents the issues that will guide the analysis in Chapter 3. The *Decision to be Made* section presents how the District Manager will determine a decision, as well as the scope of that decision. The *Public Involvement* section describes the scoping and public comment periods, and the *Consultation* section describes specific consultation requirements that occur with regards to tribes, cultural resources, and federally listed species. The *Tiering and Reference* section describes programmatic NEPA and Resource Management Plans that the EA tiers to, as well as reports that the EA references. The last section of this Chapter, *Conformance with Land Use Plans, Laws, Policies, and Other Decisions*, presents other direction that guides the analysis or decision.

The Need

Species of terrestrial and aquatic invasive plants are mapped on over 13,000 acres in over 16,500 separate known locations[5], with individual locations ranging from a few plants to 250-acre sites of yellow starthistle (*Centaurea solstitialis*). In addition, there are tens of thousands of acres of unmapped invasive plants known on the District; for example, bristly dogstail grass (*Cynosurus echinatus*), is estimated to occupy over 3,000 acres. Despite the efforts of the existing noxious weed program, these noxious weeds[6] are continuing to spread at an estimated rate of 12 percent per year (USDI 2010a:133). In addition, there are invasive plants on neighboring (non-BLM-managed) lands that may spread to BLM-managed lands at any time. Adverse effects of invasive plants include resource loss or degradation of ecosystem function including 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).

For some noxious weed species such as yellowtuft (*Alyssum corsicum* or *A. murale*), neither non-herbicide methods nor the four herbicides currently utilized on the District result in effective control. The existing program also does not have an effective method for selectively controlling[7] other non-noxious invasive plants such as annual bromes (*Bromus* species, such as *B. tectorum,* also known as cheatgrass) and wild oats (*Avena barbata* or *A. fatua*).

Herbicides that are more selective are available to treat invasive plants. These herbicides can be used in lower quantities and pose less environmental and human health safety risk[8] than the herbicides the BLM is currently authorized to use (USDI 2010a:80 and others). Furthermore, if these additional herbicides were available, it is

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[3] In addition, the injunction states that BLM shall not aerially spray herbicides west of the Cascade crest and shall not spray herbicides for the production of livestock forage or timber production.
[4] Such as the 2016 PEIS.
[5] Summarized on Table 2-1 in Chapter 2.
[6] 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.
[7] Non-selective herbicides can be used to treat any plant species; however, that can make it difficult to target an invasive plant species growing among desirable species. Selective herbicides control specific plant species, while leaving neighboring desired plant species unharmed.
[8] Risk is defined as the likelihood that an adverse effect (such as skin or eye irritation, leaf damage, mortality, etc.) may result from a specific set of circumstances.

estimated that the efficacy of BLM's invasive plant treatment would improve from an estimated 60 percent under the No Action Alternative to 80 percent under the Proposed Action (USDI 2010a:136).

Invasive plants infestations are also responsible for economic losses; a 2014 Oregon Department of Agriculture (ODA) report estimates that 25 of Oregon's noxious weeds cost the state an estimated 83.5 million dollars a year (ODA 2014). While much of this loss is to agricultural areas, invasive plants on BLM-managed lands spread to adjacent non-BLM-managed lands, increasing control costs for affected landowners and degrading land values. The BLM participates in cooperative invasive plant control efforts with other private and government entities such as the Rogue Basin Partnership, ODA, and the Rogue River-Siskiyou National Forest. However, the BLM's current inability to use herbicides commonly used by cooperators on adjacent lands results in less effective control and / or coordination challenges.

Executive Order 13112 (February 1999, as amended in December 2016) 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…"

All of the foregoing factors indicate that there is a *need* for a more effective invasive plant control program.

The Purposes

The District proposes to update its existing noxious weed management program to more effectively:

- Control invasive plants to protect native ecosystems and the flora and fauna that depend on them.
- Cooperatively control invasive plants so they do not infest or re-infest adjacent non-BLM-managed lands.
- Provide a range of direct control methods that allow individual treatments in varying conditions to have more effective control of invasive plants.
- Prevent treatments from having unacceptable adverse effects to applicators and the public, to desirable flora and fauna, and to soil, air, and water.
- Improve treatment effectiveness, so resource and economic losses from invasive plants are reduced.

Each of these purposes is addressed by one or more of the issue statements listed below and are 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).

Issues

The issues identified during internal (BLM) and external (public) scoping were used to guide the effects analysis in Chapter 3. 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.

Several issues identified during internal and external scoping were considered but not analyzed in detail in this EA. In general, the issues not analyzed in detail in this EA 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 additional analysis to aid the decision-maker and b), there is negligible likelihood of significant effects due to the requirement to implement Protection Measures (see Appendix A, *Protection Measures*). In the list below, the issues have been framed as questions. Further information about the following issues is included in Chapter 3.

Issues Analyzed in Detail

Invasive Plants

- **Issue 1:** How would the alternatives affect treatment efficacy (including resistance to herbicides) and the spread of invasive plants (both on and off BLM-managed lands)?

Native Vegetation

- **Issue 1:** How would treatment methods affect Special Status plants and fungi?
- **Issue 2:** How would treatment methods affect special plant communities, including those in Areas of Critical Environmental Concern (ACECs)?

Fish and Aquatic Organisms

- **Issue 1:** How would application of aquatic herbicides on submerged and floating aquatic invasive plants (as proposed in Alternative 3) affect aquatic habitat and aquatic organisms? How would the spread of aquatic invasive plants affect aquatic habitat and aquatic organisms?
- **Issue 2:** How would terrestrial herbicide treatments in riparian areas affect aquatic organisms or the quality of their habitat?

Soil

- **Issue 1:** Do invasive plant treatments lead to increased soil compaction and erosion?

Water

- **Issue 1:** Would domestic, livestock, or irrigation water sources be affected by herbicides moving through groundwater?

Fire

- **Issue 1:** How would the treatments of invasive plants affect fuel profiles that contribute to increased wildfire hazard and altered fire regimes in grasslands, oak woodlands, and oak savannas?

Socioeconomics

- **Issue 1:** What are the economic impacts of invasive plants on the Medford District on local area timber production, crops, livestock, and recreation?

Issues Not Analyzed in Detail

Invasive Plants

- **Issue 2:** How would climate change affect the spread of invasive plants?

Fish and Aquatic Organisms

- **Issue 3:** Would manual treatment of aquatic vegetation as proposed under Alternative 3 adversely affect aquatic organisms or their habitat?

Wildlife

- **Issue 1:** How would invasive plant treatments (especially herbicides) affect wildlife species (especially Special Status wildlife species)?
    - How would treatment methods affect Oregon spotted frogs?

  - How would treatment methods affect vernal pool fairy shrimp?
  - How would treatments affect birds (Special Status species, migratory birds, birds of conservation concern, and game birds below desired conditions) that may use potential treatment areas, especially during the nesting season?
  - How would herbicide treatments proposed in meadows or grasslands affect Special Status wildlife species that are dependent on these habitats?
  - How would herbicide use affect pollinators, especially Special Status pollinators?
- **Issue 2:** What are the effects of using biological control agents to insects, especially Special Status insects and pollinators?

Human Health

- **Issue 1:** What are the effects to human health from incidentally coming into contact with herbicides used on BLM-managed lands?
  - What are the human health effects to people who regularly consume or come in contact with contaminated vegetation, water, or wildlife? How would herbicide use affect the health of people gathering, handling, ingesting plants, fish, or wildlife or handling fossils or artifacts that are in or near the area of herbicide use? What are the human health and safety hazards to those harvesting and consuming special forest products, such as greenery, herbs, berries, and mushrooms?
  - What are the human health hazards to susceptible members of the public (including children, pregnant women, the elderly, sick people, and those with chemical-sensitive conditions) associated with herbicide applications?
  - What are the human health effects of herbicides applied near natural springs, private wells, and irrigation sources?
- **Issue 2:** What are the hazards to workers treating invasive plants?
- **Issue 3:** What are effects to human health of using glyphosate, which the International Agency for Research on Cancer (IARC) recently declared a cancer hazard and California lists as cancer causing?

Soil

- **Issue 2:** How do herbicides break down and move through soils?
- **Issue 3:** Do herbicides affect soils?

Water

- **Issue 2:** Would terrestrial invasive plant treatments impair aquatic habitat (including water quality) by changing the quantity, timing, and duration of surface water runoff to stream or other water bodies?

Air

- **Issue 1:** How would the alternatives affect air quality?
- **Issue 2:** How would the alternatives affect climate change, including greenhouse gas emissions and carbon storage?

Paleontological Resources

- **Issue 1:** How would the treatment of invasive plants affect fossils?

Archeological and Cultural Resources

- **Issue 1:** How would treatment of invasive plants affect historic and prehistoric cultural sites?

Traditional and Cultural Uses

- **Issue 1:** How would the treatment of invasive plants with herbicides affect plant resources used by Native Americans for medicinal, subsistence, ceremonial, or other use purposes, given that these plants (or their locations) may not be known by the BLM?

Environmental Justice

- **Issue 1:** How would the use of herbicides affect minorities and low-income populations?

Socioeconomics

- **Issue 2:** Given the checkerboard land ownership pattern, what is the potential for herbicide contamination of yards, gardens, organic farms, vineyards, and beehives on private lands?
- **Issue 3:** How would the alternatives affect permitted land uses, including rights-of-way and administrative site grant and leaseholders?

Livestock

- **Issue 1:** Would herbicide treatments of invasive plants cause adverse effects to livestock health?
- **Issue 2:** Would herbicide treatments of clopyralid and aminopyralid negatively affect non-target vegetation on BLM grazing allotments?
- **Issue 3:** Would invasive plant treatments decrease or increase forage quality or volume?

Recreation

- **Issue 1:** How would herbicide treatments at recreation sites affect visitor access and recreational experiences?

Special Areas

- **Issue 1:** How would treatments of invasive plants affect the qualities for which Cascade Siskiyou National Monument was created?
- **Issue 2:** How would treatments of invasive plants affect the Outstandingly Remarkable Values for which the Rogue National Wild and Scenic River was designated?
- **Issue 3:** How would treatments of invasive plants affect the Designated Wilderness on the Medford District?

Visual

- **Issue 1:** Would the use of herbicides affect the visual quality of the landscape with large stands of dead, brown vegetation?

Decision to Be Made

The decision whether to adopt the Proposed Action or whether to modify the action based on environmental analysis and any other factors identified during public review of this EA and unsigned Finding of No Significant Impact will be made by the District Manager for the Medford District. 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 or more of the Environmental Impact Statements that this EA tiers to. The decision would apply to all invasive plant control activities conducted on BLM-managed lands within the Medford District by its own personnel, contractors, grant holders, lessees, cooperators, and others conducting activities on BLM-managed lands.

The BLM may choose to adopt Alternative 3 for all or part of the District. However, additional consultation with the National Marine Fisheries Service would be required if the BLM adopts Alternative 3 in listed anadromous fish habitat. Further information can be found in the *Consultation* section, later in this Chapter.

Public Involvement

Scoping

Scoping is the process by which the BLM solicits internal and external input on the issues, impacts, and potential alternatives that will be addressed as well as the extent to which those issues and impacts will be analyzed in the NEPA document. Scoping comments, along with other pertinent information, were used to help develop the purposes, issues, and alternatives in this EA.

External scoping for the EA was conducted in July 2011, with letters sent to interested publics and notice published in the Mail Tribune (Medford). A public meeting was held on July 12, 2011 at the Medford Interagency Office. Ten scoping responses were received in 2011. Scoping was reopened from December 9, 2016 through January 9, 2017 due to the lag in time since initiation of scoping and changes to the Proposed Action. Letters were sent to approximately 100 individuals, agencies, and organizations and posted on the BLM's ePlanning website. Twenty-six comment letters were received in 2017.

Issues raised in 2010 and 2017 were similar. Comments almost exclusively focused on the effects of herbicides, suggesting reducing or eliminating all use, and relying on manual and mechanical methods of control or changing land management practices. Concerns were related to human health and unintended effects of drift or overspray on neighboring private land uses, soil, water, air, and wildlife. Some cited personal experience with the effects of herbicides used for other purposes such as agriculture or timber production and said that the cost of invasive plant control was greater than the resulting benefits.

Public Comment Period

This EA has been made available for a 30-day public comment period (August 2017) on BLM's ePlanning site and interested members of the public were notified of the availability of the EA for review. This mailing list is contained in the project record file.

Consultation

Tribes

Tribal consultation was initiated in June 2011 with letters to the Klamath Tribes, the Confederated Tribes of the Grand Ronde Community of Oregon, the Confederated Tribes of Siletz Indians of Oregon, and the Cow Creek Band of Umpqua Indians of Oregon. The letters described the proposed EA, announced that scoping would begin, and encouraged the tribes to enter into government-to-government consultation. Another letter repeating the offer was sent in September 2013.

Following a delay in the preparation of this EA, the District contacted local federally recognized tribes: the aforementioned tribes, the Karuk Tribe, and the Quartz Valley Indian Reservation. These tribes were contacted with letters and phone calls in January 2017. The letters described the purpose and need and the alternatives and encouraged the tribes to enter into government-to-government consultation and be involved with the process. In addition, scoping letters were sent to the Shasta Indian Nation and Shasta Nation, Inc. Additional consultation with the federally recognized tribes will be conducted, which will include face-to-face meetings with the tribes that include an emphasis on identifying traditional gathering areas, species of culturally significant plants, and the effects of herbicide use on plant populations of interest to the tribes.

State Historic Preservation Office

As part of BLM's requirements under Section 106 of the *National Historic Preservation Act* and its implementing regulations found at 36 CFR 800 (as amended), consultation with the State Historic Preservation Office (SHPO) would be conducted on the District's Annual Treatment Plans prior to implementing any treatments that have the potential to adversely affect cultural resources.

The BLM will follow the 2015 State Protocol between the Oregon BLM and the Oregon SHPO regarding the manner in which the Bureau of Land Management meets its responsibilities under the *National Historic Preservation Act* and the National Programmatic Agreement among the BLM, the Advisory Council on Historic Preservation, and the National Conference of State Historic Preservation Officers (Oregon SHPO and USDI 2015). Each treatment application (project) would be reviewed on a case-by-case basis to determine the appropriate Protection Measures needed. Fieldwork may be required to establish the presence / absence of cultural resources and their significance.

Endangered Species Act

The Medford District has five federally listed species that are known to occur on the District that have the potential to be affected by invasive plant management. This includes two plant species (Gentner's fritillary and Cook's lomatium), the vernal pool fairy shrimp, the Oregon spotted frog, and the Coho salmon (Oregon Coast and Southern Oregon / Northern California Coast Evolutionary Significant Units)[9]. Formal and informal consultation that covers herbicides and other invasive plant treatments on the Medford District has occurred with the U.S. Fish and Wildlife Service (FWS) and National Marine Fisheries Service (NMFS) on numerous occasions (see Table 1-1).

Table 1-1. *Endangered Species Act Consultation*

Program / Biological Assessment	Agency / Area	Year	Consultation
Vegetation Treatments Using Herbicides on BLM Lands in 17 Western States PEIS (USDI 2007a) and *Vegetation Treatments on BLM Lands in 17 Western States Programmatic Environmental Report* (USDI 2007d) and *Vegetation Treatments on BLM Lands in 17 Western States Biological Assessment* (USDI 2007c)	BLM - 17 Western States	2007	Letter of Concurrence (FWS) Biological Opinion (NMFS)
Vegetation Treatments Using Herbicides on BLM Lands in Oregon (USDI 2010a) and *Vegetation Treatments on BLM Lands in 17 Western States Biological Assessment* (USDI 2007c)	BLM - Oregon	2010	Letter of Concurrence (FWS) Biological Opinion (NMFS)
Aquatic Restoration Biological Assessment II (USDA et al. 2013)	BLM and Forest Service - OR, WA, parts of CA, NV, and ID	2013	Aquatic Restoration Biological Opinion (ARBO II – NMFS[1])
Biological Assessment of activities that may affect the federally listed plant species, Gentner's Fritillary, Cook's Lomatium, and Large-flowered Woolly Meadowfoam, on Bureau of Land Management, Medford District and Cascade-Siskiyou National Monument (USDI 2013b)	BLM - Medford District	2013	Letter of Concurrence (FWS)
Biological Assessment (USDI 2016c) for *Vegetation Treatments Using Aminopyralid, Fluroxypyr, and Rimsulfuron PEIS* (USDI 2016a)	BLM - 17 Western States	2015 / 2016	Letter of Concurrence (FWS) Biological Opinion (NMFS)
Biological Assessment FY2017-FY2022 Programmatic Activities That May Affect the Northern Spotted Owl, Marbled Murrelet, Vernal Pool Fairy Shrimp, and Oregon Spotted Frog (USDI 2017b)[1]	BLM- Medford District	2017	Biological Opinion (FWS)

1. U.S. Fish and Wildlife Service also prepared an Aquatic Restoration Biological Opinion (ARBO II) in response to the Biological Assessment, but it is not applicable to this analysis; Biological Opinions prepared in response to District Biological Assessments (USDI 2013b, 2017b) provide more site-specific consultation coverage. However, it is referenced in the 2017 Medford District Wildlife Biological Assessment (USDI 2017b).

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[9] More information about the effects to these species can be found in *Native Vegetation* Issue 1 (for listed plants), *Fish and Aquatic Organisms* Issues 1, 2, and 3 (for listed fish), and *Wildlife* Issue 1 (for the Oregon spotted frog and vernal pool fairy shrimp).

Consultation resulted in Conservation Measures and Project Design Criteria identified to protect Medford District listed species from treatments and are listed in Appendix A, in the *Protection Measures* section.

Additional consultation with the National Marine Fisheries Service would occur if:

- the use of fluazifop-P-butyl, fluroxypyr, *Pseudomonas fluorescens*, or rimsulfuron (four of the herbicides proposed for use under the Proposed Action) needs to occur within 1,500 feet from listed anadromous fish habitat; or,
- the BLM treats invasive plants below the waterline (with herbicide or non-herbicide methods) in anadromous fish habitat (as described in Alternative 3)

More details about the 2007, 2010, 2013, 2016, and 2017 consultations can be found in Appendix A.

The gray wolf is federally listed as endangered, and the marbled murrelet and northern spotted owl are federally listed as threatened. The Proposed Action is not expected to affect these species. Effects to spotted owls are not anticipated because proposed invasive plant treatments would not modify spotted owl habitat and would not affect prey species. Potential disturbance near nest sites are not anticipated because projects are usually short in duration, spatially limited, and affected areas receive baseline disturbance from vehicle traffic and other activities. Spotted owls would likely be acclimated to the potential noise disturbance associated with invasive plant treatments. Effects to marbled murrelets are not anticipated because there is a low likelihood of marbled murrelets occurring on the District and the proposed invasive plant treatments would not modify marbled murrelet habitat. Effects to wolves are not anticipated because the proposed invasive plant treatments would not modify the general habitat they would use and would not affect prey availability. Additionally, proposed treatments would be seasonally restricted to avoid potential disturbance if known den sites are discovered in the future on BLM-administered lands.

Tiering and Reference

Tiering refers to the coverage of general matters in broader environmental impact statements with subsequent narrower statements or environmental analyses. Tiering allows agencies to narrow the range of alternatives, narrow the scope of analysis, and reach a Finding of No Significant Impact for an action that may have significant impacts. This allows incorporation by reference of the general discussions, so as to concentrate solely on the issues specific to the statement subsequently prepared (40 CFR 1508.28). For its analysis of herbicide effects, this EA tiers to three EISs, all completed at the State or National level. This EA tiers to the 2007 PEIS and Record of Decision for *Vegetation Treatments Using Herbicides on BLM Lands in 17 Western States* (USDI 2007a, b) for the use of chlorsulfuron (west of the Cascades) and the use of fluazifop-b-butyl and *Pseudomonas fluorescens* for research and demonstration purposes. In addition, this EA tiers to the *Final Programmatic EIS for Vegetation Treatments Using Aminopyralid, Fluroxypyr, and Rimsulfuron* (USDI 2016a, b), for the use of those three herbicides. For the remaining herbicides analyzed in this EA, this EA tiers to the 2010 Final Environmental Impact Statement (Oregon FEIS) and Record of Decision for *Vegetation Treatments Using Herbicides on BLM Lands in Oregon* (USDI 2010a, b)

For non-herbicide treatments, this EA tiers to the 1985 / 87 Northwest Area Noxious Weed Control Program Final EIS and Supplement (USDI 1985, 1987). This EA also incorporates by reference elements of the 2007 *Vegetation Treatments on BLM Lands 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 2007d).

The EA also tiers to the analyses in the *Proposed Resource Management Plan and Final Environmental Impact Statement for Resource Management Plans for Western Oregon* (USDI 2016e) and the *Cascade-Siskiyou National Monument Proposed Resource Management Plan and Final Environmental Impact Statement* (USDI 2008d). These documents contain analyses of invasive plant control activities included as management direction in these

Resource Management Plans. Where relevant to specific effects, the analysis in Chapter 3 tiers to these documents.

Conformance and Consistency with Land Use Plans, Laws, Policies, and Other Decisions

BLM's integrated weed management program is the product of decades of laws, Executive orders, and BLM and Department of the Interior policies and direction. Several Federal laws direct the BLM to aggressively manage invasive plants and other vegetation to improve ecosystem health. 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, as amended December 5, 2016) 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), the *Plant Protection Act* of 2000 (7 U.S.C. § 7702) and the *Noxious Weed Control and Eradication Act* of 2004 (7 U.S.C. § 7781) 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.

Land Use Plans on the Medford District

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). Management activities on the Medford District are covered by two Resource Management Plans, the *Southwestern Oregon Resource Management Plan and Record of Decision* (USDI 2016d) and the *Cascade-Siskiyou National Monument Resource Management Plan Record of Decision* (USDI 2008c)[10]. These are the primary land use plans governing the area.

Southwestern Oregon Resource Management Plan

The *Southwestern Oregon Resource Management Plan* provides direction for the management of all resources on BLM-managed lands in the Klamath Falls Field Office of the Lakeview District, the Medford District, and the South River Field Office of the Roseburg District. Goals and management direction related to invasive species management is included in the following sections of the Resource Management Plan:

Invasive Species

Management Objective (USDI 2016d:93)*:*

- Prevent the introduction of invasive species and the spread of existing invasive species infestations.
-

Management Direction (USDI 2016d:93)*:*

- Implement measures to prevent, detect, and rapidly control new invasive species infestations.

[10] The portion of the Coos Bay District that is managed by the Medford District is covered by the *Northwestern and Coastal Oregon Resource Management Plan* (USDI 2016f). Management direction and objectives described in this Resource Management Plan are identical to, or closely align to, management direction and objectives described in the *Southwestern Oregon Resource Management Plan* (USDI 2016d). To simplify reading of this EA, all references to the Resource Management Plan will be to the *Southwestern Oregon Resource Management Plan* (USDI 2016d).

- Use manual, mechanical, cultural, chemical, and biological treatments to manage invasive species infestations.
- Treat invasive plants and host species for invasive forest pathogens in accordance with the Records of Decision for the *Northwest Area Noxious Weed Control Program Environmental Impact Statement* (USDI 1985, 1987) and the *Vegetation Treatments Using Herbicides on Bureau of Land Management Lands in Oregon Environmental Impact Statement* (USDI 2010a).

Congressionally Reserved Lands and National Conservation Lands

Management Direction (USDI 2016d:54)*:*

- Conduct management actions, including but not limited to fuels treatments, invasive species management, riparian or wildlife habitat improvements, forest management, and trail construction, in Wild and Scenic River corridors only if consistent with designated or tentative classifications and if any reductions in outstandingly remarkable values would be temporary and outstandingly remarkable values would be protected or enhanced over the long term.

District-Designated Reserve – Areas of Critical Environmental Concern

Management Objective (USDI 2016d:55)*:*

- Maintain or restore relevant and important values in Areas of Critical Environmental Concern, including Research Natural Areas and Outstanding Natural Areas.
-

Management Direction (USDI 2016d:55)*:*

- Implement activities as necessary to maintain, enhance, or restore relevant and important values.

District-Designated Reserve – Lands Managed for their Wilderness Characteristics

Management Direction (USDI 2016d:56)*:*

- Allow mechanical vegetation treatment consistent with Visual Resource Management Class II for the purpose of improving ecological condition, contributing to threatened or endangered species recovery, or enhancing long-term wilderness characteristics.
- Allow trail construction and maintenance, fuels treatments, invasive species management, riparian or wildlife habitat improvements, forest management, and other vegetation management only if any reductions in wilderness characteristics are temporary and wilderness characteristics are protected over the long term.

Riparian Reserve

Management Objective (USDI 2016d:75)*:*

- Maintain and restore natural channel dynamics, processes, and the proper functioning condition of riparian areas, stream channels, and wetlands by providing forest shade, sediment filtering, wood recruitment, stream bank and channel stability, water storage and release, vegetation diversity, nutrient cycling, and cool and moist microclimates.

Fisheries

Management Objective (USDI 2016d:91)*:*

- Improve the distribution and quantity of high-quality fish habitat across the landscape for all life stages of *Endangered Species Act*-listed, Bureau Special Status species, and other fish species.

Livestock Grazing

Management Direction (USDI 2016d:96)*:*
- Authorize livestock grazing through management agreements, non-renewable grazing permits or leases, or special use permits on lands not available for livestock grazing through the issuance of a grazing lease or permit to control invasive plants, reduce fire danger, or accomplish other management objectives.
- Implement range improvement projects in adherence with the following:
    - Rehabilitate disturbed soil to blend into the surrounding soil surface. Re-vegetate using seeds and plant materials that are genetically appropriate and native to the plant community or region, to the extent practicable, to replace ground cover, reduce soil loss from wind and water erosion, and discourage the potential establishment of any invasive plant species.

Rare Plants and Fungi

Management Objective (USDI 2016d:106)*:*
- Support the persistence and resilience of natural communities, including those associated with forests, oak woodlands, shrublands, grasslands, cliffs, rock outcrops, talus slopes, meadows, and wetlands. Support ecological processes and disturbance mechanisms to allow for a range of seral conditions.

Management Direction (USDI 2016d:106)*:*
- Maintain or restore natural processes, native species composition, and vegetation structure in natural communities through actions such as applying prescribed fire, thinning, removing encroaching vegetation, treating nonnative invasive species, retaining legacy components (e.g., large trees, snags, and down logs), maintaining water flow to wetlands, and planting or seeding native species.

Cascade-Siskiyou National Monument Resource Management Plan

The Cascade-Siskiyou National Monument was established in 2000 and has its own separate Resource Management Plan. It currently contains 52,947 acres of Federal land independent of other BLM-managed lands in recognition of its remarkable ecology and to protect a diverse range of biological, geological, aquatic, archeological, and historic objects. The primary goal of monument management is to, “maintain, protect, and restore habitat and ecological processes critical to richness and abundance of the objects of biological interest for which the monument was proclaimed” (USDI 2008c). The President expanded the Cascade-Siskiyou National Monument by 48,000 acres in January 2017. Approximately 29,000 of the 48,000 acres fall within the District.

The proliferation of invasive plants across the landscape is an obstacle to management goals, and is a concern throughout the monument:
- A management objective for the Old Growth Emphasis Area is to “Reduce the presence and spread of noxious weeds and undesirable nonnative species” in order to “Protect or enhance existing habitat for species associated with late-successional forests” (USDI 2008c:31);
- A management objective for the Diversity Emphasis Area is to “Control the spread of noxious weeds and other invasive grasses” (USDI 2008c:48); and,
- Management in riparian areas includes the following guidance: “Riparian areas with weed infestations will be treated following the strategy described in Appendix F. This strategy includes specific mitigating measures for herbicide treatments in or near riparian areas. Weed treatments in riparian areas will be monitored for effectiveness as well as any potential adverse impacts. Only glyphosate without surfactants (RODEO® or a product with similar environmental risks) will be used” (USDI 2008c:62). Through plan maintenance (June 2017), this has been clarified to read, “When herbicides formulated with glyphosate are being applied in riparian areas, only the non-surfactant versions will be used.”

Appendix F of the Resource Management Plan presents a *Strategy for Controlling the Spread of Noxious Weeds and Other Invasive Grasses* that includes the use of herbicide, manual and mechanical methods, biological control agents, prescribed fire, targeted grazing, and native seedings. Resource Management Plan objectives for invasive plant management are included in Appendix F of that plan (USDI 2008c:F-1 through F-6) and are described below.

Maintain healthy herbaceous plant communities as a barrier to invasive plant invasions (USDI 2008c:F-1).

- Limit ground-disturbing activities.
- Collect and maintain sources of native grass and forb seed for emergency restoration.
- Sow with native seed where natural or ground-disturbing management activities take place.

Improve condition of stands that have a mixture of invasive plants and remnant native herbaceous species (USDI 2008c:F-1).

- Apply manual or spot herbicide treatments.
- Utilize prescribed burning where appropriate.
- Restore native species by seeding and / or planting.
- Utilize different grazing strategies to reduce disturbance.

Eradicate and restore small isolated invasive plant patches to native herbaceous plant domination (USDI 2008c:F-1).

- Apply manual or spot herbicide treatment.
- Protect sensitive resources (e.g., wetlands, riparian, and rare plants). If herbicide treatments occur in riparian areas, use appropriate herbicides labeled for use in these communities.
- Seed areas with native grass and forbs.

Survey and treat primary travel corridors that serve as vectors for invasive plant spread (USDI 2008c:F-2).

- Inventory roads and power line corridors.
- Apply manual or spot herbicide treatments in a systematic manner.
- Work with power companies, the county, and adjacent land owners to reduce periodic disturbance and treat invasive plants on adjacent non-Federal land.
- Re-vegetate treated areas with native grass and forbs.

Isolate and treat large extensive invasive plant areas (USDI 2008c:F-2).

- Minimize soil disturbance and activities that could spread invasive plants, especially during the wet season.
- Manually or spot spray large patches working from the "outside" in toward the center of the infestation.
- Seed or plant treated locations with native vegetation.

Implement a long-term restoration / management plan for extensive weedy areas (greater than 1 acre; USDI 2008c:F-2).

- Work with local groups and landowners on noxious weed education and management.
- Identify high-priority treatment areas.
- Avoid disturbance in large patches.
- Monitor efficacy of treatment(s).
- Apply adaptive management strategy.

Additional information can be found in Appendix F of the Resource Management Plan (USDI 2008c). Appendix F also includes Mitigating Measures for noxious weed treatments and these are included in Appendix A of this EA.

Other BLM Direction

State and National Environmental Analyses on Herbicide Use

This EA tiers to, and is consistent with, the Oregon FEIS and Record of Decision. The 2010 Record of Decision requires, with few specific exceptions[11], 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 Medford District. The alternatives (including the No Action Alternative) must adhere to restrictions (USDI 2010b:30) including:

- Mitigation Measures[12] from the 2007 PEIS.
- Standard Operating Procedures from the 2007 PEIS.
- Conservation Measures for Special Status species from the 2007 PEIS Biological Assessment.
- Mitigation Measures from the 2010 Oregon FEIS Record of Decision.
- Typical and maximum herbicide application rates analyzed in the 2010 Oregon FEIS.

In addition, this EA is consistent with the 2016 PEIS and Record of Decision. All of the alternatives (including the No Action Alternative) must adhere to the Mitigation Measures and Conservation Measures adopted with the 2016 Record of Decision (USDI 2016b), and these are also included in Appendix A of this EA.

Integrated Vegetation Management (BLM Handbook 1740-2)

This EA is consistent with BLM Handbook 1740-2, which guides the implementation of vegetation management planning and treatment activities to maintain and restore native plant communities, diversity, resiliency, and productivity, by combining biological, cultural, physical, and chemical tools in a way that minimizes economic, health, and environmental risk (USDI 2008a).

National Policy

Federal Insecticide, Fungicide and Rodenticide Act

The Federal Insecticide, Fungicide and Rodenticide Act directs Federal agencies to use an integrated pest management approach to manage pests (including vegetation), stating "Integrated Pest Management is a sustainable approach to managing pests by combining biological, cultural, physical, and chemical tools in a way that minimizes economic, health, and environmental risks" (7 U.S.C. § 136r-1).

Clean Water Act - Section 303(d)

Under Section 303(d) of the *Clean Water Act*, the Oregon Department of Environmental Quality (ODEQ) establishes standards for the maximum amount of a pollutant that can be received by water quality limited waterbodies in the state of Oregon. The Upper Klamath Subbasin and the Rogue and Umpqua Basins all have Total Maximum Daily Loads (TMDLs) in place as required by the ODEQ and Environmental Protection Agency (EPA). The BLM is required to publish a WQRP (Water Quality Restoration Plan) for basins with an existing TMDL. These WQRPs address how the BLM manages land and water so as to not further limit water quality as defined in the TMDL. As plans are

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[11] Exceptions include NEPA analyses done for the Tyrrell and Horning seed orchards (on the Northwest Oregon District), the Provolt and Sprague seed orchards (on the Medford District)(USDI 2005) and an EA for Sudden Oak Death on the Coos Bay District (USDI 2010b:30).

[12] Mitigation Measures are practices or limitations adopted to mitigate potential adverse effects identified in the PEIS and Oregon FEIS analysis.

completed, the BLM incorporates the goals, objectives, and provisions from the WQRP into the Medford District integrated invasive plant management program. However, as further described in Chapter 3, the goals, objectives, provisions of future WQRPs will be consistent with the Proposed Action.

The *Clean Water Act* requires a National Pollution Discharge Elimination System (NPDES) permit for herbicide use that may directly enter streams. The permit is needed for herbicide treatments within three feet of streams, wetlands, and other seasonally wet areas when water is present, including conveyances with a hydrologic surface connection to a water body (e.g., near a road culvert that runs water to a creek). Treatments on small portions of infestations (currently mapped or detected in the future) may meet the criteria. NPDES Pesticide General Permits would be obtained prior to implementing any treatments in which herbicide could be directly introduced into surface waters. This generally includes treatment within stream banks or for target plants that emerge from or overhang water bodies.

Federal Strategy to Promote the Health of Pollinators

On June 20, 2014, the President issued a memorandum 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 a 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. To support these habitat-focused efforts, the U.S. Department of Agriculture and the U.S. Department of the Interior issued a set of *Pollinator-Friendly Best Management Practices for Federal Lands* (USDA and USDI 2015a), which include direction to identify and remove invasive species. Direction includes, “Management of invasive species may include felling by hand or machine, machine mulching, applying spot treatments of herbicide to bark, cut stumps, or leaves, controlled burning, mowing, or combinations of the approaches” (USDA and USDI 2015a). The National Pollinator Health Strategy states that agencies “shall, as appropriate, take immediate measures to support pollinators during the 2014 growing season and thereafter. These measures may include avoiding the use of pesticides[13] in sensitive pollinator habitats through integrated vegetation and pest management practices.”

The alternatives and the analysis in this EA conform with the objectives of this new direction. Memorandum-described pollinator direction, as it is developed, may supplement but is not expected to conflict with treatments described in this EA. Standard Operating Procedures and Mitigation Measures for pollinators outlined in Appendix A conform with the Strategy. There is a long-term benefit to pollinators from controlling invasive plants and allowing native vegetation to reestablish.

EPA Ruling on Inert Ingredients

Most herbicide products contain substances in addition to the active ingredient(s) that are referred to as inert ingredients or sometimes as “other ingredients.” An inert ingredient generally is any substance (or group of similar substances) other than an active ingredient that is intentionally included in a pesticide product. Examples of inert ingredients include emulsifiers, solvents, carriers, aerosol propellants, fragrances, and dyes. In December 2016, the EPA removed 72 ingredients approved for use in pesticide products. The EPA took this action in response to petitions asking the agency to issue a rule requiring disclosure of 371 inert ingredients found in pesticide products. A full list of these ingredients can be found on the EPA website. The BLM does not use products that contain these ingredients. A list of the herbicides that are approved for use on BLM-managed lands can be found in Appendix B.

[13] The term “pesticide” covers a wide array of chemicals and substances used to kill, repel, or control certain forms of animal or plant life that are considered pests. This includes insecticides, rodenticides, and even disinfectants intended to kill bacteria and viruses, in addition to herbicides for plants. Effects from herbicides to pollinators would generally be related to habitat loss; herbicides are formulated to work specifically on plants by disrupting the metabolic processes inherent in plants and not in other organisms.

Chapter 2 – Integrated Invasive Plant Management and the Alternatives

This Chapter begins with an *Invasive Plants* section, which summarizes information on populations of invasive plants on the District. The *Categories of Invasive Plant Populations* section describes known or estimated invasive plant sites to help clarify invasive plant treatments and the analysis in Chapter 3.

The *Integrated Invasive Plant Management* section explains how various methods are used together programmatically to combat invasive plants. Actions taken for prevention, education, and coordination are described as context and do not vary between alternatives. This section also describes direct control methods, which may vary between alternatives. Direct control methods include manual and mechanical treatment methods, competitive planting and seeding, biological treatment methods (insects and targeted grazing), and herbicides.

The *Alternatives* section is a detailed description of the alternatives analyzed in this EA: the No Action Alternative, the Proposed Action, and Alternative 3. This section outlines the key differences between these alternatives and lists Project Design Features to prevent unwanted effects from treatments under the Proposed Action and Alternative 3. Alternatives considered but not carried forward for detailed study are described at the end of Chapter 2.

Invasive Plants

An invasive plant thrives and spreads aggressively outside its natural range. An invasive species that colonizes a new area may gain an ecological edge since the insects, diseases, and foraging animals that naturally keep its growth in check in its native range are not present in its new habitat. 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.

Categories of Invasive Plant Populations

The following Categories of known or estimated invasive plant sites are described to help characterize invasive plant treatments and the analysis in Chapter 3.

Category I: Documented Invasive Plant Sites

Invasive plant inventories[14] on the District generally focus on locations where invasive plants are most likely to occur and spread from, such as road corridors, temporary road spurs and landings that access timber units, other rights-of-way, riparian / wetland areas, campgrounds, trailheads, mining and common materials sites, and animal congregation areas (e.g., livestock water developments). Inventories are also conducted in advance of planned projects, such as forest management projects, so that measures can be taken to prevent the introduction and spread of invasive plants into and from project areas. While certain inventories may be specific to invasive plant management, inventories conducted for other purposes also record the presence of invasive plants. Such surveys

[14] Inventories are surveys and assessments at a single point in time to determine the presence, absence, and distribution of invasive plants. Monitoring involves repeated assessment or measurement of a site or population to document changes over time.

include clearance surveys for Special Status species or cultural resources, and inventories of special management areas, like the Rogue National Wild and Scenic River. Invasive plant infestations detected during implementation monitoring for forest management, engineering, recreation, and other ground-disturbing projects are also mapped and documented. BLM policy requires new project areas with high likelihood of noxious weed introduction[15] to be monitored for the first three years after completion (USDI 1992b).

Inventory results are uploaded to the BLM's National Invasive Species Information Management System (NISIMS), which links to BLM planning and reporting systems. NISIMS records include the infestation's spatial location, size, and shape; the invasive plant's abundance and distribution pattern; treatment records; and other associated characteristics. Sites where the species appears to have been controlled are retained in NISIMS to guide future site monitoring. As the current program is focused on noxious weeds, most data in NISIMS concern noxious weeds.

This Category includes known locations of invasive plants mapped in NISIMS on the District. The most prevalent species are yellow starthistle and other knapweeds, Scotch broom, thistles, and blackberry. Category I includes 69 different invasive plant species occupying 13,211 acres on 16,796 sites on the District. Table 2-1, *Summary of Documented Invasive Plant Sites* lists these species and number of mapped acres and sites. Map 2-1A, *Invasive Plants Documented in NISIMS* shows the locations of these plants. Map 2-1B, *Submerged and Floating Aquatic Invasive Plants,* shows the locations of mapped aquatic invasive plants.

All species included in this Category have additional unmapped sites. These unmapped sites are discussed in Category II. However, to avoid duplication, Table 2-1 includes a *Treatment Acres* column that includes these unmapped sites. Further information about these acres can be found in the *Treatment Acres* sub-section in the *Category II, Unmapped Invasive Plant Sites* section.

[15] Generally, any type of project resulting in ground disturbance, such as slash / pile / burn units, timber harvest areas, road / bridge construction, and trail construction.

Table 2-1. *Summary of Documented Invasive Plant Sites*

Scientific Names **Common Name**	**Life Cycle**	**ODA Status**[1]	**Treatment Group**[2]	**Category I acres sites**	**Primary Project Areas**	**Common Habitat in SW Oregon**	**Treatment Acres** (includes Category I & II acres)[3]
					Dicots		
Apiaceae (parsley family)							
Conium maculatum poison hemlock	Biennial	B list	D3	27.1 acres 38 sites	Rogue National Wild and Scenic River Corridor, Areas of Critical Environmental Concern (ACECs), Fritillaria Management Areas (FMAs), Cook's lomatium critical habitat	Widespread in riparian areas, floodplains, ditches, roadsides	250
Apocynaceae (dogbane family)							
Vinca major large-leaf periwinkle	Perennial	NL	D9	6.3 acres 16 sites	Rogue National Wild and Scenic River Corridor	Roadsides, old home sites, residential areas	20
Araliaceae (ginseng family)							
Hedera helix, Hedera hibernica English ivy	Perennial	B list	D12	8.4 acres 10 sites	Rogue National Wild and Scenic River Corridor, Cathedral Hills Recreation Site	Old home sites, woodlands near residential areas	25
Asteraceae (aster family)							
Acroptilon repens Russian knapweed	Perennial	B list	D4	2.9 acres 23 sites	Sam's Valley, roadsides	Roadsides, grasslands	10
Ambrosia artemisiifolia annual ragweed	Annual	B list	D2	4.1 acres 4 sites	Rogue National Wild and Scenic River Corridor	Riparian areas, river bars, valley bottoms	5
Carduus nutans musk thistle	Biennial	B list	D4	6.4 acres 3 sites	Douglas and Oregon Gulch burned areas	Roadsides, ditches, burned areas	100
Carduus pycnocephalus Italian thistle	Annual	B list	D2	0.1 acres 1 sites	Lower West Fork Evans Creek	Roadsides, disturbed soils, meadows, woodlands, chaparral	1
Carthamus lanatus woolly distaff-thistle	Annual	A list	D2	0.2 acres 1 sites	Interstate 5 near Wolf Creek	Roadsides, disturbed openings	1
Centaurea × moncktonii meadow knapweed	Perennial	B list	D4	692.9 acres 1,339 sites	Rogue National Wild and Scenic River Corridor, Burton Nine Mile District Designated Reserve, Bobby Creek Research Natural Areas (RNA), Eight Dollar Mt ACEC, French Flat ACEC, Reeves Creek ACEC, Rough and Ready ACEC, roadsides, forest management project areas	Roadsides, meadows, river bars, disturbed openings	1,000

Scientific Names **Common Name**	**Life Cycle**	**ODA Status**[1]	**Treatment Group**[2]	**Category I acres sites**	**Primary Project Areas**	**Common Habitat in SW Oregon**	**Treatment Acres** (includes Category I & II acres)[3]
Centaurea diffusa diffuse knapweed	Perennial	B list	D4	79 acres 85 sites	Rogue National Wild and Scenic River Corridor, Soda Mt Wilderness Area, Burton Nine Mile District Designated Reserve, Wild Rogue District Designated Reserve, Pilot Rock FMA, Dakubetede FMA, roadsides	Roadsides, rangeland	200
Centaurea melitensis Maltese starthistle	Biennial	NL	D4	6.6 acres 23 sites	North River Road FMA	Grasslands, disturbed soils, burned areas	10
Centaurea solstitialis yellow starthistle	Biennial	B list	D4	5,201.3 acres 4,033 sites	Rogue National Wild and Scenic River Corridor, Berry Creek District Designated Reserve, Burton Nine Mile District Designated Reserve, Soda Mt Wilderness Area, Cobleigh Road ACEC, Dakubetede ACEC, French Flat ACEC, Mariposa Botanical Area, North River Road FMA, Pilot Rock FMA, Rough and Ready ACEC, Roundtop Butte RNA, Sterling Mine Ditch ACEC, Table Rocks ACEC, roadsides, forest management project areas	Grasslands, disturbed soils, burned areas, river bars, roadsides	10,000
Centaurea stoebe spp. *micranthos* spotted knapweed	Perennial	B list	D4	872.1 acres 236 sites	Rogue National Wild and Scenic River Corridor, Wild Rogue District Designated Reserve, Cook's lomatium critical habitat near Cave Junction, roadsides, forest management project areas	Roadsides, disturbed openings, meadows, floodplains, river bars	1,000
Centaurea virgata squarrose knapweed	Perennial	A list	D4	0.5 acres 4 sites	Illinois River Valley ACECs and Cook's lomatium habitat, roadsides	Roadsides, disturbed openings, meadows	1
Chondrilla juncea rush skeletonweed	Perennial	B list	D4	337.8 acres 517 sites	Rogue National Wild and Scenic River Corridor, Berry Creek District Designated Reserve, Wild Rogue District Designated Reserve, Table Rocks ACEC, King Mt ACEC, roadsides, forest management project areas	Roadsides, disturbed openings, river bars and floodplains	1,000
Cirsium arvense Canada thistle	Perennial	B list	D4	447.7 acres 1,627 sites	Soda Mt Wilderness Area, Rogue National Wild and Scenic River Corridor, Bobby Creek RNA, East Fork Whiskey Creek RNA, Lost Lake RNA, North Fork Silver Creek RNA, Old Baldy RNA, roadsides, forest management project areas	Widespread in roadsides, ditches, meadows, riparian areas, river floodplains	1,000
Cirsium vulgare bull thistle	Biennial	B list	D4	605.5 acres 2,462 sites	Soda Mt Wilderness Area, Rogue National Wild and Scenic River Corridor, Bobby Creek RNA, East Fork Whiskey Creek RNA, French Flat ACEC, Bald Mt FMA, Dakubetede FMA, North River Road FMA, roadsides, forest management project areas	Widespread in roadsides, meadows, riparian areas, burned areas, other disturbed openings	1,000

Scientific Names **Common Name**	**Life Cycle**	**ODA Status**[1]	**Treatment Group**[2]	**Category I acres sites**	**Primary Project Areas**	**Common Habitat in SW Oregon**	**Treatment Acres** (includes Category I & II acres)[3]
Leucanthemum vulgare oxeye daisy	Perennial	NL	D4	3.6 acres 1 site	Rogue National Wild and Scenic River Corridor, FMAs, Cook's lomatium critical habitat	Widespread in roadsides, meadows, river bars	250
Onopordum acanthium Scotch cotton-thistle	Biennial	B list	D4	2.5 acres 1 site	One occurrence on a roadside north of East Fork Whiskey Creek RNA	Roadsides, disturbed pastures, open riparian areas	2.5
Senecio jacobaea tansy ragwort	Perennial	B list	D4	181.9 acres 1,230 sites	Forest management project areas, burned areas, ACECs, mostly in western half of District	Mesic roadsides, pastures, forest openings	500
Silybum marianum blessed milkthistle	Biennial	B list	D4	0.1 acres 1 site	One occurrence in Quines Creek-Cow Creek watershed in north part of District	Not common, but known from roadsides and disturbed openings	1
Xanthium spinosum spiny cocklebur	Annual	B list	D2	5.6 acres 5 sites	Rogue National Wild and Scenic River Corridor, ACECs, FMAs, Cook's lomatium critical habitat, roadsides	Roadsides, disturbed sites, riparian areas	10
Boraginaceae (borage family)							
Cynoglossum officinale houndstongue	Biennial	B list	D5	1,027 acres 58 sites	Cascades and oak foothills in eastern part of District, forest management project areas	Forests, woodlands, rangeland, roadsides	1,200
Brassicaceae (mustard family)							
Alliaria petiolata garlic mustard	Biennial	B list	D6	153.1 acres 81 sites	Rogue National Wild and Scenic River Corridor	Riparian areas, floodplains	200
Alyssum alyssoides pale alyssum	Annual	NL	D1	0.66 acres 1 site	FMAs, Cook's lomatium critical habitat	Widespread in grasslands, disturbed sites, and open habitats	Rarely treated. 0.1 acre / year
Alyssum corsicum, A. murale yellowtufts	Perennial	A list	D6	40.8 acres 13 sites	All serpentine substrates in the Illinois River Valley	Meadows, savannah, chaparral in serpentine soils	100
Isatis tinctoria dyer's woad	Biennial	B list	D6	318.8 acres 366 sites	Rogue National Wild and Scenic River Corridor, Williams Creek watershed, Oregon Gulch burn area, Soda Mt Wilderness Area, roadsides	River banks, bars, and floodplains; roadsides; burned areas	1,000
Lepidium campestre field pepperweed	Biennial	NL	D6	1.7 acres 3 sites	ACECs, FMAs, Cook's lomatium critical habitat	Widespread in disturbed sites, rangeland, other open habitats	< 1 acre / year
Lepidium draba whitetop	Perennial	B list	D6	16.3 acres 4 sites	Beaver Creek-Applegate watershed, Rogue National Wild and Scenic River Corridor	Not common, but known from roadsides, cattle corrals, disturbed riparian areas in the Cascades	50

Scientific Names **Common Name**	**Life Cycle**	**ODA Status**[1]	**Treatment Group**[2]	**Category I acres sites**	**Primary Project Areas**	**Common Habitat in SW Oregon**	**Treatment Acres** (includes Category I & II acres)[3]
Clusiaceae (St. Johnswort family)							
Hypericum perforatum St. Johnswort	Perennial	B list	D9	34.2 acres 78 sites	ACECs, FMAs, Cook's lomatium critical habitat	Widespread in roadsides, rangeland, floodplains, disturbed openings	1,000
Convolvulaceae (morning glory family)							
Convolvulus arvensis field bindweed	Perennial	B list	D9	0.4 acres 2 sites	ACECs, FMAs, Cook's lomatium critical habitat	Widespread in roadsides and disturbed openings	500
Dipsacaceae (teasel family)							
Dipsacus fullonum common teasel	Biennial	NL	D9	36.5 acres 98 sites	ACECs, FMAs, Cook's lomatium critical habitat	Widespread in roadsides, ditches, pastures, cultivated fields, and other open habitats	500
Dipsacus laciniatus cutleaf teasel	Biennial	B list	D9	87.9 acres 37 sites	Soda Mt Wilderness Area, Mariposa Botanical Area, Applegate Valley, meadows and roadsides in the Cascades	Grasslands, roadsides, disturbed open areas	200
Euphorbiaceae (spurge family)							
Euphorbia esula leafy spurge	Perennial	B list	D9	0.3 acres 2 sites	Rogue National Wild and Scenic River Corridor, Sam's Valley	Grasslands, chaparral, open woodlands, riparian areas, roadsides	2
Fabaceae (pea family)							
Cytisus scoparius Scotch broom	Perennial	B list	D12	988 acres 1,805 sites	Rogue National Wild and Scenic River Corridor, Wild Rogue and Soda Mountain Wilderness Areas, lands with wilderness characteristics, ACECs, FMAs, roadsides, forest management project areas	Widespread in roadsides, forest openings, woodlands, floodplains, riparian areas, meadows	2,000
Cytisus striatus striated broom	Perennial	B list	D12	0.1 acres 1 site	Known from only one location in Gold Mt Creek watershed, northwest part of District	Roadsides, forest openings, woodlands, meadows	1
Genista monspessulana French broom	Perennial	B list	D12	35.6 acres 43 sites	Rogue National Wild and Scenic River Corridor	Roadsides, forest openings, woodlands, meadows	100
Lathyrus latifolius perennial peavine	Perennial	B list	D7	28.2 acres 117 sites	Rogue National Wild and Scenic River Corridor, Wild Rogue and Soda Mountain Wilderness Areas, lands with wilderness characteristics, ACECs, FMAs, forest management project areas, roadsides	Widespread in roadsides, woodlands, forest openings, disturbed open habitats	1,000
Melilotus albus, M. officinalis sweetclovers	Perennial	NL	D7	1.4 acres 5 sites	ACECs, FMAs, Cook's lomatium critical habitat	Roadsides, pastures, disturbed open habitats	< 1 acre / year
Spartium junceum Spanish broom	Perennial	B list	D12	31.3 acres 105 sites	Rogue National Wild and Scenic River Corridor, Applegate Valley	Roadsides, river banks, open disturbed habitats	100

Scientific Names **Common Name**	**Life Cycle**	**ODA Status**[1]	**Treatment Group**[2]	**Category I acres sites**	**Primary Project Areas**	**Common Habitat in SW Oregon**	**Treatment Acres** (includes Category I & II acres)[3]
Ulex europaeus common gorse	Perennial	B list	D12	0.5 acres 2 sites	Only two sites known, in the Dad's Creek and McCullough Creek watersheds, northwest part of the District	Primarily coastal; otherwise uncommon, but known from roadsides in western edges of District	1
Geraniaceae (geranium family)							
Geranium lucidum shiny leaf geranium	Biennial	B list	D8	51.1 acres 8 sites	Rogue National Wild and Scenic River Corridor, Forest Creek watershed, in Applegate Valley	Semi-open riparian areas and woodlands	100
Geranium robertianum Robert geranium	Biennial	B list	D8	0.1 acres 1 site	Whitehorse Creek watershed, east of Azalea	Mesic shaded to semi-open riparian areas, woodlands, forests	5
Haloragaceae (watermilfoil family)							
Myriophyllum aquaticum parrotsfeather	Perennial	B list	A-ALT	0.9 acres 5 sites	Rogue National Wild and Scenic River Corridor	Rogue River, irrigation ditches	10
Lamiaceae (mint family)							
Lamiastrum galeobdolon yellow archangel	Perennial	B list	D9	0.2 acres 2 sites	Rogue National Wild and Scenic River Corridor	Not common, but known from riparian areas and mesic woodlands	1
Lythraceae (loosestrife family)							
Lythrum salicaria purple loosestrife	Perennial	B list	A	37.6 acres 153 sites	Rogue National Wild and Scenic River Corridor	River banks and bars, riparian areas, ditches, pond and lake margins, wetlands	500
Onagraceae (evening primrose family)							
Ludwigia hexapetala water primrose	Perennial	B list	A-ALT	8.1 acres 18 sites	Rogue National Wild and Scenic River Corridor	In shallow slow-moving water along rivers, ditches, ponds	20
Ludwigia peploides floating water primrose	Perennial	B list	A-ALT	0.3 acres 1 site	Rogue National Wild and Scenic River Corridor	In shallow slow-moving water along rivers, ditches, ponds	1
Plantaginaceae (plantain family)							
Linaria dalmatica ssp. *dalmatica* Dalmatian toadflax	Perennial	B list	D10	0.3 acres 21 sites	Cascades east of Ashland, particularly in the Jenny Creek watershed	Not common, but known from roadsides and rangeland in the eastern part of the District	1
Linaria vulgaris yellow toadflax	Perennial	B list	D10	3.7 acres 5 sites	Poorman Creek-Grave Creek watershed, Fall Creek-Klamath River watershed, and along Hwy 62, south of Prospect	Not common, but known from roadsides, pastures, and disturbed open areas	5
Polygonaceae (knotweed family)							

Scientific Names **Common Name**	**Life Cycle**	**ODA Status**[1]	**Treatment Group**[2]	**Category I acres sites**	**Primary Project Areas**	**Common Habitat in SW Oregon**	**Treatment Acres** (includes Category I & II acres)[3]
Polygonum cuspidatum Japanese knotweed	Perennial	B list	D11	97.2 acres 251 sites	Rogue National Wild and Scenic River Corridor, Illinois River Corridor	Riparian areas, river banks	200
Polygonum sachalinense giant knotweed	Perennial	B list	D11	0.1 acres 1 site	Rogue National Wild and Scenic River Corridor, Illinois River Corridor	Riparian areas, river banks	1
Ranunculaceae (buttercup family)							
Clematis vitalba evergreen clematis	Perennial	B list	D12	1.1 acres 2 sites	Only known from eastern boundary of East Fork Whiskey Creek RNA	Roadsides, riparian areas, floodplains, residential areas	2
Rosaceae (rose family)							
Potentilla recta sulfur cinquefoil	Perennial	B list	D9	131.2 acres 48 sites	Applegate Valley and Cascades, including Soda Mt Wilderness Area	Roadsides, grasslands, rangeland, other open areas	500
Rubus armeniacus Armenian blackberry	Perennial	B List	D12	595.1 acres 1,552 sites	Rogue National Wild and Scenic River Corridor, ACECs, forest management project areas, where aggressive populations threaten Bureau Sensitive species	Widespread in riparian areas, drainage ditches, forest openings, roadsides throughout the valley, but most abundant below 3,000 feet elevation	1,000
Rubus laciniatus evergreen blackberry	Perennial	NL	D12	3.2 acres 33 sites	Rogue National Wild and Scenic River Corridor, ACECs, FMAs	Roadsides, riparian areas, forest openings	50
Scrophulariaceae (figwort family)							
Verbascum blattaria, V. thapsus moth mullein, common mullein	Biennial	NL	D9	33.7 acres 21 sites	Rogue National Wild and Scenic River Corridor, ACECs, FMAs, Cook's lomatium critical habitat	Widespread in disturbed open sites	< 1 acre / year
Simaroubaceae (quassia family)							
Ailanthus altissima tree of heaven	Perennial	B list	D12	12.1 acres 6 sites	Rogue National Wild and Scenic River Corridor	Riparian areas, river banks and bars, residential areas	25
Zygophyllaceae (caltrop family)							
Tribulus terrestris puncturevine	Annual	B list	D1	15.3 acres 12 sites	Rogue National Wild and Scenic River Corridor, recreation sites, equipment lots	Disturbed sites, parking lots, roadsides, sunny trail sides, sandy soils	30
Monocots							
Cyperaceae (sedge family)							
Cyperus esculentus yellow nutsedge	Perennial	B list	A	0.1 acres 2 sites	Rogue National Wild and Scenic River Corridor	Widespread in stream banks, disturbed soils, ditches, cultivated ground	< 1 acre / year

Scientific Names **Common Name**	**Life Cycle**	**ODA Status**[1]	**Treatment Group**[2]	**Category I acres sites**	**Primary Project Areas**	**Common Habitat in SW Oregon**	**Treatment Acres** (includes Category I & II acres)[3]
Iridaceae (iris family)							
Iris pseudacorus yellow flag iris	Perennial	B list	A	51.7 acres 73 sites	Rogue National Wild and Scenic River Corridor	Wet shores of rivers, ponds, irrigation ditches	100
Poaceae (grass family)							
Aegilops cylindrica jointed goatgrass	Annual	B list	M1	10.2 acres 6 sites	Cascade-Siskiyou National Monument, primarily in East Fork Cottonwood Creek and Upper Emigrant Creek watersheds	Roadsides, rangeland, agricultural fields	20
Aegilops triuncialis barbed goatgrass	Annual	A list	M1	1.2 acres 2 sites	Lower West Fork Illinois River Valley	Roadsides, rangelands, grasslands, including serpentine substrates	5
Brachypodium sylvaticum false-brome	Perennial	B list	M2	3.4 acres 19 sites	Rogue National Wild and Scenic River Corridor, Illinois River Corridor, Eight Dollar Mt ACEC	River bars, banks, and floodplains; wetlands; roadsides; often in shade	500
Bromus tectorum cheatgrass	Annual	NL	M1	8.4 acres 22 sites	Burton Nine Mile District Designated Reserve, Dakubetede ACEC	Disturbed grasslands, rangeland, chaparral, roadsides	1,000
Cynosurus cristatus, C. echinatus dogtail grasses	Annual	NL	M1	0.1 acres 1 site	ACECs, FMAs, Cook's lomatium critical habitat	Open woodlands, forest edges, roadsides	3,000
Phalaris arundinacea[4] reed canarygrass	Perennial	NL	M2	0.1 acres 2 sites	Rogue National Wild and Scenic River Corridor, ACECs, where aggressive populations threaten Bureau Sensitive species	River floodplains, wet meadows, lake shores	25
Taeniatherum caput-medusae medusahead rye	Annual	B list	M1	50.8 acres 51 sites	ACECs, FMAs, Cook's lomatium critical habitat	Roadsides, meadows, rangeland, chaparral, open woodlands including serpentine substrates	5,000

1. Noxious weeds are classified by the ODA for the purpose of prioritizing and implementing noxious weed control projects:
   A List: A weed of known economic importance that occurs in the state in small enough infestations to make eradication or containment possible.
   B List: A weed of economic importance which is regionally abundant, but which may have limited distribution in some areas.
   NL: Not listed.
2. Species of invasive plants that would be treated in the same manner have been arranged into treatment groups. Further information about treatment methods for these treatment groups can be found in Table 2-12, *Treatment Key*. Treatment group information for A-ALT can be found in Table 2-13, *Treatment Key – Submerged and Floating Aquatics*.
3. Treatment acres include both Category I acres and Category II acres. For more information, see the *Treatment Acres* sub-section in the *Category II, Unmapped Invasive Plant Sites* section.
4. Acres / sites may be incorrect, as it is difficult to distinguish between native and nonnative populations. Native populations would not be treated.
5. Fritillaria Management Areas are further described in the U.S. Fish and Wildlife Service's Recovery Plan (USDI 2003a)

Table 2-2. *Summary of Invasive Plants Documented in NISIMS by Infestation Size*

Infestation Size (in Acres)	Number of Sites *(percent of total sites)*		Total Acres *(percent of total acres)*	
< 0.1	9,063	*54.0%*	162	*1.2%*
0.1 to < 0.5	5,289	*31.5%*	1,199	*9.1%*
0.5 to < 1	814	*4.9%*	562	*4.3%*
1 to < 5	1,236	*7.4%*	2,826	*21.4%*
5 to < 20	288	*1.7%*	2,651	*20.1%*
20 to <100	74	*0.4%*	2,915	*22.1%*
>100	11	*<0.1%*	2,896	*21.9%*

Over 90 percent of mapped sites are smaller than 1 acre each (see Table 2-2 and Table D-1, *Invasive Plants Mapped in NISIMS by Infestation Size* in Appendix D); however, a relatively small number of large sites account for a majority of infested acres (about 65 percent of the mapped acres are on sites that are bigger than 5 acres).

Category II: Unmapped Invasive Plant Sites

This Category includes species and infestations that are known to occur on the District, but are not mapped in NISIMS. These species are generally widespread and dispersed throughout the District. District botany staff estimated these areas based on their professional judgement and field experience. For some species, this included consideration of vegetation community types and analyzing vegetation layers in GIS. While the locations are not mapped, it is possible to characterize the areas and habitat where they may occur. This Category includes additional unmapped sites for all species that are included in Category I, as well as an additional 140 species (see Table 2-3, *Summary of Unmapped Invasive Plant Sites)*. The majority of the species that are in Category II but not in Category I are not listed as noxious weeds (and hence have not been part of the existing integrated weed management program; thus, they generally have not been recorded during inventories or in NISIMS). While it is unknown how many acres of these species occur on the Medford District, it is estimated that nearly 30,000 unmapped acres would be in need of treatment. The most prevalent species are in the aster family (especially yellow starthistle, but also knapweeds and biennial thistles) and annual grasses (such as cheatgrass, medusahead, and dogtail grasses).

Treatment Acres

Table 2-1, *Summary of Documented Invasive Plant Sites,* and Table 2-3, *Summary of Unmapped Invasive Plant Sites*, include estimated gross[16] treatment acres for each species. These acres include both mapped Category I sites as well as estimated Category II sites that are proposed for treatment.

As examples:

- There are 1,000 treatment acres of Armenian blackberry listed in Table 2-1, which includes nearly 600 acres of mapped (Category I) sites and an additional estimated 400 acres of unmapped (Category II) sites. It is unknown how many acres of Armenian blackberry exist on the Medford District, but it is estimated that 1,000 acres would be treated over the life of this plan.
- Kochia is not mapped on the District (there are no Category I sites), but it exists on the District. While the extent is unknown, it is estimated that less than an acre a year would be treated. Hence, treatment acres would be less than one acre per year of Category II sites.

[16] Gross acres are the areas within which invasive plants are treated; the net acres are the actual area treated.

***Table 2-3**. Summary of Unmapped Invasive Plant Sites*

Scientific Name **Common Name**	**Life Cycle**	**ODA Status**[1]	**Treatment Group**[2]	**Treatment Acres**	**Primary Project Areas**	**Common Habitat in SW Oregon**
			Dicots			
Amaranthaceae (amaranth family)						
Amaranthus albus et al. amaranths	Annual	NL	D1	Rarely treated. 0.1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Widespread in disturbed soil, roadsides, cultivated ground
Bassia scoparia kochia	Annual	B list	D1	< 1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Widespread in disturbed soil, roadsides, cultivated ground
Dysphania botrys et al. Mexican tea, goosefoots	Annual	NL	D1	Rarely treated. 0.1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Widespread in disturbed soil, roadsides, river banks and bars
Salsola tragus Russian thistle	Annual	NL	D1	Rarely treated. 0.1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Widespread in disturbed soil, roadsides, cultivated ground
Apiaceae (parsley family)						
Anthriscus caucalis bur chervil	Annual	NL	D2	< 1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Widespread in woodlands, riparian areas, roadsides
Daucus carota Queen Anne's lace	Biennial	NL	D3	10	ACECs, FMAs, Cook's lomatium critical habitat	Widespread in disturbed soil, cultivated ground, meadows, open woodlands
Foeniculum vulgare sweet fennel	Perennial	NL	D3	100	Rogue National Wild and Scenic River Corridor, ACECs, FMAs, Cook's lomatium critical habitat	Widespread in disturbed soil, roadsides, river banks and bars
Pastinaca sativa common parsnip	Biennial	NL	D3	Rarely treated. 0.1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Widespread in disturbed soil, cultivated ground, meadows
Torilis arvensis spreading hedgeparsley	Annual	NL	D2	3,000	ACECs, FMAs, Cook's lomatium critical habitat	Widespread in woodlands, riparian areas, roadsides
Asteraceae (aster family)						
Anthemis cotula stinking chamomile	Annual	NL	D2	Rarely treated. 0.1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Widespread in disturbed soils, fields, roadsides, open woodlands
Arctium minus lesser burdock	Biennial	NL	D4	Rarely treated. 0.1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Occasional in riparian areas, moist meadows, ditches
Centaurea cyanus bachelor's button	Annual	NL	D2	20	Applegate River corridor, Rogue National Wild and Scenic River Corridor	Roadsides, oak woodlands, river bars
Cichorium intybus chicory	Perennial	NL	D4	< 1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Roadsides, cultivated sites, disturbed openings, river bars and floodplains
Conyza bonariensis South American conyza	Biennial	NL	D4	Rarely treated. 0.1 acre / year	If found in FMAs or Cook's lomatium critical habitat	Occasional in roadsides, ditches, disturbed soils
Crepis capillaris et al. hawksbeards	Biennial	NL	D4	Rarely treated. 0.1 acre / year	FMAs, Cook's lomatium critical habitat	Widespread in roadsides, disturbed openings

Scientific Name **Common Name**	**Life Cycle**	**ODA Status**[1]	**Treatment Group**[2]	**Treatment Acres**	**Primary Project Areas**	**Common Habitat in SW Oregon**
Erigeron strigosus var. *strigosus* daisy fleabane	Biennial	NL	D4	Rarely treated. 0.1 acre / year	Rogue National Wild and Scenic River Corridor. If found in FMAs or Cook's lomatium critical habitat	Not common, but known from gravel bars on the Rogue River
Filago vulgaris herba impia	Annual	NL	D2	Rarely treated. 0.1 acre / year	If found in FMAs or Cook's lomatium critical habitat	Not common, but known from disturbed mixed conifer and hardwood forest
Hypochaeris glabra smooth cat's ear	Annual	NL	D2	Rarely treated. 0.1 acre / year	FMAs, Cook's lomatium critical habitat	Widespread in roadsides, grasslands, disturbed openings
Hypochaeris radicata hairy cat's ear	Perennial	NL	D4	Rarely treated. 0.1 acre / year	FMAs, Cook's lomatium critical habitat	Widespread in roadsides, cultivated sites, disturbed openings
Lactuca saligna, L. serriola willow lettuce, prickly lettuce	Biennial	NL	D4	Rarely treated. 0.1 acre / year	FMAs, Cook's lomatium critical habitat	Widespread in roadsides, grasslands, disturbed openings
Lapsana communis common nipplewort	Annual	NL	D2	Rarely treated. 0.1 acre / year	FMAs, Cook's lomatium critical habitat	Not common, but known from riparian areas
Leontodon taraxacoides hairy hawkbit	Biennial	NL	D4	Rarely treated. 0.1 acre / year	FMAs, Cook's lomatium critical habitat	Not common, but known from disturbed soils and roadsides in the Illinois River Valley
Matricaria discoidea, M. recutita pineapple weed, wild chamomile	Annual	NL	D2	< 1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Widespread in roadsides, disturbed openings
Sonchus asper, S. oleraceus sowthistles	Annual	NL	D2	Rarely treated. 0.1 acre / year	FMAs, Cook's lomatium critical habitat	Disturbed often moist sites, riparian areas
Tanacetum parthenium, T. vulgare feverfew, common tansy	Perennial	NL	D4	Rarely treated. 0.1 acre / year	Rogue National Wild and Scenic River Corridor, ACECs, FMAs, Cook's lomatium critical habitat	Not common, but known along the Rogue River and riparian areas
Taraxacum officinale common dandelion	Perennial	NL	D4	Rarely treated. 0.1 acre / year	FMAs, Cook's lomatium critical habitat	Widespread in disturbed soils, cultivated sites, meadows, pastures, riparian areas, forest openings
Tragopogon dubius, T. porrifolius salsifys	Annual	NL	D2	Rarely treated. 0.1 acre / year	FMAs, Cook's lomatium critical habitat	Widespread in disturbed soils, cultivated sites, rangeland, forest openings
Bignoniaceae (trumpet creeper family)						
Catalpa bignonioides southern catalpa	Perennial	NL	D12	20	Rogue National Wild and Scenic River Corridor	River bars and banks
Boraginaceae (borage family)						
Myosotis discolor changing forget-me-not	Perennial	NL	D5	Rarely treated. 0.1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Widespread in oak woodlands, rocky openings, thin soils, including on serpentine substrates
Brassicaceae (mustard family)						
Arabidopsis thaliana common wall cress	Annual	NL	D1	Rarely treated. 0.1 acre / year	FMAs, Cook's lomatium critical habitat	Widespread in disturbed sites, open habitats

Scientific Name **Common Name**	**Life Cycle**	**ODA Status**[1]	**Treatment Group**[2]	**Treatment Acres**	**Primary Project Areas**	**Common Habitat in SW Oregon**
Barbarea vulgaris bitter wintercress	Biennial	NL	D6	Rarely treated. 0.1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Occasional in disturbed riparian areas, moist pastures
Brassica nigra, B. rapa field mustards	Annual	NL	D1	< 1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Widespread in roadsides, ditches, grasslands, disturbed openings
Camelina microcarpa littlepod falseflax	Biennial	NL	D6	Rarely treated. 0.1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Not common, but known from roadsides, woodlands, and forest edges
Capsella bursa-pastoris shepherd's purse	Annual	NL	D1	Rarely treated. 0.1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Widespread in roadsides, cultivated sites, disturbed openings, including on serpentine substrates
Cardamine hirsuta hairy bittercress	Annual	NL	D1	Rarely treated. 0.1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Widespread in roadsides, cultivated sites, disturbed openings
Descurainia sophia flixweed	Biennial	NL	D6	< 1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Occasional in rangelands, chaparral, forest openings, roadsides
Erysimum repandum spreading wallflower	Annual	NL	D1	Rarely treated. 0.1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Not common, but known from rocky openings, including serpentine substrates
Lepidium chalepense lens-podded whitetop	Perennial	B list	D6	10	ACECs, FMAs, Cook's lomatium critical habitat, roadsides	Not common, but known from roadsides, rangeland, other open habitats
Lepidium strictum upright pepperweed	Perennial	B list	D6	< 1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat, roadsides	Not common, but known from roadsides and disturbed openings
Nasturtium officinale watercress	Perennial	NL	D6	Rarely treated. 0.1 acre / year	Rogue National Wild and Scenic River Corridor, ACECs	Stream sides, ditches, ponds
Raphanus raphanistrum, R. sativus radishes	Biennial	NL	D6	Rarely treated. 0.1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Roadsides, cultivated sites, pastures
Sinapis arvensis wild mustard, charlock	Annual	NL	D1	Rarely treated. 0.1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Not common, but known from roadsides and disturbed sites
Sisymbrium altissimum, S. officinale tumble mustard, hedgemustard	Biennial	NL	D6	Rarely treated. 0.1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Widespread in roadsides, disturbed openings, burned areas
Thlaspi arvense fanweed	Annual	NL	D1	Rarely treated. 0.1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Occasional in roadsides and disturbed sites
Caryopyllaceae (pink family)						
Agrostemma githago common corncockle	Annual	NL	D1	Rarely treated. 0.1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Not common, but known from dry grasslands and disturbed sites
Arenaria serpyllifolia var. serpyllifolia thyme leaf sandwort	Annual	NL	D1	Rarely treated. 0.1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Rocky outcrops, mostly serpentine substrates

Scientific Name **Common Name**	**Life Cycle**	**ODA Status[1]**	**Treatment Group[2]**	**Treatment Acres**	**Primary Project Areas**	**Common Habitat in SW Oregon**
Cerastium glomeratum et al. chickweeds	Annual	NL	D1	Rarely treated. 0.1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Widespread in disturbed sites and open habitats, including serpentine substrates
Dianthus armeria Deptford-pink	Biennial	NL	D9	Rarely treated. 0.1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Widespread but rarely abundant in open habitats and roadsides
Herniaria hirsuta var. *cinerea* hairy rupturewort	Annual	NL	D1	Rarely treated. 0.1 acre / year	Rogue National Wild and Scenic River Corridor	Not common, but known from sandy bars on the Rogue River
Holosteum umbellatum jagged chickweed	Annual	NL	D1	Rarely treated. 0.1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Not common, but known from open habitats
Lychnis coronaria rose campion	Perennial	NL	D9	Rarely treated. 0.1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Not common, but known from roadsides and open habitats
Petrorhagia dubia hairypink	Annual	NL	D1	Rarely treated. 0.1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Not common, but known from floodplains, river bars, and open well-drained soils, including serpentine substrates
Sagina apetala common pearlwort	Annual	NL	D1	Rarely treated. 0.1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Not common, but known open well-drained soils, including serpentine substrates
Saponaria officinalis bouncing-bet	Perennial	NL	D9	< 1 acre / year	Rogue National Wild and Scenic River Corridor, ACECs, FMAs, Cook's lomatium critical habitat	Floodplains and alluvial soil
Scleranthus annuus annual knawel	Annual	NL	D1	Rarely treated. 0.1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Roadsides and open habitats, including serpentine substrates
Spergula arvensis cornspurrey	Annual	NL	D1	Rarely treated. 0.1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Not common, but known from pastures and disturbed openings
Spergularia rubra red sand-spurrey	Annual	NL	D1	Rarely treated. 0.1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Widespread in roadsides, disturbed openings
Stellaria media common chickweed	Annual	NL	D1	< 1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Widespread in disturbed sites, open habitats
Vaccaria hispanica cow soapwort	Annual	NL	D1	Rarely treated. 0.1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Not common, but known from disturbed sites
Fabaceae (pea family)						
Coronilla varia common crown-vetch	Perennial	NL	D7	1	Roadsides	Roadsides, road cuts
Lathyrus aphaca yellow vetchling	Annual	NL	D2	1	Roadsides	Uncommon, but known from roadsides and pastures
Lotus corniculatus, L. uliginosus bird's-foot trefoils	Perennial	NL	D7	< 1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Widespread in roadsides, pastures, disturbed open habitats
Medicago sativa et al. medicks, burclovers, alfalfa	Perennial	NL	D7	< 1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Roadsides, pastures, disturbed open habitats

Scientific Name **Common Name**	**Life Cycle**	**ODA Status**[1]	**Treatment Group**[2]	**Treatment Acres**	**Primary Project Areas**	**Common Habitat in SW Oregon**
Robinia hispida, R. pseudoacacia bristly locust, black locust	Perennial	NL	D12	10	Roadsides and open habitats near residential areas	Interstate 5 corridor, roadsides, fencerows, pastures, primarily near residential areas
Trifolium arvense et al. annual clovers	Annual	NL	D2	Rarely treated. 0.1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Widespread in roadsides, ditches, pastures, cultivated fields, and other open habitats
Trifolium repens et al. perennial clovers	Perennial	NL	D7	Rarely treated. 0.1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Widespread in roadsides, ditches, pastures, cultivated fields, and other open habitats
Vicia villosa winter vetch	Annual	NL	D2	500	ACECs, FMAs, Cook's lomatium critical habitat	Roadsides, woodlands, forest openings, disturbed open habitats
Geraniaceae (geranium family)						
Erodium cicutarium storksbills	Biennial	NL	D8	< 1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Roadsides, meadows, woodlands, forest openings, disturbed open habitats
Geranium molle et al. geraniums	Biennial	NL	D8	< 1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Disturbed open riparian areas, woodlands, cultivated sites
Haloragaceae (watermilfoil family)						
Myriophyllum spicatum Eurasian watermilfoil	Perennial	B list	A-ALT	< 1 acre / year	Howard Prairie Lake, Illinois River Corridor	Ponds, lakes, reservoirs, rivers
Lamiaceae (mint family)						
Glechoma hederacea ground-ivy	Perennial	NL	D9	Rarely treated. 0.1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Not common, but known from riparian areas and mesic woodlands
Lamium amplexicaule et al. deadnettles	Annual	NL	D1	Rarely treated. 0.1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Widespread in roadsides, ditches, pastures, cultivated fields, and other open habitats
Marrubium vulgare horehound	Perennial	NL	D9	< 1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Roadsides, rangeland, disturbed open habitats
Melissa officinalis garden balm	Perennial	NL	D9	< 1 acre / year	Rogue National Wild and Scenic River Corridor, ACECs, FMAs, Cook's lomatium critical habitat	Not common, but known from stream banks, riparian areas
Mentha × piperita, M. spicata peppermint, spearmint	Perennial	NL	D9	< 1 acre / year	Rogue National Wild and Scenic River Corridor, ACECs, FMAs, Cook's lomatium critical habitat	Not common, but known from stream banks, riparian areas
Linaceae (flax family)						
Linum bienne, L. usitatissimum pale flax, common flax	Perennial	NL	D9	Rarely treated. 0.1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Not common, but known from roadsides, rangeland, other open habitats
Malvaceae (mallow family)						
Malva neglecta mallows	Biennial	NL	D9	< 1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Roadsides, rangeland, disturbed open habitats
Papaveraceae (poppy family)						
Papaver rhoeas corn poppy	Annual	NL	D1	Rarely treated. 0.1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Not common, but known from gravelly roadsides

Scientific Name **Common Name**	**Life Cycle**	**ODA Status**[1]	**Treatment Group**[2]	**Treatment Acres**	**Primary Project Areas**	**Common Habitat in SW Oregon**
Phytolaccaceae (pokeweed family)						
Phytolacca americana American pokeweed	Perennial	NL	D9	< 1 acre / year	Rogue National Wild and Scenic River Corridor, ACECs, FMAs, Cook's lomatium critical habitat	Not common, but known from roadsides and parks in the Rogue River floodplain
Plantaginaceae (plantain family)						
Digitalis purpurea purple foxglove	Biennial	NL	D10	< 1 acre / year	ACECs and FMAs	Not common, but known from roadsides, meadows, riparian areas, mesic forest openings
Kickxia elatine, K. spuria cancerworts	Annual	NL	D1	< 1 acre / year	Rogue National Wild and Scenic River Corridor, ACECs, FMAs, Cook's lomatium critical habitat	Not common, but known from sandy bars on the Rogue River and other open disturbed sites
Plantago lanceolata, P. major English plantain, common plantain	Perennial	NL	D10	Rarely treated. 0.1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Widespread in roadsides, pastures, cultivated fields, and other open habitats
Veronica anagallis-aquatica water speedwell	Biennial	NL	D10	< 1 acre / year	Rogue National Wild and Scenic River Corridor and ACECs	Riparian areas, wetlands
Veronica arvensis et al. annual speedwells	Annual	NL	D1	Rarely treated. 0.1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Roadsides, pastures, cultivated fields, other open disturbed habitats
Veronica filiformis et al. perennial speedwells	Perennial	NL	D10	Rarely treated. 0.1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Cultivated sites and other disturbed open habitats
Polygonaceae (knotweed family)						
Persicaria hydropiper smartweed	Annual	NL	D2	Rarely treated. 0.1 acre / year	Rogue National Wild and Scenic River Corridor, ACECs	Not common, but known from river banks and bars, wet disturbed areas
Polygonum aviculare prostrate knotweed	Perennial	NL	D11	Rarely treated. 0.1 acre / year	Rogue National Wild and Scenic River Corridor, ACECs	Riparian areas, river banks and bars, wet disturbed areas
Polygonum convolvulus var. convolvulus ivy bindweed	Annual	NL	D2	Rarely treated. 0.1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Not common, but known from roadsides, cultivated sites, disturbed open areas
Rumex crispus et al. sheep sorrel, docks	Perennial	NL	D11	Rarely treated. 0.1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Widespread in disturbed open sites
Portulacaceae (purslane family)						
Portulaca oleracea common purslane	Annual	NL	D1	Rarely treated. 0.1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Disturbed open sites, cultivated sites
Potamogetonaceae (pondweed family)						
Potamogeton crispus curled pondweed	Perennial	NL	A-ALT	Rarely treated. 0.1 acre / year	Rogue National Wild and Scenic River Corridor	Ponds, lakes, reservoirs, creeks, rivers
Ranunculaceae (buttercup family)						

Scientific Name **Common Name**	**Life Cycle**	**ODA Status**[1]	**Treatment Group**[2]	**Treatment Acres**	**Primary Project Areas**	**Common Habitat in SW Oregon**
Ranunculus arvensis field buttercup	Biennial	NL	D9	Rarely treated. 0.1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Roadsides, pastures, cultivated sites, vernal pools
Ranunculus repens creeping buttercup	Perennial	NL	D9	< 1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Road ditches, irrigation ditches, riparian areas, wet meadows
Rosaceae (rose family)						
Poterium sanguisorba var. polygamum small burnet	Perennial	NL	D9	Rarely treated. 0.1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Widespread in roadsides and disturbed openings
Rosa eglanteria, R. multiflora sweetbrier, multiflora rose	Perennial	NL	D12	< 1 acre / year	Rogue National Wild and Scenic River Corridor, ACECs, FMAs	Fencerows, woodland edges, thickets, residential areas
Rubiaceae (madder family)						
Galium divaricatum et al. bedstraws	Annual	NL	D1	Rarely treated. 0.1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Occasional in meadows, woodland edges
Sherardia arvensis blue fieldmadder	Annual	NL	D1	Rarely treated. 0.1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Roadsides, riparian areas, woodlands, grasslands
Solanaceae (nightshade family)						
Datura stramonium jimson weed	Annual	NL	D2	Rarely treated. 0.1 acre / year	Rogue National Wild and Scenic River Corridor	Occasional in open disturbed sites, river bars
Solanum dulcamara climbing nightshade	Perennial	NL	D9	Rarely treated. 0.1 acre / year	Rogue National Wild and Scenic River Corridor	Occasional in riparian areas, wetland margins
Solanum physalifolium hairy nightshade	Annual	NL	D2	Rarely treated. 0.1 acre / year	Rogue National Wild and Scenic River Corridor	Occasional in open disturbed sites, river bars
Valerianaceae (valerian family)						
Valerianella carinata, V. locusta corn salads	Annual	NL	D1	Rarely treated. 0.1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Not common, but known from meadows and open habitats
Monocots						
Amaryllidaceae (amaryllis family)						
Allium vineale wild garlic	Perennial	NL	M2	Rarely treated. 0.1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Widespread in disturbed soil, cultivated ground, meadows, open woodlands
Cyperaceae (sedge family)						
Cyperus difformis Asian flatsedge	Annual	NL	M1	5	Rogue National Wild and Scenic River Corridor	Sandy river banks and bars
Poaceae (grass family)						
Agrostis gigantea redtop	Perennial	NL	M2	5	Rogue National Wild and Scenic River Corridor, ACECs	Moist and often disturbed meadows, pastures, ditches
Agrostis stolonifera bentgrasses	Perennial	NL	M2	5	Rogue National Wild and Scenic River Corridor, ACECs	Moist and often disturbed pastures, ditches, stream sides

Scientific Name **Common Name**	**Life Cycle**	**ODA Status**[1]	**Treatment Group**[2]	**Treatment Acres**	**Primary Project Areas**	**Common Habitat in SW Oregon**
Aira caryophyllea var. caryophyllea, A. elegantissima silver hairgrasses	Annual	NL	M1	Rarely treated. 0.1 acre / year	FMAs, Cook's lomatium critical habitat	Shallow disturbed soils, roadsides, talus, rock outcrops
Alopecurus pratensis meadow foxtail	Perennial	NL	M2	< 1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Moist meadows, pastures, roadsides, ditches, stream sides
Anthoxanthum aristatum ssp. *aristatum* annual vernalgrass	Annual	NL	M1	Rarely treated. 0.1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Margins of vernal pools and wetlands
Anthoxanthum odoratum sweet vernalgrass	Perennial	NL	M2	< 1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Meadows, roadsides, disturbed soils, forest openings, sometimes in dense shade
Apera interrupta interrupted windgrass	Annual	NL	M1	Rarely treated. 0.1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Disturbed soils, roadsides, cultivated fields
Avena barbata, A. fatua slender wild oats	Annual	NL	M1	< 1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Widespread in disturbed grasslands, roadsides
Briza maxima, B. minor quaking grasses	Annual	NL	M1	Rarely treated. 0.1 acre / year	FMAs, Cook's lomatium critical habitat	Roadsides, pastures, rocky areas, sandy soils, edges of vernal pools
Bromus spp. other annual bromes	Annual	NL	M1	< 1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Disturbed and mostly dry grasslands, rangeland, roadsides
Crypsis alopecuroides, C. schoenoides pricklegrasses	Annual	NL	M1	Rarely treated. 0.1 acre / year	FMAs, Cook's lomatium critical habitat	Drying lake margins, vernal pools
Cynodon dactylon bermudagrass	Perennial	NL	M2	Rarely treated. 0.1 acre / year	FMAs, Cook's lomatium critical habitat	Cultivated fields, yards, roadsides, river bars
Dactylis glomerata orchard grass	Perennial	NL	M2	< 1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Pastures, meadows, woodlands, roadsides
Digitaria ischaemum, D. sanguinalis crabgrasses	Annual	NL	M1	Rarely treated. 0.1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Disturbed soils, lawns, roadsides
Echinochloa crus-galli barnyard grass	Annual	NL	M1	Rarely treated. 0.1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Disturbed moist sites
Elymus repens quack grass	Perennial	NL	M2	< 1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Disturbed sites, roadsides, ditches, stream sides
Eragrostis cilianensis et al. annual lovegrasses	Annual	NL	M1	< 1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Disturbed sites, roadsides
Eragrostis curvula weeping lovegrass	Perennial	NL	M2	< 1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Disturbed sites, roadsides, meadows
Festuca rubra, F. trachyphylla red fescue, hard fescue	Perennial	NL	M2	< 1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Disturbed sites, roadsides, meadows

Scientific Name **Common Name**	**Life Cycle**	**ODA Status[1]**	**Treatment Group[2]**	**Treatment Acres**	**Primary Project Areas**	**Common Habitat in SW Oregon**
Holcus lanatus common velvetgrass	Perennial	NL	M2	< 1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Moist disturbed sites, roadsides
Hordeum marinum ssp. *gussoneanum, H. murinum* ssp. *glaucum* annual barleys	Annual	NL	M1	Rarely treated. 0.1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Seasonally moist disturbed sites
Lolium multiflorum, L. temulentum annual ryegrasses	Annual	NL	M1	Rarely treated. 0.1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Disturbed sites, roadsides, meadows
Lolium perenne perennial ryegrass	Perennial	NL	M2	< 1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Disturbed sites, roadsides, meadows
Paspalum dilatatum dallisgrass	Perennial	NL	M2	Rarely treated. 0.1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Moist disturbed sites, ditches, road cuts
Phleum pratense timothy	Perennial	NL	M2	< 1 acre / year	ACECs and FMAs	Pastures, rangelands
Poa annua annual bluegrasses	Annual	NL	M1	Rarely treated. 0.1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Widespread in disturbed soils, roadsides, parking lots, cultivated fields
Poa bulbosa bulbous bluegrass	Perennial	NL	M2	< 1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Disturbed grasslands, chaparral, roadsides
Poa compressa, P. pratensis, P. trivialis perennial bluegrasses	Perennial	NL	M2	< 1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Disturbed and often moist meadows, roadsides, riparian areas
Polypogon monspeliensis rabbitsfoot grass	Annual	NL	M1	< 1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Moist disturbed sites, stream sides
Schedonorus arundinaceus, S. pratensis tall fescue, meadow fescue	Perennial	NL	M2	< 1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Widespread in pastures, meadows, roadsides, lawns
Secale cereale rye	Annual	NL	M1	Rarely treated. 0.1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Disturbed grasslands, cultivated fields, roadsides
Setaria pumila et al. annual foxtails	Annual	NL	M1	Rarely treated. 0.1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Disturbed sites, cultivated fields
Sorghum bicolor sorghum	Annual	NL	M1	Rarely treated. 0.1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Disturbed sites, cultivated fields
Sorghum halepense Johnsongrass	Perennial	B list	M2	< 1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Disturbed and often moist meadows, pastures, roadsides
Thinopyrum intermedium, T. ponticum wheatgrasses	Perennial	NL	M2	< 1 acre / year	ACECs and FMAs	Grasslands, rangeland

Scientific Name **Common Name**	**Life Cycle**	**ODA Status[1]**	**Treatment Group[2]**	**Treatment Acres**	**Primary Project Areas**	**Common Habitat in SW Oregon**
Ventenata dubia Ventenata	Annual	NL	M1	500	ACECs, FMAs, Cook's lomatium critical habitat	Increasingly widespread in grasslands, rangeland, roadsides
Vulpia myuros rattail fescue	Annual	NL	M1	Rarely treated. 0.1 acre / year	ACECs, FMAs, Cook's lomatium critical habitat	Disturbed and well-drained soils

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   A List: A weed of known economic importance that occurs in the state in small enough infestations to make eradication or containment possible.
   B List: A weed of economic importance which is regionally abundant, but which may have limited distribution in some areas.
   NL: Not listed.
2. Species of invasive plants that would be treated in the same manner have been arranged into treatment groups. Further information about treatment methods for these treatment groups can be found in Table 2-12, *Treatment Key*. Treatment group information for A-ALT can be found in Table 2-13, *Treatment Key – Submerged and Floating Aquatics*.

Category III: Spread from Existing Invasive Plant Sites

The current spread rate for noxious weeds is estimated to be about 12 percent annually (USDI 2010a:135-137, 594-597) and new sites are found on the District with each invasive plant inventory. Invasive plants can spread quickly and over great distances by wind, water, animals, and humans through vehicle and foot traffic. Infestations begin mostly on disturbed sites such as roads and trails, logged areas, burned areas, cultivated fields and pastures, wildlife and livestock concentration areas, mining areas, and recreation sites. Livestock and wildlife (including birds) can introduce invasive plant seeds from their coats and feces. The checkerboard ownership pattern and patchiness of vegetation, particularly on the valley floors, increases opportunities for invasive plant movement onto the District.

Linear disturbances such as roads and utility corridors are primary pathways for spread on the District. Many invasive plant species for which there are no currently available effective control methods (such as invasive bromes) are being spread along roads by vehicles annually. (See Maps 2-2B and 2-2C, *Routes of Invasive Plant Spread: Ground Transportation Network* and *Utility Corridors and Water Developments*.)

Streams are also major pathways for the movement of invasive plants. The Applegate, Illinois, and Rogue River and smaller tributaries transport invasive plant propagules downstream. These areas attract birds, wildlife, and humans who spread invasive plants along these corridors. (See Map 2-2A, *Routes of Invasive Plant Spread: Recreation Sites and Waterways*.)

Recreation sites, both developed and dispersed, are the hub of several means of invasive plant spread. Recreation sites bring together people and their recreation equipment, vehicles, pack stock and pets where roads, trails, and waterways converge. Invasive plants can be easily transported from one site to other areas on the District and beyond. (See Map 2-2A, *Routes of Invasive Plant Spread: Recreation Sites and Waterways*.)

Timber harvest, restoration, prescribed fire, and silviculture activities disturb vegetation and soil in ways that can stimulate existing invasive plant seed banks, reduce barriers to invasive seed dispersal, and improve site conditions for invasive plant establishment and growth. Particularly where project disturbances are more severe, such as skid roads and burn pile scars, invasive plant infestations can persist and become sources for further seed spread. Equipment and work crews can also spread invasive plant seeds to and from project areas.

Mineral material sites such as quarries and mining operation sites are continuously disturbed and may have numerous users. Vegetation and top soil are removed during mining activities, and revegetation efforts may need several successional phases in order to reclaim the site. During these phases, the site may be vulnerable to establishment by invasive plants. (See Map 2-2D, *Routes of Invasive Plant Spread: Material Sites and Mineral Resources*.)

Wildfires create disturbances and remove shade and native vegetation, creating opportunities for invasive plants to establish before native vegetation has a chance to regrow. High intensity wildfire can destroy organic soil horizons that are conducive to native plant establishment and propagation. Without these substrates, invasive plants can gain a foothold. Invasive plants may also increase hazardous fuels in ways that increase fire intensity or frequency in ecosystems (Brooks et al. 2004).

Category IV: New Invaders

Species of invasive plants not previously documented on the District may be found at any time. Initial infestations are small, but may become large before being discovered. Common routes of spread (e.g., roads and waterways) are checked regularly. Species of concern not yet documented on the District but documented on adjacent lands include perennial pepperweed (*Lepidium latifolium*), plumeless thistles (*Carduus acanthoides*, *C. crispus*, and *C. tenuiflorus*), and myrtle spurge (*Euphorbia myrsinites*) (see Table 2-4, *Invasive Plants Documented on Neighboring*

Lands but Not Known to Occur on the District). For example, perennial pepperweed is present around the shore of Emigrant Lake on adjacent public and private lands, but has yet to be detected on BLM-managed lands. The District works with numerous entities to coordinate early detection activities across jurisdictional boundaries and educate the public about new invasive plants that are invading the area. All new invaders are a high priority for treatment in order to prevent them from becoming established on the District (see further information in the *Prioritizing Areas for Treatment* section later in this Chapter).

Table 2-4. *Invasive Plants Documented on Neighboring Lands but Not Known to Occur on the District*

Family	Scientific Name	Common Name	Duration	ODA Status[1]	Treatment Group[2]
		Dicots			
Apocynaceae (dogbane)	*Nerium oleander*	oleander	Perennial	NL	D9
Aquifoliaceae (holly)	*Ilex aquifolium*	English holly	Perennial	NL	D12
Asteraceae (aster)	*Carduus acanthoides*	spiny plumeless thistle	Biennial	A list	D4
	Carduus crispus	curly plumeless thistle	Biennial	A list	D4
	Carduus pycnocephalus ssp. *cinereus*	Turkish thistle	Annual	B list	D2
	Carduus tenuiflorus	winged plumeless thistle	Annual	B list	D2
	Centaurea iberica	Iberian starthistle	Perennial	A list	D4
	Hieracium aurantiacum	orange hawkweed	Perennial	A list	D4
	Onopordum tauricum	bull cottonthistle	Biennial	A list	D4
	Tussilago farfara	coltsfoot	Perennial	A list	D4
Balsaminaceae (touch-me-not)	*Impatiens glandulifera*	ornamental jewelweed	Annual	B list	D1
Boraginaceae (borage)	*Anchusa azurea*	Italian bugloss	Perennial	NL	D5
	Echium plantagineum	salvation jane	Biennial	A list	D5
Brassicaceae (mustard)	*Lepidium latifolium*	perennial pepperweed	Perennial	B list	D6
	Lunaria annua	annual honesty	Biennial	NL	D6
Buddlejaceae (butterfly bush)	*Buddleja davidii*	orange eye butterflybush	Perennial	B list	D12
Cuscutacea (dodder)	*Cuscuta spp.*	dodder	Perennial	B list	D9
Euphorbiaceae (spurge)	*Euphorbia lathyris*	caper spurge	Annual	NL	D1
	Euphorbia myrsinites	myrtle spurge	Perennial	B list	D9
Fabaceae (pea)	*Galega officinalis*	goatsrue	Perennial	A list	D7
Lamiaceae (mint)	*Salvia aethiopis*	Mediterranean sage	Biennial	B list	D9
	Salvia sclarea	clary sage	Biennial	NL	D9
Lythraceae (loosestrife)	*Lythrum hyssopifolium*	hyssop loosestrife	Biennial	NL	D9
Malvaceae (mallow)	*Abutilon theophrasti*	velvet-leaf	Annual	B list	D1
Menyanthaceae (buckbean)	*Nymphoides peltata*	yellow floatingheart	Perennial	A list	A-ALT
Oleaceae (olive)	*Ligustrum vulgare*	European privet	Perennial	NL	D12
Onagraceae (evening primrose)	*Ludwigia grandiflora*	large-flower primrose willow	Perennial	B list	A-ALT
Orobanchaceae (broomrape)	*Orobanche minor*	clover broomrape	Annual	B list	D1
Polygonaceae (buckwheat)	*Polygonum polystachyum*	cultivated knotweed	Perennial	B list	D11
	Polygonum bohemicum	Bohemian knotweed	Perennial	NL	D11
Primulaceae (primrose)	*Lysimachia nummularia*	creeping Jenny	Perennial	NL	D9
	Lysimachia punctata	large yellow loosestrife	Perennial	NL	D9
	Lysimachia vulgarism	garden yellow loosestrife	Perennial	A list	D9
Ranunculaceae (buttercup)	*Ficaria verna*	fig buttercup	Perennial	NL	D9
Rosaceae (rose)	*Cotoneaster* spp.	Cotoneaster	Perennial	NL	D12
	Crataegus monogyna et al.	hawthorns	Perennial	NL	D12
	Prunus avium et al.	ornamental cherries	Perennial	NL	D12
	Pyracantha coccinea, P. fortuneana	firethorns	Perennial	NL	D12
	Pyrus calleryana	Callery pear	Perennial	NL	D12

Family	Scientific Name	Common Name	Duration	ODA Status[1]	Treatment Group[2]
Solanaceae (nightshade)	*Solanum aviculare*	New Zealand nightshade	Perennial	NL	D9
	Solanum rostratum	buffalobur	Annual	B list	D2
Tamaricaceae (tamarisk)	*Tamarix ramosissima*	saltcedar	Perennial	B list	D12
Monocots					
Araceae (arum)	*Arum italicum*	Italian lords and ladies	Perennial	NL	M2
Cyperaceae (sedge)	*Isolepis setacea*	bristleleaf bulrush	Perennial	NL	A
Hydrocharitaceae (frogbit)	*Egeria densa*	South American waterweed	Perennial	B list	A-ALT
Poaceae (grass)	*Arundo donax*	giant reed	Perennial	NL	M2
	Bambusoideae spp.	bamboo	Perennial	NL	M2
	Cortaderia jubata, C. selloana	pampas grasses	Perennial	B list	M2
	Nardus stricta	matgrass	Perennial	A list	M2
	Saccharum ravennae	ravennagrass	Perennial	A list	M2
	Setaria faberi	Japanese bristlegrass	Annual	NL	M1
Pontederiaceae (pickerel-weed)	*Eichhornia crassipes*	water hyacinth	Perennial	NL	M2

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2. Species of invasive plants that would be treated in the same manner have been arranged into treatment groups. Further information about treatment methods for these treatment groups can be found in Table 2-12, *Treatment Key*. Treatment group information for A-ALT can be found in Table 2-13, *Treatment Key – Submerged and Floating Aquatics*.

Integrated Invasive Plant Management

As noted in Chapter 1, the Proposed Action and Alternative 3 would update the direct control methods that are available to the existing noxious weed management program, including increasing the number of herbicides available for use. In addition, the Proposed Action and Alternative 3 would add nonnative invasive plants that are not noxious to the list of plant species that can be treated. As described in the alternatives, these additional herbicides and additional invasive plants would cause the use of treatment methods to increase. Other elements of the program (such as prevention and coordination) remain essentially the same and are not part of the alternatives. However, for context and a comprehensive description of the District's integrated invasive plant management program, these other elements of the program are presented below. This is followed by information on direct control methods.

Prevention, Education, and Awareness

Prevention, education, and awareness are the highest priority for the management of invasive plants. The District maintains a District Weed Prevention Schedule that outlines prevention steps like cleaning vehicles and equipment before moving onto or from BLM-managed lands and helping with community invasive plant education events. Specific responsibilities are assigned for keeping administrative sites free of invasive plants, reestablishing desirable vegetation on disturbed sites, inspecting gravel and other materials sites, and including invasive plant prevention measures in all planning documents, contracts, and leases. Other activities include the continuing education of employees, contractors, and the public.

District staff works in cooperation with Josephine and Jackson Cooperative Weed Management Areas (CWMAs) to hold an annual *Let's Pull Together* event in each county. The District also works with the local CWMAs to publish news articles and invasive plant identification booklets; educate businesses and landowners; and, coordinate invasive plant control and other activities with County, State, and other agency invasive plant control programs and transportation departments.

Additionally, BLM policy requires that planning for ground-disturbing projects, or projects that have the potential to alter plant communities, include an assessment of the risk of introducing or spreading noxious weeds (USDI 1992b).[17] If there is a moderate or high risk of spread, actions to reduce the risk must be implemented and monitoring of the site (see *Monitoring* section below) must be conducted to prevent establishment of new infestations (USDI 1992b). A list of prevention measures applicable to projects or vegetation treatment actions is included in Appendix A, *Protection Measures*.

Competitive seeding and planting is done on the District as both a preventative and a control measure. Further information can be found in the *Direct Control Methods* section later in this Chapter.

Coordination and Cooperation

The District works cooperatively with several entities, including local, State, and Federal agencies, non-governmental organizations, and private landowners. Coordination includes the implementation of prevention and education activities (see previous section), sharing of inventory and monitoring information, and developing and implementing annual treatment programs. The District works closely with the Rogue Basin Partnership, ODA, and the Rogue River-Siskiyou National Forest through interagency and cooperative agreements in which grant monies and BLM contributions help fund invasive plant treatments on BLM and adjacent lands.

Planning

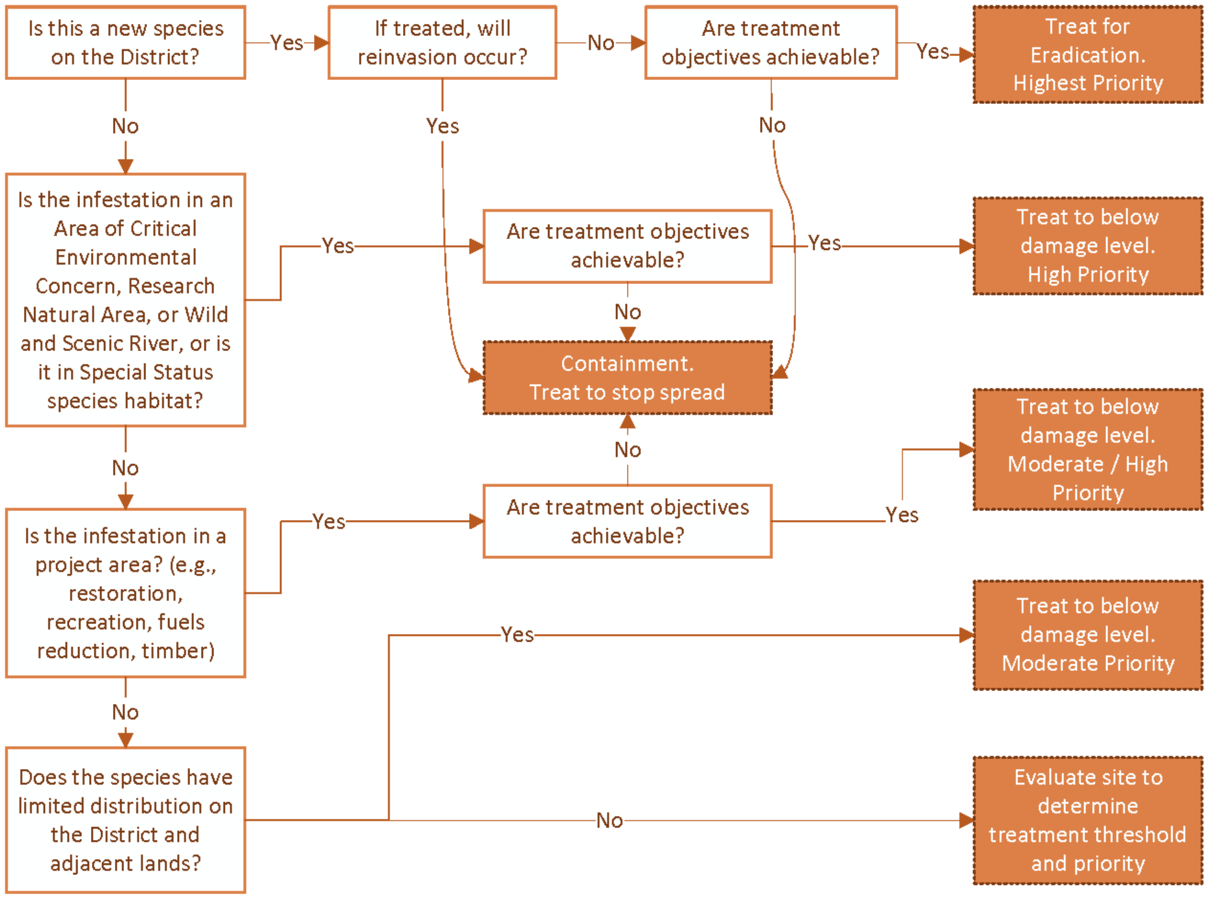
Integrated invasive plant management includes a process to determine when and where to take management action. In general, the District's strategy is to manage invasive plants to minimize adverse effects to ecological function and economic values. This strategy requires District staff to set action thresholds and to evaluate sites to determine when those thresholds have been reached or exceeded. Action thresholds are the levels of ecological or economic damage that can be done by invasive plant infestations before treatments are needed, and these thresholds differ across sites, projects, and species. For example, for most invasive plant species, the action threshold would be different along a disturbed roadside than it would be next to a population of a rare plant species known to be intolerant of competition. For some invasive plant species (e.g., yellowtuft) the threshold may be a single plant, regardless of the site, while for other species (e.g., dandelion or Queen Anne's lace) the threshold would rarely be reached except at extremely sensitive sites.

Prioritizing Areas for Treatment

Invasive plant infestations that exceed action thresholds are recommended for management action; however, because the number of invasive plant infestations requiring management action exceeds the District's annual treatment capacity, treatment sites must be prioritized. Figure 2-1 shows a generalized process for prioritizing invasive plant treatments across the District. Priorities are determined based on abundance of the target species (e.g., is it previously unknown on the District, or is it widespread?), location where the infestation is found, type and value of resources near the infestation, potential rate and severity of spread, and whether the treatment would be effective.

[17] Current handbook direction requires this assessment only for noxious weeds (Integrated Weed Management Manual 9015; USDI 1992b).

Figure 2-1. *Prioritizing Areas for Treatment*



Annual Treatment Plans

The District determines potential treatments based in part on available tools and funding, and develops a District-wide Annual Treatment Plan prior to the beginning of control treatments in the spring. In addition, specific area or project treatment plans are developed in coordination with partners. Annual Treatment Plans are subject to an interdisciplinary team[18] review to ensure there is no new information or changed circumstances that would change the Decision that results from this EA or substantially alter this EA's analysis. If there is relevant new information or changed circumstances, the Annual Treatment Plan would be revised to comply with the Decision or the appropriate level of NEPA analysis would be completed and a new Decision would be issued. Annual Treatment Plans help the District ensure that treatments conform to design and mitigation standards in the relevant NEPA documents[19], and that the required Pesticide Use Proposals, Biological Control Agent Release Proposals, and other authorizations, obligations, and commitments[20] are completed prior to implementation. Every control treatment, however, is not always on the Annual Treatment Plan. Unexpected events such as increased or decreased funding, new invaders, wildfire, or weather conditions could alter implementation of the Annual Treatment Plan.

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[18] The interdisciplinary teams would include botanists, wildlife and fisheries biologists, archeologists, and other natural resource specialists with expertise in potentially affected resources.
[19] For example, Project Design Features adopted by this EA, Standard Operating Procedures, Mitigation Measures, and Conservation Measures (for Special Status species). These are all included in Appendix A.
[20] Such as required Special Status species, archaeological, and paleontological surveys, as well as SHPO consultation.

This calendar year's invasive plant control activities planned for the District are summarized on Table 2-5 to present an example of how priorities and treatment methods would be implemented.

Table 2-5. *Annual Treatment Plan*

Field Office	Project Area	Target / Objective	Treatment Method	Treatment Acres	Comments
Ashland	Proposed forest management project areas throughout the Field Office	Treat known infestations of brooms, knapweeds, bull and Canada thistles, starthistle, Dyer's woad, skeletonweed. Inventory and treat new infestations	Backpack spray, seed / mulch	500	Includes timber sale units, hazard fuel treatment areas, haul routes, landings, staging areas, etc.
Ashland	Active and recently completed project areas	Follow-up monitoring and treatment of brooms, knapweeds, rush skeletonweed, starthistle, dyer's woad, etc.	Hand pull, backpack spray, seed / mulch	350	Includes timber sale units, hazard fuel treatment areas, haul routes, landings, staging areas, etc.
Ashland	Cascade-Siskiyou National Monument, Box-O	Follow-up monitoring / treatment of starthistle, sulfur cinquefoil, Canada thistle, dyer's woad	Hand pull, backpack spray, seed / mulch	200	
Ashland	Cascade-Siskiyou National Monument, Soda Mountain Road area	Follow-up monitoring / treatment of Canada thistle, dyer's woad	Hand pull, backpack spray, seed / mulch	60	
Ashland	Cascade-Siskiyou National Monument, Oregon Gulch wildfire area	Dyer's woad and spotted knapweed	Hand pull, backpack spray, seed / mulch	50	Particularly along roads and dozer lines. In cooperation with Klamath Falls Field Office.
Ashland	Applegate 38-2W-15, 22	Shining geranium	Hand pull, backpack spray, seed / mulch	50	New infestation discovered 2016. Expect to treat twice / year
Ashland	Cascade-Siskiyou National Monument, decommissioned roads	Monitor and treat known bull thistle infestations. Document and treat or plan treatments for new infestations.	Hand pull, seed / mulch	20	
Ashland	Other decommissioned roads	Monitor and treat known bull thistle infestations. Document and treat or plan treatments for new infestations.	Hand pull, seed / mulch	20	
Ashland	Dakubetede Fritillaria Management Area and ACEC	Yellow starthistle	Hand pull, backpack spray, seed / mulch	10	Special management area for Gentner's fritillary
Ashland	Cascade-Siskiyou National Monument, Mariposa Botanical Area	Yellow starthistle	Hand pull, backpack spray, seed / mulch	10	Special management area for Gentner's fritillary and Greene's mariposa lily
Butte Falls	Elk Camel proposed forest management project area	Scotch broom, yellow starthistle, Canada thistle, bull thistle, houndstongue, knapweeds	Backpack spray, seed / mulch	1,500	Includes timber sale units, hazard fuel treatment areas, haul routes, landings, staging areas, meadow restoration, oak woodland restoration
Butte Falls	Table Rocks ACEC integrated vegetation management project	Yellow starthistle, medusahead and other invasive annual grasses	Hand pull, backpack spray, seed / mulch	250	Continued treatment of known infestations, survey and inventory any new infestations

Field Office	Project Area	Target / Objective	Treatment Method	Treatment Acres	Comments
Butte Falls	Old Ferry Rd	Scotch broom, yellow starthistle, Canada thistle, bull thistle, houndstongue	Backpack spray	40	Road passes through BLM and private land and may be used to access some Elk Camel units. BLM has a co-operative agreement with local homeowners association to treat infestations.
Butte Falls	Flounce Back / Lost Rogue	Yellow starthistle, Canada thistle, diffuse knapweed	Backpack spray	40	Includes haul routes, landings, staging areas and quarries in recently completed timber sale
Butte Falls	Takelma Drive	Yellow starthistle	Backpack spray	40	Continued treatment of known infestations
Butte Falls	Neil Rock	Rush skeletonweed	Hand pull (to prevent seed set)	15	Only known population of rare plant, *Sidalcea hickmanii* ssp. *petraea*
Butte Falls	Double Bowen	Sulfur cinquefoil, yellow starthistle	Backpack spray	15	Includes haul routes, landings, staging areas and quarries in recently completed timber sale
Butte Falls	North River Road FMA and Mountain of the Rogue trail system	Treat known infestations of yellow starthistle, diffuse knapweed. Survey project area for new infestations.	Hand pull, backpack spray, seed / mulch	10	Continue treatment of known infestations and locate any new infestations in order to prevent spread by trail users
Butte Falls	Clarks Dog	Sulfur cinquefoil, yellow starthistle	Backpack spray	10	Includes haul routes, landings, staging areas and quarries in recently completed timber sale
Butte Falls	West Fork Trail Creek	Scotch broom	Backpack spray	10	Continued treatment of known infestations
Butte Falls	Raspberry Creek	Yellow starthistle, rush skeletonweed	Backpack spray	8	Continued treatment of known infestations
Butte Falls	E. Fork Evans Creek	Spotted and meadow knapweed	Backpack spray	7	Road used by public to access recreation sites as well as by private timber companies to access their units
Butte Falls	May Creek	Yellow starthistle, rush skeletonweed	Backpack spray	6	Continued treatment of known infestations
Butte Falls	Murphy Gulch	rush skeletonweed	Backpack spray	6	Continued treatment of known infestations
Butte Falls	Gold Hill Irrigation Ditch Rec Site	Yellow starthistle, spotted knapweed, garlic mustard	Backpack spray	5	Continued treatment of known infestations in recreation site
Butte Falls	Gold Nugget Wayside	Yellow starthistle, Scotch broom	Backpack spray	5	Continued treatment of known infestations in recreation site
Butte Falls	Maple Gulch	Yellow starthistle, rush skeletonweed	Backpack spray	4	Continued treatment of known infestations
Butte Falls	Moser Mtn. Allotment	Yellow starthistle	Backpack spray	2	Continued treatment of known infestations

Field Office	Project Area	Target / Objective	Treatment Method	Treatment Acres	Comments
Butte Falls	Antioch Rd	Yellow starthistle	Backpack spray	2	Continued treatment of known infestations. This area borders Upper Table Rock ACEC
Butte Falls	Sardine Creek	Japanese knotweed	Backpack spray	1	Continued treatment of known infestations
Butte Falls	Battle Mtn.	Yellow starthistle, rush skeletonweed	Backpack spray	1	Continued treatment of known infestations
Grants Pass	Pickett West proposed forest management project areas	Treat known infestations of brooms, knapweeds, bull thistle, Canada thistle, yellow starthistle, dyer's woad, rush skeletonweed. Inventory and treat new infestations.	Backpack spray, seed / mulch	1,500	Includes timber sale units, hazard fuel treatment areas, haul routes, landings, staging areas, etc.
Grants Pass	Active and recently completed forest management project areas (e.g., Cold Elk, Jumping Bean, Upper Cow)	Follow-up monitoring / treatment of known infestations of brooms, knapweeds, rush skeletonweed, starthistle, dyer's woad. Inventory and treat new infestations.	Backpack spray, seed / mulch	500	Includes timber sale units, hazard fuel treatment areas, haul routes, landings, staging areas, etc.
Grants Pass	Rogue River, Recreation Section	Treat known infestations of brooms, knapweeds, yellow flag iris, yellow starthistle, Japanese knotweed, dyer's woad, garlic mustard, shining geranium. Inventory and treat new non-aquatic infestations. Inventory aquatic infestations.	Hand pull, backpack spray, seed / mulch	250	Bars, banks, floodplain
Grants Pass	Rogue River, Wild and Scenic Section	Treat known infestations of brooms, knapweeds, yellow flag iris, yellow starthistle, Japanese knotweed, dyer's woad, garlic mustard, shining geranium. Inventory and treat new non-aquatic infestations and inventory aquatic infestations.	Hand pull, backpack spray	250	Bars, banks, floodplain
Grants Pass	Merlin-Galice Road	Scotch broom, yellow starthistle, dyer's woad control	Hand pull, backpack spray, seed / mulch	250	Major route of spread into Resource Area
Grants Pass	Illinois River Valley yellowtuft project	Annual inventory, monitoring, and treatment to eradicate yellowtuft Alyssum species	Hand pull, backpack spray, seed / mulch	150	In cooperation with the Alyssum Working Group
Grants Pass	Rogue River, Riverbanks Rd Parcel (across from Finley Bend)	Knapweed and blackberry control	Mow, seed / mulch	25	Floodplain
Grants Pass	Rogue River, Griffin Park Recreation Site	Scotch broom, puncturevine control	Hand pull, weed torch, backpack spray, seed / mulch	12	Bars, banks, floodplain

Field Office	Project Area	Target / Objective	Treatment Method	Treatment Acres	Comments
Grants Pass	Rogue River, Wild and Scenic Section	Yellow starthistle	Biocontrol	10	Large inaccessible infestations above the high-water zone
Grants Pass	Big Windy and Douglas Wildfire Complexes	Follow-up monitoring / treatment of known infestations of brooms, knapweeds, rush skeletonweed, starthistle, Canada thistle. Inventory and treat new infestations.	Hand pull, backpack spray, seed / mulch	10	Includes Douglas timber salvage units. Primary focus on landings, dozer lines, staging areas, and main roads
Grants Pass	Rogue River, Bud Lewis Recreation Site	Scotch broom control	Hand pull, backpack spray, seed / mulch	5	Bars, banks, floodplain
Grants Pass	Rogue River, Matson Park Recreation Site	Dyer's woad, scotch broom control	Hand pull, backpack spray, seed / mulch	5	Bars, banks, floodplain
Grants Pass	Rogue River, Stratton Creek Recreation Site	Dyer's woad, Scotch broom control	Hand pull, backpack spray, seed / mulch	5	Bars, banks, floodplain
Grants Pass	French Flat ACEC	Medusahead reduction; bull thistle and blackberry control	Hand pull, weed torch, backpack spray, seed / mulch	5	Cook's lomatium critical habitat
Grants Pass	Rough and Ready ACEC and vicinity	Barbed goatgrass control	Hand pull	5	In cooperation with ODA
Grants Pass	Rogue River, Whitehorse Park Recreation site	Trial treatments on water primrose (*Ludwigia hexapetala*) and parrotsfeather (*Myriophyllum aquaticum*)	Hand pull, backpack spray, seed / mulch	5	Near boat launch on BLM-managed land.
Grants Pass	Rogue River, Ennis Riffle Recreation Site	Dyer's woad, Scotch broom control	Hand pull, backpack spray, seed / mulch	2	Bars, banks, floodplain
Grants Pass	Slotted Pen quarry	Yellow starthistle control	Backpack spray, seed / mulch	2	
Grants Pass	Williams Creek Watershed	Dyer's woad control	Hand pull, seed / mulch	2	In coordination with Rogue Basin Partnership and Williams Creek Watershed Council
			Total acres	**6,280**	

Monitoring

Monitoring is required for many resources managed by the BLM. Some of this monitoring, while not directly done because of the invasive plant program, can reveal information about the program. For example, water quality monitoring is done to measure pollutants, including temperature and pesticides. The BLM monitors Gentner's fritillary occurrences and habitat, and botanists have observed large invasive plant threats at eight sites, including yellow starthistle and invasive annual grasses (USDA 2017a). Directly related to the invasive plant program, implementation and effectiveness monitoring is also required.

Implementation Monitoring

Where the BLM uses herbicides, monitoring is required by BLM policy and the EPA. In addition, the BLM voluntarily reports their herbicide use to the ODA. Pesticide Use Proposals are completed prior to application; they identify the site, target species, herbicide (product and active ingredient) and application rate, adjuvants, and anticipated effects to non-target species and susceptible areas. Pesticide Application Records are filled out within 24 hours of each application, documenting environmental conditions at the time of treatment, invasive plant species targeted, actual herbicide use, treatment method, applicator and license, and equipment used. Both documents have sufficient detail to determine if all planning and application requirements are met. Similar records are also kept for non-herbicide treatments.

Invasive plant treatments conducted by contractors, regardless of treatment method, must also comply with all laws, Bureau policies, Standard Operating Procedures and other Protection Measures (see Appendix A), and contract specifications. To ensure proper implementation, District Project Inspectors review contractor operations, treatment sites, and treatment records.

Effectiveness Monitoring

Monitoring invasive plant treatments involves revisiting treated sites to assess how the infestation and associated plant community have changed over time. Observers look at factors such as the size and density of the invasive plant infestation; the amount of colonization by other nonnative plants; the amount of damage or mortality in non-target plants; the growth, vigor, and density of native vegetation; and the need for follow-up treatments. Follow-up treatments are recommended when a treatment has not reduced the target invasive plant infestation to below an acceptable threshold and / or when sufficient native vegetation has not reoccupied the site. Data are recorded in NISIMS and associated field notes.

For herbicide treatments within or immediately adjacent to federally listed plant sites, the BLM is required to monitor the effects of all herbicide use for a period of two growing seasons and report findings annually to U.S. Fish and Wildlife Service. This is specified in the *Biological Assessment of activities that may affect the federally listed plant species, Gentner's Fritillary, Cook's Lomatium, and Large-flowered Woolly Meadowfoam, on Bureau of Land Management, Medford District and Cascade-Siskiyou National Monument* (USDI 2013b) and the best management practices for Fritillaria Management Areas recommended in the *Conservation Agreement for Gentner's Fritillary (Fritillaria gentneri) in Southwestern Oregon.*

The *Recovery Plan for Rogue and Illinois Valley Vernal Pool and Wet Meadow Ecosystems* (USDI 2012a) outlines several recovery actions for Cook's lomatium related to invasive plant management, including managing, monitoring, and restoring wet meadow habitat, including noxious weed prevention programs, use of mowing, burning, or managed grazing to reduce density of nonnative vegetation, monitoring management actions for effectiveness, and employing adaptive management.

Direct Control Methods

Direct control methods vary by alternative. Selection of a treatment method considers methods that would be effective for each species and what is appropriate for the lands infested (including what nearby resources may be affected). For many species, small infestations may be controlled with manual or other non-herbicide treatments. Others may require herbicides to obtain control or minimize ground disturbance. The selection of a treatment method is guided by Department of the Interior policy which states "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).

Manual Treatment Methods

Manual treatment methods (such as pulling, digging, and grubbing) can be used to control some invasive plants, particularly if the population is relatively small. These techniques can be extremely target specific and are often used to minimize damage to adjacent desirable plants. However, they can be labor and time intensive. Treatments often must be conducted several times annually to prevent the invasive plant from re-establishing, which often makes manual treatments of invasive plants in remote locations unpractical. Manual techniques are used on small infestations and / or where a large pool of labor is available. They can be used in combination with other techniques. For example, shrubs can be pulled and cut, and re-sprouts and seedlings can be treated with herbicides several weeks or months later (Tu et al. 2001).

Submerged and floating aquatic invasive plants can be treated with manual treatment methods, including hand pulling, rakes, shovels, and bottom barriers / weed mats. Weed mats are placed on the bottom of an aquatic body and held in place with a heavy object (see Figure 2-2). They are then left in place until the infestation is eradicated – potentially a few years. Bottom barriers have been used successfully by Rogue River-Siskiyou National Forest to control yellow floatingheart at Squaw Lakes.

Figure 2-2. *Weed Mats, held with Sand Bags (treating Eurasian watermilfoil in Michigan)*

Mechanical Treatment Methods

Mechanical treatment methods include string trimmers, chainsaws, propane torches, and mowers, including flail mowers and boom mowers. Some of these methods (e.g., chainsaws and string trimmer) can be more target-specific than others. String trimmer and mowing methods are commonly used in recreation, communication, and storage and administrative sites to prevent invasive plants from becoming a fire hazard and to maintain clear access. Propane torches can be used on puncturevine growing in parking lots, cobble bars, and other sparsely vegetated sites.

Competitive Seeding and Planting

When revegetating degraded and disturbed sites, the District uses locally adapted grass and forbs seeds and mulches that meet strict weed-free standards. All plant materials are native and genetically appropriate for each revegetation site, increasing the probability of successful and persistent native plant establishment that is resilient and resistant to invasive plants.

The objective of competitive seeding and planting is to provide a desirable native vegetative component to compete with invasive plants in treatment areas. BLM's Integrated Vegetation Management Handbook states, "Diverse, healthy, and resilient native plant communities provide the greatest opportunity to be successful in meeting multiple use objectives within BLM. [BLM is required to] set resource management objectives that can be met using native species for most situations." (USDI 2008a:87). Competitive seeding and planting of native, locally sourced seed and container plants often occurs in conjunction with other treatments but can also occur independently as a measure to prevent invasive plant establishment. Seeding is primarily accomplished by hand spreading to achieve a specific density of seed per area. If soil compaction has occurred, raking of the soil may be necessary to allow for successful root development. Mulching with weed-free straw often occurs in conjunction with seeding, unless the site is difficult to access. Mulch prevents seed herbivory, prevents seeds from blowing or washing off site, protects from environmental extremes, retains moisture to increase successful germination, and reduces soil erosion. Plugs and potted plants are used to complement seeding at sites where immediate vegetation cover is desired or to include native species that do not establish well from seed.

Decisions on which species to include in a planting prescription are based on an evaluation of the surrounding native plant community so that the planted site has similar species composition and structure once established. Other factors that affect the planting prescription include environmental conditions, availability and condition of native plant materials, and budget. Seed mixes and planting prescriptions typically include a combination of plant functional groups including perennial grasses, annual forbs, and perennial forbs. Shrubs and trees are included in some prescriptions.

Biological Treatment Methods

Biological treatment methods involve the intentional use of domestic animals (such as goats or cattle) or biological control agents (such as insects, bacteria, or fungi) that weaken or destroy vegetation (USDI 2007b). Biological control is used to reduce the targeted invasive plant population to an acceptable background level by stressing target plants and reducing competition with desirable plant species.

Biological Control Agents

Classical biological control refers to a subset of organisms (or "agents") that includes plant-eating insects, nematodes, mites, or pathogens. Biological control agents are usually acquired from the same ecosystems where the target invasive plant originated, and are rigorously tested by the Federal Animal and Plant Health Inspection Service (APHIS) Plant Protection and Quarantine Program to ensure that they are host specific and feed only on the target plant and not on crops or native flora. Issuance of permits by APHIS for the environmental release of nonindigenous invasive plant biological control organisms is considered a Federal action and triggers compliance with the *Endangered Species Act* and the *National Environmental Policy Act*. The ODA's Noxious Weed Control Program coordinates releases and monitors populations. Since the biological control agents are not successful unless there are enough invasive plants for them to feed upon, typically only large infestations are targeted. Often, several biological control agents are used together to reduce the density of undesired vegetation but biological controls seldom remove an invasive plant population entirely. Many biological control agents are common and widespread on noxious weeds throughout Oregon. For example, the cinnabar moth and tansy flea beetle were introduced in the 1960s and have persisted at background levels in the environment until the tansy ragwort population spreads and provides a food source for the biocontrol populations to grow. The primary factors for when and where to release additional biocontrols are infestation size and availability of effective agents for the specific site.

Since the 1980s, 37 biological control agents (all insects) have been used on 12 different noxious weeds on or near the District (see Table 2-6).

Table 2-6. *Number of Biocontrol Releases[1] on and near the Medford District.*

Invasive Plant (target species)	**Biocontrol Agent**	**1980s**		**1990s**		**2000s**		**2010s**	
		On BLM[2]	**Near BLM[3]**	**On BLM**	**Near BLM**	**On BLM**	**Near BLM**	**On BLM**	**Near BLM**
Bull thistle	Seed head gall fly *(Urophora stylata)*	-	-	1	4	-	-	-	-
Canada thistle	Crown / root weevil *(Ceutorhynchus litura)*	-	-	3	1	-	-	-	-
	Stem gall fly (*Urophora cardui)*	1	-	2	-	1	-	-	-
Diffuse knapweed	Seed head weevil (*Bangasternus fausti)*	1	-	-	-	-	1	-	-
	Seed head weevil (*Larinus minutus)*	-	-	-	-	-	2	-	-
	Seed feeding fly (*Urophora affinis)*	1	-	-	-	-	-	-	-
Leafy spurge	Leaf beetle[4] (*Aphthona abdominalis)*	-	-	-	1	-	-	-	-
	Root feeding flea beetle (*Aphthona lacertosa)*	-	-	-	-	-	1	-	-
	Root boring beetle (*Oberea erythrocephala)*	-	-	-	-	-	1	-	-
Meadow knapweed	Seed head weevil (*Bangasternus fausti)*	-	-	-	1	-	-	-	-
	Root weevil (*Cyphocleonus achates)*	-	-	-	-	-	2	-	-
	Seed feeding weevil (*Larinus minutus)*	-	-	-	1	-	-	-	-
	Seed feeding weevil (*Larinus obtusus)*	-	-	-	-	2	5	-	-
Puncturevine	Stem feeding weevil (*Microlarinus lareynii)*	-	2	-	-	-	-	-	-
	Stem mining weevil (*Microlarinus lypriformis)*	-	2	-	-	-	-	-	-
Purple loosestrife	Foliar feeding beetle (*Galerucella calmariensis)*	-	-	-	2	-	9	-	-
	Foliar feeding beetle (*Galerucella pusilla)*	-	-	-	4	3	10	-	-
	Root feeding weevil (*Hylobius transversovittatus)*	-	-	-	-	1	4	-	-
	Seed feeding weevil (*Nanophyes marmoratus)*	-	-	-	1	1	1	-	-
Rush skeletonweed	Root feeding moth (*Bradyrrhoa gilveolella)*	-	-	-	-	-	-	1	-
	Stem / leaf gall midge (*Cystiphora scmidti)*	1	-	5	2	-	-	-	-
	Bud gall mite (*Eriophyes chondrillae)*	1	-	6	2	-	-	-	-
Scotch broom	Seed weevil[4] (*Apion fuscirostre)*	-	-	1	8	-	-	-	-
	Seed weevil (*Bruchidius villosus)*	-	-	-	-	6	16	-	-
Spotted knapweed	Seed feeding weevil (*Larinus minutus)*	-	-	-	-	-	1	-	-
	Seed head gall fly (*Urophora quadrifasciata)*	-	1	-	-	-	-	-	-
St. Johnswort	Root / stem boring beetle (*Agrilus hyperici)*	-	-	1	-	-	-	-	-
	Defoliating moth (*Aplocera plagiata)*	-	-	2	-	-	-	1	-
	Defoliating beetle (*Chrysolina hyperici)*	-	-	-	-	-	1	-	-
	Defoliating beetle (*Chrysolina quadrigemina)*	-	-	-	1	-	-	1	1
	Gall forming midge[4] (*Zeuxidiplosis giardi)*	-	-	1	-	-	-	-	-
Yellow starthistle	Seed head weevil (*Bangasternus orientalis)*	1	1	3	12	-	-	-	-
	Seed feeding fly (*Chaetorellia australis)*	-	-	-	9	-	-	-	-
	Seed feeding weevil (*Eustenopus villosus)*	-	-	49	61	1	3	-	-
	Seed head weevil (*Larinus curtus)*	-	-	4	6	-	1	-	-
	Yellow starthistle rust (*Puccinia jacea)*	-	-	-	-	-	2	-	
	Yellow starthistle rust (*Puccinia jacea v. solstitialis)*	-	-	-	-	-	1	-	-
	Seed head gall fly (*Urophora sirunaseva)*	-	1	11	20	-	-	-	-

1. Once released, biological control agents may spread miles from the original site if the target species is widespread or may die off once the target species is no longer locally abundant.
2. Released on BLM-administered lands on the Medford District.
3. Released within one mile of BLM-managed lands on the Medford District.
4. Found to be ineffective and no longer released by the ODA.

Biological control treatments are currently being considered for Scotch broom, meadow knapweed, yellow starthistle, and rush skeletonweed. Scotch broom in the Grave Creek, Horseshoe Bend-Rogue River, and Grants Pass-Rogue River watersheds has a scattered-patchy distribution of large infestations in close proximity. If monitoring indicates that *Apion fuscirostre* and / or *Bruchidius villosus* are not already present, then District staff would collect the adult insects from other sites and release them at the target infestations. Meadow knapweed in Middle Cow Creek, Grave Creek, and Deer Creek watersheds includes large infestations and smaller scattered-patchy infestations that could support biological control agents. *Larinus obtusus* is expected to already be abundant at these sites, but other agents could be released. Very large infestations of yellow starthistle are located on steep slopes of the Rogue River canyon in the Horseshoe Bend-Rogue River watershed. Large infestations are also located on both BLM and adjacent private lands in the Little Butte Creek, Bear Creek, Jenny Creek, Williams Creek, and other watersheds. Although insects released on yellow starthistle in the 1990s were not effective, the District would consider new releases after consultation with regional biological control experts on candidate agents, sites, and methods. Rush skeletonweed is quickly spreading across the District, including on private lands, becoming sufficiently abundant and well distributed such that biological control may be a feasible treatment method. New releases of *Cystiphora scmidti* and *Eriophyes chondrillae* are being considered in the Grave Creek and Evans Creek watersheds. Given its current rate of spread, dyer's woad could also be a candidate for biological control agents approved by APHIS and Oregon Department of Agriculture in the future; however, none are currently available.

Table 2-7. *Biocontrols Considered for Release on the Medford District[1].*

Invasive Plant (target species)	Biocontrol	How Biocontrol Affects Target Species	Preferred Habitat	Level of Control
Scotch broom	Broom seed beetle *Bruchidius villosus*	Larval feeding on developing seeds reduces viable seed production	Does best in meadows or on hillsides with southern exposure.	Good
	Scotch broom seed weevil *Apion fuscirostre / Exapion fuscirostre*	Larval feeding on developing seeds. Adult feeding causes terminal shoot dieback but does not kill plant.	Does best in meadows and hillsides with southern exposure. Performs poorly in shady, cold, damp, or high elevation sites.	Unknown
Meadow knapweed	Knapweed flower weevil *Larinus obtusus*	Defoliation, which can stunt and even kill plant. Larval feeding consumes developing seed.	Prefers moist sites with cooler temperatures. Establishes in south and west slopes with well-drained coarse soils near water. Competing vegetation may discourage establishment.	Excellent
Yellow starthistle	Multiple approved in Oregon, including: Bud weevil (*Bangasternus orientalis*) Peacock fly (*Chaetorellia austral*) Hairy weevil (*Eustenopus villos*) Flower weevil (*Larinus curtus*) Rust (*Puccinia jacea*) Gall fly (*Urophora sirunaseva*)			
Rush skeletonweed	Rush skeletonweed gall midge *Cystiphora scmidti*	Attacked tissue is injured or destroyed, leading to fewer branches and flower heads and less viable seeds.	Does best in warm dry areas and on plants growing in open locations in well-drained soil.	Good
	Rush skeletonweed gall mite *Eriophyes chondrillae*	Mites feed on young buds and within bud galls, which weakens plants.	Widespread on rush skeletonweed.	Excellent

1. Information *from Field Guide for Biological Control of Weeds* (Winston et al. 2014) and the ODA.

Targeted Grazing

Targeted grazing[21] is the purposeful application of a specific species of livestock at a determined season, duration, and intensity, to accomplish defined vegetation or landscape objectives (ASI 2006). The basic goal of targeted grazing is to give the desired plants a competitive advantage over the target invasive plant or plants. In general, goats eat broadleaf plants, while cattle graze on grasses. Grazing can be seasonally timed for when the target plant is most palatable to livestock and to minimize effects to non-target plants and surrounding resources. Typically, a full-time herder or fencing is required to keep the grazing focused on the target areas and species. Employing grazing prescriptions may be particularly useful in areas with limited access, steep slopes, or where the most effective herbicide for a particular plant species cannot be applied (e.g., a non-aquatic herbicide application near water). Although targeted grazing with livestock can reduce invasive plant abundance and / or vigor at a particular site, grazing rarely, if ever, eradicates invasive plants. As with many other treatments, targeted grazing with livestock can be most effective when used in combination with other treatments (USDI 2010a:75).

Herbicide Treatment Methods

Herbicides used on BLM-managed lands must be approved by the BLM National Office, and must, by policy, be subject to detailed ecological and human health risk assessments for wildland applications to help satisfy the requirements of NEPA (USDI 2010a:37). However, BLM practice allows for limited and controlled use of herbicides that do not have risk assessments on demonstration plots up to 5 acres in size, with a maximum of 15 acres per Field Office[22]. Approval to use an herbicide for research and demonstration is provided by the BLM National Office after an initial evaluation of *Federal Insecticide, Fungicide and Rodenticide Act* registration materials and risk assessments (USDI 2010a:478)[23]. Herbicides analyzed in this EA are shown in Table 2-8, *Herbicide Information*, and Table 2-9, *Herbicide Characteristics.*

Herbicides are utilized:

- on pure stands of a single invasive plant species where desirable and non-target plants are scarce or absent;
- for rhizomatous invasive plant species that would otherwise require repeated cutting or pulling for control;
- on plants whose characteristics make them difficult or unfeasible to remove with non-herbicide methods;[24]
- in areas where non-herbicide methods are cost prohibitive;
- in areas where non-herbicide methods have unacceptable adverse effects to native plants;
- in areas where considerable soil disturbance is not acceptable;
- for species located in remote or limited access areas where non-herbicide methods are not feasible;
- in combination with other control treatments (for example, woody species like tree of heaven can be controlled by cutting stems close to the ground in the fall and then spraying the cut stumps with an herbicide registered for this use).

Herbicides 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). 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. This record, kept in District files for 10 years, helps the BLM duplicate successes, change procedures to improve effectiveness, and understand when and if unintended effects occur.

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[21] Also referred to as directed livestock grazing or prescribed grazing.
[22] Not an annual limit. This 15-acre limit could only be exceeded by the issuance of ecological and human health Risk Assessments, done or adopted by the BLM, and results evaluated through programmatic NEPA analysis done at the National or State level.
[23] If research and demonstration results appear favorable, then the BLM further considers the herbicide for general approval after human health and ecological risk assessments are undertaken, and the results are evaluated through the NEPA process.
[24] For example, Canada thistle root fragments readily resprout and some plants can be injurious to workers attempting to manually remove them.

Herbicide products (brands), as well as adjuvants (used to enhance the effectiveness of the herbicide) must be on the BLM lists of approved herbicides and adjuvants at the time of application. The current lists are included in Appendix B, *The Herbicides, Formulations, and Adjuvants*. For applications with a potential to enter streams or other waterbodies, herbicides are limited to aquatic formulations. For applications with a potential to affect federally listed and Bureau Sensitive fish, aquatic-approved adjuvants[25] would also be used.

Ground-based herbicide applications are primarily done with a backpack sprayer. This is usually done only in small areas, and in areas where invasive plants are scattered. A backpack sprayer is used because it can target specific plants, so that effects to non-target species can be kept to a minimum. Backpack sprayers are generally pressurized by a diaphragm or piston-style pump, not motorized. Herbicides are primarily applied to plant foliage, but some herbicides may be applied to the soil. For woody invasive plants (like tree of heaven), herbicides may also be basally applied with a wick (wiped on), or wand (sprayed on). Herbicides can be applied to trees around the circumference of the trunk on the intact bark (basal bark), to cuts in the trunk or stem (frill, or "hack and squirt"), to cut stems and stumps (cut stump), or injected into the inner bark.

Ground-based herbicide application is also accomplished from off-highway vehicles (OHV) with vehicle-mounted spraying systems using handguns, boom-less nozzles, or booms. Spray tank sizes generally vary from 15-40 gallons. Using a larger tank provides the advantage of less mixing and loading of herbicides, which, in turn, leads to less risk of accidental spills of concentrated products. Most off-highway vehicle applications are done from an existing road, trail, or right-of-way as spot treatments.

In the previous five years, the Medford District has done 95 percent of their treatments with a backpack sprayer. The remaining treatments have been done with off-highway vehicles. Aerial applications have not and would not be used.

***Table 2-8**. Herbicide Information*

Herbicide: Representative Trade Names[1] *Common Targets*	**Selective to Plant Types** Pre / post emergent *Point of application*	**Areas Where Registered Use is Appropriate[3]**							**Application Rate[5] (lbs. / acre / year)**		**Alternatives**		
		Rangeland	*Forest and Woodland*	*Riparian / Seasonal Wetland*	*Aquatic / Wetland*	*Oil, Gas, & Mineral Sites*	*Rights-of-Way*	*Recreation & Cultural Sites*	Typical	Max[2]	*No Action*	*Proposed Action*	*Alternative 3*
2, 4-D: Many, including Amine, HardBall, Unison, Saber, and Aqua-Kleen. *Broadleaf plants*	**broadleaf** Post *Foliar*	*Annual and Perennial Species*											
		✓	✓	✓		✓	✓	✓	1	(1.9 or 2[11])	✓	✓	✓
		Woody Species / Floating and Emerged Aquatic Species											
		✓	✓	✓	✓[3]	✓	✓	✓	2	(4)		✓	✓
		Submerged Aquatic Species – treatments in water											
					✓[3]				5.4	(10.8)			✓
		Submerged Aquatic Species – bottom treatments											
					✓[3]				19	(38)			✓
Aminopyralid: Milestone. *Starthistles, thistles, knapweeds, rush skeletonweed*	**broadleaf** Post *Soil or foliar*	✓	✓	✓		✓	✓	✓	0.078	0.11		✓	✓

[25] These "approved adjuvants" shown in Appendix B are indicated in the ARBO II column of Table B-3. These adjuvants were analyzed in the U.S. Fish and Wildlife Service and National Marine Fisheries Service ARBO II (USDI 2013a, NMFS 2013).

Herbicide: Representative Trade Names[1] *Common Targets*	**Selective to Plant Types** Pre / post emergent *Point of application*	**Areas Where Registered Use is Appropriate**[3]							**Application Rate**[5] **(lbs. / acre / year)**		**Alternatives**		
		Rangeland	*Forest and Woodland*	*Riparian / Seasonal Wetland*	*Aquatic / Wetland*	*Oil, Gas, & Mineral Sites*	*Rights-of-Way*	*Recreation & Cultural Sites*	Typical	Max[2]	*No Action*	*Proposed Action*	*Alternative 3*
Chlorsulfuron: Telar. *Perennial mustards*	**broadleaf** Pre and early post *Soil or foliar*	✓		✓		✓	✓	✓	0.047	0.141		✓	✓
Clopyralid: Transline, Stinger, Spur. *Hawkweeds, knapweed, Mediterranean sage, biennial thistles, starthistles*	**broadleaf** Post *Foliar*	✓	✓	✓		✓	✓	✓	0.35	0.5		✓	✓
Dicamba: Vanquish, Banvel, Diablo, Vision, Clarity *Perennial mustards, biennial thistles, field bindweed, puncturevine*	**broadleaf, woody plants** Pre and post *Foliar*	✓		✓		✓	✓	✓	0.3	2[7]	✓	✓	✓
Diflufenzopyr + Dicamba: Overdrive, Distinct *Field bindweed, oxeye daisy, St Johnswort*	**broadleaf** Post *Foliar*	✓				✓	✓	✓	0.2625	0.35		✓	✓
Dicamba									0.1875	0.25			
Diflufenzopyr									0.075	0.1			
Fluridone: Avast!, Sonar *Aquatic plants*	**submerged plants** Post *Aquatic*				✓				0.15	(1.3)			✓
Fluroxypyr: Comet, Vista. *Kochia, mustards, spurge, blackberry.*	**broadleaf** Post *Foliar*	✓	✓	✓		✓	✓	✓	0.26	0.5		✓	✓
Glyphosate: Many, including Rodeo, Mirage, Roundup, Mad Dog Plus, and Honcho. *Grasses, trees and shrubs, yellow flag iris*	**no** Post *foliar*	✓	✓	✓	✓[3]	✓	✓	✓	2	3 or 7[5, 6]	✓	✓	✓
Imazapic: Plateau, Panoramic *Annual grasses such as medusahead rye, cheatgrass, and ventenata*	**some broadleaf and grasses** Pre and post *Soil*	✓	✓	✓		✓	✓	✓	0.0313	0.1875		✓	✓
Imazapyr: Arsenal, Stalker, Habitat, Polaris *Trees and shrubs, yellow flag iris*	**no** Pre and post *Soil or foliar*	✓	✓	✓	✓	✓	✓	✓	0.45	1.50[7]		✓	✓
Metsulfuron methyl: Escort, Patriot, PureStand. *Perennial mustards, St. Johnswort, biennial thistles*	**broadleaf** Pre and post *Soil or foliar*	✓	✓	✓		✓	✓	✓	0.03	0.15[7]		✓	✓

Herbicide: Representative Trade Names[1] *Common Targets*	**Selective to Plant Types** Pre / post emergent *Point of application*	**Areas Where Registered Use is Appropriate[3]**							**Application Rate[5] (lbs. / acre / year)**		**Alternatives**		
		Rangeland	*Forest and Woodland*	*Riparian / Seasonal Wetland*	*Aquatic / Wetland*	*Oil, Gas, & Mineral Sites*	*Rights-of-Way*	*Recreation & Cultural Sites*	Typical	Max[2]	*No Action*	*Proposed Action*	*Alternative 3*
Picloram: Triumph, OutPost, Tordon. *Rush skeletonweed, leafy spurge, field bindweed, knapweed, St. Johnswort, starthistles, biennial thistles*	**broadleaf, woody plants** Pre and post *Foliar*	✓	✓			✓	✓	✓	0.35	1	✓		
Rimsulfuron: Matrix. *Annual grasses*	**annual grasses** Pre and post *Soil*	✓	✓	✓		✓	✓	✓	0.0469	0.0625		✓	✓
Sulfometuron methyl: Oust, Spyder *Annual grasses*	**no** Pre and post *Soil or foliar*		✓	✓		✓	✓	✓	0.14	0.38		✓	✓
Triclopyr: Garlon, Renovate, Element *Purple loosestrife, trees and shrubs*	**broadleaf, woody plants** Post *Foliar*	✓	✓	✓	✓[3]	✓	✓	✓	1	(10)		✓	✓
Proposed For Research and Demonstration													
Fluazifop-P-butyl[9]: Fusilade DX *Annual and perennial grasses*	**grasses** Post *Foliar*	✓	✓			✓	✓		Single app. 0.1 to 0.375. Maximum seasonal application 1.125[9]			✓	✓
Pseudomonas fluorescens: D7, ACK-55 *Jointed goatgrass, cheatgrass, medusahead rye*	**annual grasses** Pre *Soil*	✓	✓			✓	✓		0.00440925[10]			✓	✓

1. See Table B-2, *Herbicide Formulations Approved for use on BLM-managed Lands*, in Appendix B for the full list of herbicide trade names approved for use on lands managed by the BLM in Oregon, including formulations with two or more active ingredients.
2. Maximums are determined by herbicide product label and information analyzed in Risk Assessments. In cases where these two rates differ, the lower of the two rates is the maximum that can be applied on BLM-managed lands. Parentheticals denote herbicides that are limited by PEIS Mitigation Measures to typical application rates where feasible.
3. Different registrations are listed on the herbicide product label. Some types of registration (e.g., aquatic) require extensive additional testing with the EPA; the lack of registration for an area may indicate that a product has not completed that registration, not that there would be a risk. Some herbicide products may not be registered for use in an area, even though the active ingredient may have registration (e.g., in aquatic habitats, only certain formulations of glyphosate, the amine formulation of 2,4-D, and the trimethylamine (TEA) salt formulation of triclopyr are registered for aquatic use).
4. Actual application rates can be found in Tables 2-12 and Table 2-13, *Treatment Key*.
5. Three lbs. / acre acid equivalent for the No Action Alternative and 7 lbs. / acre under the Proposed Action and Alternative 3. The 1989 Integrated Weed Control Plan and EA relies on a 1985 glyphosate Risk Assessment that analyzes glyphosate at 3 lbs. / acre acid equivalent, based on the maximum application rate on a Rodeo © label. The 2011 glyphosate Risk Assessment analyzes a maximum rate of 7 lbs. / acre. Maximum rates on formulated product labels listed in Table B-2 (Appendix B) range from 7 lbs. / acre to 14 lbs. / acre.
6. PEIS Mitigation Measures include "where practical, limit glyphosate to spot applications in grazing land and wildlife habitat areas to avoid contamination of wildlife food items"
7. Mitigation Measures adopted by the Oregon Record of Decision state, "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."
8. Conservation Measures (see Appendix A) provide additional restrictions near Special Status species.
9. Information from SERA (2014). BLM maximum and typical rates have yet to be calculated.
10. From label. BLM maximum and typical rates have yet to be calculated.
11. 1.9 lbs. / acre for the No Action Alternative and 2 lbs. / acre under the Proposed Action and Alternative 3.

***Table 2-9**. Herbicide Characteristics*

Herbicides analyzed for Research and Demonstration	
Pseudomonas fluorescens	A naturally occurring soil bacterium that selectively kills germinating cheatgrass, medusahead rye, and jointed goatgrass (invasive annual grasses) by targeting and suppressing the plant's developing root cells. Native plants and wildlife are unaffected.
Fluazifop-P-butyl	Fluazifop-P-butyl is effective on annual and perennial grasses, but does not affect broadleaf plants.
Herbicides approved for use on BLM-managed lands	
2,4-D	2,4-D is effective on a wide range of broadleaf invasive plants while not affecting most grasses. 2,4-D can help inhibit seed production, prevent herbicide resistance, and effectively treat multiple invasive plant species when a variety are encountered in a particular treatment area. While having additional herbicides available can allow for more target specific control, having one herbicide that controls a vast range of vegetation can be beneficial when an area is dominated by a variety of invasive broadleaved plants. In addition, adding a small amount of an amine formulation of 2,4-D to a tank mix can often improve the effectiveness of the other herbicides and reduce the likelihood of a population developing herbicide resistance. The amount of 2,4-D used in combination with other herbicides would vary, based on these factors. 2,4-D is formulated as an amine or an ester. Esters have higher vapor pressures than amines, which results in increased volatilization. On the Medford District, amine formulations would be preferred. The use of ester formulations is not anticipated and would not be permitted near surface water or conduits to surface water.
Aminopyralid	Aminopyralid is selective for broadleaf species, particularly members of the Asteraceae (aster) and Fabaceae (pea) families and is also effective on certain species in the Apiaceae (parsley), Solanaceae (nightshade), and Polygonaceae (knotweed) families. It is effective at controlling yellow starthistle, Russian knapweed, various thistles, and rush skeletonweed (DiTomaso and Kyser 2006, Enloe et al. 2008, Bell et al. 2012). It is an alternative to other growth regulator herbicides that are commonly used on broadleaf invasive plants, such as picloram, clopyralid, 2,4-D, and dicamba. Studies have also found aminopyralid to be as or more effective than the currently approved growth regulator herbicides at lower application rates (Enloe et al. 2007, 2008; Bell et al. 2012). Aminopyralid has a higher specific activity than other growth regulator herbicides, so less of it needs to be used to achieve the same result (Iowa State University 2006). It is more effective than clopyralid on tough to control members of the Asteraceae family. In mixtures with other active ingredients like metsulfuron methyl, it can be used on hard-to-control species like poison hemlock (DiTomaso et al. 2013).
Chlorsulfuron	Chlorsulfuron is especially effective on broadleaf plants such as toadflax, whitetop, and thistles. It is often mixed with 2,4-D to reduce the likelihood of developing plant resistance and to deter seed production. Some grass species can be damaged by this herbicide, particularly wet meadow grass species.
Clopyralid	Clopyralid targets many of the same species as picloram, but is more selective. It is particularly effective on knapweeds and Canada thistle, while minimizing risk to surrounding desirable brush, grass, and trees.
Dicamba	Dicamba provides control right up to seed set, which extends the treatment window. It is often used in a tank mix with 2,4-D amine. It is effective on invasive broadleaves but offers minimal residual control. It is an option where resistance to sulfonylureas is a concern. It can reduce seed set in mustards but does not provide effective control.
Dicamba + Diflufenzopyr	Diflufenzopyr + dicamba would be used for many of the same species as dicamba. Used where resistance to sulfonylureas is a concern. It is applied in the fall when native plants are dormant. Often used on roadsides.
Fluridone	Fluridone is an aquatic herbicide that requires prolonged plant contact, so it can only be used on aquatic plants in still water. It is used primarily post-emergent to control submerged aquatic vegetation. To achieve effective control a minimum of 45 days (up to 90) of herbicide contact is required.
Fluroxypyr	Fluroxypyr is effective on annual and biennial invasive plants. It would be used to manage annuals in the Apiaceae (parsley), Asteraceae (aster), Fabaceae (pea), Polygonaceae (knotweed), and Solanaceae (nightshade) families as well as on velvet-leaf, amaranth, goosefoot, kochia, Mexican tea, and Russian thistle. Fluroxypyr is an option for addressing invasive plants that are resistant to herbicides with different modes of action. Its uses would likely include administrative sites and rights-of-way where resistance to currently approved herbicides could be a problem. For instance, kochia that is resistant to

	acetolactate synthase (ALS)-inhibiting herbicides can be treated with fluroxypyr, although kochia can also develop a resistance to fluroxypyr (Montana State University Extension 2011).
Glyphosate	Glyphosate is used on broadleaf invasive plants and woody species and has been used to treat nearly all of the mapped noxious weed species on the District. However, it is a non-selective herbicide and can harm desirable plants. The overall use of glyphosate would decrease in aquatic / riparian areas if additional aquatic formulations were available since glyphosate and 2,4-D have been the only two aquatic herbicides available to the District for the past 30 years. Aminopyralid would replace glyphosate for many terrestrial broadleaf species. The BLM does not use glyphosate formulated with polyoxyethylenamine (POEA).
Imazapic	Imazapic is a broad-spectrum herbicide for broadleaf and grass species, but is particularly effective on invasive annual grasses such as cheatgrass and medusahead. It is selective for these grasses at low rates, leaving the perennial herbaceous species critical for restoration unharmed. It is applied before plants have emerged or to small rapidly growing plants. If heavy thatch or leaf litter is present, herbicide effectiveness is reduced.
Imazapyr	Imazapyr is very effective on brushy and woody species such as brooms, blackberry, locusts, and tree of heaven. It is also used to treat perennial grasses in the Poaceae (grass) family, large yellow loosestrife and wild garlic. Imazapyr may be used for the control of aquatic invasive plants like parrotsfeather, purple loosestrife, watercress, water speedwell, and yellow flag iris in and around standing and flowing water, as well as in riparian / wetland settings.
Metsulfuron methyl	Metsulfuron methyl has similar targets and effects as chlorsulfuron. It could be used on whitetop and other mustards, as well as thistles and houndstongue. It can be used in combination with aminopyralid (Opensight) to treat annual forbs such as bedstraws, field bluemadder, and common purslane.
Picloram	Picloram is effective on knapweeds, toadflax, rush skeletonweed, leafy spurge, and thistles, and provides good residual control. Appropriate at sites where soils are not sandy or gravelly. Aminopyralid and clopyralid target many of the same species and are more selective.
Rimsulfuron	Rimsulfuron is effective against annual grasses in the fall pre-emergence, or post emergence in the fall or spring when soil temperature is cool and rainfall is available to activate the herbicide. It provides a longer window of control than imazapic, although it must be used at the highest label rates for effective spring applications. Rimsulfuron can also be used to control larger cheatgrass plants than imazapic (Beck, No date). The effectiveness of rimsulfuron at controlling cheatgrass and medusahead rye has been documented (Zhang et al. 2010), although there is conflicting evidence about its effectiveness relative to currently approved active ingredients (primarily imazapic). Some studies with rimsulfuron indicate that it is not as effective at controlling cheatgrass as imazapic or sulfometuron methyl (Clements and Harmon 2013). However, there is also evidence that rimsulfuron is more effective than imazapic under certain conditions (Hirsch et al. 2012). As with sulfometuron methyl, rimsulfuron has a one-year grazing restriction. It would not be applied near water.
Sulfometuron methyl	Like imazapic, sulfometuron methyl is effective on cheatgrass and medusahead rye and can be selective for annuals at low rates. It has a shorter half-life than imazapic, which speeds restoration efforts. At typical and maximum rates, sulfometuron methyl controls many annual and perennial grass and broadleaf species. At low rates, it is safe on perennial grasses while controlling forbs and annual grasses. Sulfometuron methyl has a one-year grazing restriction (although it is not registered for use in rangelands).
Triclopyr	Triclopyr is effective on woody plants, and would be used on brooms, gorse, evergreen clematis, and other trees and shrubs. The aquatic formulations are also the most effective herbicide for treatment of purple loosestrife. Triclopyr BEE, the ester formulation (butoxyethyl ester), is more effective at smaller doses, but is more toxic to fish (and as a result, triclopyr BEE cannot be used in aquatic or riparian habitat). It is often used as a cut-stump treatment.

Stressors such as imperfect growing conditions (too wet, too dry, or poor soil nutrients) may prevent the herbicide from acting optimally. In addition to the effects of the herbicides themselves, the application methods may have unintended adverse consequences. Similar to manual and mechanical treatments, personnel and equipment may trample vegetation and disturb soil, which can cause further spread of invasive plants. However, herbicide treatments are less likely to require numerous retreatments. In the Oregon FEIS, overall treatment efficacy was estimated at 30 percent if herbicides were not used[26].

[26] See the *Alternatives* section for treatment efficiency under the No Action and Proposed Action Alternatives.

Resistance and Rotation

Herbicide resistance[27] is the evolved ability of an invasive plant population to survive an herbicide application that was previously known to control the population. Where invasive plant infestations have been sprayed annually with the same herbicides with low likelihood of effective control, a concern is that plant populations could become herbicide resistant. Most plant populations showing herbicide resistance are in agriculture settings; however, resistance has been documented in wildland vegetation management settings and invasive plant programs (University of Idaho 2011). Resistance can result from repeated use of the same herbicides, or several herbicides with the same site of action.

The use of additional herbicides would help prevent herbicide resistance by adding chemicals that control the plants through different modes (sites) of action. More effective rotation of herbicides (see Table 2-10), when coupled with integrated invasive plant management, would help prevent the development of herbicide resistance. Many product labels for the acetolactate synthase (ALS)-inhibitors (such as chlorsulfuron and metsulfuron methyl) recommend tank-mix partners and / or sequential herbicide applications that have different modes of action.

Table 2-10. *Guide for Herbicide Rotation*[1]

Herbicide Group	Herbicide Chemical Family	Herbicide Common Name	Resistant Plants	States with Resistant Plants
ACCase Inhibitors	Aryloxyphenoxy-propanoates	Fluazifop-P-butyl	cheatgrass	Oregon
ALS Inhibitors	Imidazolinones	Imazapic	none	none
		Imazapyr	none	none
	Sulfonylureas	Chlorsulfuron	prickly lettuce kochia Russian thistle Italian ryegrass stinking chamomile littlepod falseflax	Idaho, Oregon, Washington Idaho, Oregon, Washington Idaho, Oregon, Washington Oregon Idaho, Washington Oregon
		Metsulfuron methyl	prickly lettuce kochia Russian thistle littlepod falseflax	Idaho, Oregon Oregon Oregon Oregon
		Rimsulfuron	none	none
		Sulfometuron methyl	none	none
Synthetic auxins	Phenoxyacetic acids	2,4-D	prickly lettuce	Washington
	Benzoic acids	Dicamba	kochia prickly lettuce	Idaho Washington
	Pyridines	Aminopyralid	none	none
		Clopyralid	none	none
		Fluroxypyr	none	none
		Picloram	yellow starthistle	Washington
		Triclopyr	none	none
ESPS synthase inhibitors	Glycines	Glyphosate	Italian ryegrass kochia	Oregon Oregon, Idaho

To avoid selecting for herbicide-resistant invasive plants, 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). Fluridone and *Pseudomonas fluorescens* are not included in the above table. Plants have been shown to develop resistance to repeated fluridone use (ENSR 2005c).

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[27] 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 mode 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.

Human Health and Ecological Risk Assessments

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

> A summary of the risk ratings from the various Risk Assessments, along with an explanation of how the risk ratings were derived, are included in Appendix C.
>
> The risk ratings are the source for much of the individual herbicide information, including the high-moderate-low risk ratings, presented in Chapter 3.

One of the purposes identified in Chapter 1 is *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 2007 PEIS, the 2010 Oregon FEIS, and the 2016 PEIS to which the EA tiers) rely on BLM and / or U.S. Forest Service-prepared Human Health and Ecological Risk Assessments for the herbicides included in this EA. These Risk Assessments were done or adopted as part of the 2007 and 2016 PEIS process and are included as appendices to those documents. These 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 the EPA's registration examination. Court decisions and others have 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.

Risk is defined as the likelihood that an effect (such as skin or eye irritation, leaf damage, mortality, etc.) may result from a specific set of circumstances. 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 processes of both terrestrial and aquatic non-target species are considered. The Risk Assessments consider acute and chronic toxicity data. Exposures of receptors[28] to direct spray, surface runoff, wind erosion, and accidental spills are analyzed.

The Risk Assessments, related separate analyses, the Oregon FEIS, and the 2007 and 2016 PEISs include analyses of inert ingredients and degradates for which information is available and not constrained by confidential business information restrictions. To the degree a toxic substance is known to pose a significant human or ecological risk, the BLM and U.S. Forest Service have undertaken analyses to assess their effects through Risk Assessments. Information about uncertainty in Risk Assessments is included in the Oregon FEIS, Appendix 13.

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.

The effects described in the issues in Chapter 3 often describe risk ratings, but also describe the levels at which there is an effect (or high levels where no effect can be found), even though those scenarios may involve much higher concentrations and / or use than the BLM proposes.

For more information, see Appendix C, *Herbicide Risk Assessment Summaries*.

[28] A biological entity such as a human, fish, plant, or invertebrate.

Standard Operating Procedures and other Protection 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, *Protection Measures*). 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 "use herbicides of low toxicity to wild horses and burros, where feasible" would not need to be applied to treatments where wild horses and burros are not expected to occur.

Mitigation Measures were identified for all potential adverse effects identified for herbicide applications in the 2007 and 2016 PEISs (USDI 2007a, USDI 2016a), and adopted by their Records of Decision (also listed in Appendix A). In other words, no potentially significant adverse effect identified in the PEIS analyses 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.

Mitigation Measures were also identified and adopted for adverse effects identified in the Oregon FEIS (USDI 2010a). In the analysis in this EA, application of these measures (also listed in Appendix A) is also assumed unless on-site determinations are made that they are not needed, or there are alternative ways, to meet the intended purpose or protection. No potentially significant adverse effect was identified at the programmatic scale in the Oregon FEIS with the Standard Operating Procedures and Mitigation Measures applied.

The Alternatives

This section describes three alternatives in detail, the No Action Alternative, the Proposed Action, and Alternative 3. These are the alternatives addressed in the effects analysis in Chapter 3. This section also describes the other alternatives that were considered but were not carried forward for detailed study. The alternatives address the dynamic nature of invasive plants, including increasing numbers of invasive plant[29] species and changing conditions of infestations. Due to the nature of invasive plants, 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. For the purposes of this analysis, it is assumed the alternatives would be implemented for a period of 20 years. The intent is to manage invasive plants in order to minimize adverse ecological and economic effects. A comparison of the treatment methods used under each alternative is shown in Table 2-15, *Comparison of the Alternatives, Treatment Methods*.

The 2010 Oregon FEIS, to which this document tiers, considered three action alternatives, as well as a reference analysis which displayed the effects of not using herbicides on BLM-managed lands. The Proposed Action and Alternative 3 in this EA are most similar to Alternative 3 in the Oregon FEIS, whereas the No Action Alternative in this EA is similar to the No Action Alternative (Alternative 2) in the Oregon FEIS. The 2007 PEIS, to which the Oregon FEIS tiered, considered four action alternatives. In addition, both of these EISs considered numerous alternatives not analyzed in detail. The 2016 PEIS, to which this EA also tiers, considered three additional action alternatives.

[29] 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.

The No Action Alternative – Noxious Weed Management

Under the No Action Alternative, the District would continue to implement the District-wide 1998 *Integrated Weed Management EA and Decision Record* (USDI 1998a), consistent with Resource Management Plans and other Medford District direction. Treatment methods analyzed in the 1998 EA include herbicides, biological control agents (or biocontrols), prescribed fire, and manual and mechanical methods to treat noxious weeds. The herbicides available for noxious weed management efforts are 2,4-D, dicamba, glyphosate, and picloram.

Direct control treatments on the District have consisted primarily of manual methods (hand pulling), competitive seeding and planting, and the herbicides 2,4-D and glyphosate. The use of prescribed fire, biocontrols, mechanical methods, and the herbicides picloram and dicamba to control noxious weeds has been limited to once or twice a year (biocontrols and picloram) and once or twice a decade (prescribed fire and dicamba).

Under this alternative, the District would treat approximately 2,000 gross acres (300-500 net acres)[30] annually. Approximately 60 percent of those treatments would be with herbicides and 40 percent would be manual methods. Of the herbicides, about 60 percent of the herbicide treatments would be with glyphosate and 40 percent would be with 2,4-D (see Table 2-12, *Treatment Key*). The *Annual Treatment Summary* table (Table 2-11) shows the last five years of treatments. Nearly all herbicide treatments would be spot treatments applied by backpack sprayer (95 percent) or off-highway vehicles (OHVs, 5 percent), with broadcast treatments applied on less than 1 acre per year (0.05 percent).

Table 2-11. *Annual Treatment Summary (2011-2016)*[1]

Treatment Method	2011 acres	2012 acres	2013 acres	2014 acres	2015 acres	2016 acres
Herbicide (total)	*1,766.05*	*754.10*	*1,281.52*	*651.28*	*167.37*	*82.80*
2,4-D	606.60	336.50	599.30	390.03	30.38	42.10
Dicamba	-	-	-	-	4.00	-
Glyphosate	1,121.55	413.70	682.22	261.25	133.00	35.30
Picloram	37.90	3.90	-	-	-	5.40
Re-vegetation	-	-	-	6.61	10.57	*7.90*
Manual	1,060.00	881.00	110.00	350.00	605.00	244.00
Mechanical	-	-	-	-	25.00	2.00
Biocontrol	-	12.00	-	-	-	-
Total Acres Treated	***2,826.05***	***1,647.10***	***1,391.52***	***1,001.28***	***797.37***	***429.00***
Inventory	35,787.00	28,150.00	31,543.00	19,630.00	21,150.00	17,650.00

1. Acres of plants treated each year decrease because of increased mapping accuracy, not because the need for treatment has decreased; 2011 acres likely represents gross acres, whereas 2016 acres are net acres.

For the No Action Alternative, Table 2-12, *Treatment Key*, shows treatment options by treatment group. (Treatment groups are indicated in Tables 2-1, 2-3, and 2-4, which describe the different Categories of invasive plants on the District.) Considerations as to why a specific treatment would be used are shown in Table 2-14, *Treatment Considerations*[31]. In addition, the District would use competitive seeding and planting on an average of 7.4 acres / year of noxious weed infestations (average 27 sites / year); typical sites being smaller than an acre. Plants excluded from treatment would be invasive plants not listed as noxious weeds, and most infestations of

[30] Gross acres are the areas within which invasive plants are treated; the net acres are the actual acres treated.

[31] For example, yellow starthistle is listed in Table 2-1 (Category I) as being part of Treatment Group D4. The Treatment Key (Table 2-12) shows that Treatment Group D4 can be treated under the No Action with manual methods as the preferred method, or glyphosate, dicamba + 2,4-D, or 2,4-D as methods that could be used in limited situations. The Treatment Considerations table (Table 2-14) indicates that manual methods are appropriate for smaller infestations, dicamba should not be used in riparian areas, and glyphosate is non-selective. Yellow starthistle sites can be large (Table D-1, *Invasive Plants Mapped in NISIMS by Infestation Size*, shows that there are 6 sites over 100 acres) and sites can be near water (Table 2-1 says that common habitat includes river bars). Hence, a large site near water that intermingled with desirable vegetation, if treated (see Figure 2-1, *Prioritizing Areas for Treatment*), would likely be treated with an aquatic formulation of 2,4-D.

noxious weeds not reasonably controlled by the four herbicides and other treatment methods available under this alternative.

Emergent aquatic plants that have a large portion of the plant or leaves out of the water would be treated with herbicides when precautions, such as using a wick applicator to wipe the surface of the leaves extending above the water, can be taken to prevent the herbicide from getting in the water. These plants would also be controlled with manual methods.

All treatments are constrained by the Standard Operating Procedures and other measures listed in Appendix A, by the herbicide application rates listed on Table 2-8, and by the other policy constraints described earlier in this Chapter.

As described in the Oregon FEIS to which this EA tiers, the use of these herbicides along with non-herbicide methods would continue to slow the spread of noxious weeds within the District. However, certain noxious weeds and most of the other invasive plants would continue to spread. For example, the spread of yellowtuft can be slowed but not adequately controlled under this alternative; available treatments for these species only reduce the vigor or delay seed development. Invasive annual grasses (including the noxious weeds medusahead rye and barbed goatgrass) cannot be effectively treated because there is no herbicide available that is selective to these grasses. Roughly half of the treatments in a given year would be re-treatments of areas treated previously, because the treatments available under this alternative are estimated to be 60 percent effective at controlling small populations on the first try (USDI 2010a:136). At the current 12 percent annual spread rate, the 13,211 acres of known Category I sites (see Table 2-1, *Summary of Documented Invasive Plant Sites*) would be expected to spread to approximately 41,000 acres in 20 years. The invasive plants not listed as noxious would continue to spread and compete with native plants for limited space, light, and moisture. Existing invasive plant infestations would persist and spread and the likelihood of herbicide resistance would increase. The site-specific analysis of this can be found in Chapter 3.

The Proposed Action – Invasive Plant Management

The Proposed Action allows all terrestrial invasive plants (not just noxious weeds) to be treated, and is expanded to include the use of additional herbicides. In addition to the manual treatment methods and seeding and planting used under the No Action Alternative, non-herbicide direct control methods would also include or increase the use of targeted grazing with goats and cattle, biological control agents, propane torch spot treatments, and mechanical methods such as chainsaws and string trimmers. Herbicides available for use under the Proposed Action would include 2,4-D, aminopyralid, chlorsulfuron, clopyralid, dicamba, dicamba + diflufenzopyr, fluroxypyr, glyphosate, imazapic, imazapyr, metsulfuron methyl, sulfometuron methyl, rimsulfuron, and triclopyr. (Picloram, available under the No Action Alternative, would not be used under the Proposed Action; aminopyralid and clopyralid target many of the same species and are more selective.) In addition, there would be limited and controlled use of fluazifop-P-butyl and *Pseudomonas fluorescens*, which do not have BLM Risk Assessments. This would occur on research and demonstration plots up to 5 acres in size, with a maximum of 15 acres per herbicide per Field Office[32].

The District would continue to treat approximately 2,000 gross acres (300-500 net acres) annually. Approximately three-fourths of those treatments would be with herbicides and one-fourth would be other methods, primarily manual. Of the herbicide treatments, approximately 95 percent would be spot treatments (90 percent by backpack, 5 percent by OHV) and 5 percent would be broadcast treatments (1 percent by backpack, 4 percent by OHV). More than a third of the herbicide treatments would be with aminopyralid, which is effective on starthistles,

[32] Not an annual limit. This 15-acre limit could only be exceeded by BLM's issuance or adoption of ecological and human health Risk Assessments with results evaluated through programmatic NEPA analysis done at the National or State level.

thistles, knapweeds, and rush skeletonweed. Table 2-12, *Treatment Key*, shows treatment options by treatment group. (Treatment groups are indicated in Tables 2-1, 2-3, and 2-4, which describe the different Categories of invasive plants on the District.) Considerations as to why a specific treatment would be used are shown in Table 2-14, *Treatment Considerations*[33].

The District would use competitive seeding and planting to complement other treatment methods on approximately 200 acres per year, primarily in meadows, grasslands, oak woodlands, and riparian areas. The BLM anticipates seeding or planting 20 to 30 sites per year and typical treatment size would be less than 10 acres. Many of these areas would be in conjunction with the treatment of invasive annual grasses.

Emergent aquatic plants that have a large portion of the plant or leaves out of the water would be treated with herbicides when precautions, such as using a wick applicator to wipe the surface of the leaves extending above the water, can be taken to prevent the herbicide from getting in the water. These plants would also be controlled with manual methods. In addition, submerged and floating aquatic invasive plants could be treated with manual methods outside of federally listed anadromous fish habitat[34].

As with the No Action Alternative, all treatments are constrained by the Standard Operating Procedures and other measures listed in Appendix A, by the herbicide application rates listed on Table 2-8, and by the other policy constraints described earlier in this Chapter.

As described in the Oregon FEIS to which this EA tiers, 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 level of retreatment would still take place, the additional herbicides would substantially improve the chances the invasive plant would be controlled with fewer retreatments (USDI 2010a:135-136). Treatments described under this alternative are effective on almost all[35] of the types of invasive plant species known to be present on the District, including those with potential to be new invaders. The site-specific analysis of this can be found in Chapter 3.

Additional Monitoring Adopted for the Analysis of the Proposed Action

For treatments that are new to the Medford District, for the first three to five years after the plan is implemented, the BLM would closely monitor the response of special plant communities to determine level of success in enhancing desired community attributes. The BLM anticipates some undesirable outcomes, such as reduced native plant diversity or unanticipated shifts in plant dominance. The BLM would weigh the consequences of these effects against the long-term impacts of invasive plants that would be expected in the absence of treatments. By monitoring community-level treatment effects and refining prescriptions for subsequent treatments, undesirable outcomes would decline with increasing experience. The BLM would accept short-term undesirable changes in special plant communities if treatments were expected to benefit conditions and function in the long-term. It is expected that information gained from this monitoring would provide additional detail to consider as part of Table 2-14, *Treatment Considerations*; it is not expected that monitoring would add additional treatment methods but would inform future treatments, helping to refine prescriptions for greater success.

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[33] For example, yellow starthistle is listed in Table 2-1 (Category I) as being part of Treatment Group D4. The Treatment Key (Table 2-12) shows that Treatment Group D4 can be treated under the Proposed Action with manual methods, aminopyralid, or clopyralid as the preferred methods. The Treatment Considerations table (Table 2-14) indicates that manual methods are appropriate for smaller infestations and clopyralid has a buffer near water. Hence, a large site near water, if treated (see Figure 2-1, *Prioritizing Areas for Treatment*), would likely be treated with aminopyralid.

[34] There are currently no known (Category I or II) submerged or floating aquatic invasive plants sites outside of federally listed anadromous fish habitat. However, Category III or IV sites may be treated in the future in these areas.

[35] The treatment of submerged and floating aquatic invasive plants with herbicides is not analyzed in the Proposed Action.

As required by existing Standard Operating Procedures, targeted grazing would be monitored to control the timing and intensity of the grazing, incorporating actions such as moving the animals off the site before the site is prone to erosion and compaction. Monitoring populations of traditional biological control agents is conducted by the Oregon Department of Agriculture's Noxious Weed Control Program in coordination with the BLM.

Project Design Features Adopted for Analysis of the Proposed Action

The following Project Design Features are adopted for this analysis to reduce potential adverse effects of the Proposed Action:

Bureau Sensitive Species (Plants, Fish, and Wildlife)

- Follow the Bureau Sensitive Species Treatment Conditions flowchart (Figure 3-1) when working in potential habitat for Bureau Sensitive species.

Special Status Plants

- In Gentner's fritillary and Cook's lomatium habitat, follow all Project Design Criteria outlined in the *Biological Assessment of activities that may affect the federally listed plant species, Gentner's Fritillary, Cook's Lomatium, and Large-flowered Woolly Meadowfoam, on Bureau of Land Management, Medford District and Cascade-Siskiyou National Monument* (USDI 2013b) (see Appendix A).
- Restrict mowing within Special Status plant habitat to the dormant season, unless mowing during the growing season has demonstrated beneficial effects on the Special Status species and its habitat.
- Before using targeted grazing within federally listed plant sites, develop grazing prescriptions and conservation measures in cooperation with the U.S. Fish and Wildlife Service.
- Ensure that seeding and planting prescriptions for Special Status plant habitats use only local genetically appropriate native plant materials from species that are typical components of the Special Status species' habitat, and planted at rates and patterns that reflect typical relative abundance and distribution.
- Do not apply herbicides within Special Status fungi sites if sporocarps are visible, unless protective measures can be implemented to prevent herbicide exposure.
- If broadcast herbicide treatments are deemed necessary within federally listed plant sites, develop prescriptions and conservation measures in cooperation with the U.S. Fish and Wildlife Service.
- To ensure that *Pseudomonas fluorescens* would not affect federally listed plants, do not locate demonstration plots within Fritillaria Management Areas, Cook's lomatium critical habitat, or within 1,500 feet of any known sites.

Special Plant Communities

- Ensure the availability of genetically appropriate local native seed and plant materials before implementing treatments that require subsequent revegetation.
- Ensure that seeding and planting prescriptions for special plant communities use only local genetically appropriate native plant materials from species that are typical components of that community, and planted at rates and patterns that reflect typical relative abundance and distribution.

Fish and Aquatic Organisms

- For waterbodies that contain federally threatened or endangered fish species or provide Critical Habitat, all Project Design Criteria outlined in the *Aquatic Restoration Biological Opinion II* (ARBO II, NMFS 2013) from the National Marine Fisheries Service would be applied (see Appendix A). If a treatment project cannot be covered by ARBO II, additional consultation with NMFS would occur before treatment.
- Do not use fluazifop-P-butyl, fluroxypyr, rimsulfuron, or *Pseudomonas fluorescens* in Riparian Reserves, or within 1,500 feet of Coho Critical Habitat, due to lack of consultation coverage and / or uncertainty in potential effects to aquatic habitat from these untested agents. In addition, the label for fluazifop-P-butyl states that it is toxic to aquatic organisms, has a high potential to reach surface water through runoff or leaching into groundwater, and the threat of runoff may persist for several months. For these reasons,

use of fluazifop-P-butyl will be confined to flat dry ground located greater than 1,500 feet from any aquatic features.

Wildlife

- In listed species habitat, follow all Project Design Criteria outlined in the *Biological Assessment FY2017-FY2022 Programmatic Activities That May Affect the Northern Spotted Owl, Marbled Murrelet, Vernal Pool Fairy Shrimp, and Oregon Spotted Frog for the Medford District* (USDI 2017b)(see Appendix A).
- Conservation Measures applicable to butterflies and moths will be applied, as appropriate, for other Special Status insects.
- Do not use fluroxypyr at known mardon skipper sites.

Water

- In Riparian Reserves, targeted grazing will only occur with goats on armored banks. In low gradient, wet meadow systems where post holing and bank shear are possible, keep goats 25 feet away from the wetted channel to eliminate the potential for bank erosion.
- If treatment leaves areas of bare soil adjacent to watercourses, mulch disturbed areas prior to the onset of fall precipitation.
- Treatments that may affect 303(d)-listed streams will be noted on the Annual Treatment Plan. Where invasive plant control would remove plants contributing to bank stability or stream shading, control would be delayed or phased as necessary in order to make treatments consistent with 303(d) restoration plans.

Paleontological Resources

- If possible, avoid fossil locales when spraying herbicides. In fossil locales where herbicides are needed, avoid drift or accidental direct spray on fossils.
- Avoid ground and surface disturbance (like digging, planting, or mowing) in Condition 1 and Condition 2 paleontological areas. If possible, invasive plants in these areas should be removed by hand.

Archeological and Cultural Resources

- Avoid getting herbicides (through drift or accidental direct spray) on rock art or wooden / metal structures or artifacts at NRHP[36] listed or eligible sites.
- Avoid repeated use of livestock (more than one grazing episode annually) at NRHP listed or eligible sites.

Traditional and Cultural Uses (Native American Interests)

- At least one month prior to beginning treatments, Annual Treatment Plans will be presented to the tribes showing planned treatments and treatment areas. Any resultant consultation will identify where timing of treatments can be modified, where cultural features should be avoided or protected, and where posting would help tribe members avoid areas. Maps of known invasive plant infestations (see Map 2-1A, *Invasive Plants Documented in NISIMS,* for example) can also be shared with the tribes at this time.
- Where coordination with the tribes about the Annual Treatment Plan identifies areas where herbicide use would not be consistent with cultural values and uses, alternative control methods will be implemented where feasible.

[36] National Register of Historic Places (NRHP)

Alternative 3 - Invasive Plant Management, Including Treatment of Submerged and Floating Aquatic Invasive Plants

Alternative 3 includes all of the terrestrial and emergent aquatic invasive plant treatments described under the Proposed Action, and adds the treatment of submerged and floating aquatic invasive plants. Treatments of these aquatic invasive plant species would occur using manual methods or aquatic formulations of 2,4-D, fluridone, glyphosate, imazapyr, or triclopyr. Aquatic treatments would occur in limited areas on the District, as infestations are early in the infestation curve (USDI 2010a:132) and are fairly small compared to terrestrial plant infestations. Control programs are most effective if they can eradicate the infestation while it is still in the introduction phase (USDI 2010a:133) and these treatments would be high priority before these invasive plant species become established on the District (see the *Prioritizing Areas for Treatment* section, above). Most of the known aquatic invasive plant infestations occur along the Rogue River and isolated closed aquatic systems, such as lakes and ponds. Lakes and ponds would be treated very differently than flowing streams. Treatments of aquatic invasive plants with fluridone would only occur in closed aquatic habitats that do not flow into streams during the treatment window. These are typically ponds and lakes, or sloughs and pools of standing water on floodplains connected to rivers only during high water events.

In addition to the terrestrial invasive plant species treated under the Proposed Action, species treated under this alternative include known infestations of water primrose and parrotsfeather. Water primrose infestations are an average 0.45 acres in size ranging from 0.05 to 3.2 acres in size. Parrotsfeather infestations are an average 0.27 acres in size and range from 0.02 to 1.33 acres in size. Infestations of water primrose and parrotsfeather occur in small patches from Whitehorse Park and are scattered downstream to the end of the BLM-managed section of the Rogue River at the Rogue River Ranch. Populations of water primrose occur in the main stem of the Rogue River in side channels, often with little to no flowing water from mid to late summer. Treatments of these populations would involve aquatic triclopyr, glyphosate, or imazapyr as spot treatments only. Populations of yellow floatingheart would only occur in closed aquatic habitats if the species were to be found on the District. There are 9.3 acres of submerged or floating aquatic species mapped in NISIMS on the District (Category I) and 32 total treatment acres (Categories I and II).[37]

Table 2-13, *Treatment Key – Submerged and Floating Aquatics*, shows treatment options by treatment group for these aquatic plants. (Treatment groups are indicated in Tables 2-1, 2-3, and 2-4, which describe the different Categories of invasive plants on the District; these aquatic invasive plants are indicated as being in treatment group A-ALT.) Manual methods are often used in conjunction with herbicides; while 80 percent of aquatic treatments would be done with manual methods, it is difficult to remove all viable rhizomes or creeping submerged stems from deep sediment and stem fragments can float downstream and establish new infestations. Manual treatment methods used on aquatic invasive plants include hand-pulling, rakes, shovels, or bottom barriers / weed mats. Map 2-1B, *Submerged and Floating Aquatic Invasive Plants* shows the locations of known infestations. These treatments would be done in conjunction with ODA staff.

As described under the Proposed Action as well as the Oregon FEIS to which this EA tiers, 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 level of retreatment would still take place, the additional herbicides would substantially improve the chances the invasive plant would be controlled with fewer retreatments (USDI 2010a:135-136). Treatments described under this alternative are effective on all of the invasive plant species known to be present on the District, including those with potential to be new invaders. The site-specific analysis of this can be found in Chapter 3.

[37] As described under the Proposed Action and applicable to Alternative 3, the District would continue to treat approximately 2,000 gross acres (300-500 net acres) annually, and as described above, these submerged and floating aquatic invasive plants would be a high priority for treatment. Hence, if Alternative 3 were selected, all of these acres would likely be treated as soon as feasible.

Project Design Features Adopted for Analysis of Alternative 3

In addition to Project Design Features adopted for the Analysis of the Proposed Action, the following Project Design Features are adopted for this analysis to reduce effects of Alternative 3:

Fish and Aquatic Organisms

- All Project Design Criteria identified in potential future consultations with the National Marine Fisheries Service will be incorporated into all treatments in aquatic habitats.
- Delay treating side channels and backwaters until they are disconnected from the mainstem river during low flow periods.
- For treatments proposed along the lower Rogue River, limit the treatment window to the late summer, after native smolts have migrated to the estuary, and when water temperatures are high (generally July and August) so that native salmonids would be unlikely to be present in these disconnected or slow water habitats during the treatment period.
- When using aquatic 2,4-D, glyphosate, imazapyr, or triclopyr in closed aquatic systems with heavy infestations, consider a phased treatment (treating less than 50 percent at a time) to reduce the likelihood of all of the aquatic plants dying at the same time, which could result in a rapid depletion of dissolved oxygen.

Summary of Invasive Plant Treatments Under Each Alternative

The following tables (Tables 2-12, 2-13, 2-14, and 2-15) summarize treatment methods and how they differ between the alternatives. The Treatment Key (Tables 2-12 and 2-13) shows how often treatment options would be implemented and which methods would be preferred, organized by treatment group (groups of invasive plant species that respond to similar treatments). Table 2-14, *Treatment Considerations* provides more information about the factors that are considered when determining if or how to implement a treatment option at a particular site. Table 2-15, *Comparison of the Alternatives, Treatment Methods* provides a summary of the treatment options that would be available for use under each alternative.

***Table 2-12**. Treatment Key - Terrestrial and Emergent Aquatic Invasive Plants (All Alternatives)*

			Treatment Group[3]															**Percent of Treatable Acres Where Method Used[4]**	
			Emergent Aquatics	Annual Forbs		Biennial / Perennial Forbs									Woody	Monocots		Proposed Action / Alt. 3	No Action
Treatment Methods	**Intended Rate of Application**	**Lbs. / Acre[5]**	A	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12	M1	M2		
Biological control agents												L[2]	P		L			1%	< 1%
Manual control			P	P	P	P	P	P	P	P	P	P	P	L	P	L	L	24%	40%
Mechanical control				L	L	L	L	L	L	L	L	L	L	L	L	L	L	<1%	1%
Prescribed fire																P		NA	< 1%
Propane torch				L												L		<1%	NA
Targeted grazing - cattle																L	L	<1%	NA
Targeted grazing - goats							L					L			L			<1%	NA
2,4-D	1% solution (spot)	**1 to 2**		L	L	L	L	L	L	L	L	L	L	L				2%	27%
Aminopyralid	3 to 7 oz. / ac.	0.05 to **0.11**			P		P			P	P	L		L	L			25%	NA
Aminopyralid + Metsulfuron methyl (trade name Opensight)	2 to 2.8 oz. / ac.	**0.08** to **0.11** + **0.12** to **0.15**		P		L	L		P			L						1%	NA
Chlorsulfuron + 2,4-D amine	1.3 oz. / ac. + 32 oz. / ac.	**0.06** + 0.95		L				P	P				P					< 1%	NA
Clopyralid	10 to 21 oz. / ac.	0.23 to **0.49**			L		P			P		L						2%	NA
Clopyralid + 2,4-D amine	16 oz. / ac. + 32 oz. / ac.	**0.38** + 0.95					L											< 1%	NA
Clopyralid + 2,4-D amine	20 oz. / ac. + 40 oz. / ac.	**0.47** + **1.19**										L						< 1%	NA
Dicamba + 2,4-D amine	16 oz. / ac. + 32 oz. / ac.	**0.50** + 0.95		L	L		L	L	L			L						< 1%	< 1%
Dicamba + 2,4-D amine	32 oz. / ac. + 32 oz. / ac.	**1.00** + 0.95		L								L						< 1%	< 1%
Dicamba + Diflufenzopyr (trade name Overdrive)	4 to 8 oz. / ac.	0.18 to **0.35**		L	L		L				L	L		L				2%	NA
Fluazifop-P-butyl	16 to 24 oz. / ac.															L		< 1%	NA
Fluroxypyr	6 to 12 oz. / ac.	0.13 to **0.26**		L	L													1%	NA
Glyphosate	16 oz. / ac.	0.50														L		< 1%	NA
Glyphosate	96 oz. / ac.	**3.00**															L	< 1%	NA
Glyphosate	1.5% solution (spot)	**2.00** to **7.00**	P	L	L	P	L	P	L	L	P	P	L	P	L	L	L	5%	31%
Glyphosate	20-100% sol. (cut / inject)	**2.00** to **7.00**													P			< 1%	< 1%
Glyphosate + 2,4-D amine	16 oz. / ac. + 24 oz. / ac.	0.50 + 0.70		L								L						< 1%	< 1%
Imazapic	4 to 8 oz. / ac.	**0.06** to **0.12**		P												P		10%	NA
Imazapic	8 to 12 oz. / ac.	**0.12** to **0.19**		L					L			L					P	5%	NA

Treatment Methods	Intended Rate of Application	Lbs. / Acre[5]	Treatment Group[3]															Percent of Treatable Acres Where Method Used[4]	
			Emergent Aquatics	Annual Forbs		Biennial / Perennial Forbs									Woody	Monocots		Proposed Action / Alt. 3	No Action
			A	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12	M1	M2		
Imazapic + Glyphosate (Journey)	10.7 to 16 oz. / ac.	**0.06** to **0.09** + 0.13 to 0.19		L	L	L						L	L				P	2%	NA
Imazapic + Glyphosate (Journey)	21 to 32 oz. / ac.	**0.12** to **0.19** + 0.25 to 0.38		L		L						L	P				P	2%	NA
Imazapyr	16 to 32 oz. / ac.	0.25 to **0.5**	L															< 1%	NA
Imazapyr	24 to 48 oz. / ac.	0.38 to **0.75**	L			L						L					L	< 1%	NA
Imazapyr	1% solution (spot)	**0.45** to **1.25**	L			L						L					L	< 1%	NA
Imazapyr	6-12% sol. (cut / inject)	**0.45** to **1.25**													L			< 1%	NA
Metsulfuron methyl + 2,4-D amine	1 oz. / ac. + 32 oz. / ac.	**0.04** + 0.95					L	L										1%	NA
Picloram	16 to 32 oz. / ac.	0.25 to **0.50**																NA	< 1%
Picloram	32 to 64 oz. / ac.	**0.50** to **1.00**																NA	< 1%
Pseudomonas fluorescens	2 g. / ac.															L		< 1%	NA
Rimsulfuron	2 to 4 oz. / ac.	0.03 to **0.06**		L	L						L	L				P	L	5%	NA
Sulfometuron methyl	0.75 to 1.5oz. / ac.	0.04 to 0.07														L		< 1%	NA
Triclopyr	2% solution (spot)	**1.00** to **8.00**	P							P		P			P			5%	NA
Triclopyr	25-100% sol. (cut / inject)	**1.00** to **8.00**													P			< 1%	NA
Category I Acres			89	15	10	27	8,440	1,027	530	29	51	330	4	97	1,675	330	70	Total Acres: 13,211	12,219
Treatment Acres (Categories I and II)			600	34	3,540	360	16,077	3,000	1,362	1,003	106	2,728	67	201	3,337	9,533	542	Total Treatment Acres: 42,441	33,368
Category IV Species			1	4	3	-	6	2	2	1	-	11	-	2	10	1	7		

1 P: Preferred method in most situations.
2 L: Method used in limited situations, where preferred methods are not feasible or would not provide sufficient control.
3. Considerations as to why a specific treatment would be used are shown in Table 2-14, *Treatment Considerations.*
4. Tables D-3 and D-4, *Estimated Total Treatment Acres, Categories I and II*, in Appendix D indicate acres of various treatment types, based on these percentages.
5. Lbs. / acre in bold are at or above the typical application rate. Red indicates lbs. / acre at the maximum application rate. Rates are rounded to two digits; e.g., the max rate of imazapic is 0.1875 lbs. / acre is shown as 0.19 in this table. In rows where the intended rate of application is described as "percent solution," the lbs. / acre would generally be the typical rate.

***Table 2-13**. Treatment Key – Submerged and Floating Aquatics (All Alternatives)*

Treatment Methods	**Intended Rate of Application**	**Lbs. / Acre[6]**	Brazilian waterweed *Egeria densa*	Water primrose *Ludwigia hexapetala* et al.	Parrotsfeather *Myriophyllum aquaticum*	Eurasian watermilfoil *Myriophyllum spicatum*	Yellow floatingheart *Nymphoides peltata*	Curly pondweed *Potamogeton crispus*	**Percent of Treatable Acres Where Method Used[1, 2]**	
									Alternative 3	No Action / Proposed Action
Manual control			L[3]	P[4]	P	P	P	P	80%	100%[5]
2,4-D	0.5 to 1.5 ppm (in water)					L			< 0.1%	NA
2,4-D	16 to 32 oz. / ac.	0.50 to 0.95		L	L				< 0.1%	NA
Fluridone	5 to 30 ppb (in water)	**0.15** to **1.20**	P		L	L		L	< 0.1%	NA
Glyphosate	1.5 to 2% solution (spot)	**2.00** to **7.00**		L			L		< 0.1%	NA
Imazapyr	32 to 64 oz. / ac.	**0.50** to **1.00**			L				< 0.1%	NA
Imazapyr	64 to 80 oz. / ac.	**1.00** to **1.25**		L					< 0.1%	NA
Imazapyr	1 to 1.5% solution (spot)	**0.45** to **1.25**		L	L				1%	NA
Triclopyr	1 to 2.5 ppm (in water)	**1.00** to **8.00**			L	L			< 0.1%	NA
Triclopyr	42 to 85 oz. / ac.	**2.50** to **5.30**		P	P				25%	NA
Triclopyr	2% solution (spot)	**1.00** to **8.00**		P	P				10%	NA
			Category I Acres						Total Acres	
			-	8.4	0.9	-	-	-	9.3	9.3[5]
			Treatment Acres (Categories I and II)						Total Treatment Acres	
			-	21	10	1	-	0.1	32	31
			Category IV Species							
			✓	✓			✓			

1. Many sites would be treated with a combination of methods; thus, cumulative treatment acres exceed 100%. For example, manual treatments would often be used in combination with herbicide treatments.
2. Tables D-3 and D-4, *Estimated Total Treatment Acres, Categories I and II*, in Appendix D indicate acres of various treatment types, based on these percentages.
3. L: Method used in limited situations, where preferred methods are not feasible or would not provide sufficient control.
4. P: Preferred method in most situations.
5. In areas outside of listed anadromous fish habitat; all Category I acres are in listed anadromous fish habitat.
6. Lbs. / acre in bold are at the typical application rate or above. Red indicates lbs. / acre at the maximum application rate.

***Table 2-14**. Treatment Considerations*

Treatment Method	**Considerations**
Biocontrols	• Would be preferred for: o Large infestations. o Infestations that are difficult to access. o Species that are widely distributed and on adjacent lands and, consequently, likely to continually reinfest BLM-managed lands. • Would be complemented by other treatment methods at higher priority sites, but could be the only form of control at low priority sites. • Would not include use of the thistle seed head weevil (*Rhinocyllus conicus*), which can attack native thistles.
Manual	• Would be preferred for: o Small infestations of annual forbs and grasses and biennial forbs. o Small infestations of woody seedlings, vines, or some shrubs, including brooms. o River bars and sandy floodplains for species that can be effectively pulled, such as garlic mustard, yellow starthistle, dyer's woad, and broom seedlings. o Personnel, cooperators, and volunteers not authorized or qualified to use other methods. • Would be used to complement herbicide treatments, such as: o Clipping and bagging seed heads prior to spraying houndstongue. o Pulling mature reproductive plants, but spraying dense patches of seedlings.
Mechanical	• Would not be preferred for any species groups or habitats.

Treatment Method	Considerations
	• Would rarely be used except for roadsides, utility corridors, recreation areas, and disturbed sites. • Would not be used where there is concern about damage to desirable vegetation, such as rare plant habitat or other sites with high ecological value. • Would require seasonal restrictions in some wildlife habitat. • Would require additional prevention measures, such as cleaning mechanical equipment to prevent spreading invasive plant seeds.
Propane torch	• Would not be preferred for any treatment group or habitat. • Would be used only as spot treatments and in limited situations, such as: o To control puncturevine on sparsely vegetated sites, such as river bars, parking lots, and equipment yards. o To control small patches of invasive annual grasses, primarily prior to seed set in wet meadows and vernal pools.
Targeted grazing - cattle	• Would not be preferred for any treatment group or habitat. • Would be used only in limited situations, primarily in meadows from late fall to early spring. • Would be used to reduce biomass and seed production of invasive grasses. • Would be followed by broadcast applications of imazapic or rimsulfuron at some heavily infested sites. • Would often be followed by competitive seeding with native grasses and forbs.
Targeted grazing - goats	• Would not be preferred for any treatment group or habitat, but could be used in any terrestrial habitat type. • Would be used only in limited situations, primarily to reduce biomass and seed production of forbs and woody vegetation. • Would be used in conjunction with herbicide spot treatments at some sites. • Would often be followed by competitive seeding and planting.
2,4-D	• Would not be preferred as a stand-alone herbicide for any treatment groups or habitats. • Use would be limited to sites where other herbicides are ineffective or where a second mode of action is needed to increase efficacy or reduce the potential for herbicide resistance. • Would be applied when target plants are young and actively growing. • Would not be used in sandy or gravelly soils, particularly where depth to water table is shallow. • Amine formulations would be preferred. The use of ester formulations is not anticipated and would not be permitted near surface water or conduits to surface water. • Aquatic formulations can be applied around water. • Would have some grazing restriction.
Aminopyralid	• Would be preferred in most terrestrial habitat types and sites, except wetlands. • Would be applied primarily post-emergence: o To annual forbs that are small and actively growing. o To biennial and perennial forbs from spring to fall, depending on optimum timing for specific target species as indicated on the product label. • Would be applied infrequently as a pre-emergent in high-density infestations. Best timing would be late summer to early fall, prior to fall rains that stimulate germination. • Would be used up to the edge of surface waters. • Would be used in dry seasonal wetlands, including vernal pools. • Would not be used in sandy or gravelly soils, particularly where depth to water table is shallow. • Would not be used at higher rates in oak woodlands if oak seedling injury or mortality would be unacceptable. • Would not be used at higher rates under conifer canopy or among conifer seedlings if conifer injury is not acceptable. • No grazing restrictions.
Aminopyralid + metsulfuron methyl (trade name Opensight)	• Would be preferred for yellowtuft control • Would be applied infrequently as a pre-emergent in high-density infestations. Best timing would be late summer to early fall, prior to fall rains that stimulate germination.

Treatment Method	Considerations
	• Would be used to expand the spectrum of treatable species when working in mixed infestations of multiple forb species. • Would not be applied near water. • No grazing restrictions.

Chlorsulfuron + 2,4-D amine	• Chlorsulfuron would always be used in combination with 2,4-D to provide a second mode of action to reduce potential for herbicide resistance.
	• Would be preferred only in rangeland and grasslands to control:
	  o Biennial thistles and houndstongue if burn-down needed to prevent seed formation.
	  o Perennial mustards, toadflaxes, and some other species that are difficult to control.
	• Would be applied primarily post-emergence:
	  o To annual forbs that are small and actively growing.
	  o To biennial and perennial forbs from bud to bloom or to fall rosettes.
	• Would not be used where concerns exist for off-site movement by wind or water, including near residential areas and agricultural lands.
	• Would not be used for most yellowtuft infestations.
	• Would require no-spray buffers near water and wells.
	• Would have some grazing restrictions.

Clopyralid	• Would be preferred in most terrestrial habitats and sites, except wetlands.
	• Would be applied post-emergence:
	  o To annual forbs that are small and actively growing.
	  o To biennial and perennial forbs from rosette to bud stage, usually in spring and early summer.
	• Is less effective as a pre-emergent, but would provide residual control of new germinants for some species.
	• Would be used as an alternative to aminopyralid if there were concerns about injury to conifers or oak seedlings.
	• Would not be used in sandy or gravelly soils, particularly where depth to water table is shallow.
	• Would require no-spray buffers near water and wells.
	• No grazing restrictions.

Clopyralid + 2,4-D amine	• Would not be preferred for any treatment groups or habitats. • Would be used infrequently to expand the spectrum of treatable species when working in mixed infestations of multiple forb species. • Would not be applied near water. • Would have some grazing restrictions.
Dicamba + 2,4-D amine	• Dicamba would be used in combination with 2,4-D (or diflufenzopyr; see below) to provide a second mode of action to reduce potential for herbicide resistance. • Would not be preferred for any treatment groups or habitats. • Would be applied when target plants are young and actively growing, before flowering, for most species. • Would not be used in forests, woodlands, or wetlands. • Would not be used in sandy or gravelly soils, particularly where depth to water table is shallow. • Would not be applied near water. • Would have some grazing restrictions.
Dicamba + diflufenzopyr (trade name Overdrive)	• Would not be preferred for any treatment groups or habitats. • Would be used primarily along roads and in disturbed sites. • Would be applied when target plants are young and actively growing, before flowering, for most species. • Would not be used in forests, woodlands, or wetlands. • Would not be used in sandy or gravelly soils, particularly where depth to water table is shallow. • Would not be applied near water and would require no-spray buffers near wells. • No grazing restrictions.

Treatment Method	Considerations
Fluazifop-P-butyl	• Would be used experimentally on up to 15 acres per field office. • Would be broadcast sprayed to control primarily invasive grasses in meadows and around dry vernal pools. • Would require repeated applications. • Would not be used in drought conditions. • Would kill or injure native grasses, which may need to be replaced by competitive seeding. • Would not be applied near water. • Would not be applied in grazing allotments.
Fluridone	• Would be applied only in ponds, lakes, and other non-flowing water bodies to control submerged and floating aquatic plants. • Would require prolonged contact (45-90 days) with the target plants.
Fluroxypyr	• Would not be preferred for any treatment groups or habitats. • Would be used to treat annual forbs in a variety of habitats and sites, except for wetlands. • Would be applied when plants are young and actively growing. • Would not be used near water. • No grazing restrictions.
Glyphosate	• Would be preferred in most habitat types and treatment groups, but only when injury or death of non-target plants is acceptable. • Foliar treatments would often be followed by competitive seeding. • Would be applied at more concentrated rates to selectively control woody vegetation using cut-stump and hack-and-squirt techniques. • Aquatic formulations would be used when herbicide could come in contact with surface water.
Glyphosate + 2,4-D amine	• Provides synergistic control of leafy spurge when applied in late spring, prior to seed set. • Would otherwise not be a preferred treatment. • Aquatic formulations would be used when herbicide could come in contact with surface water.
Imazapic	• Would be a preferred treatment for annual grasses and some annual forbs in a variety of habitats and sites, except wetlands. • Would be primarily broadcast sprayed as a pre-emergent in fall, prior to rains that stimulate germination of annual grasses and forbs. • Would be rotated with rimsulfuron if repeated treatments were needed. • Would be used at higher rates to control some susceptible perennial grasses. • Would be used on flat terrain or on sites where some herbicide movement from surface runoff would be acceptable. • Would not be used near water. • No grazing restrictions.
Imazapic + glyphosate	• Would be a preferred treatment for many grasses and forbs in a variety of habitats and sites, except wetlands. • Would be used where injury or death of non-target plants would be acceptable. • Would be primarily broadcast sprayed for pre-emergent and post-emergent control of annual grasses and forbs in the fall, if some germination has already occurred. • Would typically be followed by competitive seeding of perennial grasses and other species tolerant of residual imazapic in the soil. • Would be used at higher rates to control some susceptible perennial grasses. • Would be used on flat terrain or on sites where some herbicide movement from surface runoff would be acceptable. • Would not be used near water.
Imazapyr	• Could leach from dying plant material and affect adjacent plants. • Aquatic formulations could be applied near water. • Would be used on flat terrain or on sites where some herbicide movement from surface runoff would be acceptable. • No grazing restrictions.

Treatment Method	Considerations
Metsulfuron methyl + 2,4-D amine	• Would not be a preferred treatment. • Would be used only where other treatments were not effective on some perennial forb species. • Would not apply near water. • No grazing restrictions.
Picloram	• Would not be a preferred treatment. • Restricted-use herbicide. • Would have residual soil activity that limits revegetation, resulting in persistent bare soil. • Would not be used in sandy or gravelly soils, particularly where depth to water table is shallow. • Would not be applied near water and would require no-spray buffers near wells. • Would have grazing restrictions.
Pseudomonas fluorescens	• Would be used experimentally on up to 15 acres per field office. • Would be broadcast sprayed to control cheatgrass and medusahead in meadows.
Rimsulfuron	• Would be a preferred treatment only for control of annual grasses in grasslands, rangelands, and open woodlands. • Would be broadcast sprayed as a pre-emergent, primarily in the fall, prior to fall rains. • Would not be applied in light powdery or sandy soils that are susceptible to wind or water movement. • Would be rotated with imazapic if repeated treatments were required. • Would not be applied near water. • Would have grazing restrictions.
Sulfometuron methyl	• Would not be a preferred treatment. • Would be used in limited situations, primarily to control annual grasses in rights-of-way, forests, and woodlands, but would not be applied in rangelands. • Would not be applied in soils with high pH or low organic matter. • Would not be applied near water. • Would have grazing restrictions.
Triclopyr	• Would be a preferred treatment for some aquatic and terrestrial perennial forbs and woody vegetation in a variety of habitats and sites. • Would be applied at more concentrated rates to selectively control woody vegetation using cut-stump and hack-and-squirt techniques. • Aquatic formulations would be used when herbicide could come in contact with surface water. • No grazing restrictions.

***Table 2-15**. Comparison of the Alternatives, Treatment Methods*

Direct Control Method	No Action Alternative[1]	Proposed Action	Alternative 3
Non-Herbicide Methods			
Biological control agents	Allowed, rarely used	Allowed on terrestrial[2] invasive plants	
Manual control	Allowed	Allowed on terrestrial[2] invasive plants	Allowed[3]
Mechanical control	Allowed, rarely used	Allowed on terrestrial[2] invasive plants	Allowed[3]
Prescribed fire	Allowed, rarely used	Not allowed	
Propane torch	Not allowed	Allowed on terrestrial invasive plants	
Targeted grazing - cattle	Not allowed	Allowed on terrestrial invasive plants	
Targeted grazing - goats	Not allowed	Allowed on terrestrial invasive plants	
Seeding and planting	Allowed	Allowed on terrestrial invasive plants	
Herbicides			
2,4-D	Allowed	Allowed on terrestrial[2] invasive plants	Allowed[3]
Aminopyralid	Not allowed	Allowed on terrestrial invasive plants	
Chlorsulfuron	Not allowed	Allowed on terrestrial invasive plants	
Clopyralid	Not allowed	Allowed on terrestrial invasive plants	
Dicamba	Allowed, rarely used	Allowed on terrestrial invasive plants	
Dicamba + diflufenzopyr	Not allowed	Allowed on terrestrial invasive plants	

Direct Control Method	No Action Alternative[1]	Proposed Action	Alternative 3
Fluridone	Not allowed	Allowed on terrestrial[2] invasive plants	Allowed[3]
Fluroxypyr	Not allowed	Allowed on terrestrial invasive plants	
Glyphosate	Allowed	Allowed on terrestrial[2] invasive plants	Allowed[3]
Imazapic	Not allowed	Allowed on terrestrial invasive plants	
Imazapyr	Not allowed	Allowed on terrestrial[2] invasive plants	Allowed[3]
Metsulfuron methyl	Not allowed	Allowed on terrestrial invasive plants	
Picloram	Allowed, rarely used	Not allowed	
Rimsulfuron	Not allowed	Allowed on terrestrial invasive plants	
Sulfometuron methyl	Not allowed	Allowed on terrestrial invasive plants	
Triclopyr	Not allowed	Allowed on terrestrial[2] invasive plants	Allowed[3]
Allowed in limited areas as part of Research and Demonstration			
Fluazifop-P-butyl	Not allowed	Allowed on terrestrial invasive plants (up to 15 acres per Field Office)	
Pseudomonas fluorescens	Not allowed	Allowed on terrestrial invasive plants (up to 15 acres per Field Office)	

1. Treatment methods allowed on terrestrial noxious weeds or emergent aquatic noxious weeds.
2. Includes emergent aquatic plants that have a large portion of the plant or leaves out of the water.
3. Only aquatic formulations of these herbicides would be used on aquatic plants or in riparian habitats.

Alternatives Considered but Eliminated from Detailed Study

No Herbicides

The alternative was suggested by public scoping comments on this EA. This alternative would manage invasive plants with a full range of treatment methods except herbicides. It 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.

Use Fewer Herbicides than Analyzed Under the Proposed Action

An alternative was considered that would remove one or more herbicides from consideration in the Proposed Action 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. This proposed alternative would not meet the purpose and need; having this range of herbicides available helps applicators select the most appropriate one for site conditions, timing, and management objectives, and helps to avoid resistance of targeted species to specific herbicides. This allows the BLM to more effectively control invasive plants to protect native ecosystems and the flora and fauna that depend on them. Specific treatments are shown in the *Treatment Key* (Tables 2-12 and Table 2-13), treatment considerations are shown in Table 2-14, and effects are analyzed in Chapter 3. For any herbicide or use, the Decision-maker could modify the selected alternative to remove an herbicide or modify its use; however, there are no adverse effects (as described in this EA) that indicate a need to remove any of the herbicides. (It should be noted that the Proposed Action and Alternative 3 do not include the use of picloram, which is available under the No Action Alternative).

Use More Herbicides than Analyzed Under the Proposed Action

An alternative was considered that would include additional herbicides, including herbicides that are not approved for use on BLM-managed lands. Herbicides used on BLM-managed lands must be approved by the BLM National Office, and are, by policy, subject to detailed ecological and human health risk assessments for wildland applications to help satisfy the requirements of NEPA (USDI 2010a:37). However, BLM practice allows for limited and controlled use of new herbicides on demonstration plots up to 5 acres in size, with a maximum of 15 acres per

Field Office. Approval to use an herbicide for research and demonstration is provided by the BLM National Office after an initial evaluation of *Federal Insecticide, Fungicide and Rodenticide Act* (FIFRA) registration materials and risk assessments (USDI 2010a:478).

In addition to the herbicides analyzed in this EA, Risk Assessments have been completed or adopted by the BLM for bromacil, diquat, diuron, hexazinone, and tebuthiuron, and the results are evaluated through the NEPA process (USDI 2010b). Research and demonstration has been approved on numerous herbicides, including two that the Medford District analyzes under the Proposed Action (fluazifop-P-butyl and *Pseudomonas fluorescens*). In general, having a larger range of herbicides available helps applicators select the most appropriate one for site conditions, timing, and management objectives, and helps to avoid resistance of targeted species to specific herbicides. However, the herbicides available under the Proposed Action and Alternative 3 effectively treat all of the invasive plants species present on the District (in varying conditions), as well as invasive plants on neighboring lands that have the potential to be new invaders, without unacceptable adverse effects to District resources. As a result, additional herbicides are not needed to aid the BLM with its invasive plant program. Having additional herbicides that are not appropriate for the invasive plants or the conditions on the District would not meet the need for a more effective invasive plant management program. Hence, this alternative was eliminated from detailed analysis because it does not meet the purpose and need.

Use Non-Herbicide Methods First, Use Herbicides Only Where Absolutely Necessary and Decrease Their Use in the Future

This alternative was not considered 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 “Establish 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” (USDI 1992a). Invasive plants are difficult to control and previous analysis in the 2010 Oregon FEIS and monitoring data show that all control methods including herbicide applications (individually or in combination) are necessary to prevent undue degradation and promote land health (USDI 2010a, USDI 2010b:18-25). The Proposed Action and Alternative 3 include using herbicides that are generally selective and subject to numerous Project Design Features to reduce potential adverse effects. These alternatives also include an adaptive management approach to select the control method (herbicide and non-herbicide) that is most effective while minimizing adverse effects.

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 (USDI 2010a:139); therefore, this proposed alternative would not meet the purpose and need.

Limit Herbicide Treatments to Early Detection Rapid Response

An alternative was considered using the herbicides included in the Proposed Action, but strictly limiting their use to early detection rapid response-type treatments[38] of new sites or new species. Non-herbicide treatments of invasive plant sites would continue, but existing invasive plant sites would not be actively controlled with herbicides.

This alternative was eliminated from detailed analysis because it does not meet the purpose and need. Control of established infestations essential to preventing or reducing ecologic and economic degradation, and controlling many of these sites cannot be achieved without herbicides. Using herbicides to prevent invasive plant spread to uninfested areas is cost-effective and consistent with current laws, administrative direction, and the Resource Management Plans and plans that tier to them.

[38] Treatment of small, new infestations while there is strong likelihood for eradication.

Include the Use of Herbicides for Native Vegetation

An alternative was considered that would allow herbicides 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.
- Improve Special Status species habitat. Examples of this could include treatment of native species to promote federally listed species habitat restoration.

The need described in Chapter 1 is focused on more effective invasive plant management, and does not include a need for more effective native plant management. Therefore, this alternative was eliminated from detailed analysis. However, more effective invasive plant management will improve safety and operations objectives around roads and administration sites and Special Status Species habitat.

Reduce Management Activities Implicated in Invasive Plant Spread

This alternative was suggested by public scoping comments on this EA. This alternative would curtail or restrict various management and public use activities taking place on BLM-managed lands (such as timber harvest, grazing, mining, off-highway vehicles, camping, hiking, wildfire control, or boating) in order to reduce invasive plant spread. This alternative is not considered in detail because a reconsideration of the level of various land uses is the purview of the land management planning process described in the *Federal Land Policy and Management Act* (FLPMA) and is beyond the scope of this project to change land use plan decisions. A variety of management uses are authorized and directed by the FLPMA, by the *Oregon and California Lands Act*, and by other policy and direction. While these activities variously contribute to the spread of invasive plants (and in some cases, to their control), it is the role of each district's Resource Management Plan to identify an appropriate mix of public uses and management practices consistent with land capability, long-term productivity, and ecosystem health. The potential for an activity to contribute to the spread of noxious weeds and other invasive plants was analyzed in the Final EIS for the Southwestern Oregon Resource Management Plan and was considered in the decision to select the Resource Management Plan (USDI 2016d:93).

Use a "Natural Selection Alternative" Emphasizing Prevention and Passive Vegetation Management

This alternative was suggested by public scoping comments on this EA. It is characterized as forest management emphasizing natural succession and maintenance of fully stocked natural stands. This alternative would remove only "naturally selected dead and dying trees, conditioned upon meeting the needs of other species." Timber harvesting of such trees would be accomplished with small equipment from a network of narrow roads. Invasive plant "elimination, when necessary," would be accomplished by "physical removal, manual application of least toxic effective chemicals, and invasive plant prevention protocols and eradication, in accordance with the Medford Integrated Weed Management Plan and programmatic EIS." (Quoted text taken from proposed alternative description.)

The "Natural Selection Alternative" proposal is a land management alternative most appropriately considered in a resource management planning process and is outside the scope of this EA. This alternative was proposed during the completion of the 2016 EIS for the *Resource Management Plans for Western Oregon* and addressed in the *Alternatives Considered but not Analyzed in Detail* section of that document.

It was also submitted as a potential alternative during the completion of the Oregon FEIS to which this EA tiers. As described in the Oregon FEIS, the invasive plant control portion of the proposed alternative is not substantially different from the integrated weed management approach already used by the BLM as is evidenced by the stated reference to the Medford Integrated Weed Management Plan. Prevention, education, and awareness are central components of the District's integrated invasive plant management program and would be implemented regardless of alternative selected. Direct control methods, including manual, mechanical, and herbicides, are analyzed in this EA.

Ongoing and Reasonably Foreseeable Actions

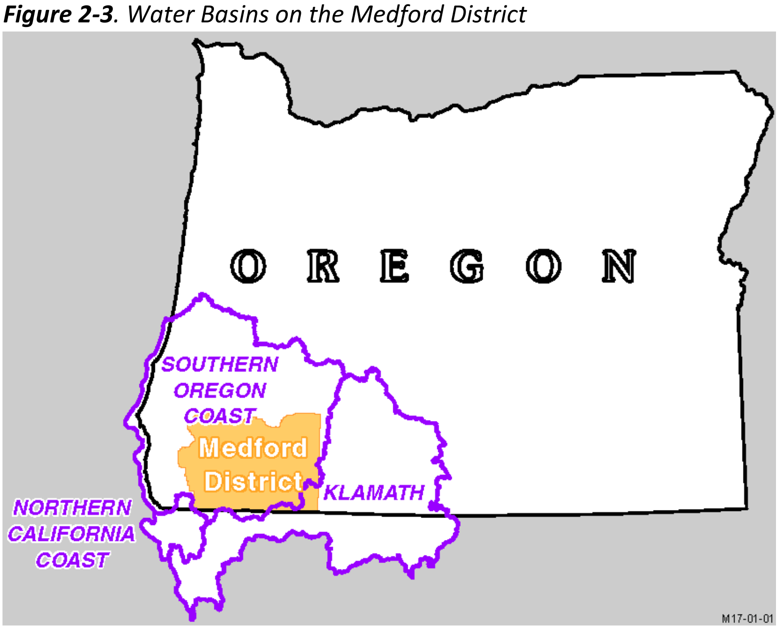
In addition to the invasive plant management program described in this EA, other activities occur on or near the Medford District. These activities are described below, as they may have the potential to affect resources analyzed in Chapter 3.

Neighboring Lands

Pesticide Use

In 2007 and 2008, the State of Oregon compiled pesticide use in Oregon via the self-reporting Pesticide Use Reporting System. Reports compile the resultant information by major water basin. The report acknowledges a number of limitations associated with the data; it was largely voluntary for some users, and some of the reporting fields were ambiguous, so the amount of pesticide use reported was likely underestimated. However, the ODA's 2008 Annual Report provides the best available information on the use of pesticides in Oregon (USDI 2010a, ODA 2009).

Figure 2-3. *Water Basins on the Medford District*



Ninety-three percent of the BLM-managed lands on the Medford District lie within the Southern Oregon Coast drainage basin, and only 7 percent within the Klamath Basin (see Figure 2-3). Given the small number of acres of District-administered land within the Klamath Basin, a rough comparison between pounds of pesticides used under each alternative and pounds of pesticides used in these basins as a whole is possible with information provided for the Southern Oregon Coast. Twenty-nine percent of the Southern Oregon Coast drainage basin is managed by the Medford District.

In 2008, 3,098,503 pounds of pesticides (including herbicides) were reported used in the Southern Oregon Coastal basin. Under the alternatives in this EA, the annual pounds of herbicides used annually by the BLM would be approximately 128 (No Action) and 393 (Proposed Action and Alternative 3). (With the exception of the pesticide use described below for other Districts and the Provolt and Sprague Seed Orchards, the BLM uses no other pesticides in this basin.) This calculation assumes typical rates and current budgets for Categories I and II. This represents about 0.01 percent of the pounds of pesticides used in the basin.

A direct comparison of quantities of specific active ingredients is not possible. The State report provides the pounds of pesticides for the top five most-used active ingredients. The top five active ingredients used in the Southern Oregon Coastal basin are not herbicides; they are insecticides, algaecides, or wood preservatives, representing 72 percent of all reported pesticide use. The same is true for the Klamath Basin; 89 percent of pesticide use reported is soil fumigants or fungicides.

The 2008 State of Oregon report estimated that 15,221,190 pounds (or 77 percent) of pesticides used in the state were for agriculture purposes. Glyphosate is commonly used, along with soil fumigants, insecticides, and desiccants. Pesticides used for forestry represent 4.4 percent of statewide use. All of the most commonly applied pesticides for forestry use were herbicides: glyphosate, atrazine, 2,4-D, hexazinone, and triclopyr (ODA 2009).

The 2010 Oregon FEIS to which this EA tiers suggests the use of herbicides on lands adjacent to lands managed by the BLM could conceivably decrease as BLM and cooperative invasive plant treatments become more effective, reducing the number of private land invasive plant infestations originating from BLM-managed lands (USDI 2010a:118).

Invasive Plants

The Oregon Department of Agriculture has mapped 62 noxious weeds in Josephine and / or Jackson counties (all ownerships), current or historic[39]. Four current (barbed goatgrass, yellow floatingheart, Woolly distaff-thistle, and yellowtuft) and two historic (coltsfoot (*Tussilago farfara*) and goatsrue) of these noxious weeds are on the State A list; that is, an invasive plant of known economic importance which occurs in the state in small enough infestations to make eradication or containment possible. The remainder are on the State B list: an invasive plant of economic importance which is regionally abundant, but which may have limited distribution in some counties. Sixteen of these B listed noxious weeds are widespread throughout the counties. These noxious weeds also spread as described in Category III; they spread down roads and streams and do well in disturbed areas like burned areas, harvested areas, and pastures. The Josephine and Jackson Cooperative Weed Management Areas work with Federal, State, and local government agencies, tribes, individuals, and various interested groups to manage invasive plants in these counties.

Other Federal, State, or County Lands

U.S. Forest Service

U.S. Forest Service administered lands in the project area are within the Rogue River-Siskiyou and Umpqua National Forests in Region 6, as well as a small portion of the Klamath National Forest in Region 5 (see Map 1-1). An environmental impact statement authorizing the use of herbicides, manual and mechanical methods, biological control agents, mulching, and seeding to treat invasive plants was completed in 2005 for Region 6. This EIS allows the use of herbicides on Region 6 National Forests once site-specific analysis has been done. Herbicide treatments would be part of the initial prescription for most sites, with the ongoing goal to reduce reliance on herbicides over time as control objectives are met and populations become small enough to effectively treat manually or mechanically.

The Umpqua National Forest uses very little herbicide, primarily operating under a 2003 Forest Integrated Weed Management Project EA. Glyphosate and picloram are used on 50 locations totaling about 50 acres. Herbicide treatments are done with backpack sprayers during the dry summer months focusing along Highway 138 in the North Umpqua and Diamond Lake Ranger Districts. Manual methods are used on 155 acres, solarization on 5 acres, and seeding and planting on 140 acres. Target species include false brome, Italian thistle, diffuse, spotted and meadow knapweed, yellow starthistle, rush skeletonweed, French broom, yellow toadflax, Japanese and giant knotweed, and gorse.

The Rogue River-Siskiyou National Forest works in conjunction with ODA, Jackson County Cooperative Weed Management Area, Medford BLM, Northwest Youth Corps, Siskiyou Mountain Club, and various individual volunteers to treat U.S. Forest Service lands in Jackson and Josephine counties. Invasive plant treatments primarily target medusahead, Japanese knotweed, garlic mustard, dyer's woad, Scotch broom, spotted knapweed, yellowtuft, and yellow starthistle. The Rogue River-Siskiyou National Forest primarily uses triclopyr, imazapic,

[39] Historic indicates previously known noxious weed species that have been eradicated from the area.

picloram, and glyphosate on sites addressed in a 1999 EA decision for the 1.7 million acre National Forest. In 2016, the National Forest treated 1,080 acres with herbicides; including 582 acres of spotted knapweed with picloram, 165.7 acres of Dalmatian toadflax, 178.9 acres of spotted knapweed with clopyralid, 133.9 acres of tansy ragwort and Scotch broom with glyphosate, and 19.5 acres of medusahead rye with imazapic. An additional 1,685 acres were hand-pulled, cut, or pulled with weed wrenches.

Crater Lake National Park

The National Park Service is in the process of updating their Invasive Vegetation Management program using an adaptive management framework that prioritizes invasive plant species for treatment and then uses a Treatment Selection Protocol to identify the most effective and appropriate treatment method. Crater Lake National Park straddles the crest of the Cascade Range and contains many headwater streams, springs, and ponds, some of which drain to the Rogue River and Klamath Basin. The park currently has only one approved herbicide available (fluroxypyr) and the proposed action is to increase the herbicides available to 10 (all of which are analyzed in this EA for Medford District use – aminopyralid, chlorsulfuron, clopyralid, glyphosate, imazapic, imazapyr, metsulfuron methyl, rimsulfuron, sulfometuron methyl, and triclopyr).

Oregon State Parks

Oregon State Parks are managed by the Oregon Parks and Recreation Department. Invasive plants are common on state park lands and threaten natural native environments. Preventative methods of control include prohibiting collection of plant resources, excluding access to some areas, and requesting visitors to stay on trails. Within the Valley of the Rogue Management Unit, the Oregon Parks and Recreation District treated invasive plants with herbicides in 2016 in four state parks – Valley of the Rogue, Fort Lane, Touvelle, and Joseph Stewart. A total of 42 acres were treated with herbicides including glyphosate (27 acres), aminopyralid (6 acres), metsulfuron methyl (8.5 acres), imazapyr (2 acres), and triclopyr (1.7 acres)[40]. Target invasive plant species include blackberry, yellow starthistle, rush skeletonweed, purple loosestrife, and small amounts of black locust and garlic mustard.

Oregon Department of Transportation (ODOT)

ODOT controls vegetation using a statewide integrated vegetation management practice of mechanical methods, biological control agents, and herbicides. The local maintenance district plan maps locations of sensitive natural resources and identifies areas where herbicide spraying would not occur. It also identifies buffer limits and other restrictions around water resources, sensitive fish, and plant species. Herbicides are used to control invasive plants and roadside vegetation. From 2010 to 2015, ODOT achieved a statewide reduction in herbicide use by 44 percent annually (measured in pounds of active ingredients), largely by switching to herbicides with less active ingredient (ODOT 2016). Within Maintenance District 8, which roughly correlates to the area containing Medford District-administered lands, ODOT conducts an average of 700 acres of herbicide treatments from February through May using 2,4-D, glyphosate, aminopyralid, sulfometuron methyl, chlorsulfuron, and imazapyr. Invasive plants of concern are rush skeletonweed, Russian thistle (I-5 and Highway 62 corridor in Jackson County), puncturevine, Dalmatian toadflax (small patch on Highway 140), and blackberry.

ODOT is partnering with the Oregon Department of Agriculture to implement pilot projects targeting dyer's woad and rush skeletonweed along I-5 at the Siskiyou Summit. One example is designating one mower for roadside treatments in a nine-mile stretch of I-5 to the north of the Siskiyou Summit. The mower is thoroughly cleaned before use and then is the only vehicle used for treatments in that area for the season to prevent seeds from being dispersed throughout the maintenance district.

[40] Includes double counting a treatment of 1.2 acres with a mix of triclopyr and glyphosate.

Jackson County

Jackson County's vegetation management program controls roadside vegetation using a variety of methods to manage grasses, shrubs, and trees on county-owned properties and rights-of-way. Grading of shoulders, flail mowing of brush, cattails and grasses, mechanical ditching, manual brushing, and herbicides are all used to control the vegetation that limits visibility or otherwise poses safety concerns. Invasive plant species of concern include puncturevine, Scotch broom, Armenian blackberry, and Russian thistle. Aquatic treatments have targeted yellow flag iris, purple loosestrife, and cattails. Biocontrol releases have been coordinated through the Oregon Department of Agriculture to treat puncturevine.

Other BLM Pesticide Use

Provolt and Sprague Seed Orchards

BLM manages two seed orchards in the Medford District – the 300 acre Provolt Seed Orchard located near Grants Pass and the 200 acre Sprague Seed Orchard near Merlin. The orchards are used to produce Douglas fir, ponderosa pine, and sugar pine seeds and seedlings. The 2006 Record of Decision (USDI 2006) for an Integrated Pest Management program on these seed orchards describes the need to control insect, vegetation, animal, and disease problems that threaten the trees, plants, and seeds that are produced for restoration and other land management activities. Vegetation management includes reducing the growth of vegetation to allow for tree establishment and growth and is achieved through a variety of methods including biological, chemical, prescribed fire, manual, mechanical, and other pest control methods. Dicamba, glyphosate, hexazinone, picloram, and triclopyr are the herbicides allowed for vegetation treatments, though glyphosate has been the only herbicide applied for several years. Other pesticides that can be used include dimethoate, esfenvalerate, horticultural oil, imidacloprid, permethrin, and Safer soap (insecticides) and chlorthalonil (fungicide). Acephate, chlorpyrifos, diazinon, and propargite, (for insects) are also allowed, but, like hexazinone and picloram, would be used seldom or not at all because of ecological protection limitations and considerations. Restrictions are applied to all methods to protect worker health and natural resources, including protections such as buffers that vary by application method and timing restrictions. Annual pesticide use (including herbicides) on the two seed orchards is generally less than an acre. This EA would complement, not replace, the invasive plant management that occurs on the seed orchards.

Coos Bay District

The Coos Bay District, to the west and north of the Medford District, currently treats noxious weeds following existing BLM policy and a District-wide 1997 *Integrated Weed Management Plan and Environmental Assessment* and Decision Record, using a range of methods including manual (e.g., hand-pulling) and mechanical treatments, using biological control agents (e.g., insects, mites, or diseases), proactive use of seeding and planting, and using herbicides (primarily 2,4-D and glyphosate, but also limited amounts of dicamba and picloram). They treat about 1,000 acres each year and approximately 75 percent of noxious weed treatments are herbicides. The District is beginning a planning process to expand and update its program to include treatments for all invasive plants, making additional herbicides available for use and adding other non-herbicide methods such as solarization, propane torches, and targeted grazing. In addition, the District treats approximately 75 acres a year of tanoak with imazapyr and glyphosate to prevent the spread of Sudden Oak Death. Sudden Oak Death treatments also involve cutting and piling, and pile and broadcast burning.

Roseburg District

The Roseburg District BLM, north of the Medford District, is in the process of updating their Integrated Weed Control Plan to add up to 13 herbicides to the four that are currently approved (2,4-D, dicamba, glyphosate and picloram) to treat vegetation. The proposed action is to treat invasive plants as well as limited use on native species in specified areas to meet restoration or safety objectives. All herbicide use will be ground based (no aerial spray). The District currently treats approximately 2,500 acres of invasive plants each year – 2,000 acres with herbicides and 500 acres by manual, mechanical, fire, and biological control methods.

Klamath Falls Resource Area

The Klamath Falls Resource Area of the Lakeview District BLM currently treats approximately 600 gross acres of noxious weeds each year. Of those, about 45 net acres are treated with herbicides and the remaining 555 acres are treated using other methods, including manual, mechanical, and biological (mostly insects) control methods to meet resource objectives. The Resource Area is in the process of updating their program to add the ability to treat all invasive plants with up to 16 new herbicides in addition to the four that are currently approved, as well as adding prescribed fire and targeted grazing.

California BLM

The Redding Field Office, south of the Medford District, is in the process of creating an integrated vegetation management program for control of invasive plants and other target species. The Field Office proposes to use manual and mechanical methods, prescribed fire, glyphosate, triclopyr, chlorsulfuron, aminopyralid, 2,4-D, dicamba, and imazapyr to target the invasive plants stinkwort, broom species, tree of heaven, yellow starthistle, puncturevine, silverleaf nightshade, and toadflax species, as well as native species of manzanita, toyon, and poison oak. The number of acres to be treated is currently unknown.

Other Foreseeable Actions on the Medford District

The following additional ongoing and foreseeable management activities on the Medford District (see Table 2-16) could create effects to some of the same resources potentially affected by treatments done under one or all of the alternatives in this EA. Activities listed below are considered in the analysis in Chapter 3 as they apply.

Table 2-16. *Reasonably Foreseeable Actions*

Project	Location	Field Office	Decision Date
Cascade-Siskiyou National Monument Transportation Management Plan EA Comprehensive transportation management plan to evaluate the road network within the Cascade-Siskiyou National Monument and determine transportation, restoration, and protection needs.	Cascade-Siskiyou National Monument, southeast of Ashland to the California border	Ashland	Spring 2017
Cascade-Siskiyou National Monument Land Exchange EA Second of two land exchanges identified in P.L. 111-011-Land Tenure Actions (GLI).	East of Ashland, near Lincoln	Ashland	Winter 2016 / 2017
Cascade-Siskiyou National Monument Pine Plantation Restoration EA Restoration thinning on approximately 300 acres of pine plantations within the Cascade-Siskiyou National Monument.	East of Ashland	Ashland	Summer 2017
Grazing Lease Authorization EA Proposal to authorize the Grizzly allotment grazing lease.	Little Butte Creek watershed	Ashland	Spring 2018
Renew communication leases on Soda Mountain (to ODOT, US Cellular, PacifiCorp)	Cascade-Siskiyou National Monument, southeast of Ashland	Ashland	2017
East Applegate Ridge Trail Project EA Construct a non-motorized trail system in the Applegate Valley.	Bishop Creek drainage in the Middle Applegate River watershed	Ashland	Winter 2016 / 2017
Jacksonville-to-Ashland Trail Project EA (Jack-Ash Trail) Develop non-motorized trail segments that would allow users to travel on foot, bicycle, or horseback from Ashland to Jacksonville.	Little Applegate River watershed	Ashland	Fall 2016

Project	Location	Field Office	Decision Date
Grazing Lease Authorization Renewals Proposal to authorize grazing lease renewals in the Bear Mountain, Crowfoot, Vestal Butte Moser Mountain, and Neil-Tarbell allotments.	Shady Cove-Rogue River and Big Butte Creek watersheds	Butte Falls	2016
Bieber Salt Forest Management Project Landscape-scale forest management projects	Little Butte Creek watershed (Salt Creek and Lower North Fork Little Butte Creek sub-watersheds)	Butte Falls	2016
Lost Creek Forest Management EA Landscape-scale forest management projects	Lost Creek-Rogue River watershed and the South Fork Rogue River watershed	Butte Falls	2016
Table Rocks ACEC Management Area Resource Management Plan Amendment EA Amend the Medford District Resource Management Plan to revise the ACEC boundary and establish the Table Rocks Management Area.	Gold Hill-Rogue River watershed	Butte Falls	Fall 2016
Sam's Valley Reinforcement Project Right-of-Way EA Proposal from Pacific Power to widen its existing right-of-way on BLM-managed lands to accommodate an additional power line between Sam's Valley and Grants Pass.	Rogue River watershed	Butte Falls	Winter 2016 / 2017
Elk Camel Forest Management Project Landscape-scale forest management projects	Elk Creek watershed, Shady Cove-Rogue River watershed, and Big Butte Creek watershed	Butte Falls	Summer 2017
Upper Cow Late Successional Reserve Project EA Proposed forest management project to improve late-successional conditions and attain the Aquatic Conservation Strategy objectives in riparian reserves.	Middle Cow Creek watershed	Grants Pass	Summer 2016
Cold Elk Forest Management Project EA Landscape-scale forest management activities.	West Fork Cow Creek watershed	Grants Pass	Summer 2016 and Spring 2017
Road Right-of-way Agreements and Hauling Permits Individual requests from other public agencies and private parties for access through BLM-managed lands.	Throughout the Grants Pass Resource Area	Grants Pass	Ongoing
Section 13 Quarry Expansion EA Proposal to extract mineral material	Lower Applegate River watershed	Grants Pass	Spring 2017
Stray Dog Mining EA Mineral material extraction	Hellgate Canyon-Rogue River watershed	Grants Pass	Spring / Summer 2017
Crooks Creek / Limestone Caves Mining Withdrawal EA Proposal to withdraw 3,680 acres from mineral entry to protect geological, fisheries, and wildlife resources.	Deer Creek watershed	Grants Pass	Summer 2016
Pickett West Forest Management Project Landscape- scale forest management activities	Hellgate Canyon- Rogue River, Deer Creek and Lower Applegate watersheds	Grants Pass	Sept 2017
Josephine County Crossing Plat EA Josephine County is requesting the construction of 745 feet of new forest road on BLM-managed lands.	Jumpoff Joe Creek watershed	Grants Pass	Spring / Summer 2017
4 Apples Association Mining Plan of Operation Proposed mining of 0.5 acres of BLM-managed land on an unnamed tributary of Starveout Creek.	Middle Cow Creek watershed	Grants Pass	Spring 2018

Chapter 3 – Affected Environment and Environmental Effects

This Chapter describes the natural, cultural, and social environment of BLM-managed lands on the Medford District 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 Proposed Action and Alternative 3 as opposed to continuing current management (the No Action Alternative) relative to those issues.

Determination of Effects in this Environmental Analysis

The individual issues in this Chapter take into consideration the following factors to draw conclusions as to whether the alternatives have the potential for significant adverse effects at the site-specific scale:

- **Treatment / Application Methods**: The *Treatments Planned Related to the Issue* section describes those parts of the alternatives that specifically relate to the issue statement.

- **Risk Assessments**: These serve as indicators of a potential adverse effect from an herbicide application. The analysis describes the potential for the given resource to experience the Risk Assessment-modeled exposure scenarios (See Appendix C, *Herbicide Risk Assessment Summaries).*

- **Estimated Treatment Acres** (see Tables D-3 and D-4, *Estimated Treatment Acres*): Acres provided both for annual estimates and total acres potentially treated over the life of the plan.

- **Protection 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. Mitigation Measures were identified for all potential adverse effects identified for herbicide applications in the 2007 and 2016 PEISs and the Oregon FEIS (USDI 2007a, USDI 2016a, USDI 2010a), and adopted by their Records of Decision (USDI 2007b, USDI 2016b, USDI 2010b). Conservation Measures were identified in the 2007 and 2016 Biological Assessments (USDI 2007c, USDI 2016c) for the 2007 and 2016 PEISs, and minimize adverse effects to federally listed species. Mitigation Measures adopted in the 2007 and 2016 PEISs also apply the Conservation Measures to other Special Status species. Project Design Criteria adopted in Medford District Programmatic Biological Assessments (USDI 2013b, 2017b) and ARBO II (NMFS 2013) further protect federally listed species. In addition, Project Design Features have been adopted as part of this analysis' Proposed Action.

- **Other NEPA Analyses:** The analysis tiers to the Oregon FEIS and the 2007 and 2016 PEISs (USDI 2007a, 2010a, 2016a) at the programmatic scale for effects that could be anticipated from herbicide treatments.

- **Cumulative Effects:** These are defined in the Council on Environmental Quality 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 generally considered part of the description of the Affected Environment in the analysis in this Chapter. Ongoing and reasonably foreseeable actions are addressed in the cumulative effects discussions for each issue as applicable.

Invasive Plants

Invasive Plants Issue 1

How would the alternatives affect treatment efficacy (including resistance to herbicides) and the spread of invasive plants (both on and off BLM-managed lands)?

Analytical Methods

Numerical projections of treatment efficacy under each alternative (see *The Alternatives* section in Chapter 2) and rate of invasive plant spread (see *Category III: Spread from Existing Plant Sites* in Chapter 2) follow the methodology and underlying assumptions used in the 2010 Oregon FEIS (USDI 2010a:135-139, 594-603), which were based on published data. Invasive plant control treatments are not 100 percent effective at controlling all treated populations, as some level of retreatment may be necessary to achieve complete control (USDI 2010a:135-139). Treatment efficacy is estimated to be 60 percent under the No Action Alternative and 80 percent under the Proposed Action and Alternative 3. As described in the Oregon FEIS, the 60 percent treatment efficiency was estimated based on how often retreatments happen under the current program, with four herbicides available. This estimate is program-wide and may not be true for each species; for example, there is no treatment method available to selectively treat invasive annual grasses under the No Action Alternative, so treatments of invasive annual grasses would not be 60 percent effective. The herbicides analyzed in the Oregon FEIS were chosen, in part, because they would be more effective at treating invasive plants that occur in the Pacific Northwest. Hence, an 80 percent treatment effectiveness rate was estimated for a program where a full range of treatment methods were available. In addition, a twelve percent invasive plant spread rate was estimated based on BLM and U.S. Forest Service data which showed that invasive plants spread an estimated 10 to 15 percent annually (USDI 2010a:594-603). It is unknown if submerged and floating aquatic invasive plants described under Alternative 3 spread at the same rate; however, in the absence of better or conflicting data, they are assumed to spread at 12 percent.

The BLM acknowledges that projections at the statewide scale may not be as accurate for conditions within the Medford District. The Oregon FEIS describes that noxious weeds on BLM-managed lands west of the Cascades may have a lower spread rate than the state as a whole based on weather, geography, and level of disturbance (USDI 2010a:595). Even within particular plant communities, rate of spread fluctuates over time, depending on invasive plant seed / propagule pressure, disturbance patterns, climate, and other environmental factors. Furthermore, the Oregon FEIS projections were based on noxious weed data and may not hold true for other invasive plants, particularly invasive annual grasses (USDI 2010a:595). Nonetheless, in the absence of better data, the BLM assumes in this analysis that the rate of spread for all invasive plants is equivalent to the rate for noxious weeds. Given these limitations, these projections should not be considered absolute values but, instead, reasonable approximations of the relative differences among the alternatives.

Based on these projections, Table 3-1 shows projected infestations of specific invasive plant species on the District over the next ten years.

Table 3-1. *Projected Infestation Size for Selected Invasive Plant Species Over 10 Years*[1]

Species	Mapped Infestation Acres	Treatment Efficacy		Infestation Acres after 10 Years				
				No Treatment	10% of initial infestation treated / year		25% of initial infestation treated / year	
		No Action	Proposed Action / Alternative 3		No Action	Proposed Action / Alternative 3	No Action	Proposed Action / Alternative 3
Yellow starthistle	5,201	60%	80%	16,154	10,678	8,853	2,466	0
Rush skeletonweed	338	20%	80%	1,050	931	575	753	0
Scotch broom	988	60%	80%	3,069	2,028	1,682	468	0
Dyer's woad	319	60%	80%	991	656	543	151	0
Medusahead rye	51	10%	50%	158	149	114	136	47

1. Under different efficacy and treatment level scenarios. All scenarios assume that residual infestations spread at 12 percent per year, regardless of other variables.

The analysis area / geographic scale includes all existing invasive plant infestations and all habitats across the District susceptible to future invasion. The temporal scale of the analysis is twenty years, the expected life of this plan; short-term effects include those that would last less than two growing seasons, long-term effects would last greater than two growing seasons.

Affected Environment

The District has documented 69 invasive plant species on 16,796 sites, totaling 13,211 infested acres (Table 2-1, Maps 2-1). Over 90 percent of these infestations are smaller than one acre (Table 2-2). An additional 140 invasive plant species are known or suspected to occur on the District, but the BLM has not mapped infestations of these species. Only two species of submerged or floating aquatic invasive plants are mapped on the District, but two others are known to occur. Chapter 2 describes in additional detail the District's invasive plant species and infestations.

Environmental Consequences

Direct and Indirect Effects

No Action Alternative

The BLM would continue to emphasize prevention as the first line of defense against the spread of invasive plants. Under the No Action Alternative, the Medford District would treat approximately 2,000 gross terrestrial acres per year and would not treat any submerged or floating aquatic invasive plants. Invasive plants would continue to spread at their current rate, estimated at 12 percent per year. Treatment efficacy would be limited because fewer treatment methods and only four herbicides are available. The BLM estimates that treatment methods would be effective on 60 percent of treated acres (USDI 2010a:136), requiring multiple retreatments to meet management objectives. Given a 12 percent rate of spread and annual treatment of 2,000 gross acres per year at a 60 percent effective treatment rate, the 13,211 acres of mapped infestations would spread to 19,973 acres over the next decade and to 40,974 acres after two decades. The effective annual rate of increase in infested acres in year 10 and 20 would be 5.7 and 8.8 percent respectively, meaning that despite a combination of prevention efforts and control treatments (biocontrol, chemical, manual, and mechanical), rate of spread would outpace rate of control.

Fourteen noxious weed species could not be effectively controlled using the tools available under this alternative, including rush skeletonweed, Canada thistle, yellowtuft, whitetop, parrotsfeather, water primrose, false brome, and medusahead rye. Treatments for these species would not achieve objectives, including reducing infestations to below the damage level; however, treatments would be conducted anyway if they would slow infestation growth by reducing vigor or seed development. Over 140 other invasive plants could not be treated under this alternative unless the State of Oregon designated them as noxious. In the meantime, they would continue to spread unchecked.

Limited treatment efficacy would also affect the distribution and abundance of invasive plants across all ownerships within and surrounding the Medford District. The inability to effectively control species on BLM-managed lands would result in the spread of infestations to other landowners. Even if those landowners have more effective treatment options, their long-term success would be reduced because infestations on BLM-managed lands would continue to provide a seed or propagule source. Thus, the opportunity to collaborate in an all-lands strategy to control these species would be compromised. Ultimately, limited treatment efficacy on BLM-managed lands would reduce treatment efficacy at the landscape scale. For example, in 2013, nearly 49,000 acres of mostly BLM and private industrial forestlands burned in a wildfire known as the Douglas Complex. Subsequently, the remaining merchantable timber was salvaged from thousands of acres. As a consequence of these disturbances, several invasive plant species quickly invaded, including rush skeletonweed, particularly along the road network within the Douglas Complex. Under the No Action Alternative, the BLM would not have an effective treatment method to control these rush skeletonweed infestations or to prevent their spread. Even if private industrial forest landowners were to effectively control infestations on their lands, rush skeletonweed seeds from BLM-managed lands could be transported long distances by wind[41] to reinvade treated sites on private lands.

Because the Medford District would continue to favor the same two or three herbicides under the No Action Alternative that have been used for several decades, the potential for invasive plants to develop resistance to the herbicide is higher than under the Proposed Action and Alternative 3. Within any plant population, a small percentage of individual plants may have natural resistance to an herbicide or mechanism of action that is otherwise effective at killing all susceptible plants in the population. If the resistant plants survive and reproduce, then the percentage of plants in the population that are naturally resistant will increase. Repeated use of the herbicide or herbicides with the same mechanism of action could continue to select for the naturally resistant plants in the population, such that the efficacy of the herbicide would decrease over time.

Proposed Action

Under the Proposed Action, the BLM would also continue to emphasize prevention, which combined with additional treatment methods would result in a more effective integrated management program compared to the No Action Alternative. Invasive plants would continue to spread at an estimated 12 percent per year; however, the BLM estimates that herbicide treatments would be effective on 80 percent of treated acres (USDI 2010a:136), requiring fewer retreatments to meet management objectives compared to the No Action Alternative. Given a 12 percent rate of spread and annual treatment of 2,000 gross acres per year at an 80 percent effective treatment rate, the 13,211 acres of mapped infestations would be reduced to 12,153 acres after 20 years of treatment, which is 28,821 fewer acres than under the No Action Alternative. There would be a 1.0 percent effective annual rate of *decrease* in infested acres in year 20, compared to an 8.8 percent *increase* under the No Action Alternative.

Increases in treatment efficacy and the percent of an infestation that can be treated per year have a substantial effect on the size of the infestation over time assuming a fixed rate of spread (see Table 3-1, above). For example, there are 5,201 mapped infestation acres for yellow starthistle. At a 12 percent rate of spread, under the No Action Alternative, where efficacy is 60 percent, treating only 10 percent of those initial acres (520) per year over ten years would result in the infestation growing by 5,477 acres. In contrast, under the Proposed Action, where efficacy is 80 percent, the infestation would grow by 1,825 fewer acres. Differences between the two alternatives in infestation size over time are more dramatic for species such as rush skeletonweed, where treatments under the No Action Alternative would be only 10 percent effective, but by using aminopyralid under the Proposed

[41] In canyon grasslands in Idaho, rush skeletonweed patches were found to move within a range of 4 to 12 km in an estimated time period of 5 to 12 years (Kesoju et al. 2015).

Action, efficacy would increase to 80 percent. For all species, increasing annual treatment level to 25 percent of the initial infestation acres would result in eradication in the 9th year of treatment at the 80 percent efficacy rate, but not until the 15th year at the 60 percent rate. Thus, eradication is a more feasible objective under the Proposed Action, particularly for small infestations.

The improvement in herbicide efficacy would allow the BLM to focus non-herbicide treatments where they are most practical and effective, either as stand-alone treatments or in combination with herbicide treatments. The combination of tools available under the Proposed Action would be effective on all of the terrestrial invasive plant species known or suspected to occur on the District, as well as potential new invaders (see Chapter 2 for more information). As a consequence, treatment objectives, such as reducing infestations to below damage levels for Special Status species and special communities, would be met more frequently and on more acres compared to the No Action Alternative.

An important benefit of the more effective integrated invasive plant management under the Proposed Action would be the opportunity to better collaborate with partners on an all-lands strategy to reduce the impacts of invasive plants on the southern Oregon landscape. For example, for approximately a decade, the BLM, U.S. Forest Service, Oregon Department of Agriculture, Cultural & Ecological Enhancement Network, The Nature Conservancy, and other partners have worked cooperatively in trying to eradicate two yellowtuft species from the Illinois Valley. Treatment options have been limited on some infested lands, including BLM-managed lands, resulting in a disproportionate amount of resources being applied at those sites. On other lands, where effective herbicides were used in combination with hand-pulling and competitive seeding, infestation size was quickly reduced and spread from those sites was eliminated. Infestations at these sites are now small enough to be treated by hand pulling alone, with two retreatments per year, and complete eradication of these infestations is expected within two years (Pirosko 2017). In contrast, on BLM and other lands where no herbicides or less effective herbicides were used, infestations are not close to eradication and in order to prevent spread, these infestations must be visited five times per year. Under the Proposed Action, the BLM and its partners would use the same integrated treatment approach on the Medford District that has proven effective on other lands, meeting treatment objectives more quickly and at lower costs. In addition to yellowtuft, more effective collaboration is also anticipated within the first three years of this plan under the Proposed Action for barbed goatgrass, medusahead, dyer's woad, garlic mustard, shining geranium, and yellow archangel. With the availability of effective treatment options, collaborative treatment efforts would also better reduce the risk of establishment and spread of new invaders, such as perennial pepperweed.

The use of additional herbicides would also prevent loss of treatment efficacy from herbicide resistance. Under the Proposed Action, invasive plant infestations would be treated with a combination or rotation of multiple herbicides with different mechanisms of action. Because individual plants are very unlikely to be resistant to multiple mechanisms of action, even those individuals that are resistant to one mode of action would be eliminated and, therefore, would not reproduce or persist in the population. Using combinations of different treatment methods would achieve the same result. For example, both garlic mustard and dyer's woad could be effectively treated with herbicides in the early rosette stages. By returning to the infestation two to three weeks post-treatment, any surviving plants could be hand-pulled, thereby removing any survivors with resistance to herbicides. Timing of the second visit would be critical to ensure that no plants could disperse seed. Acres of invasive plants treated with 2,4-D and glyphosate would be reduced by 74 percent and 57 percent respectively over the life of the plan. Instead, more selective herbicides (e.g., aminopyralid, imazapic) would be used that would have fewer impacts to Special Status plants and habitat. Picloram would no longer be used. (Dicamba, with limited use on 424 acres would remain unchanged.)

Alternative 3

Alternative 3 would have the same beneficial effects on terrestrial invasive plant control as the Proposed Action, while also providing effective tools for controlling submerged and floating aquatic invasive plants. The BLM would use manual treatment methods on up to 26 acres of submerged and floating invasive plants and aquatic herbicide formulations on up to 12 acres, often in combination with manual treatments. A majority of herbicide use would be aquatic formulations of triclopyr to treat approximately 11 acres of water primrose and parrotsfeather, the two Category I aquatic invasive plants on the District. The District has not tested the effectiveness of manual treatments for water primrose or parrotsfeather, but District botanists estimate that effectiveness would be only 10 percent because of the difficulty in removing all viable rhizomes or creeping submerged stems from deep sediment. For example, DiTomaso et al. (2013) state that removal of 6 to 10 inches of sediment may be required to remove parrotsfeather infestations. Furthermore, manual treatments would break off stem fragments that could float downstream and establish new infestations, thereby increasing the rate of spread above the baseline rate. In California's freshwater rivers and wetlands, spread of two water primrose species has been almost entirely through clonal reproduction from shoot fragments (Okada et al. 2009), and the BLM assumes that this is the primary mechanism of spread in southwest Oregon (rather than through sexual reproduction and seed dispersal). Consequently, control would be most effective under Alternative 3, under which herbicides could be applied without the stem fragmentation that would occur through manual treatments. Manual treatments would remain a viable option during low-water periods or where there would not be a risk of vegetative propagules dispersing downstream. Triclopyr is the most effective of the available herbicides for parrotsfeather (up to 90 percent reduction) (Hofstra et al. 2006) and water primrose (over 80 percent reduction) (Sartain et al. 2015). Under Alternative 3, assuming a 12 percent rate of spread and 80 percent treatment effectiveness, the combined 11 acres of water primrose and parrotsfeather treated with triclopyr on the District would be at a maintenance level (0.1 acre) by the fifth year of treatment, if all acres were treated each year. Under the No Action Alternative and the Proposed Action, these infestations would continue to grow, occupying 106 acres by year 20, eventually reaching a size exceeding the District's capacity for annual treatment.

In addition to improved treatment efficacy for floating and submerged aquatic invasive plants, Alternative 3 would also allow the BLM to better collaborate with the Oregon Department of Agriculture and other partners to manage these species across the landscape and to respond more quickly to new invaders, such as yellow floatingheart and South American waterweed.

Summary of Effects

Table 3-2. *Summary of Effects (Invasive Plants)*

Effect	No Action Alternative	Proposed Action	Alternative 3
Treatment efficacy	Up to 60% for terrestrial plants and 10% for submerged or floating aquatic plants. Invasive plant spread would outpace control.	Up to 80% for terrestrial plants and 10% for submerged or floating aquatic plants. Invasive plant control would outpace spread in terrestrial sites only.	Up to 80% for all plants. Invasive plant control would outpace spread in terrestrial and aquatic sites.
Number of invasive plant species without effective control	Over 150, including any species not designated as noxious.	4 species of submerged or floating aquatic plants.	None known.
Category I infestation growth in 20 years	Infested acres would more than double for terrestrial invasive plants and increase by approximately 50 percent for submerged and floating aquatic invasive plants.	Infested acres would be reduced by 8 percent for terrestrial invasive plants and increase by approximately 50 percent for submerged and floating aquatic invasive plants.	Infested acres would be reduced by 8 percent for terrestrial invasive plants and 3 percent for submerged and floating aquatic invasive plants.
Potential for herbicide resistance	Highest of the three alternatives.	Low.	Low.
Collaboration	Moderately effective for noxious weeds, but ineffective for other invasive plant species.	Improved effectiveness for all species except submerged or floating aquatic invasive plants.	Improved effectiveness for all invasive plants.

Cumulative Effects

A variety of ongoing and reasonably foreseeable activities would contribute to the introduction and spread of invasive plants on the Medford District, including abandoned mine land remediation, quarry operations, mining and mineral exploration, livestock grazing and range operations, hazard fuel management, wildfire suppression, timber harvesting, silvicultural treatments, habitat restoration, watershed restoration, permitting for rights-of-way, road construction, road maintenance and decommissioning, and recreation. Table 2-16 lists specific ongoing and foreseeable projects that would increase risk of invasion by disturbing soil, reducing canopy, transporting equipment, and / or other factors. The BLM has also estimated the amount of disturbance that would occur for certain routine management activities over the next five years (Table 3-3), all of which would further contribute to the spread of invasive plants across the landscape. Furthermore, based on modeled areas of timber harvest on BLM-administered lands in western Oregon, 36 percent of watersheds have a moderate or higher risk of introduction and spread of invasive plants from timber harvest over the next ten years, given a positive correlation between risk and the percent of a watershed that would be harvested (resulting in soil disturbance and reduced canopy) (USDI 2016e:428). In addition, 44 percent and 69 percent of BLM-administered watersheds have a moderate or higher risk of introduction and spread from road construction (USDI 2016e:433) and public motorized vehicle use (USDI 2016e:434), respectively, over the next ten years. Each of the above-mentioned activities could increase the rate of spread to above the estimated baseline rate of 12 percent per year, but the BLM is unable to precisely quantify the increase.

Table 3-3. *Projected Annual Disturbances from Routine Management Actions that Increase Risk of Invasive Plant Introduction and Spread*

Management Activity	Estimated Annual Disturbance
Hazard Fuels Management: Manual Treatments	4,500 acres
Hazard Fuels Management: Understory Burning	6,000 acres
Hazard Tree Removal	600 acres
Livestock Grazing and Range Operations	148,103 acres
Locatable Mining and Quarry Operations	4 acres
Pre-Commercial Thinning	2,800 acres
Pump Chance Maintenance	10 acres
Recreation Facility and Trail Maintenance	100 miles
Road Maintenance and Brushing	400 miles
Special Forest Product Permits, Firewood Sales, and Small Pole Sales	900 acres
Trail Construction / Reconstruction	20 miles
Timber harvest	Varies (see Table 2-16)

As described in Chapter 2, *Ongoing and Reasonably Foreseeable Actions*, invasive plants exist across all ownerships in Jackson and Josephine Counties, and these invasive plants spread as described in *Category IV, Spread from Existing Plant Sites*. The BLM assumes that actions on private lands (such as grazing, mining, logging, and recreation) would contribute to the spread of invasive plants in the analysis area, but the BLM lacks information on the locations or intensity of these actions and, therefore, cannot estimate the magnitude of their effects or whether they would increase rate of spread above the estimated baseline of 12 percent per year.

However, the treatments proposed under each of the three alternatives would have a countervailing effect that would limit invasive plant spread within the analysis area from actions on all ownerships. Although the BLM cannot reasonably estimate the magnitude of the effect, it can reasonably conclude that the Proposed Action and Alternative 3 would have the strongest countervailing effect on terrestrial invasive plant spread, while only Alternative 3 would have a strong countervailing effect for submerged and floating aquatic species.

Combined with the BLM's invasive plant management actions under each of the three alternatives, invasive plant management by the U.S. Forest Service, Army Corps of Engineers, National Park Service, Oregon Department of Agriculture, Oregon Parks and Recreation Department, Oregon Department of Transportation, and many others, would have an additional countervailing effect on the spread of invasive plants across the analysis area; however, the BLM is unable to quantify the magnitude of that cumulative effect.

Because the Medford District does not use and is not proposing to use herbicides for any purposes other than invasive plant management, no other projects or activities on BLM-administered lands would contribute to herbicide resistance. The BLM does not have enough information about herbicide use and rotation on other ownerships to draw conclusions about their effects on herbicide resistance within the analysis area.

Invasive Plants Issue 2 (Not Analyzed in Detail)

How would climate change affect the spread of invasive plants?

This issue was not analyzed in detail because effects were previously described in the analysis for the Oregon FEIS (USDI 2010a:171-172) and there are no new circumstances or information at the site-specific level that would change the effects anticipated for this EA.

The Oregon FEIS discusses that increased temperatures, longer hotter summers, earlier snowmelt, and resultant increased hydrologic droughts will change plant communities. Climate change is essentially a disturbance that makes an increasing number of niches available for invasive plants to occupy. The same characteristics that make invasive plants successful at invading other disturbances will likely give other invasive plants an advantage over native plants during this migration (USDI 2010a:171).

One study looking at changes in understory plant communities in the Siskiyou Mountains reported similar conclusions as the Oregon FEIS. Temperatures in the Siskiyou Mountains have increased 2 degrees Celsius since 1948 and plant communities have changed consistent with a drier climate at lower levels. Changes at higher elevations were more modest, validating predictions that climate change effects are nonlinear (Harrison et al. 2010). Such research supports the conclusions in the Oregon FEIS and further analysis is not warranted at the Medford District level. The type of actions and the amount of treatments under all alternatives would be consistent with the actions analyzed in the 2010 Oregon FEIS and the 2016 PEIS.

Background: Potential Effects to Non-Target Organisms

The following four Issue sections (*Native Vegetation*, *Fish and Aquatic Organisms*, *Wildlife*, and *Human Health*) rely on herbicide Risk Assessments to aid in analyzing and describing adverse effects. As further described in Chapter 2 and Appendix C, these BLM and / or Forest Service-prepared Risk Assessments quantitatively evaluate the probability (i.e., risk) that herbicide use in wildland settings might pose harm to an organism. These Risk Assessments were done or adopted as part of the 2007 and 2016 PEISs and the 2010 Oregon FEIS. Risk Assessments are necessarily done on surrogate species in laboratory conditions, identified to represent a species group. Risk Assessments take a conservative approach at assessing risk, incorporating assumptions in the analysis to account for highly susceptible[42] individuals; testing builds in and accounts for uncertainty (multiplying the lowest observable effects by a factor of 10, 100, or even a 1,000) and testing scenarios may be severe (e.g., soaking the test animal or consuming treated vegetation for an entire day). The likelihood of actual exposures comparable to those described in the Risk Assessments is reduced by application of Protection Measures (see Appendix A), as well as by the nature of the application and the location and actions of the receptor[43]. The Risk Assessments are summarized in tables in Appendix C and show herbicide risk ratings for vegetation, wildlife, and humans at BLM maximum and typical application rates[44], in a variety of application scenarios.

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[42] Rare, old, young, sick, etc.

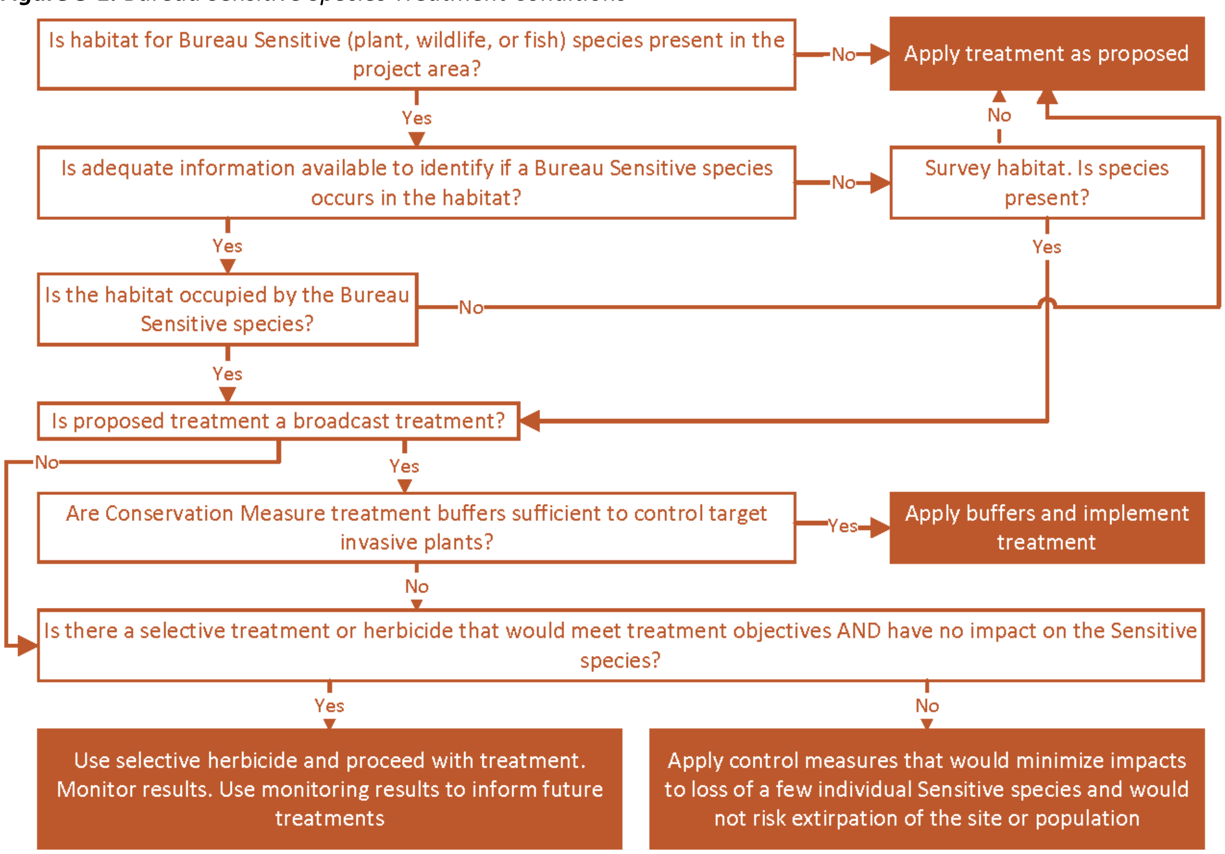
[43] For example, a risk assessment might indicate a risk to a large mammal if the mammal were directly sprayed. However, 95 percent of herbicide applications are spot treatments and a large mammal is unlikely to remain in a treatment area while treatment is occurring.

[44] Actual rates used are listed in Tables 2-12 and 2-13 (*Treatment Key*). Maximum rates are rarely used.

The following three Issues sections (*Native Vegetation*, *Fish and Aquatic Organisms*, and *Wildlife*) include effects to Special Status species; species that are federally listed as threatened or endangered or proposed for listing, as well as Bureau Sensitive species; species that are rare, but are not federally listed or proposed for listing. Bureau Sensitive species are those for which population viability is a concern, as evidenced by significant current or predicted downward trends in population numbers or density and habitat capability that would reduce a species' existing distribution. Management of Bureau Sensitive species "must not result in a loss of species viability or create significant trends toward Federal listing" (USDI 2008b). Consultation with the U.S. Fish and Wildlife Service or the National Marine Fisheries Service has occurred for listed species on the District, including at the national level with the 2007 and 2016 PEISs. This consultation resulted in Conservation Measures applicable to listed species or species proposed for listing (see Appendix A). (Consultation done at other levels has also resulted in other Protection Measures that are applicable to listed species; see Appendix A.) Mitigation Measures adopted with the Records of Decision for the 2007 and 2016 PEISs at the national level state that, "To protect Special Status wildlife species, implement Conservation Measures for terrestrial animals presented in the 2007 *Vegetation Treatments on Bureau of Land Management Lands in 17 Western States* and 2016 *Vegetation Treatments Using Aminopyralid, Fluroxypyr, and Rimsulfuron Biological Assessments*." These Conservation Measures include herbicide-free buffers from non-target species. The following ***Project Design Feature***, included in the analysis of the Proposed Action and Alternative 3, would further minimize the potential for invasive plant treatments to adversely affect a site or population of Bureau Sensitive species. The loss of a few individuals may be acceptable if treatments were expected to improve habitat conditions, which would provide long-term benefits to the population.

- Follow the Bureau Sensitive Species Treatment Conditions flowchart (Figure 3-1) when working in potential habitat for Bureau Sensitive species.

Figure 3-1. *Bureau Sensitive Species Treatment Conditions*



Native Vegetation

Native Vegetation Issue 1

How would treatment methods affect Special Status plants and fungi?

Analytical Methods

The analysis area includes all suitable habitat for 129 Bureau Special Status plant and fungi species documented or suspected within the Medford District, as well as habitat of species occurrences on adjacent lands where there is unrestricted gene flow or dispersal between populations (or subpopulations) across ownership boundaries. Special Status species include federally listed, proposed, and candidate species, as well as Bureau Sensitive species designated by the BLM State Director.

The following information is used to quantify and qualify the effects in this analysis:

- Application of Protection Measures, conservation strategies, plans, and other formalized conservation mechanisms;
- Existing survey records, inventories, and spatial data;
- Professional research, literature, and other technology transfer sources; and
- Expertise, both internal and external, that is based on documented, substantiated professional rationale.

The BLM used species occurrence data in the BLM's Geographic Biological Observations database (GeoBOB) to evaluate the effects of the alternatives on Special Status plants and fungi. GeoBOB includes spatial and tabular information about species' occurrences, distribution, and habitat, as well as a record of when and where inventories were completed for specific lists of taxa. The Medford District surveys less than 5 percent of the District per year for Special Status plants and fungi, primarily for pre-disturbance project clearance. Consequently, not all of the District has been surveyed for the current list of Special Status plants and fungi. In addition, some species—particularly fungi—are difficult to detect and, thus, are underrepresented in GeoBOB.

The BLM used rare plant monitoring reports in GeoBOB and invasive plant infestation data in NISIMS to evaluate where invasive plant infestations occur within and around rare plant populations and habitat. The NISIMS dataset best represents noxious weed infestations located within the Medford District's project areas, roadsides, and priority treatment areas, such as ACECs and the Rogue River corridor. NISIMS does not reflect the distribution and abundance of all invasive plants species or for all portions of the District.

The decision whether to treat and how to treat invasive plants within and around rare plant and fungi populations is dependent on evaluation of each site, including the health and vigor of the rare species' population, the potential for harm by invasive plants, and the tradeoffs between potential short-term negative treatment effects and long-term benefits. These evaluations are the foundation of integrated pest management, but it is not feasible for the BLM to complete evaluations for over 4,000 Special Status plant and fungi sites as part of this planning effort, nor would the determinations made through evaluations completed today apply as site conditions change over time. While interdisciplinary team review of Annual Treatment Plans helps to ensure that that treatments conform to design and mitigation standards and that pre-project clearances[45] are completed, these uncertainties limit the ability to quantify effects on Special Status plants and fungi.

[45] Projects that have the potential to disturb Special Status plant habitat require pre-project clearances, including review for potential habitat and surveys in suitable habitat (USDI 2008b).

Effects vary by species and location, but where effects are anticipated, their intensity and duration are described as follows:

- Negligible: Effects would be at or below the level of detection and changes would be so slight that they would not be of any measurable or perceptible consequence to individuals or to the population. A negligible effect could include reduced flowering on a plant that possibly could have been caused by a treatment method, competition from an invasive plant, or abnormal weather.
- Minor: Effects on individuals would be detectable or measurable, but localized, and of little consequence to the population. A minor effect could include mortality of two to a few individuals from treatment methods or one to a few invasive plants moving into habitat that could have been occupied by the Special Status plant. Mitigating measures, if needed to offset effects, would be simple and successfully implemented.
- Major: Effects on individuals or habitat conditions would change the trajectory of population viability and probability of persistence. A major adverse effect could trigger a population decline that may not be reversible, even with extensive mitigating measures. Actions that would likely result in adverse effects to special status species of this severity would not be authorized or undertaken.

  Short-term: A change in a resource or its condition would last less than two growing seasons.
  Long-term: A change in a resource or its condition would last for more than two growing season.

The threshold between minor and major effects is important within the context of the Bureau's *Manual 6840 – Special Status Species Management*, which directs the BLM to "implement measures to conserve these species and their habitats, including ESA proposed critical habitat, to promote their conservation and reduce the likelihood and need for such species to be listed pursuant to the ESA." For the purposes of this analysis and the implementation of this plan, estimates of viability follow NatureServe methodology as modified and described by Hammerson et al. (2008) to qualitatively assess species occurrences. This methodology incorporates factors of population size, condition, and landscape context to estimate the probability that a species occurrence would persist under existing conditions.

The *Protection Measures* section, below, describes existing measures that limit effects to Special Status plants, as well as additional Project Design Features adopted for the Proposed Action and Alternative 3. For the purposes of this analysis, it is assumed the Proposed Action would be implemented for a period of 20 years.

Some of the District's Special Status plant and fungi species would not be affected by the Proposed Action or Alternative 3 or there would be no measurable differences in effects between the alternatives; thus, those species or species groups are not analyzed in detail.

Affected Environment

There are 129 Bureau Special Status plant and fungi species documented or suspected within the Medford District, including 100 vascular plants, 7 liverworts, 9 mosses, 2 lichens, and 11 fungi (USDA and USDI 2015b). As of February 28, 2017, GeoBOB includes 4,177 mapped sites totaling 4,944 acres of Special Status plants and fungi on the District (Table 3-4).

Table 3-4. *Special Status Plants and Fungi*

Family	Scientific Name	Common Name	Life Cycle[1]	Documented or Suspected	Acres[2]	Number of sites[2]
		FUNGI				
Cortinariaceae	*Phaeocollybia californica*	fungus	-	Documented	1.5	22
Cortinariaceae	*Phaeocollybia gregaria*	fungus	-	Documented	unk	unk
Rhizopogonaceae	*Rhizopogon ellipsosporus*	fungus	-	Documented	0.3	5

Family	Scientific Name	Common Name	Life Cycle[1]	Documented or Suspected	Acres[2]	Number of sites[2]
Rhizopogonaceae	*Rhizopogon exiguus*	fungus	-	Documented	0.1	1
Russulaceae	*Gymnomyces fragrans*	fungus	-	Documented	unk	unk
Boletaceae	*Chamonixia caespitosa*	fungus	-	Suspected	-	-
Boletaceae	*Gastroboletus vividus*	fungus	-	Suspected	-	-
Cortinariaceae	*Dermocybe humboldtensis*	fungus	-	Suspected	-	-
Discinaceae	*Pseudorhizina californica*	fungus	-	Suspected	-	-
Rhizopogonaceae	*Rhizopogon chamaleontinus*	fungus	-	Suspected	-	-
Russulaceae	*Gastrolactarius camphoratus*	fungus	-	Suspected	-	-
LICHENS						
Collemataceae	*Leptogium cyanescens*	lichen	-	Documented	unk	unk
Lobariaceae	*Lobaria linita*	lichen	-	Documented	7.3	3
LIVERWORTS						
Calypogeiaceae	*Calypogeia sphagnicola*	liverwort	-	Documented	unk	unk
Cephaloziellaceae	*Cephaloziella spinigera*	liverwort	-	Documented	unk	unk
Porellaceae	*Porella bolanderi*	liverwort	-	Documented	0.7	9
Gymnomitriaceae	*Gymnomitrion concinnatum*	liverwort	-	Suspected	-	-
Jungermanniaceae	*Anastrophyllum minutum*	liverwort	-	Suspected	-	-
Jungermanniaceae	*Rivulariella gemmipara*	liverwort	-	Suspected	-	-
Phymatocerotaceae	*Phymatoceros phymatodes*	liverwort	-	Suspected	-	-
MOSSES						
Andreaeaceae	*Andreaea schofieldiana*	moss	-	Documented	0.1	1
Bryaceae	*Bryum calobryoides*	moss	-	Documented	0.1	2
Ephemeraceae	*Ephemerum crassinervium*	moss	-	Documented	0.1	2
Grimmiaceae	*Racomitrium depressum*	moss	-	Documented	unk	unk
Grimmiaceae	*Schistidium cinclidodonteum*	moss	-	Documented	0.9	14
Pottiaceae	*Tortula mucronifolia*	moss	-	Documented	unk	unk
Encalyptaceae	*Encalypta brevicollis*	moss	-	Suspected	-	-
Funariaceae	*Entosthodon fascicularis*	moss	-	Suspected	-	-
Orthotrichaceae	*Orthodontium pellucens*	moss	-	Suspected	-	-
VASCULAR PLANTS						
Apiaceae	*Lomatium cookii*	Cook's lomatium[3]	P	Documented	26.8	44
Apiaceae	*Perideridia erythrorhiza*	red-rooted yampah	P	Documented	0.2	3
Asteraceae	*Erigeron cervinus*	Siskiyou daisy	P	Documented	6.5	1
Asteraceae	*Eucephalus vialis*	wayside aster	P	Documented	157.3	162
Asteraceae	*Hieracium horridum*	shaggy hawkweed	P	Documented	0.1	1
Asteraceae	*Rafinesquia californica*	California chicory	A	Documented	252.0	95
Boraginaceae	*Cryptantha milo-bakeri*	Milo Baker's cryptantha	A	Documented	8.9	33
Boraginaceae	*Hackelia bella*	beautiful stickseed	P	Documented	84.8	66
Boraginaceae	*Plagiobothrys austiniae*	Austin's popcorn-flower	A	Documented	19.8	35
Boraginaceae	*Plagiobothrys figuratus* ssp. *corallicarpus*	coral seeded allocarya	A	Documented	4.7	21
Boraginaceae	*Plagiobothrys greenei*	Greene's popcorn-flower	A	Documented	90.1	61
Brassicaceae	*Arabis modesta*	Rogue Canyon rockcress	P	Documented	12.8	26
Brassicaceae	*Draba howellii*	Howell's whitlow-grass	P	Documented	0.1	1
Brassicaceae	*Rorippa columbiae*	Columbia cress	P	Documented	unk	unk
Brassicaceae	*Streptanthus glandulosus*	common jewelflower	A, B	Documented	7.3	3
Brassicaceae	*Streptanthus howellii*	Howell's jewelflower	A, B	Documented	55.7	7
Callitrichaceae	*Callitriche marginata*	winged water-starwort	A	Documented	115.7	21
Campanulaceae	*Nemacladus capillaris*	slender nemacladus	A	Documented	18.5	55
Caryophyllaceae	*Silene hookeri* ssp. *bolanderi*	Bolander's catchfly	P	Documented	9.8	41
Crassulaceae	*Sedum moranii*	Rogue River stonecrop	P	Documented	14.9	80

Family	Scientific Name	Common Name	Life Cycle[1]	Documented or Suspected	Acres[2]	Number of sites[2]
Cuppressaceae	*Hesperocyparis bakeri*	Baker's cypress	P	Documented	4.9	1
Cyperaceae	*Carex capitata*	capitate sedge	A, P	Documented	0.1	1
Cyperaceae	*Carex comosa*	bristly sedge	A, P	Documented	unk	unk
Cyperaceae	*Carex klamathensis*	Klamath sedge	A, P	Documented	13.4	1
Cyperaceae	*Carex livida*	pale sedge	A, P	Documented	1.1	17
Cyperaceae	*Scirpus pendulus*	drooping bulrush	P	Documented	12.8	16
Ericaceae	*Arctostaphylos hispidula*	hairy manzanita	P	Documented	0.1	2
Fabaceae	*Astragalus californicus*	California milk-vetch	P	Documented	14.1	49
Fabaceae	*Astragalus gambelianus*	Gambel milk-vetch	P	Documented	0.6	11
Fabaceae	*Lotus stipularis*	stipuled trefoil	P	Documented	86.5	58
Fabaceae	*Sophora leachiana*	western necklacepod	P	Documented	26.0	48
Fumariaceae	*Dicentra pauciflora*	few-flowered bleeding heart	P	Documented	unk	unk
Gentianaceae	*Frasera umpquaensis*	Umpqua green gentian	P	Documented	49.3	22
Gentianaceae	*Gentiana setigera*	Waldo gentian	P	Documented	12.1	41
Geraniaceae	*Erodium macrophyllum*	large-leaved filaree	A, B	Documented	0.1	1
Grossulariaceae	*Ribes divaricatum* var. *pubiflorum*	straggly gooseberry	P	Documented	44.4	13
Hydrophyllaceae	*Romanzoffia thompsonii*	Thompson's mistmaiden	A	Documented	13.2	6
Lamiaceae	*Monardella purpurea*	Sikiyou monardella	P	Documented	493.6	27
Lemnaceae	*Wolffia borealis*	dotted water-meal[4]	P	Documented	0.9	1
Lentibulariaceae	*Utricularia minor*	lesser bladderwort[4]	P	Documented	1.7	3
Liliaceae	*Allium peninsulare*	peninsula onion	P	Documented	28.5	13
Liliaceae	*Calochortus greenei*	Greene's mariposa-lily	P	Documented	431.5	203
Liliaceae	*Calochortus howellii*	Howell's mariposa-lily	P	Documented	192.9	146
Liliaceae	*Calochortus monophyllus*	one-leaved mariposa-lily	P	Documented	0.1	1
Liliaceae	*Calochortus persistens*	Siskiyou mariposa-lily	P	Documented	0.1	1
Liliaceae	*Camassia howellii*	Howell's camas	P	Documented	737.2	187
Liliaceae	*Chlorogalum angustifolium*	narrow-leaved amole	P	Documented	3.7	7
Liliaceae	*Erythronium howellii*	Howell's adder-tongue	P	Documented	96.5	190
Liliaceae	*Fritillaria gentneri*	Gentner's fritillary[3]	P	Documented	169.3	252
Liliaceae	*Hastingsia bracteosa* var. *atropurpurea*	purple-flowered rush-lily	P	Documented	0.1	1
Liliaceae	*Hastingsia bracteosa* var. *bracteosa*	large-flowered rush-lily	P	Documented	1.5	8
Liliaceae	*Zigadenus fontanus*	small-flowered death camas	P	Documented	240.6	117
Limnanthaceae	*Limnanthes alba ssp. gracilis*	slender meadow-foam	A	Documented	69.9	112
Limnanthaceae	*Limnanthes floccosa* ssp. *bellingeriana*	Bellinger's meadow-foam	A	Documented	171.4	159
Limnanthaceae	*Limnanthes pumila* ssp. *pumila*	dwarf meadow-foam	A	Documented	220.0	22
Malvaceae	*Iliamna latibracteata*	California globe-mallow	P	Documented	52.0	49
Malvaceae	*Sidalcea hickmanii* ssp. *petraea*	Hickman's checkerbloom	P	Documented	0.1	1
Marsileaceae	*Pilularia americana*	American pillwort	P	Documented	0.1	1
Onagraceae	*Epilobium oreganum*	Oregon willow-herb	P	Documented	4.6	21
Onagraceae	*Tetrapteron graciliflorum*	slender-flowered evening-primrose	A	Documented	105.5	53
Orchidaceae	*Cypripedium fasciculatum*	clustered lady's slipper	P	Documented	161.3	969
Papaveraceae	*Eschscholzia caespitosa*	gold poppy	A	Documented	8.0	23
Papaveraceae	*Meconella oregana*	Oregon fairypoppy	A	Documented	34.9	27
Poaceae	*Poa rhizomata*	timber bluegrass	A	Documented	3.0	19
Portulacaceae	*Lewisia leeana*	Lee's lewisia	P	Documented	8.8	1

Family	Scientific Name	Common Name	Life Cycle[1]	Documented or Suspected	Acres[2]	Number of sites[2]
Pteridaceae	*Adiantum jordanii*	California maiden-hair	P	Documented	3.5	12
Pteridaceae	*Cheilanthes covillei*	Coville's lipfern	P	Documented	unk	unk
Pteridaceae	*Cheilanthes intertexta*	coastal lipfern	P	Documented	6.8	49
Pteridaceae	*Pellaea andromedifolia*	coffee fern	P	Documented	0.6	7
Ranunculaceae	*Delphinium nudicaule*	red larkspur	P	Documented	51.6	45
Ranunculaceae	*Ranunculus austrooreganus*	southern Oregon buttercup	A	Documented	400.1	90
Rhamnacaea	*Rhamnus ilicifolia*	redberry	P	Documented	0.1	2
Rosaceae	*Horkelia tridentata* ssp. *tridentata*	three-toothed horkelia	P	Documented	4.9	3
Saxifragaceae	*Bensoniella oregana*	bensoniella	P	Documented	49.3	80
Saxifragaceae	*Saxifragopsis fragarioides*	joint-leaved saxifrage	P	Documented	34.9	10
Scrophulariaceae	*Diplacus bolanderi*	Bolander's monkeyflower	A	Documented	0.7	11
Scrophulariaceae	*Diplacus congdonii*	Congdon's monkeyflower	A	Documented	0.9	14
Solanaceae	*Solanum parishii*	Parish's horse-nettle	P	Documented	27.3	128
Violaceae	*Viola primulifolia* ssp. *occidentalis*	western bog violet	P	Documented	0.7	10
Apiaceae	*Lomatium engelmannii*	Englemann's desert-parsley	P	Suspected	-	-
Aspleniaceae	*Asplenium septentrionale*	grass-fern	P	Suspected	-	-
Asteraceae	*Arnica viscosa*	Shasta arnica	P	Suspected	-	-
Asteraceae	*Ericameria arborescens*	golden fleece	P	Suspected	-	-
Brassicaceae	*Arabis macdonaldiana*	McDonald's rockcress[3]	P	Suspected	-	-
Cyperaceae	*Carex nervina*	Sierra nerved sedge	A, P	Suspected	-	-
Cyperaceae	*Cyperus acuminatus*	short-pointed cyperus	A, P	Suspected	-	-
Cyperaceae	*Rhynchospora alba*	white beakrush	P	Suspected	-	-
Cyperaceae	*Schoenoplectus subterminalis*	water clubrush	P	Suspected	-	-
Fabaceae	*Lupinus tracyi*	Tracy's lupine	P	Suspected	-	-
Fumariaceae	*Corydalis aquae-gelidae*	cold-water fumewort	P	Suspected	-	-
Gentianaceae	*Gentiana plurisetosa*	elegant gentian	P	Suspected	-	-
Hydrophyllaceae	*Phacelia leonis*	Siskiyou phacelia	A	Suspected	-	-
Lemnaceae	*Wolffia columbiana*	Columbia water-meal[4]	P	Suspected	-	-
Liliaceae	*Calochortus coxii*	crinite mariposa lily	P	Suspected	-	-
Liliaceae	*Calochortus umpquaensis*	Umpqua mariposa lily	P	Suspected	-	-
Liliaceae	*Prosartes parvifolia*	Siskiyou fairy bells	A	Suspected	-	-
Limnanthaceae	*Limnanthes pumila* ssp. *grandiflora*	large-flowered woolly meadow-foam[3]	A	Suspected	-	-
Polygonaceae	*Eriogonum lobbii*	Lobb's buckwheat	P	Suspected	-	-
Pteridaceae	*Pellaea mucronata* ssp. *californica*	California bird's-foot cliff-brake	P	Suspected	-	-
Scrophulariaceae	*Keckiella lemmonii*	bush beardtongue	P	Suspected	-	-

1. Annual (A), Biennial (B), Perennial (P)
2. Number of sites and acres documented in GeoBOB as of February 28, 2017. Information is unknown (unk) for some species for which records have not yet been entered in GeoBOB. Number of sites and acres not applicable to suspected species.
3. Federally listed as endangered.
4. Aquatic Special Status plant.

Of the District's 4,177 mapped Special Status plant and fungi sites, 346 (8.3 percent) are known to be infested by Category I invasive plant sites. Special Status plants and fungi occupy 4,944 acres on the District, of which 417 acres (8.4 percent) are infested by one of more Category I invasive plant sites. Mapped invasive plant species that most frequently occur within 100 feet of rare vascular plants sites include yellow starthistle, Scotch broom, meadow knapweed, Armenian blackberry, dyer's woad, rush skeletonweed, bull thistle, garlic mustard, Japanese knotweed, Canada thistle, houndstongue, spotted knapweed, and yellowtuft. The extent to which Category II invasive plant sites affect Special Status plant habitat is unknown, but could include hundreds of additional acres, particularly of invasive annual grasses.

Some Special Status plant groups tend to grow in habitats that are not typically infested by invasive plants. Few of the District's Special Status moss sites are infested by invasive plants, primarily because these mosses grow on rocks, rock outcrops, and cliffs that are not suitable habitat for most invasive plants. The exception is two sites of *Schistidium cinclidodonteum* (a moss) growing on rocks in Oregon white oak woodlands infested by yellow starthistle in the Little Butte Creek watershed. The District's Special Status liverworts and lichens also grow in habitats that are rarely infested by invasive plants, including fens, rock outcrops, and tree trunks. The same is true for Special Status fungi, except for two sites of *Phaeocollybia californica* that are within 50 feet of Armenian blackberry and tansy ragwort. One site of *Rhizopogon clavitisporus*, a fungus species that qualifies, but is not yet designated, as Special Status[46], is also adjacent to a yellow starthistle infestation. There are no known invasive plants growing within 100 feet of aquatic Special Status plants, such as *Wolffia borealis* (dotted water-meal) or *Utricularia minor* (lesser bladderwort).

There are two federally listed plant species, Gentner's fritillary (*Fritillaria gentneri*) and Cook's lomatium (*Lomatium cookii*), documented on the Medford District. Gentner's fritillary occupies 169 known acres of primarily Oregon white oak woodlands, Oregon white oak / chaparral, and mixed hardwood-conifer forests. The greatest concentration of populations occurs in the Applegate Valley and east of Interstate 5 in the Cascade-Siskiyou National Monument. Cook's lomatium occurs on 27 acres of the Medford District in the Illinois Valley in wet meadows and vernally wet oak woodlands. The species also occurs near the City of Medford, but those occurrences are not located on the Medford District and that Recovery Zone is not connected to the Illinois Valley Recovery Zone

The U.S. Fish and Wildlife Service has not designated critical habitat for Gentner's fritillary; instead, the Service and the Medford District designated 6,583 acres of Fritillary Management Areas (FMAs) in 2015 through a Conservation Agreement (USDI 2015a). The eight FMAs are focal areas for species' protection and management, including invasive plant control. Recovery Action 2.51 and 2.52, in the *Recovery Plan for Gentner's fritillary* (USDI 2003a), calls for development and implementation of habitat management strategies in FMAs that consider prevention, monitoring, and control of invasive plants, including by manual removal, biocontrols, herbicide application, mowing, or other means. Habitat condition and threat assessments were completed for four FMAs in 2016, confirming that invasive plants threaten Gentner's fritillary habitat at North River Road FMA (yellow starthistle, knapweeds, medusahead rye, and wild oats) and Pilot Rock FMA (yellow starthistle, medusahead rye, and bulbous bluegrass), but not at Dakubetede FMA or Pickett Creek FMA (Brown et al. 2016). NISIMS shows that FMAs are most frequently infested by yellow starthistle, bull thistle, dyer's woad, and Armenian blackberry.

The BLM annually monitors Gentner's fritillary occurrences and habitat at 57 sites. In 2016, botanists observed large invasive plant threats at eight sites (Pacific Crest Consulting 2017). The primary species of concern are yellow starthistle, Armenian blackberry, bulbous bluegrass, cheatgrass, medusahead rye, soft brome, tall oatgrass, wild oats, dogtail grass, spreading hedgeparsley, and bur chervil.

In 2010, the U.S. Fish and Wildlife Service designated 13 critical habitat units for Cook's lomatium in the Illinois Valley (Federal Register Vol. 75, No. 139, pp. 42490-42570), including 1,793 acres on the Medford District (Figure 3-2). The *Recovery Plan for Rogue and Illinois Valley Vernal Pool and Wet Meadow Ecosystems* (USDI 2012a) outlines several recovery actions for Cook's lomatium related to invasive plant management:

- Manage, monitor, and restore wet meadow habitat, including noxious weed prevention programs, use of mowing, burning, or managed grazing to reduce density of nonnative vegetation, monitoring

[46] Rob Huff, Interagency Special Status Sensitive Species Program, 2017 personal communication.

management actions for effectiveness, and employing adaptive modification.

- Conduct research on prescribed burning, mowing, and native planting on introduced annual grasses, such as medusahead rye. Examine techniques such as prescribed burning, mowing, native grass and forb cultivation, and combinations of treatments.
- Refine research on appropriate grazing practices that reduce grass cover to enable germination of listed plants and reduce competition with introduced grasses and accumulated thatch.

Botanists have observed an increasing abundance of medusahead rye over time within Cook's lomatium populations and critical habitat (Giles et al. 2016). Two Oregon A-rated noxious weeds, yellowtuft and barbed goatgrass, are located within or adjacent to critical habitat and are the targets of multi-agency collaborative eradication efforts. Bull thistle, Armenian blackberry, Scotch broom, and meadow knapweed have also been documented within Cook's lomatium critical habitat.

The Medford District includes potential habitat for the federally listed plant, large-flowered woolly meadow-foam (*Limnanthes pumila* ssp. *grandiflora*), which is known to occur in Jackson County, Oregon. All known potential habitat has been surveyed on Medford District, but the species has never been observed.

A fourth federally listed plant, McDonald's rockcress (*Arabis macdonaldiana*), was previously believed to occur in nearby Curry County, Oregon, and Del Norte and Siskiyou County, California; however, recent taxonomic and genetic studies suggest that the species occurs only in Mendocino County, California, and does not occur in southwest Oregon (USDI 2013c).

Treatments Planned Related to the Issues

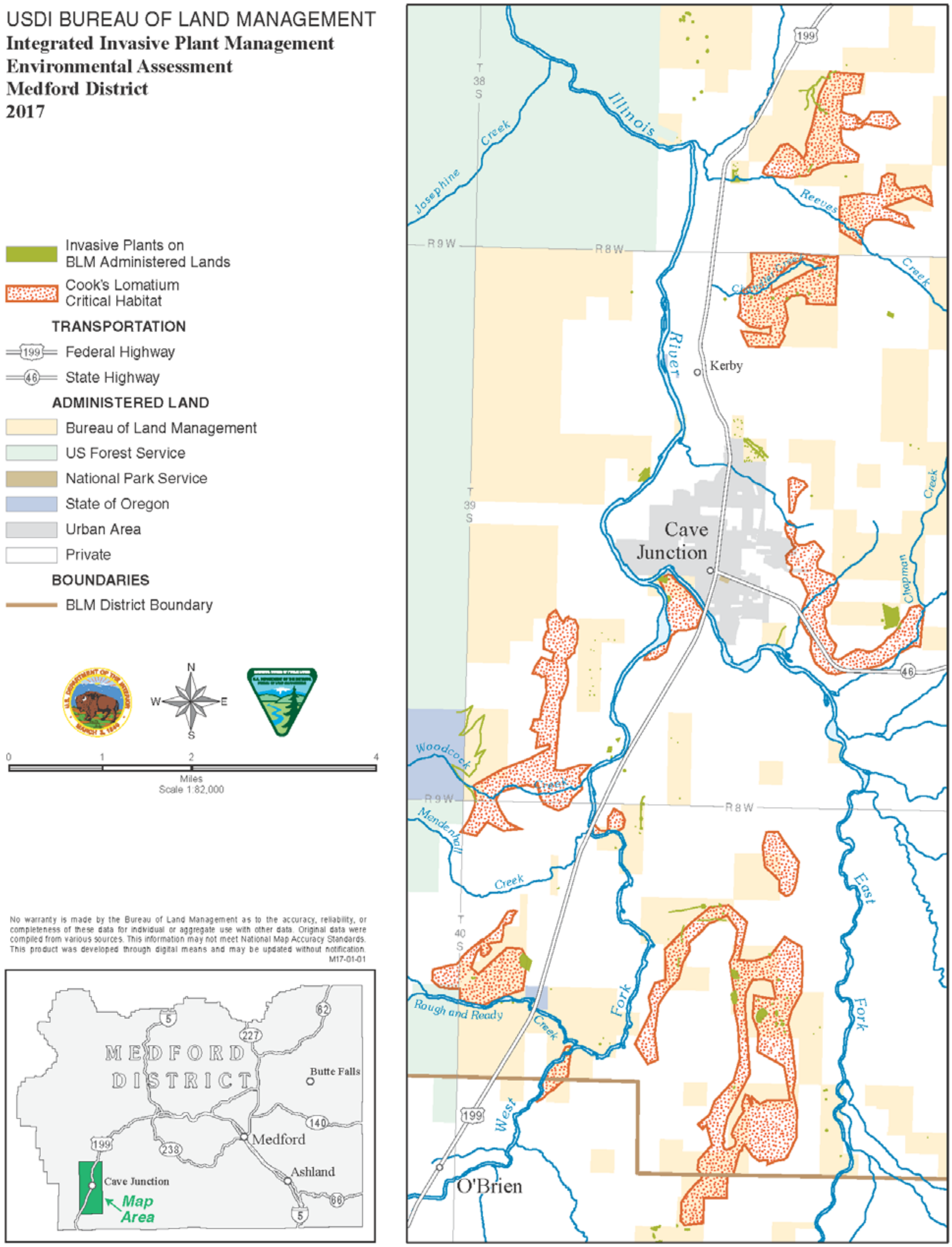
No Action Alternative

The BLM would use manual, mechanical, biocontrol, competitive seeding and planting, and herbicide treatments to treat noxious weeds in habitat for Special Status plants and fungi. Approved herbicides would include dicamba, glyphosate, picloram, and 2,4-D, although the BLM does not anticipate using picloram in Special Status plant and fungi habitat. Most herbicide applications would be spot treatments using backpack sprayers, although off highway vehicles could be used to spot spray up to an estimated 5 percent of infested acres. Broadcast treatments would be used on no more than one percent of infested acres. Limitations of the four available herbicides would constrain the ability to meet treatment objectives at some sites (see Figure 2-1, *Prioritizing Areas for Treatments*). Approximately 45 acres of infested Special Status plant habitat would not be treated under this alternative because the available herbicides would not be selective enough, other treatment methods would not be effective, or the invasive plants are not designated noxious weeds. Because the methods available under this alternative would be only 60 percent effective, retreatments would be required for many sites.

Proposed Action

Under the Proposed Action, the BLM would expand treatment to all invasive plants that threaten Special Status plants and fungi and would permit the use of additional herbicides. Experimental use of two additional herbicides, fluazifop-P-butyl and *Pseudomonas fluorescens*, would be allowed on up to 15 acres each per Field Office, including in Special Status plant and fungi habitat. Because some of the herbicides under this alternative would be more selective, they could be broadcast sprayed with booms on an estimated 5 percent of infested acres. Targeted grazing and spot treatment with propane torches would also be permitted. Because treatment objectives would be more likely to be achieved under this expanded integrated management approach, all 417 acres of Category I terrestrial infestations and other infestations documented in the future could be treated.

***Figure 3-2**. Invasive Plant Infestations in Cook's Lomatium Habitat*



Alternative 3

In addition to the treatments described under the Proposed Action, Alternative 3 would also include the treatment of submerged and floating invasive plant species with herbicides or manual removal. None of the District's Special Status plant sites are known to be infested by any Category I or II aquatic invasive plants; therefore, the BLM does not currently anticipate any treatments in their habitat. There are two Special Status aquatic plants on the district: *Wolffia borealis* (dotted water-meal) and *Utricularia minor* (lesser bladderwort); treatments of Category III (spread from other sites) or Category IV (new invaders) sites may be in Special Status aquatic plant habitat.

The District has not tested the effectiveness of manual treatments for water primrose or parrotsfeather, the two Category I aquatic invasive plants on the District. Because they reproduce vegetatively from rhizomes or creeping submerged stems, manual treatments could result in broken stem fragments that could float downstream and establish new infestations. Because of this possibility, the District would apply an adaptive management approach to determine the most effective treatment method, or combination of methods, that could be safely used in Special Status plant habitat. For example, broken stem fragments might not be an important consideration if manual treatments could be implemented when infestations are not hydrologically connected to the stream, such as during summer low-flow periods.

Protection Measures

Standard Operating Procedures and Mitigation Measures for All Alternatives Relevant to the Issue

Projects that have the potential to disturb Special Status plant habitat require pre-project clearances, including review for potential habitat and surveys in suitable habitat (USDI 2008b). The potential for adverse effects to Special Status plants would be further reduced for the alternatives by implementing existing Standard Operating Procedures and Mitigation Measures (see Appendix A), including:

- Minimize use of ground-disturbing equipment near Special Status species of concern.
- Consider impacts to Special Status species when designing herbicide treatment programs.
- Use a selective herbicide and a wick or backpack sprayer to minimize risk to Special Status plants.
- Avoid treating vegetation during time-sensitive periods (e.g., susceptible life stages) for Special Status species in areas to be treated.
- When necessary to protect Special Status plant species, implement Conservation Measures for plants presented in the 2007 *Vegetation Treatments on Bureau of Land Management Lands in 17 Western States* and the 2016 *Vegetation Treatments Using Aminopyralid, Fluroxypyr, and Rimsulfuron* Programmatic Biological Assessments.

For herbicide treatments within or immediately adjacent to federally listed plant sites, follow Project Design Criteria outlined in the *Biological Assessment of activities that may affect the federally listed plant species, Gentner's Fritillary, Cook's Lomatium, and Large-flowered Woolly Meadowfoam, on Bureau of Land Management, Medford District and Cascade-Siskiyou National Monument* (USDI 2013b), and the best management practices for Fritillaria Management Areas recommended in the *Conservation Agreement for Gentner's Fritillary (Fritillaria gentneri) in Southwestern Oregon*:

- Ensure that work is implemented or supervised by a botanist who is a BLM-certified pesticide applicator.
- Treat primarily during the dormant season using spot treatments of post-emergent herbicides applied by backpack sprayers, spray bottles, wicks, and other selective equipment and techniques (e.g., cut-stump, hack-and-squirt, direct inject).
- Use post-emergent herbicides during the growing season only if dormant season treatments are not effective and when there is no measurable wind.
- Within the treatment site, prior to treatment, visibly mark all listed plants or patches with pin flags or

similar markers.

- Use only spot treatments (no broadcast treatments).
- Use selective equipment (backpack sprayers, hand bottles, wicks) and techniques (cut-stump, hack-and-squirt, direct inject, foliar spot spray).
- In the case of foliar spot treatments, use spray shields or cover listed plants with tarps or buckets during application.
- Use pre-emergent herbicides only in controlled experiments coordinated with U.S. Fish and Wildlife Service until effects are fully known and full-scale implementation is approved by U.S. Fish and Wildlife Service.
- Monitor the effects of all herbicide use for a period of two growing seasons and report findings annually to U.S. Fish and Wildlife Service.
- Mix and store herbicides in secondary containment, away from listed plant populations.

Project Design Features Adopted for the Proposed Action and Alternative 3

The following additional Project Design Features would further reduce effects to Special Status plants:

- In Gentner's fritillary and Cook's lomatium habitat, follow all Project Design Criteria outlined in the *Biological Assessment of activities that may affect the federally listed plant species, Gentner's Fritillary, Cook's Lomatium, and Large-flowered Woolly Meadowfoam, on Bureau of Land Management, Medford District and Cascade-Siskiyou National Monument* (USDI 2013b) (see Appendix A).
- Follow the Bureau Sensitive Species Treatment Decision flowchart (Figure 3-1, earlier in this Chapter) when working in potential habitat for Bureau Sensitive plants.
- Restrict mowing within Special Status plant habitat to the dormant season, unless mowing during the growing season has demonstrated beneficial effects on the Special Status species and its habitat.
- Before using targeted grazing within federally listed plant sites, develop grazing prescriptions and conservation measures in cooperation with the U.S. Fish and Wildlife Service.
- Ensure that seeding and planting prescriptions for Special Status plant habitats use only local genetically appropriate native plant materials from species that are typical components of the Special Status species' habitat, and planted at rates and patterns that reflect typical relative abundance and distribution.
- Do not apply herbicides within Special Status fungi sites if sporocarps are visible, unless protective measures can be implemented to prevent herbicide exposure.
- If broadcast herbicide treatments are deemed necessary within federally listed plant sites, develop prescriptions and conservation measures in cooperation with the U.S. Fish and Wildlife Service.
- To ensure that *Pseudomonas fluorescens* would not affect federally listed plants, do not locate demonstration plots within Fritillaria Management Areas, Cook's lomatium critical habitat, or within 1,500 feet of any known sites.

Environmental Consequences

Direct and Indirect Effects

Individual Special Status plants could be injured or killed by invasive plant treatments, but adverse effects to populations would be minor because implementation of Protection Measures (see Appendix A) would reduce effects to below levels that could adversely affect populations or trend species toward listing. Annual Treatment Plan reviews would provide additional opportunities to develop site-specific treatment prescriptions and prescribe Protection Measures that would further reduce adverse effects to Special Status plants and fungi. Treatments would cause the loss of individual plants but would improve habitat conditions and provide long-term benefits to the population.

Common to All Alternatives

Manual and mechanical treatments in Special Status plant sites could cause mortality, damage to above- and below-ground plant parts, reduced vigor, and reduced seed or spore production. Habitat changes, such as soil disturbance, compaction, and stimulation of dormant weed seeds could also reduce the vigor and reproductive output of Special Status plants. For selective treatments (such as hand pulling and string trimmers) that target individual invasive plants or patches, these effects would be minor, potentially affecting individual Special Status plants, but not entire populations. In contrast, because mowing is not selective, it could damage all plants within a population, with potential long-term consequences for reproduction and population demographics if mowing prevents annual seed or spore production. These effects would be compounded if mowing treatments occurred over consecutive years. Therefore, mowing would not be a preferred treatment type in most Special Status plant habitat; but, if used, mowing would be restricted to the dormant season (when plants are not present) unless growing season mowing has demonstrated beneficial effects.

Hand-pulling invasive plants within Special Status fungi sites would disturb surface soils, dislodging or breaking mycelia near the soil surface that are important for nutrient and water absorption; however, this would represent only a fraction of the total volume of soil and roots occupied by the fungus, resulting in only minor effects. Similarly, aboveground sporocarps (the fruiting body of the fungus that produced spores for reproduction) could be trampled or dislodged if hand pulling occurred during the time that fungi are producing fruit bodies (mushrooms). However, not all sporocarps would be damaged, allowing for some spore production, and damage would not occur in consecutive fruiting windows, meaning these effects would be local, short-term, and minor. String trimmers could also damage sporocarps, with effects equivalent to hand-pulling treatments; but string trimmers would not affect fungi mycelia. Mowing is not a practical treatment in Special Status fungi sites given the inaccessibility of these habitats to mowers and the small size of invasive plant infestations; thus, there would be no effects from this treatment type.

Biological control agents are tested for host specificity and approved by the U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS) prior to release in the United States. Biocontrols suspected of being capable of adversely affecting non-target organisms are not approved for release. In some instances, approved biocontrols have attacked closely related non-target plant species; however, none of the invasive plants targeted for biocontrol treatments on the Medford District are in the same genus as any documented or suspected Special Status plants. Consequently, the effects of biocontrols on Special Status plants would be negligible. Approved biocontrols would not attack fungi or affect Special Status fungi habitat.

Competitive seeding and planting would disturb soil and could damage above- and below-ground plant parts. Establishment of additional plant cover could also occupy niche space important to Special Status plants or exert competitive pressure that could reduce vigor and reproduction. The decision to use competitive seeding or planting within Special Status species' habitat would weigh the benefits of reducing invasive plant cover against the risks of unintended consequences. To reduce effects to minor or negligible, seeding and planting prescriptions for Special Status plant habitats would use only local genetically appropriate native plant materials from species that are typical components of the Special Status species' habitat, and those materials would be planted at rates and patterns that reflect typical relative abundance and distribution for that habitat. The BLM does not anticipate a need for competitive seeding and planting in Special Status fungi sites; thus, BLM does not anticipate any effects from this treatment type.

Where herbicide impacts to Special Status plants are necessary in order to achieve long-term benefits, site-specific prescriptions, buffers, selective treatment methods, and other protective measures would be implemented to ensure that impacts would not exceed loss of a few individuals or risk long-term viability of the population. For example, treatments could be timed to take advantage of differing phenology between invasive plants and Special Status plants, such as spraying actively growing yellowtuft with 2,4-D while the rare plant, Howell's mariposa-lily *(Calochortus howellii)*, is dormant and not receptive to herbicide uptake.

Under all alternatives, dicamba, glyphosate, and 2,4-D would be available to treat noxious weeds. The Forest Service Risk Assessment ratings and discussions for susceptible plants (Appendix C, *Herbicide Risk Assessment Summaries*) are assumed to represent Special Status plants. All three herbicides present a high risk of damage to Special Status Plants under direct spray scenarios, but present no risk under surface runoff scenarios. 2,4-D presents low risk with low boom applications and zero risk with backpack direct foliar application for off-site drift scenarios. Risk of off-site drift from low booms is low for dicamba and moderate for glyphosate at typical rates. Risk of off-site drift from backpack direct foliar applications is low for glyphosate at typical rates, but was not evaluated for dicamba (although the risk can be reasonably assumed to be lower than for drift from low booms). The BLM would use backpacks to directly spray foliage on over 90 percent of herbicide treatments, so the overall risk of impacts from drift would be low.

Glyphosate is not selective and could kill any of the plant species in Table 3-4 when applied to plant parts receptive to herbicide uptake. Both 2,4-D and dicamba target broadleaf plants and could injure or kill Special Status broadleaf plants, but both chemicals could be safely used around rare monocots in the Cyperaceae and Poaceae family. Dicamba, unlike glyphosate, can injure or kill broadleaf plants when it is absorbed through the soil by plant roots and other receptive belowground structures. 2,4-D can also be absorbed from soil and cause injury to susceptible and actively growing broadleaf plants, although it has a very short half-life (10 days) and does not persist.

Because most of the District's Special Status non-vascular plant species grow in habitats that are not prone to invasion by invasive plants, herbicide use is currently anticipated in only 2 of the 32 known non-vascular plant sites. The exception is two sites of *Schistidium cinclidodonteum* (a moss) growing on rocks in Oregon white oak woodlands infested by yellow starthistle in the Little Butte Creek watershed. Under all alternatives, these infestations could be spot treated with dicamba, glyphosate, or 2,4-D using backpack sprayers. The effects of these herbicides on Special Status non-vascular plants have not been studied; however, in vitro and field studies have demonstrated that some bryophytes and lichens are injured or killed by glyphosate (McMullin et al. 2012, Newmaster et al. 1999, Vannini et al. 2015). The BLM anticipates that individuals of *S. cinclidodonteum* could also be killed by application of glyphosate, dicamba, and 2,4-D, but expects that implementation of Protection Measures would prevent adverse effects more substantial than this.

The effects of dicamba, glyphosate, and 2,4-D have not been specifically studied for any of the 11 Special Status fungi documented or suspected on the District. Fungicidal effects have been observed in some laboratory studies of glyphosate (Busse et al. 2001, Morjan et al. 2002) and 2,4-D (Estok et al. 1989) on other fungi species grown in vitro or on soil-free media. However, studies of glyphosate effects on fungi growing in greenhouse soil or in field conditions have shown negligible or transitory effects of no ecological significance (Busse et al. 2001, Houston et al. 1998, Wardle and Parkinson 1990, Ratcliff et al. 2006). Wardle and Parkinson (1990) also concluded that 2,4-D had "no significant effect on soil microbial biomass or activity when applied at typical field rates." The discrepancy between in vitro studies and greenhouse or field studies suggests that direct exposure to high rates of some herbicides may be toxic to some fungi, but at typical field treatment rates and scenarios, where fungi are buffered by forest litter and soil, the effects are minor and short-term or negligible.

Furthermore, the District's Special Status fungi are ectomycorrhizal, colonizing feeder roots of conifers in the Pinaceae family, primarily in late successional forests that are not prone to infestation by invasive plants. For example, only 2 of the District's 30 known Special Status fungi sites are adjacent to noxious weed infestations (Armenian blackberry and tansy ragwort), each composed of only a single plant, occupying less than 0.005 net acres. If these infestations were spot treated with dicamba, glyphosate, or 2,4-D using backpack sprayers, most of the herbicide would be intercepted by plant foliage. Drips or overspray would land on forest litter, resulting in negligible amounts of herbicide reaching forest soil where it could contact mycelia growing in the upper soil horizon. Given that these fungi may have extensive belowground mycelial networks (Cushman et al. 2013), occupying a large volume of soil and roots, the effects of low-rate and low-volume herbicide treatments would be negligible. Herbicide treatment timing could overlap the fruiting windows of several Special Status fungi species, potentially exposing sporocarps to herbicides. Given that the effects of dicamba, glyphosate, and 2,4-D on sporocarps (e.g., mushrooms) are unknown, herbicides would not be applied within Special Status fungi sites if sporocarps were visible, unless protective measures can be implemented to prevent herbicide exposure.

The effects of invasive plants on the District's Special Status lichens, liverworts, mosses, and fungi would be negligible under all alternatives because sites of these species on the Medford District are nearly free of invasive plants and their habitats are not prone to invasion. Habitat for the lichen, *Lobaria linita*, is not currently threatened by invasive plants (Rolle 2015), and sites of the lichen, *Leptogium cyanescens*, are not infested by invasive plants according to NISIMS. The District's Special Status liverworts occur on rocks, tree trunks, and fens, none of which are infested by invasive plants. The District's Special Status moss sites also grow on rocks, rock outcrops, and cliffs that are not suitable habitat for most invasive plants. A Conservation Assessment for Special Status fungi in Oregon and Washington (Cushman et al. 2013) addresses threats to these species, but does not mention invasive plants.

No Action Alternative

Picloram could also be used to treat noxious weeds under the No Action Alternative. Although the BLM would not prescribe the use of picloram in Special Status plant or fungi sites, these species could be injured or killed from herbicide movement from nearby treatments. Forest Service Risk Assessments show a high risk of damage from surface runoff and off-site drift from low booms and a moderate risk from off-site drift during backpack directed foliar treatments. However, the potential for either boom or backpack sprayer scenarios to occur would be low because picloram would only be used on approximately 330 acres over the life of the plan. The BLM anticipates that not more than 1 percent of those applications would be done using booms. Standard Operating Procedures and Protection Measures prescribed during the Annual Treatment Plan review would further reduce effects to negligible to minor levels for both boom and backpack treatments.

Because herbicide treatments under the No Action Alternative would be only 60 percent effective, infestations within Special Status plant sites would often need to be sprayed multiple times, increasing the frequency and duration of disturbance and its effects. Although direct effects of each treatment would be minor because of Protection Measures, when combined with the indirect effects of loss of non-target vegetation or shifts in species composition, the overall effects could become major over the life of this plan for some Special Status plant sites.

The restriction to treat only noxious weeds and the limited effectiveness and selectivity of the four herbicides available under the No Action Alternative would constrain the BLM's ability to meet treatment objectives at some of the Medford District's 344 Special Status vascular plant sites affected by Category I infestations (416 acres). Consequently, the adverse effects of invasive plants would continue or increase over the life of the plan for some Special Status plant sites. Untreated invasive plant infestations would continue to spread and new infestations would occupy Special Status plant sites. Through a variety of mechanisms, invasive plants can dominate habitats and reduce the ability of native plants—particularly many rare plant species—to compete for space and other resources. See Mitchell et al. (2006) for a comprehensive summary of plant invasion mechanisms, many of which take place within the Medford District's Special Status plant occurrences and which are likely to persist and increase under the No Action Alternative.

The invasive annual grass, medusahead rye presents a good example of several invasion and competition mechanisms that allow it to outperform and impact Special Status plants: (1) germination in the fall, successful overwintering, followed by quick growth in the spring; (2) accumulating biomass, leaf area, and root length faster than native plants (Young and Mangold 2008); (3) producing persistent, decay-resistant litter that accumulates into a thick mat, forming a physical barrier that impedes growth and prevents establishment of native plant seedlings; but, in contrast, medusahead rye seedlings successfully establish and grow through the litter mat. On the Medford District, medusahead rye has recently started forming dense stands in vernally wet meadows that are habitat for Cook's lomatium and slender meadow-foam (*Limnanthes alba* ssp. *gracilis)*, both southwestern Oregon endemics growing in specialized and spatially limited suitable habitat (Figure 3-2). Similarly, medusahead rye has recently increased in abundance in vernal pool and mound habitat on Table Rocks ACEC (Gray and Bahm 2016), where the invasive grass threatens other southern Oregon endemics, including dwarf meadow-foam *(Limnanthes pumila* ssp. *pumila)*—known from only two populations—and southern Oregon buttercup *(Ranunculus austrooreganus)*.

Populations of the Bureau Sensitive plant, Siskiyou mariposa-lily *(Calochortus persistens)*, are heavily infested by dyer's woad in northern California. Although not yet present on the Medford District, similar invasive plant infestations in the single known extant Siskiyou mariposa-lily site on the Medford District and in Oregon could result in extirpation of the population, which comprises only five reproduction-limited plants within approximately 25 square feet. Although Amsberry and Meinke (2016) did not observe effects of dyer's woad competition or allelopathy on Siskiyou mariposa-lily germination, emergence, or growth, in a laboratory and greenhouse study, the authors could not conclude that those effects were absent and, therefore, recommended treatment in and near Siskiyou mariposa-lily populations.

Some of the other most notable examples of invasive plants threatening local endemics and globally rare Special Status plants on the Medford District include yellowtuft in sites of Howell's mariposa-lily *(Calochortus howellii)* and a host of other serpentine endemics; medusahead rye and cheatgrass in common jewelflower *(Streptanthus glandulosus* ssp. *josephinensis)* sites; and rush skeletonweed in Oregon's only population of Hickman's checkerbloom *(Sidalcea hickmanii* spp. *petraea)*. In each of these examples, the BLM may be unsuccessful in achieving long-term control of these invasive plants under the No Action Alternative because the four herbicides BLM is currently authorized to use are not effective for these invasive plant species or not selective enough to use safely around the Special Status plants. Consequently, uncontrolled invasive plants could cause major adverse effects to populations, potentially trending species toward listing.

Proposed Action

Under the Proposed Action, the BLM anticipates using manual treatments on 20-25 percent fewer acres of Special Status plant habitat compared to the No Action Alternative because of the availability of more effective and selective herbicides. Only the spatial extent, but not the types and intensity of effects of manual treatment, would differ from the No Action Alternative.

Targeted grazing with cows and goats would damage Special Status plants if they were eaten or trampled. Cows and goats could damage all plants within a grazing area, with potential long-term consequences for reproduction and population demographics if the damage prevents annual seed or spore production. These effects would be compounded if grazing occurred over consecutive years. Therefore, grazing would not be a preferred treatment type in most Special Status plant habitat; but, if used, grazing would be restricted to the dormant season unless growing season grazing has demonstrated beneficial effects for the Special Status plant and its habitat. For example, Recovery Action 4.5 in the *Recovery Plan for Rogue and Illinois Valley Vernal Pool and Wet Meadow Ecosystems* (USDI 2012a) calls for researching and refining appropriate grazing practices to improve habitat for several Special Status vascular plant species, including Cook's lomatium. The BLM would prescribe site-specific Protection Measures during review of Annual Treatment Plans. The District's Special Status fungi do not occur in habitats where targeted grazing is a viable treatment; thus, there would be no effects.

The BLM would use propane torches to selectively spot treat invasive plants within Special Status plant habitat. Special Status plants growing in wet meadows, fens, cobble bars, and other rocky habitats would be at greatest risk of exposure to this treatment. Plants exposed to high heat could be damaged or killed. Belowground perennial plant parts would be protected, allowing plants to regrow, but annual plants with less robust root structures would be killed. To ensure that effects to Special Status species would be minor or below, the BLM would prescribe site-specific Protection Measures during review of Annual Treatment Plans and could include actions such as covering Special Status plants with buckets or otherwise shielding plants from heat. The BLM does not anticipate a need for propane torches in Special Status fungi habitat; thus, there would be no effects.

Under the Proposed Action, the BLM would increase overall herbicide use from approximately 60 percent to 75 percent of treatment acres, compared to the No Action Alternative, with a similar increase expected in Special Status plant habitat. However, glyphosate and 2,4-D would be nearly replaced by more selective herbicides (e.g., aminopyralid, imazapic) that would have fewer impacts to Special Status plants and habitat. The total estimated acres on which BLM would use glyphosate and 2,4-D would decrease by 72 percent and 75 percent, respectively, with similar or greater decreases expected in Special Status plant habitat. Of the additional terrestrial herbicides available under the Proposed Action, all except for imazapic and fluazifop-P-butyl present a high risk of damage to terrestrial Special Status plants under direct spray scenarios. The risk from imazapic is low at typical rates and the risk from fluazifop-P-butyl is moderate. Fluridone is an aquatic herbicide; therefore, its risk to terrestrial plants was not evaluated. Certain herbicides target specific types of plants (see Table 2-9, *Herbicide Characteristics*), so adverse direct effects to Special Status plants would depend upon their susceptibility to that herbicide, and those effects are described below, grouped by mechanism of herbicide action.

ALS-inhibitors: The ALS-inhibiting herbicides, chlorsulfuron, imazapyr, metsulfuron methyl, rimsulfuron, and sulfometuron methyl are highly active as both pre- and post-emergents and can injure or kill Special Status plants at low application rates. Off-site movement of small concentrations of these herbicides can result in damage to non-target plants, even at concentrations lower than those reportedly required to kill target invasive plants (Fletcher et al. 1996). Chlorsulfuron may reduce seed production of some crops, such as cherries, if exposed to the herbicide at critical stages of development (Fletcher et al. 1993). This study suggests that fruit development of Special Status plants may also be reduced, which could reduce population viability. Chlorsulfuron mixed with 2,4-D would be a preferred treatment on thistles, mustards, houndstongue, and toadflax in rangelands and grasslands, but not when these sites are occupied by Special Status species, such as *Calochortus* species (mariposa lilies) or Bellinger's meadow-foam (*Limnanthes floccosa* ssp. *bellingeriana*), resulting in negligible effects to these species. Metsulfuron methyl is known to harm commercial onion crops of the Liliaceae family, suggesting that the 12 Special Status plants in the Liliaceae family documented on the Medford District could be at risk from this herbicide. Metsulfuron methyl would not be a preferred treatment except when used as a mix with aminopyralid to control yellowtuft, which occurs only in the Illinois Valley. Because yellowtuft has infested habitat for Howell's mariposa-lily *(Calochortus howellii)*, a Special Status plant in the Liliaceae family, the BLM would implement Protection Measures or choose other treatment options in these sites; thus effects would be minor or negligible. Rimsulfuron would be one of the preferred treatments for invasive annual grasses in rangelands, grasslands, and open woodlands; however, the BLM would not prescribe this herbicide in sites that are occupied by Special Status plants, unless Protection Measures could be implemented to reduce effects to minor or below. Effects of imazapyr and sulfometuron methyl on Special Status plants would be negligible because these herbicides would not be preferred treatments for any invasive plant groups (as described in the Tables 2-13 and 2-15) and the BLM would not prescribe these herbicides in Special Status plant habitat if treatment objectives could be met with other methods. Overall adverse effects from ALS-inhibitors would not exceed minor because treatments would be selected to avoid effects that are more substantial.

Unlike the previously discussed ALS-inhibitors, which would not be used in rare plant habitat when treatment objectives could be met using other methods, imazapic is an ALS-inhibitor that would be preferred for treating invasive annual grasses in Special Status plant habitat. The risk to Special Status plants from direct imazapic spray is low at typical application rates and moderate at high rates. Lists of target plants on imazapic product labels suggest that annual dicots are susceptible, particularly at high rates, but perennial dicots are more tolerant. This is consistent with studies that have observed tolerance in perennial forbs (e.g., Bahm and Barnes 2011), but more variable responses have occurred in annual forbs, depending on rate and site conditions (e.g., Sheley et al. 2007). In a field trial examining the response of the perennial forb, Cook's lomatium, and its habitat in the Illinois Valley to a low rate of imazapic applied in November, Giles et al. (2016) observed no damage to Cook's lomatium in the first or second growing season after treatment. Many of the habitats infested by invasive annual grasses where imazapic would be a preferred treatment are also occupied by annual Special Status forbs, such as Oregon fairypoppy *(Meconella oregana)* and *Limnanthes* (meadowfoam) species. Because the effects of imazapic on these species are unknown, the BLM would implement protective measures and conduct small field trials to clarify effects prior to operational-scale treatments in these sites. The BLM would not prescribe imazapic in these habitats if treatments could not be applied without having unintended adverse effects on annual Special Status forbs.

Synthetic auxins: Synthetic auxins regulate plant growth and include aminopyralid, clopyralid, fluroxypyr, and triclopyr. Risk Assessments indicate that each of these herbicides present a high risk of damage to Special Status plants under direct spray scenarios. For clopyralid and triclopyr, the risk of plant damage from off-site drift ranges from low to moderate (depending on rate) for low boom applications and zero risk for backpack foliar spraying. Aminopyralid and fluroxypyr present a low risk of damage from off-site drift. Aminopyralid, clopyralid, and fluroxypyr present zero risk of damage from surface runoff, but the risk is low to moderate for triclopyr, depending on rate. Aminopyralid would be the most extensively used herbicide on the District (25 percent of treatment acres). Aminopyralid is selective, exhibiting greatest activity in the Apiaceae, Asteraceae, Fabaceae, Onagraceae, and Rosaceae families, meaning that at least 13 Special Status vascular plants could be highly susceptible to this herbicide, but many others would be tolerant, particularly at low application rates. Clopyralid has little effect on grasses and members of some dicot families, including Brassicaceae, so effects to Special Status plants in these groups would be negligible. However, Special Status plants in the Fabaceae family, such as California milk-vetch *(Astragalus californicus)*, Gambel milk-vetch *(A. gambelianus)*, stipuled trefoil *(Lotus stipularis)*, and Western necklacepod *(Sophora leachiana)* would be highly susceptible. Triclopyr is selective for broadleaf plants and would be a preferred treatment for several invasive plant groups, including in Special Status plant habitats. Treatment of woody plants would involve highly selective techniques, such as hack-and-squirt and cut-stump[47], meaning Special Status plants would not be exposed and, thus, would not be affected by these treatments. However, susceptible Special Status plants, including non-vascular plants, could be harmed if triclopyr were applied as a foliar spray. Newmaster et al. (1999) observed that aerial applications of triclopyr reduced abundance and richness of lichens and bryophytes in boreal mixed hardwood-conifer forests. Aerial herbicide applications are not permitted on the Medford District, but similar effects are reasonably assumed if lichens and bryophytes were exposed to triclopyr sprayed from backpack sprayers or hydraulic pumps. The BLM would not prescribe aminopyralid, clopyralid, or triclopyr in habitats occupied by susceptible Special Status plants, unless the BLM could implement protective measures that ensure effects would be minor or below. Effects of fluroxypyr on Special Status plants would be negligible because this herbicide would not be a preferred treatment for any invasive plant group and the BLM would not prescribe its use in Special Status plant habitat.

Other herbicides: Two additional herbicides could be used on the Medford District for invasive plant control on an experimental basis. Fluazifop-P-butyl inhibits fatty acid synthesis by blocking activity of the ACCase enzyme. The ACCase enzyme of many, but not all, grass species is more sensitive than in broadleaf plants, which are tolerant of fluazifop-P-butyl. Thus, fluazifop-P-butyl could be used to treat invasive grasses, such as medusahead rye and barbed goatgrass, with negligible effects to Special Status dicot plants. For example, Giles et al. (2016) demonstrated that fluazifop-P-butyl could be applied over Cook's lomatium during the growing season, with no effects on survivorship within the first two years after treatment. Experiments with this herbicide would be designed to test effects where invasive annual grasses are dominant, desirable native grasses are of minor importance, and the Special Status grass, *Poa rhizomata*, does not occur; therefore, there would be no effects to Special Status grasses. The scale of adverse or beneficial effects would be limited because experimental use of this herbicide could not exceed 15 acres per Field Office, for a total of 45 acres across the District.

The EPA recently registered the microbial pesticide *Pseudomonas fluorescens*, strain D7 (under the product name, D7), for control of cheatgrass, jointed goatgrass, and medusahead rye in rangelands (USEPA 2014). Subsequently, the BLM issued Information Bulletin No. 2015-082, *General Use of Pseudomonas fluorescens strain D7 for Research and Demonstration Field Work* (USDI 2015b), which permitted BLM Field Offices to treat demonstration plots with D7, following appropriate environmental review. In 2015, the BLM Boise District, Owyhee Field Office, analyzed the

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[47] Hack and squirt is an herbicide application method for woody species in which a hatchet is used to cut into the bark and herbicide applied to the cut. In cut-stump treatments, herbicide is applied to the cut surface after a whole tree or limb is removed.

effects of D7 in the *Pseudomonas fluorescens strain D7 Field Trial Environmental Assessment* (DOI-BLM-ID-B030-2015-0017-EA, USDI 2015c). The effects on vegetation discussed in that analysis are summarized below and are equivalent to the anticipated effects if the Medford District were to use D7 to control cheatgrass, medusahead, or jointed goatgrass in rangelands.

D7 specifically targets cheatgrass, medusahead, and jointed goatgrass; therefore, no direct effect to other vegetation [including Special Status plants] is expected. In a growth chamber study, D7 meaningfully reduced growth on two of three tested cheatgrass accessions, but not on other species tested (Kennedy et al. 2001). D7 produces a suppressive compound in the intracellular spaces outside the cell wall, which inhibits root cell elongation (Gealy et al. 1996). The compound is of a specific shape such that it inhibits certain lipid combinations in the root cell membrane; these combinations are specific to cheatgrass, medusahead, and jointed goatgrass. The bacterium does not enter the cell and is not mobile in the plant vascular system. The bacterium injures only germinating seeds and seedlings, but does not injure mature plants. This compound decomposes readily and does not persist in the soil or the soil solution (Gurusiddaiah et al. 1994).

To ensure that *Pseudomonas fluorescens* would not affect the federally listed plants, Gentner's fritillary and Cook's lomatium, demonstration plots would not be located within Fritillaria Management Areas, Cook's lomatium critical habitat, or within 1,500 feet of any known sites.

Gentner's fritillary and Cook's lomatium plants grown in cultivation could be injured or killed during greenhouse trials for pre-emergent herbicides available under the Proposed Action. The highest priority herbicides for trials would be aminopyralid, fluazifop-P-butyl, and imazapic. The collection and use of Gentner's fritillary bulbs and Cook's lomatium seeds for cultivation and research is permitted under U.S. Fish and Wildlife Service Permit #054395-3, issued to the Medford District.

As described under the *Common to All Alternatives* section, the District's Special Status fungi are ectomycorrhizal, colonizing feeder roots of conifers in the Pinaceae family, primarily in late successional forests that are not prone to infestation by invasive plants. Consequently, under the Proposed Action, the BLM estimates that it would use the new herbicides in these habitats on less than 1 acre per year. Again, most of the herbicide would be intercepted by plant foliage, with negligible amounts of herbicide reaching fungi mycelia, resulting in negligible adverse effects. As with dicamba, glyphosate, and 2,4-D, the new herbicides would not be applied within Special Status fungi sites if sporocarps are visible, unless protective measures could be implemented to prevent herbicide exposure and adverse effects.

Under the Proposed Action, the expansion of treatments to all invasive plants and the availability of more herbicide active ingredients compared to the No Action Alternative could result in increased herbicide use within Special Status fungi sites, but these sites are not prone to invasion. The effects of the additional herbicides have not been specifically studied for any of the 11 Special Status fungi documented or suspected on the District. Fungicidal effects of triclopyr have been observed in a laboratory study (Estok et al. 1989). However, in a field study, Houston et al. (1998) observed no differences in fungal richness, diversity, or composition between mixed hardwood-conifer stands treated with glyphosate or triclopyr and untreated stands; although abundance was lower for two species two years post-treatment. In a greenhouse study, triclopyr, imazapyr, and sulfometuron methyl did not reduce colonization of mycorrhizal fungi in ponderosa pine, Douglas-fir, or white fir seedlings in a variety of soil types (Busse et al. 2004). In the field, herbicides do not interact with fungi in isolation; instead, the effects are influenced by litter, other organic matter, soil, and other soil microbes. Thus, as with glyphosate and 2,4-D, the herbicides available under the Proposed Action could be toxic to some fungi, but at typical field treatment rates and scenarios, the effects would be short-term and minor or negligible. Invasive annual grasses targeted by *Pseudomonas fluorescens* do not occur in Special Status fungi habitat; thus, the BLM would not use this treatment and there would be no effects on Special Status fungi in these sites.

The ability to treat all invasive plants using a more targeted, integrated, and effective management approach would result in more beneficial effects to Special Status plants compared to the No Action Alternative, although the benefits are difficult to quantify. Based on NISIMS and GeoBOB data, an estimated 180 Special Status plant sites (1,600 acres) currently known to be infested would become treatable or would have improved treatment efficacy under the Proposed Action. Studies on the effects of invasive plants on rare or endemic plant species have shown reduced reproductive potential (Moroney et al. 2011), germination and recruitment (Huenneke and Thompson 1995, Thompson 2005, Walck et al. 1999), and growth and vigor (Huenneke and Thompson 1995, Moroney et al. 2011, Walck et al. 1999). The causal mechanisms of these effects can include direct competition for space and resources, faster growth and biomass accumulation, altered soil chemistry, inhibition of soil biota, allelopathy, and accumulation of litter. The removal of invasive plants from Special Status habitat under the Proposed Action also would eliminate or reduce the intensity and duration of these mechanisms. Benefits to Special Status plants could include improved reproductive output, higher rates of recruitment, and a higher potential to colonize adjacent suitable habitat. However, for Special Status plant sites that are extensively infested or that have been infested for a long time, invasive plants could leave legacy effects, such as substantial shifts in plant community dominance, which persist after the infestations have been controlled (Corbin and D'Antonio 2012) and could continue to have adverse effects on Special Status plants.

Alternative 3

Under Alternative 3, aquatic formulations of 2,4-D, glyphosate, triclopyr, imazapyr, and fluridone would be used to control aquatic invasive plants. The effects to Special Status plants from all but fluridone are described above, under the *Common to All Alternatives* (2,4-D and glyphosate) and the *Proposed Action* (imazapyr and triclopyr) sections. Fluridone is a bleaching agent that prevents aquatic plants from synthesizing food. The BLM has not identified any currently infested sites where fluridone would be used. Fluridone would not be a preferred treatment for any Category I or II infestation, but would be preferred if Category IV infestations of South American waterweed were discovered in ponds or similar aquatic habitats that were not hydrologically connected to Special Status fish habitat. Two Special Status plants could occur in aquatic habitats: dotted water-meal (*Wolffia borealis)* and lesser bladderwort *(Utricularia minor).* Lesser bladderwort occurs in nutrient-poor aquatic sites not frequently infested by invasive plants (Neid 2006), while South American waterweed occurs in nutrient-rich sites (DiTomaso et al. 2013), so the BLM does not anticipate a need to apply fluridone in lesser bladderwort habitat. The susceptibility of either Special Status species to fluridone is not known, but the Forest Service Risk Assessment ratings (Table 3-8, *Fish and Aquatic Organisms* Issue 1) indicate a moderate risk to susceptible aquatic plants (macrophytes) from non-accidental acute fluridone exposure and the BLM assumes that this would apply to dotted water-meal and lesser bladderwort. However, as with all other aquatic herbicides, prior to applying fluridone, the BLM would survey aquatic sites for Special Status plants. If present, the BLM would prescribe other treatment methods, unless Protection Measures, such as selective application methods or timing to avoid sensitive life stages, could be implemented to reduce effects to minor or below.

Manual methods could be safely used to control aquatic invasive plants growing near Special Status aquatic plants, but those methods would be difficult or impossible to use directly within Special Status plant populations without damaging or killing individual Special Status plants. The number of individual plants affected would depend on the density of the infestation and the portion of the Special Status plant population infested. For low-density infestations, manual treatments could remove invasive plants with only minor adverse effects to Special Status plants; however, if a population were heavily infested, treatments could cause substantial adverse effects, particularly if the entire population was infested.

In the short term, there would be no effect to the District's Special Status aquatic plants because of known invasive plants, as sites of these species on the Medford District are not infested by invasive plants. If aquatic invasive plants spread into Special Status aquatic plant habitat, these invasive plants could cause adverse effects to populations, potentially trending species toward listing. There would be no effects to Special Status fungi, as they do not grow in aquatic habitats.

Other effects would remain as described under the Proposed Action.

Summary of Effects

Table 3-5. *Summary of Effects (Native Vegetation Issue 1)*

Alternative	Direct Effects	Indirect Effects
No Action Alternative	Direct effects would be adverse, including mortality and damage to aboveground and belowground plant and fungi parts. Protection Measures would prevent major adverse effects.	Beneficial effects would include higher reproductive output, rates of recruitment, and potential to colonize adjacent suitable habitat. Magnitude and duration of effects would be highly variable and dependent on species and site, but long-term major benefits would be possible. Benefits would occur on fewer acres and sites because only noxious weeds could be treated and treatment methods would be limited. Adverse effects of treatments would include soil disturbance, compaction, and stimulation of dormant weed seeds. Failure to effectively control invasive plants would result in adverse effects, which could reduce Special Status plant population viability. Adverse effects would be long-term.
Proposed Action	Direct effects would be adverse, including mortality and damage to aboveground and belowground plant and fungi parts. Protection Measures would prevent substantial adverse effects. The ability to treat all invasive plants with more effective and selective methods would result in additional acres treated in Special Status plant habitat (but not fungi), which could cause minor adverse effects at more sites and acres than the No Action Alternative.	Beneficial effects would include higher reproductive output, rates of recruitment, and potential to colonize adjacent suitable habitat. Magnitude and duration of effects would be highly variable and dependent on species and site, but long-term substantial benefits would be possible. Benefits would occur on more acres and sites because all invasive plants could be treated with more effective and targeted methods. Adverse effects of treatments would include soil disturbance, compaction, and stimulation of dormant invasive plant seeds, but the magnitude would be less than for the No Action Alternative because treatments would be more targeted and selective, resulting in less disturbance. Failure to effectively control invasive plants would result in adverse effects, but would happen less frequently because of more effective treatment methods.
Alternative 3	Direct effects from treatment methods to aquatic Special Status plants would be negligible or minor. There are currently no known aquatic Special Status plant sites with invasive plants, so there would be no effects from treatments. If treatments needed to occur in the future, they would only occur if Protection Measures could be implemented to reduce effects to negligible or minor. Other effects are as described under the Proposed Action.	Indirect effects to aquatic Special Status plants would be related to the spread of invasive plants. There are currently no known aquatic Special Status plant sites with invasive plants. Future spread could cause adverse effects to populations. Other effects are as described under the Proposed Action.

Cumulative Effects

In addition to the Medford District, other agencies and organizations have ongoing and foreseeable invasive plant management programs that, when combined with the effects of BLM's actions under each alternative, would have cumulative benefits to Special Status plants, but the magnitude of those effects would be greater for the Proposed

Action and Alternative 3 compared to the No Action Alternative. For example, since 2008, the BLM, Oregon Department of Agriculture (ODA), Rogue River-Siskiyou National Forest, The Nature Conservancy, Cultural & Ecological Enhancement Network, and others have worked together to eradicate yellowtuft from all lands in the Illinois Valley, resulting in removal, reduction, or prevention of adverse impacts to rare plants, such as Cook's lomatium (and its critical habitat) and Howell's mariposa lily, as well as at least ten other serpentine-associated species. Because of their restricted range and specialized habitat, maintaining genetic diversity, gene flow, and dispersal across all of a rare species' populations within the Illinois Valley could be critical to their long-term viability. In other words, the loss of one population due to failure to control yellowtuft could be detrimental to other nearby populations of that species. Thus, the direct and indirect benefits of the BLM's yellowtuft control treatments on serpentine-associated Special Status plant species, when added to the benefits of similar treatments on adjacent lands, could have substantial beneficial cumulative effects by preventing loss of viability and gene flow across populations and the subsequent need for Federal listing under the *Endangered Species Act* (except for Cook's lomatium, which is already listed). However, because there is a possibility that, under the No Action Alternative, yellowtuft control on BLM could take longer to achieve or may not be achieved, cumulative benefits would not occur as quickly or would not occur at all under the No Action Alternative.

Similar scenarios exist throughout the analysis area, including for the Special Status plant species associated with vernal pools and mounded prairies at the Table Rocks and Agate Desert area, including Greene's popcorn flower, Austin's popcorn-flower, dwarf meadow-foam, and winged water-starwort. In addition to beneficial effects of BLM's invasive plant management in these habitats, The Nature Conservancy also controls invasive plants in its adjacent Table Rocks Preserve and nearby Agate Desert Preserve and Whetstone Savanna Preserve. The Oregon Department of Transportation (ODOT), in cooperation with The Nature Conservancy and U.S. Fish and Wildlife Service, also control invasive plants in the nearby Vernal Pool Mitigation and Conservation Bank. These agencies are committed to the long-term management and conservation of these species and habitats, which the BLM assumes would extend at least through the life of this plan. Again, the direct and indirect benefits of the BLM's invasive plant control treatments on Special Status plant species growing in vernal pool and mounded prairie habitats, when added to the benefits of similar treatments on adjacent lands, could have substantial beneficial cumulative effects by preventing loss of viability and gene flow across populations and the subsequent need for Federal listing under the *Endangered Species Act*. Again, the magnitude of beneficial cumulative effects would be greater under the Proposed Action and Alternative 3.

As described in the analysis of direct and indirect effects, the District's invasive plant management treatments would also have negligible to minor adverse effects to Special Status species, potentially damaging or killing individual plants within a population, but not reducing population viability. The BLM assumes that the same is true for control treatments implemented by adjacent BLM Districts, Rogue River-Siskiyou National Forest, Army Corps of Engineers, ODA, ODOT, Oregon Parks and Recreation Department, The Nature Conservancy, and other organizations managing nearby Special Status plant habitat, because these organizations also apply protection measures to prevent adverse effects to Special Status plants. The BLM assumes that, except where held under conservation easement, most private landowners would not conduct invasive plant management treatments or implement measures to conserve Special Status plants or fungi. Private industrial forest landowners would conduct noxious weed control treatments, but the BLM assumes that they also would not take precautions to protect Special Status plants or fungi because they are not legally required to do so. The BLM lacks information on where treatments would occur on private lands but assumes that they would not affect the viability of populations on BLM-managed land as populations of Special Status plants tend to be somewhat isolated from each other. The cumulative loss of individuals across populations would not result in substantial effects because the viability of each population would not be affected, nor would the flow of genes across populations. Cumulative adverse effects of invasive plant management would not result in the need for Federal listing of any Special Status plant or fungi species. Cumulative adverse effects from invasive plant management would not differ among the alternatives.

Outside of the invasive plant program described in this EA, the BLM treats approximately one acre per year of noxious weeds at two former conifer seed orchards, using manual and herbicide treatments. Treatments at these orchards do not affect any Special Status plant or fungi populations because those populations do not occur there and, therefore, do not contribute to cumulative effects.

Herbicides are not used, nor are there foreseeable uses, on the Medford District for any purpose other than invasive plant management; therefore, there is no additional risk of herbicide damage to Special Status plants or fungi from BLM actions. Within the Rogue Basin, including adjacent to BLM-managed lands, unknown amounts of herbicides are used for roadside vegetation control every year by state and county transportation departments. Under those circumstances, the BLM does not consider these sites to be suitable long-term habitat for Special Status plants and fungi. Private industrial forestlands are aerially treated with herbicides adjacent to BLM-managed lands. Because these landowners have no legal responsibility to protect Special Status plants or fungi, the BLM assumes that these lands would not provide adequate habitat to maintain Special Status plants or fungi. However, the BLM has no basis for determining the magnitude of the cumulative effects.

The release of biological control agents on adjacent lands by ODA and other government agencies could have beneficial effects on the District's Special Status plants if those agents help to reduce invasive plant density across the landscape or within Special Status plant habitat. However, the BLM cannot predict the success of those agents or estimate their incremental benefit when added to the beneficial effects of the District's invasive plant management actions.

Other than invasive plant management, other ongoing or foreseeable management activities on the District could affect Special Status plants and fungi in the analysis area, including forest management, rangeland management, hazardous fuel treatments, road construction and maintenance, trail development and maintenance, mining activities, water development and maintenance, and restoration projects. Table 2-16 lists ongoing and foreseeable projects and their anticipated timeframe on the Medford District. The BLM would survey all project areas for Special Status plants and incorporate Protection Measures to ensure that projects would not adversely affect populations. Consequently, adverse effects of projects would be minor or less, which, when added to the overall beneficial direct and indirect effects of invasive plant management, would not result in cumulative adverse effects or the need for Federal listing.

The BLM would not survey project areas for Special Status fungi, and some project activities, such as timber harvesting, could adversely affect these species. However, the Resource Management Plans for Western Oregon EIS notes that a majority of rare fungi sites and habitat are in reserve land use allocations where the effects of forest management would be minimal given the type and intensity of allowable treatments (USDI 2016d:537). Combined with the negligible effects of invasive plant management treatments, cumulative adverse effects to fungi would not exceed minor under any alternative.

Other proposed or ongoing projects would have beneficial effects. Oak woodland restoration, meadow restoration, and rare plant habitat improvement would include thinning vegetation, pile burning, and broadcast burning in and adjacent to Special Status plant habitat. For example, the BLM is implementing oak woodland and savannah restoration treatments on approximately 200 acres at Table Rocks ACEC, including habitat for Special Status plants like southern Oregon buttercup and Oregon fairypoppy. The BLM is also restoring 180 acres of wet meadows and oak woodlands in French Flat ACEC, Rough & Ready ACEC, and Reeves Creek ACEC, to improve habitat for Cook's lomatium. To meet recovery objectives for Gentner's fritillary, the District also plans to manage vegetation to reduce conifer succession and litter accumulation on up to 500 acres of oak woodlands and chaparral in up to eight Fritillaria Management Areas. As with other habitat-disturbing projects, the BLM has or would survey all project areas for Special Status plants and incorporate Protection Measures to ensure that projects would not adversely affect populations. As with invasive plant management treatments, some individual rare plants could be damaged or killed from restoration project activities, but the overall long-term effects on populations would be beneficial because of improvements in habitat conditions. When combined with the overall beneficial effects of

invasive plant management, these projects would not contribute to adverse cumulative effects and, instead, are anticipated to cumulatively improve population viability for 2 to 10 years after project implementation.
As described in the *Direct and Indirect Effects* section, under the Proposed Action and Alternative 3, the BLM would have the ability to treat all invasive plants using a more targeted, integrated, and effective management approach, resulting in a greater magnitude of beneficial effects to Special Status plants than under the No Action Alternative. Consequently, when combined with the overall beneficial effects of other ongoing and foreseeable actions, as described above, the Proposed Action and Alternative 3 would have greater beneficial cumulative effects than the No Action Alternative.

There would not be any direct or indirect effects to Special Status plant or fungi species from aquatic applications under Alternative 3, so there would not be any additional cumulative effects when compared to the Proposed Action.

Native Vegetation Issue 2

How would treatment methods affect special plant communities, including those in Areas of Critical Environmental Concern (ACECs)?

Analytical Methods

The analysis area includes special plant communities within the Medford District that have been identified as having high conservation value within the Klamath Mountains and Southern Cascade ecoregions. These plant communities support a concentration of Special Status species, endemic species, or are otherwise considered rare or imperiled. Many special plant communities are referenced in the *Southwest Oregon Record of Decision and Resource Management Plan* (USDI 2016d), the *Oregon Natural Areas Plan* (OPRD 2015), and the Oregon Conservation Strategy (ODFW 2016), including late-successional conifer forests, Port-Orford cedar forests, oak woodlands and savannah, Jeffrey pine woodlands and savannah, chaparral, grasslands and meadows, vernal pool-mounded prairies, *Darlingtonia* fens, serpentine barrens, cliffs and rock outcrops, and talus slopes.

Because the Medford District has not inventoried or mapped all of its special plant communities, the BLM cannot comprehensively characterize the extent, distribution, and composition of invasive plants within all occurrences of these plant communities within the analysis area or how each occurrence would respond to invasive plant management treatments. Instead, the BLM compiled infestation information from NISIMS, botany survey reports, and vegetation monitoring data for representative examples of special plant communities for which data were available and assumed that infestations, treatments, and effects would be similar for all occurrences of those plant communities across the Medford District.

In order to focus the analysis on special plant communities that would have a measurable response to invasive plant treatments, the BLM considered the following:

- Whether invasion levels are currently, or expected in the foreseeable future to be, above the action threshold that would trigger management action,
- Whether, if treated, the community-level response would be detectable above the typical range of variability in species composition, structure, or functional attributes.

For special plant communities in which neither of the above statements is true, the BLM did not analyze the effects of invasive plant treatments in detail. Three plant community groups—grasslands, savannahs, and oak woodlands—are currently highly invaded, exceeding action thresholds (described above), and, if treated to the extent needed to control their target invasive plants, would have measurable community-level responses.

The analysis of this issue is primarily qualitative, rather than quantitative. Plant communities are complex interactions between and among species and environmental variables, making it impossible to reliably predict how site-specific community-level attributes would change in response to management. Characterizing native plant community response to invasive plant treatments requires comparative studies between invaded, non-invaded, and treated sites that examine both the impacts of the target invasive plant and the changes in community attributes following removal of the invasive plants (Andreu and Vilà 2011) and the conclusions of such studies have limited applicability outside the spatial extent (and potentially the timeframe) from which the studies were conducted. Although the BLM and its partners are conducting long-term monitoring in some special plant communities, monitoring alone is insufficient for conclusively pinpointing causal mechanisms of observed changes in population or habitat attributes (Elzinga et al. 1998:3). Furthermore, some of the treatments (particularly herbicides) under the Proposed Action and Alternative 3 have not been used within these plant communities in southwest Oregon. Consequently, the BLM currently has a limited basis from which to make site-specific effects determinations for special plant communities. Therefore, because specific community-level treatment effects are not quantifiable, the BLM conducted a qualitative analysis based on the results of relevant regional studies, general trends discussed in peer-reviewed scientific literature, and the professional experience and observations of Medford District botanists. The analysis focuses on the effects of invasive plant treatments on the following plant community attributes:

- Native plant species richness
- Native plant abundance
- Abundance of important functional groups (e.g., forbs important to pollinators, perennial bunch grasses)
- Factors that promote secondary invasion (e.g., bare soil)

The analysis focuses on community-level effects, rather than the effects on individual plants. The intensity and duration of community-level effects are described using the following categories:

Negligible: Effects on native plant community attributes would be difficult to detect and not easily distinguished from natural variability.
Minor: Effects on native plant community attributes would be measurable and distinguishable from natural variability at the treatment-area scale, but not at the community scale.
Major: Effects on native plant community attributes would be measurable and distinguishable from natural variability at the treatment-area scale and widespread enough to measure at the community scale.

Short-term: A change in a resource or its condition would last less than two growing seasons.
Long-term: A change in a resource or its condition would last for more than two growing season.

The BLM assumed that Protection Measures would reduce, but not eliminate, adverse community-level effects, but that adverse effects would decrease over time as monitoring data and study results are used to refine treatment prescriptions. As described in Chapter 2, for treatments that are new to the Medford District, for the first three to five years after the plan is implemented, the BLM would closely monitor the response of special plant communities to determine level of success in enhancing desired community attributes. The BLM anticipates some undesirable outcomes, such as reduced native plant diversity or unanticipated shifts in plant dominance. The BLM would weigh the consequences of these effects against the long-term impacts of invasive plants that would be expected in the absence of treatments. By monitoring community-level treatment effects and refining prescriptions for subsequent treatments, undesirable outcomes would decline with increasing experience. The BLM would accept short-term undesirable changes in special plant communities if treatments were expected to benefit conditions and function in the long-term. Whether treatments would be beneficial or adverse in the long-term would depend on whether they move the plant community closer or further from natural or reference conditions for that particular community.

Affected Environment

Management of Special Plant Communities

To ensure that the special management needs of certain plant communities are met, the BLM designated Areas of Critical Environmental Concern (ACECs), including Research Natural Areas (RNAs) that capture many of the District's outstanding examples of special plant communities. The *Southwest Oregon Record of Decision and Resource Management Plan* (USDI 2016d) and the *Cascade-Siskiyou National Monument Record of Decision and Resource Management Plan* (USDI 2008c) call for implementation of activities necessary to maintain, enhance, or restore relevant and important values in ACECs and RNAs. Relevant and important values include special plant communities for many of which invasive plant control is a necessary activity to ensure their maintenance and proper function. Although not a comprehensive list, Table 3-6 shows many of the District's special plant community types and the ACECs and RNAs in which their management would be emphasized, along with information on mapped invasive plant infestations.

Level of Invasion in Special Plant Communities

Extensive research and reviews have been conducted on the patterns, mechanisms, and causal factors of plant community invasion and dominance by nonnative plants. Authors frequently cite a variety of abiotic and biotic factors to explain community invasibility, including site productivity, light availability, water availability, cover of existing vegetation, plant species richness or diversity, availability of invasive plant propagules, invasive plant life history, and disturbance frequency and intensity. The relationships and interactions among variables can vary between plant communities (Williamson and Harrison 2002). Davis et al. (2000) argue that invasibility is not an inherent property of a plant community; rather, invasibility fluctuates within a community as availability of resources change over time. Increases in resource availability correlate with increases in invasion, provided that invasive plant propagules are available to capitalize on the opportunity. Resource availability can increase if existing vegetation decreases its demand for resources, which can occur when disturbance events (e.g., fire) or agents (e.g., disease, pests, and herbivores) damage vegetation. Alternatively, gross resource supply can increase from additional precipitation, nutrient inputs, or solar radiation, such as would follow loss of canopy vegetation.

Within the analysis area, oak woodlands, grasslands, and vernal pool-mounded prairies in the interior valleys and foothills are the most heavily invaded of the special plant communities, presumably because they are the most disturbed and fragmented, with the highest pressure from invasive plant propagules. At Table Rocks ACEC, these communities are heavily infested by medusahead rye, brome grasses, hedgehog dogtail grass, bulbous bluegrass, and yellow starthistle (USDI and TNC 2013). Disturbances from recreation, past grazing, and other management practices have contributed to the invasion of these communities and impacts to rare plants (Gray and Bahm 2016). Even the most outstanding examples, such as the grasslands, savannahs, and open woodlands at Round Top Butte RNA, have a conspicuous presence of invasive annual grasses, including medusahead rye, wild oats, hedgehog dogtail, and soft brome (Wineteer and Schuller 2014).

However, within the Illinois Valley, which is fragmented and disturbed by development and agriculture, special plant communities on serpentine soils appear more resistant to invasion by many nonnative species. Serpentine-influenced sites are generally considered to be less susceptible to invasion because few plants are adapted to grow in nutrient-poor soils with high magnesium to calcium ratios (Aigner and Woerly 2011, Williamson and Harrison 2002). At French Flat ACEC, Mousseaux (2004) observed that invasive plants were uncommon, but more prevalent where the serpentine soil influence was limited, such as in meadows. Botanists have observed an increasing abundance of medusahead rye in recent years within these meadows (Giles et al. 2016). Two Oregon A-rated noxious weeds, yellowtuft and barbed goatgrass, have also invaded serpentine habitats in the Illinois Valley. Both species of yellowtuft are adapted to serpentine or similar ultramafic soils and are not known to occupy other soil types (Amsberry et al. 2014). Barbed goatgrass has shown high tolerance for serpentine soils in California, where it has invaded serpentine grasslands (Aigner and Woerly 2011).

Serpentine *Darlingtonia* fens appear resistant to yellowtuft, barbed goatgrass, and other invasive plants. No invasive plants have been observed in long-term monitoring transects installed in these habitats in Woodcock Bog RNA (Schuller et al. 2010). Recently completed assessments of habitat conditions and threats in *Darlingtonia* fens within the analysis area detected no invasive plants, although slender false-brome and Armenian blackberry were observed on the edge of similar habitats nearby on the Rogue River-Siskiyou National Forest (Amsberry 2015). Even when disturbed by fire, invasive plants are not known to colonize these habitats. During 5 years of post-fire sampling, nonnative plants were not observed in eight *Darlingtonia* fens burned by the 2002 Biscuit Fire (Jules et al. 2011).

In general, on the Medford District, late successional moist conifer, mixed-conifer, and mixed-evergreen forests have low levels of invasion when canopies are relatively intact. In a vegetation survey of the 529-acre Pipe Fork RNA, Rohland et al. (2004) found only one small patch each of bull thistle, St. Johnswort, and Armenian blackberry covering less than 0.1 cumulative gross acres. The latter two species occurred in an old roadbed. Invasive plants are more abundant in these systems following disturbance (e.g., fire, timber harvesting) and where road networks are dense. In addition to bull thistle, Armenian blackberry, and St. Johnswort, Scotch broom and tansy ragwort have also invaded roadsides, forest edges, and disturbed openings of some late successional conifer forests. Likewise, following the Oregon Gulch fire within Cascade-Siskiyou National Monument in 2014, dyer's woad and yellow starthistle capitalized on disturbed openings and edges. In contrast, in a survey of North Fork Silver Creek RNA in 2003, of which 95 percent had been impacted by the Biscuit Fire of 2002, Lawrence and Kaye (2003) observed only scattered individuals of bull thistle along a roadside.

Montane evergreen chaparral communities, commonly dominated by manzanita, snowbrush ceanothus, huckleberry oak, and canyon live oak, have low levels of invasion, presumably due to their dense vegetation cover that excludes the herbaceous layer. In contrast, rosaceous chaparral in Scotch Creek RNA (within Cascade-Siskiyou National Monument), which has less evergreen cover to exclude light year-round, has invasive annual grasses in the understory, along with yellow starthistle, although its presence is more strongly associated with the adjacent grasslands (USDI 2008d:Appendix K).

BLM records of vascular plant surveys in rock outcrops and talus slopes indicate that these habitat types have low cover of invasive plants, particularly at high elevations, within conifer forests, and on north aspects. Exposed rock outcrops within open plant communities, such as grasslands, tend to have higher abundance of invasive plants, such as cheatgrass.

Table 3-6. *Special Plant Communities and their Level of Invasion*
Shaded cells indicate communities where treatment effects would be measurable at the community-scale.

Plant Community	Representative Special Management Areas	Percent of Community Infested within Representative SMAs / Primary Invasive Plants[1]
Late-successional Douglas fir, Shasta red fir, white fir, and hemlock forests	Grayback Glades RNA, Holton Creek RNA, Moon Prairie ACEC, Old Baldy RNA, Oregon Gulch RNA,	< 1% / yellow starthistle, dyer's woad, cheatgrass, Scotch broom
Port-Orford cedar forest	Grayback Glades RNA, Pipe Fork RNA, North Fork Silver Creek RNA	< 1% / Canada thistle
Brewer spruce and Alaska yellow cedar forest	Brewer Spruce RNA	0% / none documented
Baker cypress forest	Baker Cypress ACEC	0% / none documented
Jeffrey pine savannah on serpentine	Eight Dollar Mountain ACEC, French Flat ACEC, Waldo-Takilma ACEC, Woodcock Bog ACEC, West Fork Illinois River RNA	< 1% / medusahead rye, yellow starthistle, Scotch broom, meadow knapweed, bull thistle, St Johnswort, Armenian blackberry, perennial peavine

Plant Community	Representative Special Management Areas	Percent of Community Infested within Representative SMAs / Primary Invasive Plants[1]
Ponderosa pine-white oak woodland	French Flat ACEC, Round Top Butte RNA, Table Rocks ACEC	5% / medusahead rye, yellow starthistle, meadow knapweed, bull thistle, St Johnswort, Armenian blackberry
Ponderosa pine-black oak woodland	Table Rocks ACEC	5% / medusahead rye, yellow starthistle
Oregon white oak savannah and woodland	Dakubetede ACEC, Oregon Gulch RNA, Round Top Butte RNA, Table Rocks ACEC, Scotch Creek RNA	>50% / medusahead rye, hedgehog dogtail grass, brome species, wild oats, bulbous bluegrass, yellow starthistle, bur chervil, spreading hedgeparsley
High-elevation alder and vine maple glades	Grayback Glades RNA	0% / none documented
Manzanita chaparral on serpentine	Rough & Ready ACEC, West Fork Illinois River RNA	< 1% / yellowtuft, barbed goatgrass, medusahead rye, yellow starthistle
Rosaceous chaparral and Oregon white oak shrublands	Scotch Creek RNA	5% / dyer's woad, yellow starthistle, annual brome grasses, bulbous bluegrass, hedgehog dogtail grass, St. Johnswort
Montane evergreen chaparral types (non-serpentine)	Brewer Spruce RNA, East Fork Whiskey Creek RNA , Old Baldy RNA	< 1% / bull thistle, meadow knapweed, St Johnswort
Perennial bunchgrass grasslands (non-serpentine)	Dakubetede ACEC, Poverty Flat ACEC, Round Top Butte RNA, Table Rocks ACEC, Scotch Creek RNA	> 50% / medusahead rye, bulbous bluegrass, brome species, wild oats, yellow starthistle
Tufted hairgrass-California oatgrass meadows (serpentine influence)	French Flat ACEC, Rough & Ready ACEC	5% / yellowtuft, medusahead rye, yellow starthistle, bull thistle, meadow knapweed, St Johnswort, Scotch broom, Armenian blackberry
Valley floor vernal pool – mounded prairie	Poverty Flat ACEC, Table Rocks ACEC	> 50% / medusahead rye
Darlingtonia fens	Eight Dollar Mountain ACEC, North Fork Silver Creek RNA, West Fork Illinois River RNA, Woodcock Bog RNA	0% / none documented
Ultramafic outcrops and barrens	King Mountain ACEC, Waldo-Takilma ACEC, West Fork Illinois River RNA	< 1% / medusahead rye, yellow starthistle

1. Based on NISIMS, botany survey reports, and vegetation monitoring plot data.

Treatments Planned Related to the Issue

No Action Alternative

Treatment methods and the relative percent of acres treated within each of the special plant communities would not be substantially different from those described for the District as a whole. The BLM would use manual, mechanical, biocontrol, competitive seeding and planting, and herbicide treatments to treat noxious weeds in special plant communities. Approved herbicides would include dicamba, glyphosate, picloram, and 2,4-D and the BLM would apply them in the same relative percent of acres as elsewhere on the District (see Table 2-12, *Treatment Key*). Approximately 95 percent of herbicide treatments within special plant communities would be spot treatments using backpack sprayers; the remainder would be spot treatments with off-highway vehicles. Limitations of the four available herbicides (lack of selectivity and / or low efficacy) would constrain the ability to meet treatment objectives in some special habitats (see Figure 2-1); therefore, the BLM would not treat all infested acres (or other infestations discovered in future surveys or monitoring) under this alternative.

Proposed Action

Under the Proposed Action, the BLM would expand treatment to all invasive plants that threaten special plant communities and would permit the use of additional herbicides. Herbicide treatments within special communities would include spot treatments using backpack sprayers and broadcast treatments using backpack sprayers and hydraulic pumps on off-highway vehicles. Because of the broader target species list and increased efficacy and selectivity of the additional herbicides, the BLM would treat more infestations in special plant communities than under the No Action Alternative. Aminopyralid and imazapic would be the most frequently used herbicides on grasslands, savannahs, and oak woodlands, with clopyralid, triclopyr, rimsulfuron, and glyphosate used on some treatment groups, as indicated in Table 2-12, *Treatment Key*, and Table 2-14, *Treatment Considerations*. The BLM would also conduct experimental treatments with fluazifop-P-butyl and *Pseudomonas fluorescens* (strain D7) on up to 15 acres each per Field Office, including in special plant communities heavily infested by invasive annual grasses. Targeted grazing and spot treatment with propane torches would also be permitted. The BLM would use competitive seeding on more special plant community acres than under the No Action Alternative, particularly to complement herbicide treatments on larger infestations. Because treatment objectives would be more likely to be achieved under this expanded integrated management approach, fewer priority infestations would go untreated.

Alternative 3

No additional treatments not already described under the Proposed Action would be implemented under Alternative 3 within special plant communities. All of the special plant communities analyzed within this section are terrestrial (rather than aquatic) habitats.

Protection Measures

Standard Operating Procedures and Mitigation Measures for All Alternatives Relevant to the Issue

The potential for adverse effects would be further reduced for all alternatives by implementing existing Standard Operating Procedures and Mitigation Measures (see Appendix A), including:

- 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 results.
- Avoid accidental direct spray and spill conditions to minimize risks to resources.
- Take precautions to minimize drift by not applying herbicide when winds exceed 10 mph, or a serious rainfall event is imminent.
- Refer to the herbicide label when planning revegetation to ensure that subsequent vegetation would not be injured following application of the herbicide.

Project Design Features Adopted for the Proposed Action and Alternative 3

The following additional Project Design Features adopted as part of the Proposed Action and Alternative 3 would further reduce effects:

- Ensure the availability of genetically appropriate local native seed and plant materials before implementing treatments that require subsequent revegetation.
- Ensure that seeding and planting prescriptions for special plant communities use only local genetically appropriate native plant materials from species that are typical components of that community, and planted at rates and patterns that reflect typical relative abundance and distribution.

Environmental Consequences

Direct and Indirect Effects

Common to All Alternatives

As described above, late successional conifer forests, Port-Orford cedar forests, Brewer spruce and Alaska yellow cedar forests, alder glades, montane evergreen chaparral, *Darlingtonia* fens, cliffs, rock outcrops, barrens, and talus communities within the analysis area have very few invasive plant infestations, most of which are less than 0.1 net acres. In the absence of major disturbances, these communities have low susceptibility to future nonnative plant invasion. Because treatments would be conducted infrequently (estimated to be one treatment every 3-5 years) and over only a small fraction of the overall community (see infestation levels in Table 3-6), community-level effects of treatments and invasive plants would be negligible, with no measurable differences among the alternatives. Therefore, only grassland, savannah, and oak woodland communities are analyzed in detail below.

A discussion of the effects of treatment methods on grasslands, savannahs, and oak woodlands also requires understanding how the target invasive plants would affect these communities in the absence of treatment. These effects include suppressing native plant growth, altering plant species composition, modifying vegetation structure, altering successional trajectories, and altering fire cycles[48] (D'Antonio and Vitousek 1992). Invasive plants also impact community dynamics by reducing viability and persistence of native plant populations (Gilbert and Levine 2013), disrupting pollinator interactions with native plants (Graves and Shapiro 2003), altering soil chemical and physical attributes (Weidenhamer and Callaway 2010), and inhibiting soil biota, including mycorrhizal associations (Jordan et al. 2012).

The response of a plant community to disturbances—including invasive plant treatments—depends on the characteristics of the disturbance, including severity, intensity, spatial pattern, seasonality, and frequency of occurrence. In general, treatments effects on special plant communities are anticipated to be greater when treatments cover a large proportion of the community and decrease a high percentage of vegetation cover, exposing bare soil. Effects would be greater when treatments occur during the growing season as opposed to when most plants are dormant, and when treatments occur multiple times per year or over multiple years.

In a review and meta-analysis of observational and experimental data from studies around the world, Andreu and Vila (2011) detected a general pattern in which invasive plants reduce native plant species richness (by an average of 23 percent) and abundance (by an average of 41 percent), but that invasive plant removal returns native plant richness and abundance to similar levels as in non-invaded reference sites. However, studies of the effects of invasive plant control treatments on native plant species richness and abundance in grasslands in the western U.S. indicate high variability in plant community response, depending on treatment method, treatment timing, and herbicide selectivity (e.g., DiTomaso and Kyser 2015, Aigner and Woerly 2011, Sheley and Denny 2006). For example, Rinella et al. (2009) documented cases of native plant species that were otherwise coexisting with target invasive plants, becoming rare following broadcast herbicide treatments in grasslands, underscoring the importance of a treatment monitoring program that examines not only the efficacy of the treatment method, but also the effects to non-target plants in the community (such as the program described in Chapter 2, under *Additional Monitoring Adopted for the Analysis of the Proposed Action*).

No Action Alternative

Under the No Action Alternative, for both manual and herbicide methods, approximately 90 percent of noxious weed infestations targeted for treatment in grasslands, savannahs, and oak woodlands would be small (less than

[48] See *Fire* Issue 1 for more information.

0.5 acre) or have a scattered distribution such that generally less than 10 percent of the community would be affected. Community-level effects would be minor because, although native plant cover, species richness, and the importance of functional groups would change within treated spots, the untreated areas (90 percent or greater) would not respond in a measurable way.

Some treatable noxious weeds, such as yellow starthistle and meadow knapweed, occur in large infestations that cover more than 10 percent of grasslands, savannahs, and oak woodlands, including at portions of Table Rocks ACEC. The BLM would treat large infestations in these plant communities using glyphosate or 2,4-D (or rarely dicamba or picloram), complemented by manual treatments. Community-level effects could be major, but the nature of those effects would differ between the two herbicides.

Because glyphosate is not selective, it would result in the loss of all sprayed vegetation, both native and invasive, and increase bare soil on all treated portions of the plant community. These areas would remain mostly unoccupied by vegetation until fall precipitation, at which point annual grasses and forbs and other colonizer plants would emerge and grow, with total vegetation cover resembling pre-treatment levels within 2-3 years. However, the composition of that cover, meaning the particular plant species that successfully colonize these disturbed areas, would typically differ from those that occurred prior to treatment and those changes could persist for the long-term. By removing all existing live vegetation from the treatment area, large glyphosate treatments would essentially reshuffle the deck, leaving the site wide open for colonization, including by other nonnative invasive plants that may have been previously suppressed. This secondary invasion process is a common community-level response to aggressive methods of invasive plant control, sometimes resulting in no net beneficial effects compared to not conducting treatments at all (Pearson et al. 2016).

Because 2,4-D is selective for broadleaf plants, its use would not reduce cover of grasses and other monocots (either native or nonnative) or result in as much bare ground as glyphosate. Grass cover would increase and forb cover and richness would decrease within areas treated with 2,4-D, potentially for the long-term. Secondary invasion could negate beneficial treatment effects of invasive broadleaf removal if invasive grasses are present in the plant community.

Competitive seeding would be used to mitigate adverse effects of spot herbicide treatments by increasing the abundance of native plants and dominance of particular species or functional groups, thereby reducing the potential for shifts to undesirable species (including those caused by secondary invasion).

The No Action Alternative does not provide effective treatment options or permit the treatment of certain invasive plant species, including invasive grasses, which can often exceed 50 percent cover in grasslands, savannahs, and oak woodlands. Grasses such as bulbous bluegrass, cheatgrass, and ventenata are not designated as noxious and would not be treated within special plant communities. Even for medusahead and other designated noxious grasses, the No Action Alternative does not include effective treatment methods for large infestations; while glyphosate is effective on invasive annual grasses, it is not selective and cannot be broadcast sprayed (and dicamba, picloram, and 2,4-D do not affect grasses), manual methods are not practical, mowing and other mechanical methods are not effective, and biological control agents are not available. Consequently, under the No Action Alternative, invasive grasses would go untreated and continue to cause major adverse effects to these special plant communities.

Mechanical treatments could be used to complement manual and herbicide treatments in grasslands, savannahs, and oak woodlands. For example, moist grasslands heavily infested with meadow knapweed are also frequently invaded by Armenian blackberry. Brush-hogging these sites can reduce blackberry cover for approximately one season, which is long enough to improve access for herbicide treatments. The effects of mechanical treatments alone would be minor, because mechanical methods would be localized, rarely treating more than 10 percent of a target community. Effects would persist only for 1 to 2 growing seasons, because most native plants are tolerant of occasional mowing.

Biocontrol treatments are highly selective, targeting only a single species within the plant community, and, therefore, do affect community-level species richness or select for any particular functional group. Biocontrol agents also are not expected to reduce vegetation cover enough to cause bare soil or promote secondary invasion. Community-level effects of biocontrol treatments alone would be negligible.

Proposed Action and Alternative 3

Because the BLM would treat more infestations under the Proposed Action and Alternative 3, including large infestations of invasive grasses, beneficial treatment effects would have a larger footprint than under the No Action Alternative. Because the more selective herbicides aminopyralid and imazapic would largely replace glyphosate and 2,4-D, these alternatives would result in less loss of native vegetation cover, fewer shifts in species composition, and fewer impacts to important functional plant groups over time compared to the No Action Alternative. Adverse community-level effects, such as secondary invasion, would occur less frequently and have shorter duration because the BLM would need to retreat infestations less often under the Proposed Action and Alternative 3, which would have an estimated 80 percent herbicide treatment efficacy compared to 60 percent under the No Action Alternative.

Aminopyralid would be the most extensively used herbicide in grasslands, savannahs, and oak woodlands (an estimated 25-35 percent of treatment acres) to treat thistles, knapweeds, rush skeletonweed and other forbs, particularly in the Asteraceae and Fabaceae families (treatment groups D2, D4, D7), as well as broom species (Fabaceae shrubs in treatment group D12). The extent of community-level effects from aminopyralid would depend on whether it would be sprayed as a spot or broadcast application. As a spot treatment, its improved selectivity over herbicides available under the No Action Alternative would make aminopyralid a preferred treatment option for many target species and would limit undesirable shifts in plant community species composition, including reductions in species richness, compared to the No Action Alternative. Spot treatments with aminopyralid would have minor community-level effects because the spatial extent of treated areas would rarely exceed 10 percent of the total community and no changes in community attributes would occur in untreated areas.

Although more selective than herbicides under the No Action Alternative, broadcast treatments with aminopyralid would still reduce abundance of some native forbs, particularly members of the Asteraceae and Fabaceae families that are closely related to targeted invasive plants in those same families and, therefore, expected to respond to treatment in a similar way. DiTomaso and Kyser (2015) observed statistically significant reductions in forb cover and richness in California annual grasslands broadcast sprayed with aminopyralid to control yellow starthistle, but the effects did not persist into the third growing season. Effects of similar magnitude and persistence are expected where aminopyralid is broadcast sprayed within the analysis area, with native plant cover and richness returning to pre-treatment levels within 3 years (given that BLM would follow treatment considerations in Table 2-14). Because grasslands, savannahs, and oak woodlands in the analysis area have an abundance of grasses and forbs that would be tolerant of aminopyralid, broadcast treatments would not create bare soil conditions or reductions in native plant cover that would lead to a substantial secondary invasion.

Imazapic would be used on 10 to 25 percent of treatment acres in grasslands, savannahs, and oak woodlands in the analysis area, primarily to control dense infestations of invasive grasses. Widespread grass infestations would require broadcast applications, resulting in changes detectable at the community scale. Perennial native grass cover is expected to increase in response to imazapic treatments, which would be a beneficial change bringing these communities closer to reference or desired conditions. However, the response of forbs is more difficult to predict. Although often cited as being selective for grasses, annual and some perennial forbs are also susceptible to imazapic, particularly at high rates. This is consistent with studies that have observed tolerance in many perennial forbs (e.g., Bahm and Barnes 2011), but more variable responses have occurred in annual forbs, depending on rate and site conditions (e.g., Sheley et al. 2007). Sites that have a high pre-treatment abundance of tolerant forbs, such as those in the Asteraceae family, have exhibited increases in broadleaf cover following imazapic treatment (Kyser et al. 2012).

Rimsulfuron would also be broadcast sprayed to control large infestations of invasive annual grasses in these communities, with effects expected to be very similar to imazapic treatments. In northern California foothill grasslands, Kyser et al. (2012) observed similar responses between rimsulfuron and imazapic used to control medusahead as measured by broadleaf plant cover and biomass.

Large reductions in invasive annual grass cover following broadcast herbicide treatments could result in enough bare soil[49] and loss of vegetation cover to promote secondary invasion, perhaps requiring additional treatments. Alternatively, increases in perennial grass abundance would minimize the long-term persistence of secondary invaders. Treatments could also allow previously suppressed native forbs to occupy treated areas, excluding secondary invaders. Given the unpredictable responses in forb cover and secondary invaders following imazapic or rimsulfuron treatments, as described in Chapter 2 in the *Additional Monitoring* section of the *Proposed Action*, the BLM would monitor changes in community attributes and use those observations to refine prescriptions to reduce undesirable outcomes of subsequent treatments.

Fluazifop-P-butyl is a grass-specific herbicide that could be used in these special plant communities to treat some annual or perennial invasive grasses, including barbed goatgrass and slender false-brome. Community-level effects would be minor because the use of this herbicide would be limited to experimental use on no more than 15 acres per Field Office. Where used, fluazifop-P-butyl could shift community dominance away from grasses towards forbs, including nonnative forbs. Similarly, *Pseudomonas fluorescens*, as described under the Special Status plants issue, is selective for cheatgrass, medusahead rye, and jointed goatgrass. Although its use would be limited to 45 acres cumulative across the District (thus limiting community-level effects), effective control of these annual grasses would shift plant species dominance to other species present on treatment sites.

Other herbicides would be used for spot treatments. Triclopyr would be used to treat blackberries and other broadleaf woody invasive plants, as well as some forbs in treatment group D9. Clopyralid, which has selectivity similar to aminopyralid but without the residual control, would be used to treat invasive plants in the Asteraceae and Fabaceae families, particularly where there are concerns that aminopyralid would cause damage to adjacent seedlings of susceptible woody species. Triclopyr and clopyralid are not active on grasses, but could result in lower cover and richness of susceptible broadleaf plants within treated areas. The extent of treatments would rarely approach 10 percent of a target plant community and resulting changes in community attributes would be minor and measurable only at the treatment scale.

The BLM would also use competitive seeding on more acres within special plant communities compared to the No Action Alternative, to complement expanded herbicide treatments. The combined use of selective herbicide treatments and competitive seeding would improve treatment outcomes by increasing the abundance of native plants and the dominance of desirable species or functional groups, such as forbs or bunch grasses, thereby reducing the potential for shifts to undesirable species.

Short-duration targeted grazing could also be used in grasslands, savannahs, and oak woodlands to reduce dominance of invasive plants and improve efficacy of complementary treatments. High-intensity, short-duration goat grazing has proven effective for reducing cover of Armenian and cutleaf blackberry, while also increasing the number of plant species and plant functional groups (Ingham 2014). Grazing has a community-level effect through selection of plants preferred by the grazing animals (or avoidance of unpalatable plants), trampling vegetation, increasing bare soil, and compacting soil. Plant functional groups with substantial carbohydrate reserves in roots, bulbs, and other belowground perennial parts are tolerant of periodic trampling and grazing. The effects of grazing treatments alone would be minor, because they would be used only on heavily infested patches, rather than

[49] See *Soil* Issue 1

widespread across the community. Effects would persist only for 1 to 2 growing seasons, because most native plants are tolerant of occasional short-duration grazing and trampling. As described for other treatment methods that reduce vegetation cover and increase bare soil, targeted grazing could result in secondary invasion; however, the BLM would reduce the effect through post-grazing competitive seeding with site-specific native plants.

The effects of manual, mechanical, and biological treatments on special plant communities would be the same for the Proposed Action and Alternative 3 as described for the No Action Alternative. In the long-term, the BLM anticipates substantial beneficial community-level effects from an integrated management approach that combines these treatments with selective herbicides, targeted grazing, and competitive seeding.

Summary of Effects

Table 3-7. *Summary of Effects (Native Vegetation Issue 2)*

Indicator	No Action Alternative	Proposed Action / Alternative 3
Native plant species richness	Major long-term declines from invasive plants that cannot be treated or effectively controlled (community-level scale). Minor short- to long-term declines from herbicide spot treatments (treatment-area scale only). Short-term increases from manual treatments (treatment-area scale only). No change from mechanical or biocontrol treatments.	Substantial short-term declines or increases from broadcast herbicide treatments, with long-term richness expected to be higher than before treatment occurred (community-level scale). Minor short- to long-term declines from herbicide spot treatments (treatment-area scale only). Short-term increases from manual treatments (treatment-area scale only). No change from mechanical or biocontrol treatments.
Native plant functional group abundance	Minor shifts in functional group importance from herbicide treatments, depending on the herbicide: 2,4-D selects against forbs, favoring annual and perennial monocots. Glyphosate: reshuffles the deck, favoring annuals and early colonizers in the short-term with unpredictable long-term outcomes.	Minor treatment-area scale shifts in functional group importance from herbicide spot treatments and community-level shifts from broadcast treatments, depending on the herbicide: Aminopyralid and clopyralid select against forbs (and some shrubs) in Asteraceae, Fabaceae, and some other families. Fluazifop-P-butyl selects against most grasses, favoring other monocots and forbs (but use limited to 45 acres). Imazapic and rimsulfuron select against annual grasses and some annual forbs, favoring most perennial grasses. *Pseudomonas fluorescens* strain D7, selects against specific invasive annual grasses, favoring most other species present in the community (but use limited to 45 acres). Triclopyr selects against woody plants and forbs, favoring most monocots.
Secondary invasion	Observed at the treatment-area scale for manual and herbicide treatments, but not affecting a majority of the plant community except where glyphosate used on large	Observed at the treatment-area scale for manual, targeted grazing, and herbicide spot treatments, but not affecting a majority of the plant community.

Indicator	No Action Alternative	Proposed Action / Alternative 3
	infestations that are widespread across the community. Effects would be mitigated through competitive seeding.	Observed at the community scale for broadcast herbicide treatments, particularly for invasive annual grass treatments. Effects would be mitigated through competitive seeding.
Comparison to reference or desired conditions	Plant communities would continue to deviate from reference or desired conditions due to the effects of uncontrolled invasive plants	Plant communities would move closer to reference or desired conditions by reducing adverse effects on invasive plants, but additional management would still be required.

Cumulative Effects

Landscape-level forest management projects (see Table 2-16) are expected to occur annually across the District and some project areas would include grasslands, savannahs, and oak woodlands. To meet Resource Management Plan objectives, forest management projects could include activities designed to reduce hazardous fuels and maintain or restore natural processes, native species composition, and vegetation structure in these special community types. Management activities would include thinning, reducing shrub cover, pile burning, and / or broadcast burning, and seeding and / or planting site-appropriate native plants. Invasive plant control would also be prescribed within project sites.

Similarly, oak woodland restoration, meadow restoration, and rare plant habitat improvement projects would include thinning, pile burning, and broadcast burning in the same special plant communities targeted for invasive plant treatments. The BLM is implementing oak woodland and savannah restoration treatments on approximately 200 acres at Table Rocks ACEC. The BLM is also restoring 180 acres of meadows and oak woodlands in French Flat ACEC, Rough & Ready ACEC, and Reeves Creek ACEC to improve habitat for Cook's lomatium. To meet recovery objectives for Gentner's fritillary, the District also plans to manage vegetation to reduce conifer succession and litter accumulation on up to 500 acres of oak woodlands and mixed chaparral-grassland communities in ACECs and Fritillaria Management Areas.

Thinning and slashing woody vegetation increases available resources for residual plants and can result in shifts in species composition and cover. The magnitude and extent of thinning and slashing effects would depend on the prescription. Slash piles bury vegetation and, if subsequently burned, the radiant heat can penetrate the soil, killing plants, injuring below-ground perennial plant parts, and modifying soil biota, all of which could cause shifts in plant species composition. The magnitude and extent of effects would depend on number, size, location, and composition of piles, and the amount of heat generated. Piles can sometimes occupy as much as 10 percent of an acre, depending on the plant community and the fuel loads. Effects of pile burning would be mitigated through project design features that require seeding burn scars with site-appropriate native seed.

Broadcast burning would also affect community structure and composition by selecting for fire-adapted plants, reducing accumulated litter and thatch, releasing nutrients, stimulating seed banks, and stimulating growth of some perennial forbs and shrubs. Broadcast burning could also stimulate invasive plant seed banks or otherwise promote invasion, increasing the need for follow-up invasive plant treatments.

Despite some short-term adverse effects to native vegetation, the overall effects of these vegetation management and restoration activities, when combined with the beneficial effects of invasive plant control, would result in substantial long-term cumulative benefits to community structure and species composition, moving them closer to desired or reference conditions.

Cattle grazing is authorized in allotments that include grasslands, savannahs, and oak woodlands. Historic high livestock utilization in the Cascade-Siskiyou National Monument has been implicated in increased bare soil, reduced cover of native perennial grasses, and increased cover of nonnative annual grasses (Frost and Hosten 2007), and those effects likely persist in other grazed portions of the District as well. However, because of currently low utilization rates within allotments, the effects of historic heavy livestock use are moderating over time, except at some water sources and other areas of cattle concentration (Hosten et al. 2007). Nonetheless, ongoing grazing and trampling by cattle would continue to cause community-level effects, such as reducing biomass of preferred species, favoring tolerant plant functional groups, increasing or decreasing native species richness, perpetuating invasive plant infestations, and promoting new infestations. The effects of invasive plant treatments would counterbalance the effects of cattle grazing by reducing the spread of existing infestations and limiting new infestations.

Fish and Aquatic Organisms

Fish and Aquatic Organisms Issue 1

How would application of aquatic herbicides on submerged and floating aquatic invasive plants (as proposed in Alternative 3) affect aquatic habitat and aquatic organisms? How would the spread of aquatic invasive plants affect aquatic habitat and aquatic organisms?

Analytical Methods

The analysis area includes any area on the District which could potentially receive treatments to control aquatic invasive plants, which is any water source found on the Medford District. Primary project areas have been identified for treatments in Category I and II, but treatments could occur anywhere across the District to treat Category III (spread from existing invasive plant sites) and IV (new invaders) when they are discovered, for the life of this EA. Therefore, the aquatic analysis area includes all of the large rivers, streams, springs, ponds, pump chances, and reservoirs on BLM-administered lands on the Medford District. The Medford District primarily includes lands in the Rogue River catchment basin, but also includes small portions of the Umpqua and Klamath River catchment basins. Within the analysis area, there are approximately 464 miles of fish-bearing streams on BLM-managed lands.

Analysis of effects to aquatic organisms from herbicide treatments is based on the Risk Assessments conducted for the individual herbicides (see Appendix C and Table 3-8 later in this Issue), and on proposed application rates and treatment acres as described in Chapter 2 of this EA. Assumptions of indirect effects to aquatic habitat are predicated on the likelihood of aquatic treatments occurring in isolated disconnected aquatic habitats where there is no surface flow of water in or out of the treatment areas, and assume the worst-case scenario, in that herbicide treatments would kill all aquatic vegetation, which could then rapidly decompose and lead to depletion of dissolved oxygen levels to an extent that would result in mortality of aquatic fauna. The intensity and duration of effects are described as follows:

> *Short term*: A change in a resource or its condition lasting less than one year.
> *Long term*: A change in a resource or its condition lasting greater than one year.
>
> *Negligible:* The impact would not be detectable or measurable to aquatic habitat or aquatic species.
>
> *Minor localized effect*: Short-term changes to aquatic habitat or aquatic species would be measurable or perceptible in small localized habitats, but would fall within the range of natural variability and would

result in no appreciable changes to aquatic species or their habitats beyond the scale of an individual habitat unit (e.g., a single pool).

Conclusions described below are based on the review of existing data (e.g., the chapter on forest chemicals contained in *Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitats*, Meehan 1991) and other data including spatial data; utilization of professional research and literature; and use of expertise, both internal and external, that is based on documented, substantiated professional rationale.

Affected Environment

Numerous analysis area watersheds within the Rogue and Umpqua basins include streams and rivers designated as Critical Habitat and Essential Fish Habitat for federally listed (threatened) populations of Coho salmon (*Onchorhynchus kisutch*). The Umpqua basin contains the Oregon Coast Evolutionary Significant Unit of Coho, while the Rogue catchment basin supports the Southern Oregon Coasts / Northern California Coasts (SONCC) Coho salmon Evolutionary Significant Unit. Critical Habitat has been officially designated for the Oregon Coast Coho, and on the Medford District, there are 22 miles of Critical Habitat for Oregon Coast Coho on BLM-managed lands. Critical Habitat for SONCC Coho salmon was designated as “all accessible reaches of rivers (including estuarine areas and tributaries) between Cape Blanco, Oregon and Punta Gorda, California” (NMFS 1999), but these “accessible reaches” have not been precisely mapped. A rough estimate suggests approximately 320 miles of Critical Habitat for SONCC Coho on the Medford District.

In addition to Coho, other commercial, recreational, and culturally important species found in those portions of the Rogue and Umpqua within the analysis area include Chinook salmon (*O. tshawytscha*), steelhead, rainbow, and cutthroat trout (*O. mykiss and O. clarkii)*, and Pacific lamprey (*Entosphenus tridentatus*). There are numerous other native and nonnative fish species present in many of the watersheds within these two basins as well. This analysis will focus on the native salmonids, as they are the fish species most likely to be present in waters located on BLM-managed lands, and are typically more susceptible than other species to disturbances and toxins (Meehan 1991).

The portion of the analysis area that includes the Klamath is composed of headwater areas and watersheds that are located above impassable barriers, and hence there are no anadromous federally listed fish species in the Klamath portion of the analysis area. There is one Bureau Sensitive fish species present in the Klamath on BLM-managed lands within the analysis area, the Jenny Creek sucker (*Catostomus rimiculus*).

Given the large geographic area covered by the District, and the many miles of streams contained within, there exists a wide range of aquatic habitat conditions, from relatively pristine to highly degraded. In general, the large fish bearing streams and mainstem rivers have been the most altered by non-natural disturbances. These areas are characterized by lower gradients, wider valleys, easier access, and longer periods of human use, and include extensive urban and agricultural development in proximity to aquatic habitats. These, and stream reaches located downstream of such areas, are the portion of the aquatic ecosystem most likely to be impacted by chemicals, including herbicides. They are also the most likely to be infested by aquatic invasive plants.

The smaller streams located further up in the analysis area generally have steeper gradients, are located in narrower valleys, and have been much less impacted by urban and agricultural development. Timber management (past and ongoing) is the dominant land use in most of these areas. The majority of Medford District lands include these types of streams, with the notable exception being the Wild and Scenic section of the mainstem Rogue River, which flows 47 miles through a block of BLM ownership. This area is a canyon, and has not been subject to the extent of development that has occurred adjacent to upstream reaches of the Rogue and many of its largest tributaries.

Other factors influencing aquatic habitat relevant to this EA include water quality, in particular temperature, sediment levels, dissolved oxygen levels, and presence of toxins. As described in *Water* Issue 2 of this EA, many streams are listed as water quality limited for exceeding one or more parameters set for these indicators. Instream cover is also important for aquatic organisms, including that provided by aquatic vegetation. Aquatic plants and algae (including nonnative species) provide cover and forage for insects, which are the primary food source for most of the native fish found in the area. However, an over-abundance of invasive aquatic plants could potentially do more harm than good to aquatic organisms. For example, in the lower Rogue River, the introduced northern pikeminnow thrives in slower and warmer reaches and off-channel habitats of the river. These same areas are also where dense vegetative mats are most likely to form. The vegetation in these cases functions to provide cover for pikeminnow and other nonnative aquatic organisms, such as bullfrogs, allowing their populations to proliferate. Additionally, aquatic vegetation can both produce dissolved oxygen, and also rapidly deplete it, which can have negative effects to aquatic organisms, especially the native assemblages that generally require higher oxygen levels than nonnative species. Dense mats of invasive aquatic plant species are less likely to be found in the smaller streams, as their steeper gradients and location upstream of common sources of aquatic plant infestations work in tandem to limit both the likelihood of infestation, and amount of suitable habitat available should an introduction occur. The exception to this would be in the numerous ponds, reservoirs, and pump chances that can be found scattered at all elevations across the District. As these are ponded habitats with little or no flowing water, at least in the summer, they would be more susceptible for invasion by nonnative aquatic plants. Most of these ponded areas on BLM-managed lands do not provide suitable habitat for native fish; however, many of them do eventually drain to suitable aquatic habitats during periods of high flow, including Critical Habitat and Essential Fish Habitat.

Treatments Planned Related to the Issue

No Action Alternative and Proposed Action

Manual methods would be used to control submerged and floating aquatic vegetation. For populations of aquatic invasive plants, only the aquatic formulations of 2,4-D and glyphosate (No Action Alternative) or 2,4-D, glyphosate, imazapyr, and triclopyr (Proposed Action) would be used for periodic spot treatments that would occur on an average on one to two acres per year, and only in areas after water levels had seasonally receded, leaving the plants above the water line.

Alternative 3

In addition to terrestrial invasive plant treatments described under the Proposed Action, if consultation with NMFS occurs, herbicide treatments with aquatic formulations could be implemented directly in aquatic habitat. Alternative 3 includes the use of the aquatic formulations of fluridone in ponded waters only; and aquatic formulations of 2,4-D, glyphosate, imazapyr, and triclopyr in ponded and flowing waters. Triclopyr would be the preferred treatment option for several species of submerged aquatic invasive plants, as described in Table 2-13. Imazapyr would also be used in limited situations. The use of fluridone, 2,4-D, and glyphosate is proposed in very limited situations (less than 0.1 percent of the time); fluridone would only be used in isolated ponded waters.

There are currently 32 acres of Category I and II submerged and floating aquatic invasive plants identified on the District (see Table 2-13). Up to 11.5 acres of aquatic habitat could potentially be treated in the first year[50], but on average, the amount of area proposed for treatments would be two to three acres per year. Treatment strategies would continue to target small, localized spots.

[50] See Figure 2-1, *Prioritizing Areas for Treatments*. Treatments in aquatic areas would generally be classified as high or highest priority for treatment, and hence would occur as soon as feasible.

Protection Measures

Standard Operating Procedures and Mitigation Measures for All Alternatives Relevant to the Issue

The National Marine Fisheries Service has not been consulted with regarding use of aquatic herbicides directly in aquatic habitat where listed species are present. Therefore, use of herbicides to treat submerged or floating aquatic vegetation directly in Critical Habitat or waterways flowing to Critical Habitat is not permitted without future individual or programmatic consultation. Use of herbicides may be considered on a case-by-case basis in waters not connected to Critical Habitat as determined by District or field area fish biologists.

There are numerous Protection Measures that have been developed to protect water resources, riparian and aquatic habitat, and aquatic organisms, and are listed in full in Appendix A. Some of the ones most relevant to aquatic herbicide use include:

- 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 potential for injury to desirable vegetation and aquatic organisms, and 3) follow water use restrictions on the herbicide label.
- 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 treatments rather than broadcast treatments.
- 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.
- 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.

In addition, projects that have the potential to disturb Special Status fish or other aquatic species habitat require pre-project clearances, including review for potential habitat and / or project site surveys (USDI 2008b).

Project Design Features Adopted for the Proposed Action and Alternative 3

Assuming consultation with the National Marine Fisheries Service occurs at some later date that allows for use of herbicide treatments directly in aquatic habitats, the following Project Design Features would further reduce effects on fish and other aquatic organisms under Alternative 3:

- All Project Design Criteria identified in potential future consultations with the National Marine Fisheries Service will be incorporated into all treatments in aquatic habitats.
- Delay treating side channels and backwaters until they are disconnected from the mainstem river during low flow periods.
- For treatments proposed along the lower Rogue River, limit the treatment window to the late summer, after native smolts have migrated to the estuary, and when water temperatures are high (generally July and August) so that native salmonids would be unlikely to be present in these disconnected or slow water habitats during the treatment period.
- When using aquatic 2,4-D, glyphosate, imazapyr, or triclopyr in closed aquatic systems with heavy infestations, consider a phased treatment (treating less than 50 percent at a time) to reduce the likelihood of all of the aquatic plants dying at the same time, which could result in a rapid depletion of dissolved oxygen.

Environmental Consequences

Direct and Indirect Effects

No Action Alternative and Proposed Action

Under the No Action Alternative and the Proposed Action, the herbicides available for use would be limited to the treatment of emergent vegetation. Current treatment practices under the No Action Alternative allow the use of aquatic formulations of glyphosate and 2,4-D to treat aquatic invasive plants above the waterline; under the Proposed Action, imazapyr and triclopyr are additionally allowed. These populations are currently treated when water levels recede leaving the plants on dry ground. Effects of these treatments are essentially the same as treatments as applied in terrestrial riparian habitats and are described in detail under *Fish and Aquatic Organisms* Issue 2 below. Submerged vegetation would only be treated with manual methods, resulting in reduced treatment options and treatment efficacy. Many aquatic invasive plants regrow from root crowns, tubers, rhizomes, or plant fragments, so all plant material must be completely removed for this method to be successful. Invasive aquatic plants would continue to proliferate to the detriment of aquatic habitats and organisms, crowding out native plants, trapping heat, reducing the penetration of light and oxygen, and impeding the flow of water. Aquatic invasive plants are estimated to continue to spread at 12 percent annually; the 9.3 acres of Category I aquatic invasive plants would be expected to spread to 28.9 acres in 10 years.

Alternative 3

Potential effects to water quality from aquatic herbicide use are discussed in the *Water* Issue 2 of this EA; this discussion focuses on potential effects to aquatic organisms themselves and is based on the Risk Assessment information (summarized below in Table 3-8) and is predicated on the assumption that future consultation with the National Marine Fisheries Service occurs and allows for herbicide treatments directly to aquatic habitat.

Table 3-8. *Forest Service-Evaluated Herbicide Risk Categories for Aquatic Organisms (Aquatic Formulations)*

		2,4-D Amine		**Fluridone**		**Glyphosate**		**Imazapyr**		**Triclopyr**	
		Typ[1]	Max[1]	Typ	Max	Typ	Max	Typ	Max	Typ	Max
Flora											
Accidental Acute Exposures											
Macrophyte	Susceptible	H	H	H	H	H	H	H	H	H	H
Macrophyte	Tolerant	0	L	H	H	0	0	M	H	L	M
Algae	Susceptible	L	L	H	H	H	H	L	L	M	H
Algae	Tolerant	0	0	H	H	0	L	0	0	L	M
Non-Accidental Acute Exposures											
Macrophyte	Susceptible	M	M	M	M	L	M	M	M	H	H
Macrophyte	Tolerant	0	0	0	L	0	0	0	L	0	0
Algae	Susceptible	0	0	0	L	L	L	0	0	0	L
Algae	Tolerant	0	0	0	0	0	0	0	0	0	0
Chronic / Longer Term Exposures											
Macrophyte	Susceptible	M	M	L	M	L	L	M	M	M	H
Macrophyte	Tolerant	0	0	0	L	0	0	0	L	0	0
Algae	Susceptible	0	0	0	L	0	L	0	0	0	0
Algae	Tolerant	0	0	0	0	0	0	0	0	0	0
Fauna											
Accidental Acute Exposures											
Fish	Susceptible	0	0	H	H	M	H	0	L	0	L
Fish	Tolerant	0	0	M	M	L	L	NE	NE	0	0
Amphibian	Susceptible	0	0	NE	NE	0	0	NE	NE	0	L

		2,4-D Amine		**Fluridone**		**Glyphosate**		**Imazapyr**		**Triclopyr**	
		Typ[1]	Max[1]	Typ	Max	Typ	Max	Typ	Max	Typ	Max
Amphibian	Tolerant	0	0	NE	NE	0	0	NE	NE	0	L
Invertebrate	Susceptible	0	0	H	H	M	M	NE	NE	0	L
Invertebrate	Tolerant	0	0	M	M	0	0	0	0	0	0
Non-Accidental Acute Exposures											
Fish	Susceptible	0	0	0	0	0	L	0	0	0	0
Fish	Tolerant	0	0	0	0	0	0	NE	NE	0	0
Amphibian	Susceptible	0	0	NE	NE	0	0	NE	NE	0	0
Amphibian	Tolerant	0	0	NE	NE	0	0	NE	NE	0	0
Invertebrate	Susceptible	0	0	0	0	0	0	NE	NE	0	0
Invertebrate	Tolerant	0	0	0	0	0	0	0	0	0	0
Chronic / Longer Term Exposures											
Fish	Susceptible	0	0	0	L	0	L	0	0	0	0
Fish	Tolerant	0	0	0	0	0	0	0	0	0	0
Amphibian	Susceptible	NE	NE	NE	NE	0	0	NE	NE	NE	NE
Amphibian	Tolerant	NE	NE	NE	NE	0	0	NE	NE	NE	NE
Invertebrate	Susceptible	0	0	0	0	0	0	NE	NE	0	0
Invertebrate	Tolerant	0	0	0	0	0	0	0	0	0	0

1. Typ = Typical application rate; and Max = Maximum application rate.
Risk categories: 0 = No risk (majority of Hazard Quotients < 1); L = Low risk (majority of Hazard Quotients >1 but < 10); M = Moderate risk (majority of Hazard Quotients > 10 but < 100); H = High risk (majority of Hazard Quotients > 100); and NE = Not evaluated. Risk categories are based on upper Hazard Quotient estimates. To determine risk for lower or central Hazard Quotient estimates, see the individual herbicide Risk Assessments. Risk categories are based on comparison to the Hazard Quotient of 1 for typical and maximum application rates.

Two factors determine the risk to aquatic organisms from use of herbicides: the toxicity of the chemicals to individual organisms, and the likelihood of exposure to the chemical by the organisms. Because aquatic herbicides would be applied directly to water, there would be a high likelihood of exposure, and therefore Risk Assessments focusing on the toxicity to organisms from direct exposure, including an accidental spill, are the appropriate scenarios for evaluating risk to aquatic flora and fauna from use of aquatic herbicides.

The Risk Assessment for aquatic formulations of 2,4-D shows a hazard quotient of less than 0.5 (essentially no risk) under all scenarios analyzed to fish and other aquatic organisms. Therefore, there is no potential that use of this herbicide would impart direct or indirect effects to these aquatic species.

The Risk Assessment for aquatic glyphosate shows a hazard quotient of less than one for typical non-accidental applications for susceptible fish and aquatic macroinvertebrates. However, under the accidental acute exposure scenario (e.g., a spill), the risk is elevated to 73 (moderate) at typical application rates, and 257 (high) at maximum application rates to fish and is within the moderate range for aquatic macroinvertebrates. However, the application rates (see Table 2-13) would be less than 1.5 percent of the maximum rate and only 5 percent of the typical rate analyzed by the Risk Assessment. At these low concentrations, there would be essentially no risk to aquatic fauna from glyphosate, unless a spill of concentrated chemical occurred directly in water, which would likely result in localized impacts to aquatic organisms. Standard Operating Procedures such as mixing and loading in areas where spill would not contaminate waterbodies would ensure the risk of such a spill is unlikely. Given the small area likely to be treated in any given year, and lack of direct risk to fish and other aquatic organisms, any potential future use of these herbicides as currently allowed would not impart direct effects to fish or aquatic insects. The Risk Assessment for triclopyr shows no risk to any aquatic organisms under all scenarios, except for the accidental acute exposure scenario calculated for maximum rates of application, which has low risk to susceptible fish and invertebrates. Proposed application rates of triclopyr would, at their high end, be less than half that analyzed in the Risk Assessment scenario; therefore, there would be no risk to any aquatic fauna from use of this herbicide as proposed in this EA. For imazapyr, data are limited, but tests showed a similar risk to fish as described for triclopyr; no risk under any scenarios except for a low risk at the maximum rate under acute accidental exposure.

The Risk Assessment of fluridone showed no risk to macroinvertebrates, a low risk to susceptible fish under chronic long-term exposure, and a high risk at typical rates of application from acute accidental exposure to both fish and insects. Application rates proposed for fluridone use under this alternative are very low (5 to 30 parts per billion in water) and fluridone would only be used in disconnected ponded habitats on an extremely limited basis (less than 0.1 percent of all anticipated future treatments). Standard Operating Procedures (applicable under all alternatives), such as conducting mixing and loading operations in areas where an accidental spill would not contaminate an aquatic body, would further reduce risk of exposure. Fluridone is identified as the preferred method for treatment of Brazilian waterweed, which is currently not known to exist on BLM-managed lands, though there are established populations in some ponds in the Umpqua catchment. Because treatments using fluridone would be limited, if ever used at all, and because concentrations would be so low, and because it would only be applied in habitats not occupied by native fish, there is no potential that use of it as described in this EA would result in any direct or indirect effect to native fish.

Potential future herbicide treatments in aquatic habitat would be limited to a maximum of 11.5 acres in a given year, but are anticipated to occur on only two or three acres annually. Identified locations where these treatments would be likely to occur include side channel and backwater areas along the lower Rogue River corridor. These treatments would occur during the late summer, when many of these areas would be isolated from the main channel due to low flows. Data from gages operated by the United States Geological Survey (USGS) show that water temperatures in this stretch of river in late summer routinely range from 70 degrees Fahrenheit (from the Grants Pass gage) to 75 degrees Fahrenheit (Agness gage) (USGS 2016), which is well above the preferred upper temperature range (57.2 degrees Fahrenheit) for Coho. Water temperatures would likely be even higher in the off-channel habitats where treatments could occur. The reported upper lethal temperature limit for Coho is 78.8 degrees Fahrenheit (Meehan 1991). Temperature tolerances for other native fish vary slightly but are similar to those reported for Coho. Because treatments would only occur in off-channel habitats during a period of the year when this type of habitat would not be suitable for native fish, and given that the typical amount of habitat treated by herbicides would be only two to three acres a year, and that the Risk Assessments found no risk to susceptible fish under application scenarios that represent how BLM would use herbicides, no adverse effects to native fish are anticipated to result from any potential future herbicide treatments directly in aquatic habitats.

Aquatic macrophytes treated by these herbicides would be directly affected, as this is the intent of the treatment. Should all vegetation in a closed (i.e., no flow in or out) aquatic environment die and decay at once, there would be potential for oxygen depletion, which could be lethal to gilled aquatic organisms. This would not affect native fish since they would be very unlikely to be found in such locations during the summer months when treatments would occur. Native fish in the analysis area are dependent on cool, flowing, well-oxygenated water for survival, which are conditions not typically found in closed aquatic environments. The depletion of oxygen could result in localized die-offs of aquatic invertebrates. These populations would quickly (within a few months) rebound by re-colonization from nearby source populations (Anderson 1992) through insect drift and dispersal mechanisms once the disconnected habitats were re-connected to adjacent aquatic habitats in the fall / winter. The loss of vegetation would change the nature of the aquatic habitat. However, this is unlikely to have any meaningful impact on native aquatic fauna, as the amount of area treated any given year would be a miniscule fraction (less than 1/100th of one percent) of all available aquatic habitats. Furthermore, these areas are not representative of natural habitat. Species most likely to be impacted by this small localized habitat loss include nonnatives such the pikeminnow and bullfrog. Both of these species are detrimental to native species. As the loss of habitat would be so small, it would be inconsequential to these nonnative species as well, and would not appreciably benefit native aquatic fauna. The analysis of effects on Oregon spotted frogs and vernal pool fairy shrimp is discussed in *Wildlife* Issue 1.

Indirectly, aquatic habitat would be improved in the long term at these localized spots, as removal of the invasive plant species could allow for colonization by native plant species. However, these effects would occur on such a small scale as to be inconsequential to populations of both native and nonnative species. The greatest benefit to fish and aquatic organisms from treatments of currently small infestations of aquatic invasive plants is the prevention of future spread that has the potential to degrade large areas of habitat.

Summary of Effects

Table 3-9. *Summary of Effects (Fish and Aquatic Organisms Issue 1)*

Alternative	Direct Effects	Indirect Effects
No Action Alternative and Proposed Action	There would be no application of herbicide directly to aquatic habitats, so no direct effects would occur to aquatic species or their habitats.	There would be no application of herbicide directly to aquatic habitats, so there would be no short-term indirect effects. In the long term, invasive aquatic plants would continue to spread at 12 percent annually, to detriment of aquatic habitats and organisms.
Alternative 3	Aquatic vegetation would be directly killed by herbicide treatments in water. This minor localized effect could affect two to three acres of aquatic habitat annually. No direct effects to aquatic fauna are anticipated to result from treatments as proposed.	Minor localized indirect effects to macroinvertebrate assemblages in disconnected habitats could result from depleted dissolved oxygen from decaying vegetation. Re-colonization from adjacent untreated areas would begin to occur following treatments when aquatic habitats become re-connected.

Cumulative Effects

Under the No Action Alternative, herbicides would not be used to treat submerged or floating aquatic invasive plants, so there would be no direct or indirect effects from herbicide use to any aquatic organisms or aquatic habitat, and thus no cumulative effects are expected. Invasive aquatic plants would continue to proliferate to the detriment of aquatic habitats and native organisms similar to current rates.

Under Alternative 3, there would be no direct or indirect effects to native fish, but there would be direct effects to treated aquatic vegetation, which could in turn lead to indirect adverse effects to aquatic macroinvertebrates resulting from decaying aquatic vegetation and short term decreases in dissolved oxygen in localized habitats, as described above. In addition, there would be an indirect beneficial effect of improved habitat, albeit on such a small scale as to not appreciably benefit native species or their habitats. Under all alternatives, perturbations to aquatic habitat are expected to continue as described under the *Affected Environment* section. Some of these perturbations impact water quality and habitat, and have led to shifts in macroinvertebrate assemblages. Excess sediment resulting from roads, instream mining, grazing, and other disturbances has buried coarse substrates in some stream systems. Elevated stream temperatures and reduced dissolved oxygen content from water withdrawals and clearing of riparian vegetation on private residential and agricultural lands has also degraded water quality and aquatic habitat to varying degrees of select stream reaches across the District. These types of disturbances have led to reductions in numbers and diversity of macroinvertebrate populations in areas, and are chronic in nature and can persist for very long time periods (decades). Natural disturbance mechanisms such as floods and droughts also episodically affect macroinvertebrates, and can potentially result in local extirpations (i.e., a drought event that results in the desiccation of a stream or off-channel ponded habitat feature). However, these events are short duration, typically lasting less than a few months, and once conditions change, aquatic insects are known to be able to rapidly re-colonize and populations would re-bound in a very short time (within months in most cases). Selection and implementation of Alternative 3 would essentially mimic a localized drought event by increasing the amount of habitat disturbance, on average in up to 3 acres of disconnected aquatic habitat annually. This could potentially result in localized reductions in the number of aquatic macroinvertebrates for a few months by a small fraction of a percent relative to the No Action Alternative. This disturbance would be well within the range of natural variability and would have much less impact on aquatic invertebrate populations than episodic drought and flood events, with which these aquatic organisms have evolved.

Fish and Aquatic Organisms Issue 2

How would terrestrial herbicide treatments in riparian areas affect aquatic organisms or the quality of their habitat?

Analytical Methods

The analysis area includes any riparian area that could potentially receive treatments to control invasive plants. This includes all Riparian Reserves on BLM-administered lands on the Medford District. Primary project areas have been identified for treatments in Category I and II, but treatments could occur anywhere across the District to treat Category III (spread from existing invasive plant sites). There are over 221,000 acres of Riparian Reserves on BLM-managed lands.

Analysis of effects to aquatic organisms and their habitat from terrestrial herbicide treatments is based on the Risk Assessments conducted for the individual herbicides (see Appendix C), and on proposed application rates and treatment acres as described in Chapter 2 of this EA. Indirect effects to aquatic habitat are based on the assumption that some stream-side adjacent areas are monocultures of invasive plants and that ensuing treatments would bare continuous patches of ground immediately adjacent to the stream. Treatments targeting invasive plants in Riparian Reserves would not target large over-story trees, so shade and sources of future coarse wood inputs would be maintained in most treatment areas; however, in streamside areas where no native vegetation exists, there could be a loss of overhead cover, for example if a blackberry thicket around a small narrow stream were removed. The intensity and duration of effects are described as follows:

> *Short-term*: A change in a resource or its condition lasting less than one season.
> *Long-term*: A change in a resource or its condition lasting greater than one season.
>
> *Negligible:* The impact would not be detectable or measurable to aquatic habitat or aquatic species.
>
> *Minor localized effect*: Short-term changes to aquatic habitat or aquatic species would be measurable or perceptible in small localized habitats, but would fall within the range of natural variability and would result in no appreciable changes to aquatic species or their habitats beyond the scale of an individual habitat unit (e.g., a single pool).

Conclusions described below are based on the review of existing data and other data including spatial data; utilization of professional research and literature; and use of expertise, both internal and external, that is based on documented, substantiated professional rationale.

Affected Environment

Riparian areas are the transition zones between aquatic and terrestrial habitats, and contain high biological diversity relative to the small area they comprise across the landscape. The vegetation within riparian areas provides many important ecological functions including stream shade, large wood, and nutrient inputs. Riparian vegetation provides bank stability, and reduces erosion during flood events. It also serves to filter sediment from upslope areas of disturbance which otherwise may enter aquatic habitat. All of these benefits work to create and maintain the complex high quality habitat and water quality necessary for native aquatic organisms. Riparian areas on BLM-managed lands have been protected under the land use allocation of Riparian Reserve, which establishes a protective vegetative buffer adjacent to all waterways on BLM-managed lands. Riparian Reserves on the Medford District range in width from 50 feet on either side of the stream up to a full site potential tree height, depending on the particular class of sub-watershed and if the stream is fish bearing, perennial, or intermittent, as described in the *Southwestern Oregon Resource Management Plan and Record of Decision* (USDI 2016d:75). The majority of the

Riparian Reserves on the Medford District are a full site potential tree height, which ranges from 155 to 210 feet. There are over 221,000 acres of designated Riparian Reserves on BLM-managed lands in the analysis area.

There is a tremendous degree of variation across the District in the Riparian Reserve conditions, both concerning native plant communities and in the degree of degradation of the Riparian Reserves relative to a natural state. The majority of Riparian Reserves adjacent to large fish bearing streams are paralleled by roads and have had some past disturbances within them, including but not limited to timber harvests, mining, and livestock grazing in some low gradient areas with appropriate browse. Infestations by invasive plants are a common problem in these disturbed areas, and in some cases, this has reduced riparian function. For example, in areas where heavy infestations of blackberry occur, the dense thickets have hindered the re-establishment of native vegetation. Blackberry is not as well rooted as native tree species would be, is less effective at dissipating and withstanding flood flows, and does not contribute a source of coarse large wood, an important element to aquatic habitat. In addition, blackberry does not provide the level of shade and thermal buffering that native tree species would offer, resulting in less overhead cover for aquatic organisms, and increased stream temperatures. Many miles of roads have been constructed in the analysis area, and many streams are now bounded by roads in close proximity to their channels. This holds true for both the large rivers and principal tributaries, and for the smaller streams. Roads are a known route of dispersal for invasive plants, so it stands to reason that watersheds with higher road densities would have a higher likelihood of infestations by invasive plants. There are approximately 400 acres of Category I infestations within Riparian Reserves. There are likely many more thousands of acres of un-mapped areas with invasive plants (Category II) within Riparian Reserves across the District.

Treatments Planned Related to the Issue

Common to All Alternatives

Approximately 60 acres (less than 0.0003 percent of the Riparian Reserves on the District) of riparian vegetation dispersed throughout the District would be treated annually with herbicide. Only herbicides registered for riparian or wetland use would be applied in those areas. Table 2-8 provides the areas where registered use is appropriate. Herbicide treatments would be conducted with spot spraying.

No Action Alternative

Aquatic formulations of 2,4-D and glyphosate can be applied in both riparian and wetland areas. Dicamba cannot be applied in wetland areas when water is present. Picloram cannot be applied in riparian or wetland areas. Herbicide treatments would occur primarily with glyphosate and 2,4-D and limited amounts of picloram and dicamba on an estimated 300 net acres each year District-wide, including approximately 60 acres in Riparian Reserves (with 2,4-D or glyphosate). Only noxious weeds would be treated.

Proposed Action and Alternative 3

These alternatives would expand the number of herbicides available to use, as described in Chapter 2 of this EA, though picloram would no longer be available. Approximately 375 net acres of vegetation would be treated by herbicides annually; herbicide treatment acreage in Riparian Reserves would be similar (approximately 60 acres per year) as under the No Action Alternative. Of the additional herbicides proposed for use to treat terrestrial vegetation, only aminopyralid and aquatic formulations of imazapyr and triclopyr could be used up to the water line. (Fluridone, available under Alternative 3, is only used to treat aquatic, not terrestrial, invasive plants.)

Protection Measures

Standard Operating Procedures and Mitigation Measures for All Alternatives Relevant the Issue

There are numerous Protection Measures that have been developed to protect water resources, riparian and aquatic habitat, and aquatic organisms, and are listed in full in Appendix A.

Some of the pertinent Standard Operating Procedures or Mitigation Measures to protect aquatic habitat from adverse effects include:

- Use a selective herbicide and a wick or backpack sprayer
- Do not spray if precipitation is occurring or is imminent (within 24 hours).
- Do not broadcast spray when wind velocity exceeds 10 mph.
- 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.
- Use appropriate herbicide-free buffer zones for herbicides not labeled for aquatic use based on risk assessment guidance, with minimum widths from water of 25 feet for vehicle, and 10 feet for hand spray applications.
- 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 Mitigation Measure).

Project Design Features Adopted for the Proposed Action and Alternative 3

The following Project Design Features would further reduce effects on fish and other aquatic organisms under the Proposed Action and Alternative 3:

- For waterbodies that contain federally threatened or endangered fish species or provide Critical Habitat, all Project Design Criteria outlined in the Aquatic Restoration Biological Opinion II (ARBO II, NMFS 2013) from the National Marine Fisheries Service would be applied (see Appendix A). If a treatment project cannot be covered by ARBO II, additional consultation with the National Marine Fisheries Service would occur before treatment.
- Do not use fluazifop-P-butyl, fluroxypyr, rimsulfuron, or *Pseudomonas fluorescens* in Riparian Reserves, or within 1,500 feet of Coho Critical Habitat, due to lack of consultation coverage and / or uncertainty in potential effects to aquatic habitat from these untested agents. In addition, the label for fluazifop-P-butyl states that it is toxic to aquatic organisms, has a high potential to reach surface water through runoff or leaching into groundwater, and the threat of runoff may persist for several months. For these reasons, use of fluazifop-P-butyl will be confined to flat dry ground located greater than 1,500 feet from any aquatic features.

Environmental Consequences

Direct and Indirect Effects

Common to All Alternatives

Treatments targeting invasive plants in Riparian Reserves are not anticipated to result in any negative effects to the health and function of the Riparian Reserves. None of the proposed treatments would target large over-story trees, so shade and sources of future coarse wood inputs would be maintained in most treatment areas. In streamside areas where no native vegetation exists, there could be a loss of overhead cover, for example if a blackberry thicket around a small narrow stream was removed. This could potentially lead to elevated water temperatures, but the small amount of riparian vegetation proposed for treatment in any given year coupled with the small spatial extent of any given treatment area makes it extremely unlikely that treatments would result in detectable changes to water temperature.

Under all alternatives, only 60 acres of riparian vegetation dispersed throughout the District in small treatments[51] would be treated annually (60 acres is less than 0.0003 percent of the Riparian Reserves on the District), so any benefits accrued by these treatments would only be measurable at local levels. In the long term (one year to decades, depending on the riparian area and length of time required for native vegetation to become re-established), treating invasive plants in riparian areas would have a beneficial effect to Riparian Reserves, as it could allow for the establishment of native vegetation in previously infested areas. Depending on the site, this could be a conversion from a blackberry thicket to a wooded riparian corridor, which would (at the site level) yield positive benefits to riparian and aquatic habitats through increased shade, cover, nutrient inputs, bank stability, and source of wood inputs.

No Action Alternative

Herbicide treatments would occur on roughly 60 acres within Riparian Reserves annually, primarily using the herbicides glyphosate and 2,4-D. Aquatic formulations would be used near waterbodies. Broadcast and spot spraying are assumed to result in some amount of herbicide missing the target plant and reaching the ground, where it could be available for transport due to surface runoff or leaching to aquatic habitat, with spot spraying resulting in much less herbicide coming into contact with the ground than broadcast spraying. Hand-selective application methods of treatment are assumed to result in all herbicide being directly applied to the target plant. The Medford BLM conducts 95 percent of its herbicide treatments by spot spraying with backpack sprayers. Spot application to the waterline is allowed for aquatic formulations of glyphosate and 2,4-D and 10 feet from the water for hand spray applications of dicamba and picloram. (In waterbodies that contain listed anadromous fish, ARBO II directs that dicamba would not be allowed within 15 feet of the waterline, and picloram, which has a high risk to aquatic organisms if directly applied to water, would not be allowed within 50 feet of any waterbodies.)

Herbicide treatments would be spot applied directly to the target plants, resulting in no direct ground disturbance. Spot application would allow for the retention of non-targeted vegetation within treated riparian areas, which would preclude the likelihood of baring large areas of non-vegetated soil. However, in areas where streamside zones are monocultures of invasive plants, it is possible that bare soil could be available for transport to the stream during winter rain events. Sedimentation would only be a risk to water quality if treatments occur within 10 meters of the stream (Rashin et al. 2006).

There would be a negligible amount of sediment delivered to streams as a result of treatments. This is because there would be less than 60 total acres of riparian treatments. However, given that less than 60 total acres of riparian treatments dispersed across the entire Medford District would occur in any given year; that most infestations are less than ½ acre in size; that most of this acreage would not be adjacent to the stream and hence untreated vegetation would remain as a stream side buffer to capture any displaced sediment; and, that measures to stabilize disturbed ground adjacent to streams would be taken; the magnitude of sediment potentially contributed to aquatic habitat in any given stream from treatments would be very small and undetectable in aquatic habitat. Any sediment that was contributed would occur during the first freshet (elevated stream flow caused by heavy rain) following treatments, and would quickly dissipate downstream as a small turbidity pulse which would be a tiny fraction of any given stream's annual sediment budget and would be undetectable behind background levels which would be expected to occur during a freshet. This small, one-time pulse of turbidity would

[51] See Table 2-2, *Summary of Invasive Plants Documented in NISIMS by Infestation Size*, for more information; 85.5 percent of Category I sites are smaller than ½ acre.

be inconsequential to fish and other aquatic organisms (which evolved in environments prone to periodic inputs of sediment and turbidity), and would be very short in duration, persisting only a few minutes. Therefore, inputs of sediment to aquatic habitat resulting from herbicide treatments in Riparian Reserves would result in negligible effects to sediment levels.

Applications of herbicides to terrestrial invasive plants are unlikely to adversely affect aquatic fauna. Various Protection Measures would limit the potential for terrestrial applications of herbicides from entering the water directly. Indirect contributions of herbicide to aquatic habitat from runoff is a potential concern, though most of the analysis area is forested, and surface runoff in forested environments is extremely unlikely because precipitation rates are usually much less than infiltration rates (Rothacher and Lopushinsky 1974). Runoff would be more likely to occur from disturbed and compacted surfaces, such as along roads and their associated ditches and landings. This represents only a very small fraction of the analysis area, but these areas are at higher risk for invasion so there is an elevated potential for runoff from these treatments. Leaching of chemicals has been reported to be unlikely to occur in forested environments, as most of the chemicals are relatively immobile in soil, and most do not persist long enough in the soil for leaching distances greater than 1 meter to occur (Meehan 1991). However, several of the herbicides are known to have potential to leach through the soil and into ground water, which may eventually daylight as surface water further downslope. Therefore, there is a potential that small amounts of herbicide could enter aquatic habitat through runoff from compacted surfaces and leaching from areas close to streams (see *Soil* Issue 2). This would be most likely to occur during the first heavy rains of the season and would likely happen weeks to months after application of the herbicide. An Oregon FEIS Mitigation Measure requires analyses for roadside treatments 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; this would be considered as part of the Annual Treatment Plan interdisciplinary team review.

Glyphosate has been reported to be immobile in the soil as it is readily absorbed by soil particles and subject to microbial degradation (Norris et al. 1991). 2,4-D in its ester form is known to be toxic to aquatic organisms even through contact from runoff from applications in upland areas. However, the BLM does not typically use the ester form of 2,4-D, and it would not be permitted in areas with hydrological connectivity to aquatic habitat. The U.S. EPA classifies the toxicity of 2,4-D to freshwater and marine fish as practically non-toxic for 2,4-D acid / salts. Adverse effects on aquatic animals are not likely with formulations of 2,4-D salts except for accidental and extreme exposures at the upper ranges of application rates assessed in the Risk Assessments (SERA 2006). Dicamba would be rarely used. It has a short life span in soil and would be unlikely to persist long enough to run off. Further, it would not be used near water or in soils where it would be likely to runoff. Picloram would also rarely be used. The picloram Risk Assessment found no chronic risk exposure (the scenario which best represents input of this chemical to waterways from runoff originating from upland sources) to fish (see Appendix C).

Aquatic flora would be more likely than aquatic fauna to be affected by the terrestrial application of these herbicides. Glyphosate and 2,4-D rate from low to high risk for aquatic plants (see Appendix C); any direct input of these herbicides into water would correspond with at least a moderate risk to affect susceptible aquatic plants. If these herbicides were to enter water via runoff, risk ratings indicate a low risk from glyphosate and a moderate risk from 2,4-D. Because streamside buffers would be required if dicamba and picloram were used in riparian areas, these herbicides would only be likely to enter aquatic habitat through indirect means, such as runoff from upland areas. The effects of these herbicides on aquatic macrophytes has not been evaluated under the runoff scenario, but there is potential that they too would pose some level of risk to aquatic plants. However, given the small amount of treatments likely to occur within Riparian Reserves on an annual basis; that most of the herbicide treatments would be buffered from aquatic habitats; and, that overall treatment acres represent less than 0.0003 percent of the Riparian Reserves on the District on an annual basis, any unintended impacts to aquatic vegetation are anticipated to be localized and confined to individual habitat units (i.e., a single pool). The loss of aquatic vegetation at such small spatial and temporal scales would not result in biologically meaningful effects to aquatic habitat; un-affected habitats would remain up and downstream to provide un-altered habitats and a source population of aquatic vegetation to allow for the re-colonization of any affected habitat units.

Proposed Action and Alternative 3

Herbicide treatments would occur on roughly 60 acres within Riparian Reserves annually. Since there would be more selective herbicides that could be used to treat invasive plants in Riparian Reserves, the potential for large areas of bare soil and thus sediment input to aquatic habitat would be less likely than described above for the No Action Alternative. In addition, if large areas of bare soil occurred as a result of a treatment (for example, if an area is a monoculture of invasive plants and large bare areas would result even with selective herbicides), mulching any areas of continuous bare soil, as described in a Project Design Feature in *Water* Issue 2, adjacent to watercourses would minimize this risk.

Of the additional herbicides proposed to treat terrestrial vegetation under these alternatives, only aminopyralid and aquatic formulations of imazapyr and triclopyr would be sprayed up to the water line of aquatic habitats. Risk assessments prepared for aminopyralid and aquatic imazapyr showed no risk to any tested aquatic organisms under any of the tested application rates and delivery scenarios as shown in Appendix C*, Herbicide Risk Assessment Summaries*. Aquatic formulations of triclopyr were found to have only a low risk for susceptible fish, amphibians, and susceptible insects at maximum application rates under the accidental spill scenario, with no risks under any other scenarios (see Table 3-8 in *Fish and Aquatic Organisms* Issue 1).

The other new herbicides proposed for use (chlorsulfuron, clopyralid, dicamba, diflufenzopyr, fluroxypyr, imazapic, metsulfuron methyl, rimsulfuron, or sulfometuron methyl) would be applied no closer than ten feet from water for hand spray applications and 25 feet for vehicle. (In waterbodies that contain listed anadromous fish, ARBO II directs that herbicides be buffered from waterways by distances varying from 15 feet to 150 feet.) The potential for indirect input into waterways of these herbicides by runoff would exist, but would be lessened due to these application buffers. However, Risk Assessments for all of the additional herbicides proposed for use found no risk to aquatic organisms from these herbicides under the surface runoff scenario and non-accidental acute and chronic / longer-term exposure scenarios, except for *Pseudomonas fluorescens*, which has not had a Risk Assessment prepared. *Pseudomonas fluorescens* and fluazifop-P-butyl treatments would be used on a very limited basis on research plots up to 5 acres in size, with a maximum application of 45 acres (per herbicide) across the District. Because potential effects from *Pseudomonas fluorescens* to aquatic organisms and habitat have not been assessed, and BLM has not consulted on its use with the National Marine Fisheries Service, these herbicides (as well as fluazifop-P-butyl, fluroxypyr, and rimsulfuron) would not be applied within 1,500 feet of Critical Habitat, or within any Riparian Reserve.

It is unlikely that use of the additional herbicides available under the Proposed Action Alternative and Alternative 3 would have any potential to affect aquatic fauna. This is because only aquatic formulations shown to be non-toxic to aquatic organisms are approved for use near water. Other herbicides would be buffered from water and therefore could only be transported to aquatic habitat indirectly. The Risk Assessments showed no effects to aquatic organisms from these herbicides under any of the scenarios that would result in transport to water from upland applications.

Aquatic flora would be more likely (than aquatic fauna) to be affected by terrestrial application of these herbicides. Risk assessments for aminopyralid and aquatic formulations of triclopyr and imazapyr (herbicides that could be applied down to the water line) show no risk to aquatic vegetation under any scenario for aminopyralid, but moderate to high risk under all scenarios for both imazapyr and triclopyr. For the other herbicides that would be available for use in upland areas, metsulfuron methyl was assessed as having a low risk to susceptible aquatic macrophytes under the acute exposure scenario, but no risk under the chronic exposure scenario, and sulfometuron methyl was found to pose a low risk to aquatic plants (in ponded environments only) under the surface runoff scenario. The other herbicides were found to have no risk to aquatic vegetation from exposure scenarios mimicking inputs of the herbicides from runoff. Because there would be more options to use herbicides less likely to affect aquatic vegetation from surface runoff under these alternatives, the potential for unintended effects to occur to aquatic vegetation would be reduced slightly under these alternatives relative to the No Action Alternative.

None of the parameters in 303(d)-listed waterbodies on the District would be measurably affected by the implementation of the Proposed Action. The Proposed Action and Alternative 3[52] are consistent with the *Clean Water Act* as Standard Operating Procedures, Mitigation Measures, and other measures are designed to keep non-aquatic herbicides from getting into waters. The benefits of controlling invasive plants with aquatic herbicides before they spread and adversely affect aquatic habitat, water quality and quantity, infiltration, and runoff, outweigh the risk of using herbicides, as none of those proposed for use pose a risk to aquatic systems.

Summary of Effects

Table 3-10. *Summary of Effects (Fish and Aquatic Organisms Issue 2)*

Alternative	Direct Effects	Indirect Effects
No Action Alternative	Protection Measures would limit the potential for terrestrial applications of herbicides from entering the water directly. No direct effects are anticipated to result to aquatic organisms or aquatic habitat because of applications of herbicide in Riparian Reserves.	Potential for short-term minor localized effects to aquatic vegetation, and negligible effects to sediment. Potential adverse effects to aquatic vegetation would be reduced slightly under the Proposed Action and Alternative 3 relative to the No Action Alternative. Potential effects to sediment would be the same for all alternatives.
Proposed Action		
Alternative 3		

Cumulative Effects

The only potential detectable adverse effect to aquatic and riparian habitats and aquatic organisms anticipated to result from selection of any of the alternatives would be the potential for minor localized effects to aquatic vegetation. Other anthropogenic disturbances that could affect aquatic vegetation in the analysis area at small localized scales include grazing, mining, in-stream habitat restoration projects, and maintenance of instream infrastructure, such as pump chances and culverts. Natural disturbance events including episodic flood and drought events will continue to impart effects to aquatic vegetation on much larger scales (i.e., entire stream reaches). This project could potentially increase disturbances by a small fraction of a percent (less than 0.0003 percent of Riparian Reserves would be treated in any given year). As indicated, the duration of any potential disturbances to aquatic vegetation resulting from herbicide treatments would be less than one year. Any loss of vegetation in any given habitat unit would be well within the range of natural variability, and would not appreciably affect aquatic habitat or fish.

Negligible inputs of sediment to aquatic habitat resulting from disturbed or bare ground adjacent to waterways due to the removal of vegetation are also possible. The extent of disturbance proposed in riparian areas in any given year would remain the same under the three alternatives, though the treatment herbicides may vary. However, the effects from sediment input into aquatic habitat would be similar for all alternatives. The small magnitude of any potential inputs, coupled with the timing of the inputs (during high precipitation events) would render the sediment undetectable in aquatic habitats beyond background levels, and hence would not contribute adverse cumulative sediment impacts to aquatic habitat. Other disturbances, such as grazing, mining, and sediment derived from roads will continue to input much larger quantities of sediment to aquatic habitat on a chronic basis, and episodic events such as fire, floods, and debris torrents will continue to periodically contribute many tons of sediment to aquatic habitats across the District.

[52] As well as the No Action Alternative

Fish and Aquatic Organisms Issue 3 (Not Analyzed in Detail)

Would manual treatment of aquatic vegetation as proposed under Alternative 3 adversely affect aquatic organisms or their habitat?

This issue was not analyzed in detail because the nature of the disturbance associated with manual treatments would have little potential to adversely affect native aquatic organisms. The effects to aquatic habitat would be minimal and in large part beneficial to native aquatic organisms and aquatic habitat. Manual treatments in aquatic habitat would use hand pulling and rakes to physically remove invasive aquatic plants. Follow up treatments could occur as water levels receded, including use of a shovel to dig up root masses of previously pulled invasive plants. Additionally, to control yellow floatingheart in ponds or lakes, weed mats may be placed over portions of the substrate to preclude future rooting and emergence of yellow floatingheart. Treatments could occur in the same habitats described under *Fish and Aquatic Organisms* Issue 1; disconnected and isolated side channels and backwaters along the lower Rogue River in the summer, and ponds, lakes, and pump chances. These types of aquatic habitat are generally unsuitable for native fish due to higher water temperatures and lower dissolved oxygen levels that occur during the summer. Therefore, it is very unlikely that native fish would be present in aquatic habitat at the time of treatment. Furthermore, fish are mobile organisms, and would be able to avoid injury from hand pulling or raking simply by swimming away from the area where manual weed controls were occurring. For these reasons, there is little potential for manual treatments to affect native fish.

Pulling of invasive plants may inadvertently result in the removal of aquatic macroinvertebrates from aquatic habitat, particularly those species that live and forage in and around aquatic vegetation, potentially resulting in temporary localized reductions in population sizes. However, many individuals would escape or remain in undisturbed areas, and populations would quickly rebound, and therefore no adverse effects to macroinvertebrate species diversity or populations are anticipated to result from this activity.

Placement of weed mats would result in a temporary (lasting up to a few years) conversion of the bottom substrate of portions of treated ponds from mud (the substrate yellow floatingheart would likely be found in) to a non-natural mat. This could result in less burrowing habitat for some species of macroinvertebrates. Over time, it is likely that additional fine sediments and decomposing organic materials would settle out and eventually cover the mats, and that eventually the treated areas would be indistinguishable from non-treated areas. Non-treated areas would remain adjacent to the installed mats, so these species would have other available habitats to utilize in the interim, resulting in no adverse effects to macroinvertebrate species diversity or populations.

Aquatic habitat would ultimately benefit from the manual treatments, as nonnative vegetation would be removed, allowing for the development of more natural habitat conditions to occur. There could be small localized short duration increases in turbidity, as pulling of the weeds could disturb fine sediment already in the aquatic substrate. This sediment would rapidly (within minutes) settle out of solution and be deposited back on the stream / pond bed. As this sediment is already in the aquatic system, it would not be an addition of fine sediment, just a temporary displacement of it. Due to the short duration and magnitude of increased turbidity, no adverse effects to aquatic organisms are anticipated to result from this action.

Wildlife

Wildlife Issue 1 (Not Analyzed in Detail)

How would invasive plant treatments (especially herbicides) affect wildlife species (especially Special Status wildlife species)?

Wildlife issues are not analyzed in detail because the effects of the herbicides were analyzed in three NEPA analyses to which this EA tiers; the 2007 and 2016 PEISs (done at the National level) and the 2010 Oregon FEIS

(USDI 2010a:241-257, USDI 2007a:4-96 to 4-13, USDI 2016a:4-51 to 4-64). There are no new circumstances or information at the site-specific level that would change the effects anticipated for this EA. The herbicides analyzed in this EA were chosen in part because they were unlikely to have adverse effects to wildlife (Appendix C and USDI 2010a:245) and Mitigation Measures adopted with the Records of Decision for these three EISs mitigated all potentially significant effects at the National and State level. The risk of adverse effects is further minimized as a result of Project Design Features adopted for the Proposed Action and Alternative 3.

There are 30 documented and four suspected Special Status wildlife species on the Medford District, including five federally listed species: the Northern spotted owl, marbled murrelet, the gray wolf, the Oregon spotted frog, and the vernal pool fairy shrimp (see Table 3-11). Table 3-11 also includes additional potentially susceptible birds.

Table 3-11. *Wildlife Special Status Species, Birds of Conservation Concern, and Game Birds Below Desired Conditions*

Common Name	Scientific Name	2017 Status[1]	Medford Presence[2]	General Habitat
		Birds		
Allen's hummingbird	*Selasphorus sasin*	BCC	Suspected	Found in narrow, moist coastal fog zones in open areas of coastal scrub. Nest in nearby wooded areas. Potentially in the far west of the District.
American peregrine falcon	*Falco peregrinus anatum*	Bureau Sensitive and BCC	Documented	Wide range of habitats, nests on cliff ledges
Bald eagle	*Haliaeetus leucocephalus*	Bureau Sensitive and BCC	Documented	Nests in large older trees in forested areas near large bodies of water, along rivers, lakes, and reservoirs.
Band-tailed pigeon	*Patagioenas fasciata*	GBBDC	Documented	Coniferous and mixed forests and woodlands
Grasshopper sparrow	*Ammodramus savannarum*	Bureau Sensitive	Documented	Open grasslands with scattered shrubs for perching.
Lewis’ woodpecker	*Melanerpes lewis*	Bureau Sensitive	Documented	Open mixed conifer-hardwoods, including oaks and pines with standing snags.
Marbled murrelet	*Brachyramphus marmoratus*	Federally Threatened	Suspected	Nests inland in old growth forest stands within 35-50 miles of the coast. No documented sites on the Medford District.
Mourning dove	*Zenaida macroura*	GBBDC	Documented	Breed in variety of open habitats, including agricultural areas, open woods, and forest edges
Northern goshawk	*Accipiter gentilis*	BCC	Documented	Mature forests with large trees on moderate slopes with open understories.
Northern spotted owl	*Strix occidentalis caurina*	Federally Threatened	Documented	Older mixed conifer forests with high canopy cover.
Olive--sided flycatcher	*Contopus cooperi*	BCC	Documented	Open conifer forests (< 40% canopy cover) and edge habitats where standing snags and scattered tall trees remain after a disturbance.
Oregon vesper sparrow	*Pooecetes gramineus affinis*	Bureau Sensitive and BCC	Documented	Grassland and savannah habitat types in lowland valleys and foothills, except for the Klamath Mountains ecoregion where it occurs in montane meadows.
Purple finch	*Carpodacus purpureus*	BCC	Documented	Breed in moderately moist, open conifer forests, and edge habitat at low -to-mid elevations. Use a variety of habitats including deciduous woodlands, riparian corridors, and edge habitat. In winter, they are more widespread, using forests, shrubby areas, weedy fields, hedgerows, and backyards.

Common Name	Scientific Name	2017 Status[1]	Medford Presence[2]	General Habitat
Purple martin	*Progne subis*	Bureau Sensitive	Suspected	Open habitat near forest edges and clearings. Snags with cavities.
Rufous hummingbird	*Selasphorus rufus*	BCC	Documented	Found in a variety of habitats, most likely in brushy areas with flowers and forests with a well-developed understory.
Tri-colored blackbird	*Agelaius tricolor*	Bureau Sensitive	Documented	Wetlands, cattail marshes
White-headed woodpecker	*Picoides albolarvatus*	Bureau Sensitive and BCC	Documented	Open mixed conifer forests (< 40% canopy cover) dominated by old growth Ponderosa Pine and open habitats where standing snags and scattered tall trees remain.
White-tailed kite	*Elanus leucurus*	Bureau Sensitive	Documented	Open fields and agricultural lands
Willow flycatcher	*Empidonax traillii*	BCC	Documented	Riparian and shrub habitat
Amphibians				
Black salamander	*Aneides flavipunctatus*	Bureau Sensitive	Documented	Found in forests, open woodlands, moist talus, and streamside areas with down logs and rock debris.
Foothill yellow-legged frog	*Rana boylii*	Bureau Sensitive	Documented	Permanent streams with gravel bottoms
Siskiyou Mountains salamander	*Plethodon stormi*	Bureau Sensitive	Documented	Talus in mature forests with high canopy cover
Oregon spotted frog	*Rana pretiosa*	Federally Threatened	Documented	Found in or near a perennial body of water (at least 2.5 acres in size) that includes zones of shallow water and abundant emergent or floating aquatic plants, which the frogs use for basking and escape cover.
Reptiles				
Northwestern pond turtle	*Actinemys marmorata*	Bureau Sensitive	Documented	Spends the majority of their life cycle in aquatic environments, but leave the water to adjacent meadows to dig terrestrial nests and lay their eggs. Often over-winter in the uplands.
Mammals				
Fisher	*Pekania pennantia*	Bureau Sensitive	Documented	Mature older forests with higher canopy cover, snags, and down logs.
Fringed myotis bat	*Myotis thysanodes*	Bureau Sensitive	Documented	Roosts in caves, abandoned buildings, rock crevices, and trees. They are found in chaparral to ponderosa pine habitat, but preferred habitats are oak woodlands, mixed conifers, and mature Douglas firs and snags.
Gray wolf	*Canis lupus*	Federally Endangered	Documented	Habitat generalists
Pacific marten	*Martes caurina*	Bureau Sensitive	Documented	Older / mature conifer dominated forests with dense understory shrub layers and down wood and snags.
Pallid bat	*Antrozous pallidus*	Bureau Sensitive	Documented	Found in brushy, rocky terrain, but have been observed at edges of coniferous and deciduous woods and open farmland. Roosts in buildings, bridges, large decadent snags, and rock outcrops.
Townsend's big-eared bat	*Corynorhinus townsendii*	Bureau Sensitive	Documented	Roost and hibernate in mines and caves, but have been found roosting in hollow trees.
Invertebrates				
Coronis fritillary	*Speyeria coronis*	Bureau Sensitive	Documented	Lower elevation canyons and grasslands as well as mid-montane meadows and forest margins and openings. Larvae feed mostly on *Viola hallii*, found in rocky serpentine habitats.

Common Name	**Scientific Name**	**2017 Status**[1]	**Medford Presence**[2]	**General Habitat**
Crater Lake tightcoil	*Pristiloma crateris*	Bureau Sensitive	Suspected	Found in mature conifer forests and among rushes, mosses and other surface vegetation or under rocks and woody debris within 10 meters of open water in wetlands, springs, seeps and riparian areas which experience perennially moist conditions and long winters.
Franklin's bumblebee	*Bombus franklini*	Bureau Sensitive	Suspected	Requires habitat with a sufficient supply of floral resources to provide continuous blooming throughout the colony season. Generalist foragers, gathering pollen and nectar from a wide variety of flowering plants. *Bombus franklini* have been observed collecting pollen on lupine (Lupinus) and California poppy (Eschscholzia), and nectaring on horsemint (Agastache) and mountain penny-royal (Monardella).
Gray-blue butterfly	*Plebejus podarce klamathensis*	Bureau Sensitive	Documented	Occurs at high elevation wet montane meadows from 5,100 ft. to over 6,500 ft. Marshy slopes and meadows that are lushly overgrown with deep grasses and dense stands of false hellebore (*Veratrum viride*). Found on adjacent Forest Service lands.
Johnson's hairstreak butterfly	*Callophrys johnsoni*	Bureau Sensitive	Documented	Spends lifespan in and near the tops of conifer trees, although it descends to ground level for nectaring (including Oregon grape, Pacific dogwood, ceanothus, pussy paws, and Rubus species) and to visit moist muddy areas as a source of water. Dependent on conifer mistletoe for egg laying and for food in its larval stage.
Mardon skipper butterfly	*Polites mardon*	Bureau Sensitive	Documented	Populations in the southern Oregon Cascades occupy small (0.5 to 10 ac), higher-elevation (4,500 to 5,100 ft.) grasslands within mixed conifer forests. They are usually associated with a water source, usually a small perennial or intermittent stream running through the grassland, but also with areas with shallow subsurface water.
Oregon shoulderband snail	*Helminthoglypta hertleini*	Bureau Sensitive	Documented	Associated with shrublands or rocky inclusions in forested habitat with substantial grass and subsurface water sources.
Siskiyou hesperian snail	*Vespericola sierranus*	Bureau Sensitive	Documented	Associated with talus and rock outcrops, oak and maple overstory component, in mixed conifer-hardwood forests.
Siskiyou short horned grasshopper	*Chloealtis aspasma*	Bureau Sensitive	Documented	Associated with open grassland with an elderberry shrub component.
Travelling sideband snail	*Monadenia fidelis celeuthia*	Bureau Sensitive	Documented	Talus and rock outcrops, with oak and maple overstory component
Vernal pool fairy shrimp	*Branchinecta lynchi*	Federally Threatened	Documented	Found on the top of Table Rocks in vernal pools, which are shallow depressions, which fill with water during the wet season.

Common Name	Scientific Name	2017 Status[1]	Medford Presence[2]	General Habitat
Western bumblebee	*Bombus occidentalis*	Bureau Sensitive	Documented	Require plants that bloom and provide adequate nectar and pollen throughout the colony's life cycle. Flower-rich meadows of forests and subalpine zones. Nests are primarily in underground cavities such as old squirrel or other animal nests and in open west-southwest slopes bordered by trees.

1. BCC = Migratory Birds of Conservation Concern; GBBDC = Game Birds Below Desired Conditions
2. Source: 2015 State Directors List, with updates from site-specific information. Includes on-District or adjacent to Medford BLM-managed lands.

The Oregon FEIS concluded the likelihood of significant adverse effects to wildlife from contact with the herbicides analyzed in that document was negligible at the population scale. The herbicides are formulated to affect plants and have been selected to have some of the lowest (or no) demonstrable wildlife toxicity of EPA-registered herbicides, do not bioaccumulate, and are quickly degraded in wildland settings (USDI 2010a:245). An occasional individual could be exposed to doses above the level of concern, but risks would not be expected to be significant at the population level (USDI 2010a:245). The 2016 PEIS stated that aminopyralid and rimsulfuron would not pose toxicological risks to any special status wildlife under modeled exposure scenarios. Fluroxypyr would have a low risk to susceptible pollinating insects as a result of direct spray scenarios (USDI 2016a:4-61) and is discussed further below.

The Oregon FEIS described that the risk of adverse effects to wildlife from dermal contact or ingestion would vary by the amount of herbicide applied to vegetation that is used as forage, 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 associated with herbicide treatments generally would cause wild animals to temporarily leave the immediate area.

Table 3-12 is a summary of the potential risks to wildlife from each of the herbicides considered in this analysis. This summary was adapted from the 2007 PEIS, the Oregon FEIS, the 2016 PEIS, and the Risk Assessments that were created or adopted as part of those analyses.

***Table 3-12**. Effects of Herbicides (Wildlife)*[1]
Additional information about the risk ratings discussed below can be found in Appendix C, *Herbicide Risk Assessment Summaries*.

Available under the No Action Alternative	
Picloram	Studies on birds, bees, and snails generally support picloram as relatively nontoxic to terrestrial animals. The few field studies indicated no change to mammalian or avian diversity following picloram treatment. Variations in different exposure assessments have little effect on 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 conclusive studies on invertebrates were found. No sublethal effects were noted on honeybee activity patterns.
Available under all Alternatives	
2,4-D	2,4-D 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 2006) 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 LD50. However, bats were not specifically included in these mammal groups; only small and large mammalian herbivores were included. Bats are generally wide-ranging and forage in multiple locations two miles or more from their roost sites. It is unlikely they would only forage on insects that have been sprayed due to the small treatment areas, so the potential effects are minimal. 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. Honeybees would not be adversely affected by 2,4-D use, even at the highest application rate (SERA 2006). Studies that quantify exposure for other terrestrial invertebrates suggest that adverse effects occur at application rates of 4 lbs. / acre but this rate is greater than that used by the District. The salt form is practically non-toxic to amphibians, but the ester form is highly toxic. It can be neurotoxic to amphibians; although not all amphibians respond the same (e.g., toads were more susceptible than leopard frogs) (SERA 2006).
Dicamba	No adverse effects on mammals are plausible for either acute or chronic exposures to dicamba at the typical rate. At the highest tested rate, there are adverse reproductive effects possible for acute scenarios consuming contaminated vegetation. Dicamba has no adverse effects on birds for acute or chronic exposures at the typical rate, although highest tested application rates had possible adverse reproductive concerns for acute scenarios involving birds consuming contaminated vegetation or contaminated insects (SERA 2004f). Dicamba is practically non-toxic to amphibians and honeybees. Amphibians are as tolerant as fish to the acute toxicity of dicamba, and aquatic invertebrates appear to be somewhat more susceptible to dicamba than fish or amphibians.
Glyphosate	Glyphosate formulations vary in toxicity, but studies support the conclusion that the toxic effect of POEA-containing glyphosate herbicides is due to POEA rather than to the active glyphosate ingredient and BLM no longer uses formulations that include POEA. The glyphosate Risk Assessment (SERA 2011a) found that toxicity to wildlife under most of the Risk Assessment scenarios is very low, so much so that No Observed Adverse Effects Levels are used because the LD_{50} were not found. Observed effects in mammals had to do with reduced feeding efficiency and reduced weight gain. Glyphosate does not bioaccumulate. Larval amphibians were more susceptible in some studies (Relyea 2005b), but less so in other studies (Thompson et al. 2004). However, glyphosate without POEA has not been tested on a wide range of amphibians. Glyphosate is low risk to honeybees, but little information is available for other terrestrial invertebrates. Most field studies suggest that effects on terrestrial invertebrates would be minimal (SERA 2011a). A recent study found that chronic exposure (over the course of 75 days) to very low doses of glyphosate resulted in kidney and liver damage to laboratory animals (Mesnage et al. 2015).
Available under both the Proposed Action and Alternative 3	
Aminopyralid	The Risk Assessment for aminopyralid predicted that exposure to this active ingredient would not pose a risk to terrestrial wildlife (including pollinators) under any of the modeled exposure scenarios. Risk quotients were all below the level of concern of 0.5 (acute high risk). Therefore, exposure of wildlife to this active ingredient by direct spray, contact with sprayed vegetation, or ingestion of plant materials or prey items that have been exposed to this active ingredient is not a concern from a toxicological perspective.
Chlorsulfuron	Chlorsulfuron 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 level of concern for wildlife groups under tested scenarios, even under spill or off-site drift scenarios. There is very little information on the effects of chlorsulfuron on terrestrial invertebrates, amphibians, or reptiles (SERA 2004a). The literature includes two toxicity studies involving leaf beetles exposed to chlorsulfuron that reported there were no substantial effects on survival or growth for insects from host plants treated with chlorsulfuron. Toxicity studies in honeybees were not identified for chlorsulfuron.
Clopyralid	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. There is no risk to honeybees from direct spray at typical application rates. No studies on reptiles, amphibians, or invertebrates were found (SERA 2004b).
Dicamba + Diflufenzopyr	Diflufenzopyr has slightly more toxic effects 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. Risk quotients for terrestrial wildlife were all below the most conservative level of concern of 0.1, indicating that accidental direct spray effects 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 the maximum application rates. There are chronic and acute ingestion concerns for mammals as well (see Appendix C, *Herbicide Risk Assessment Summaries*). It has low toxicity to

	honeybees. It is practically non-toxic to aquatic invertebrates, although they are more susceptible to dicamba than fish. One study on dicamba indicates it is practically non-toxic to amphibians (ENSR 2005b, e).
Fluroxypyr	The Risk Assessment for fluroxypyr predicted that exposure to fluroxypyr would not pose a risk to most terrestrial wildlife (including pollinators) under any of the modeled exposure scenarios; the Risk Assessments indicate that there is a low risk under typical and maximum rates to susceptible pollinators under the 100 percent absorption scenario (direct spray). All other risk quotients were below the level of concern of 0.5 (acute high risk); Therefore, exposure of wildlife to this active ingredient by direct spray, contact with sprayed vegetation, or ingestion of plant materials or prey items that have been exposed to this active ingredient is not a concern from a toxicological perspective.
Imazapic	Imazapic is an ALS-inhibitor that rapidly metabolizes and does not bioaccumulate. 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 mammals or birds shows any ratings that exceed the level of concern. Imazapic has one of the lowest toxic risks to wildlife of herbicides evaluated in this EA along with other ALS-inhibitors (SERA 2004c). Very little information on toxicity to terrestrial invertebrates is available. Even at exposure associated with direct spray, there is no basis for expecting mortality in honeybees (SERA 2004c).
Imazapyr	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. There is a lack of information on dose levels that demonstrate harm to mammals, amphibians, or birds.
Metsulfuron methyl	Metsulfuron methyl 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 level of concern at the typical rate, and few exceeded the level of concern at maximum rate. Metsulfuron methyl has very low toxicity to birds for direct spray and consumption and no mortality of acute spray on honeybees. Aquatic invertebrates do not appear to be susceptible. One study on rove beetles indicated reduced egg hatching. Like other ALS-inhibitors, it is one of the least toxic of the herbicides evaluated (SERA 2004d).
Rimsulfuron	The Risk Assessment for rimsulfuron predicted that none of the exposure scenarios would pose a risk to any type of terrestrial wildlife (including pollinators). Risk quotients were all below the level of concern of 0.5 (acute high risk).
Sulfometuron methyl	Sulfometuron methyl has the lowest risk to all groups of wildlife of the herbicides evaluated (with other ALS-inhibitors). All scenarios indicate no risk rating that exceeded the level of concern, although it may be moderately toxic to amphibians; Sulfometuron methyl can cause malformations in amphibians (SERA 2004e), but whether the malformations are caused by endocrine disruption, cellular toxicity, or other pathways has not been reported.
Triclopyr	Triclopyr is available as triethylamine (TEA) salt and butoxyethyl ester (BEE). 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 level of concern for mammals, but average hazard quotients do not exceed the level of concern 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. Using less toxic formulas reduces risk (SERA 2011d). No studies on invertebrates were found.
Available for Research and Demonstration (Proposed Action and Alternative 3)	
Fluazifop-P-butyl	The risk characterization of mammals and birds is constrained by the lack of field studies and is based solely on laboratory studies and modeled estimates of exposure. There are no data to suggest that levels of long-term exposure cause adverse effects in birds. For acute non-accidental exposures, hazard quotients are below the level of concern except for mammals and large birds consuming contaminated grass. This scenario is unlikely because fluazifop-P-butyl kills most treated grasses before wildlife has an opportunity to consume it. Based on the available toxicity data on the honeybee, fluazifop-P-butyl

	would not cause adverse effects following direct spray or surface contamination of the insect due to spray drift. Risks to reptiles and terrestrial phase amphibians cannot be characterized directly because of the lack of data.
Pseudomonas fluorescens	Studies submitted in support of the strain D7 registration indicated that there was no impact on the growth and development of daphnia, mites, ladybugs, honeybees, fish, birds, or mice, as specified through the EPA Registration process (USDI 2015c). No other studies were found.
Available Under Alternative 3	
Fluridone	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 to aquatic species (fish and aquatic invertebrates); however, it has very low risk to other wildlife forms (see Appendix C, *Herbicide Risk Assessment Summaries*). 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 2005c). Although terrestrial invertebrates are not likely to be exposed to fluridone, and risks to this group are not quantified in the Risk Assessment, the single available acute NOAEL suggests that terrestrial insects are less sensitive than mammals or birds to the effects of fluridone exposure (SERA 2008).

1. Herbicide information summarized from the 2010 Oregon FEIS (USDI 2010a:247-250), the 2007 PEIS (USDI 2007a:4-96 to 4-123), and the 2016 PEIS (USDI 2016a:4-51 to 4-63).

Ninety-five percent of herbicide treatments on the Medford District would be spot treatments to target specific plants, so that effects to non-target species can be kept to a minimum. Pre-project surveys would identify the presence of Special Status species and would inform the Conservation Measures that would be applied (see Figure 3-1), including herbicide-free buffers. Risk ratings (the high / moderate / low / none, described in Table 3-12 above) are based on various exposure scenarios. Standard Operating Procedures and Mitigation Measures including limitation on the herbicide types and doses, handling procedures, application methods, drift minimization, and timing of application are designed to greatly reduce the likelihood that the modeled exposure scenarios described would actually occur, and thus reduce the described adverse effects to wildlife species, including Special Status species.

The District prepares an Annual Treatment Plan with the year's planned invasive plant treatments. These are subject to an interdisciplinary team review, which helps the District ensure that treatments conform to design and mitigation standards[53], and that the required Pesticide Use Proposals, Biological Control Agent Release Proposals, and other authorizations, obligations, and commitments[54] are completed prior to implementation. Projects that have the potential to disturb Special Status wildlife habitat require pre-project clearances, including review for potential habitat and / or pre-project site surveys (USDI 2008b).

The Oregon FEIS states that long-term beneficial effects to Special Status wildlife habitat would occur as a result of the Proposed Action and Alternative 3, as habitat change can result from invasive plants (USDI 2010a:251). The International Union for the Conservation of Nature (IUCN) notes that a substantial portion of species now considered extinct were driven to extinction by invasive species and generally ranks invasive species as one of the top ten threats to currently threatened species (IUCN 2008 as cited in USDI 2010a:251). The Oregon FEIS notes that native bird diversity corresponds with native plant diversity, invasive plants can crowd out amphibians, and many invasive plants are unpalatable for grazing animals (USDI 2010a:251-252). Invasive plant populations are estimated to spread 12 percent a year, damaging native plant communities and wildlife habitat and inhibiting ecosystem functions associated with those communities. Treatments under the Proposed Action and Alternative 3 are expected to be 80 percent effective and treatments under the No Action Alternative are expected to be 60 percent effective (see Chapter 2 and USDI 2010a:136-138).

[53] For example, Project Design Features adopted by this EA, Standard Operating Procedures, Mitigation Measures, and Conservation Measures (for Special Status species). These are all included in Appendix A.
[54] Such as required Special Status species surveys.

The type of actions and the amount of treatments under all alternatives would be consistent with the actions analyzed in the 2010 Oregon FEIS and the 2007 and 2016 PEISs. All Standard Operating Procedures and Mitigation Measures analyzed in those documents would be applied to all alternatives.

Additional information about specific Special Status species and effects from herbicides can be found in subsequent sections. The conclusions presented regarding wildlife and Special Status species above apply to the species discussed in the following sections.

The following ***Project Design Feature*** adopted by this analysis for the Proposed Action and Alternative 3 further minimize the potential for effects to federally listed species:

- In listed species habitat, follow all Project Design Criteria outlined in the *Biological Assessment FY2017-FY2022 Programmatic Activities That May Affect the Northern Spotted Owl, Marbled Murrelet, Vernal Pool Fairy Shrimp, and Oregon Spotted Frog for the Medford District* (USDI 2017b)(see Appendix A).

How would treatment methods affect Oregon spotted frogs?

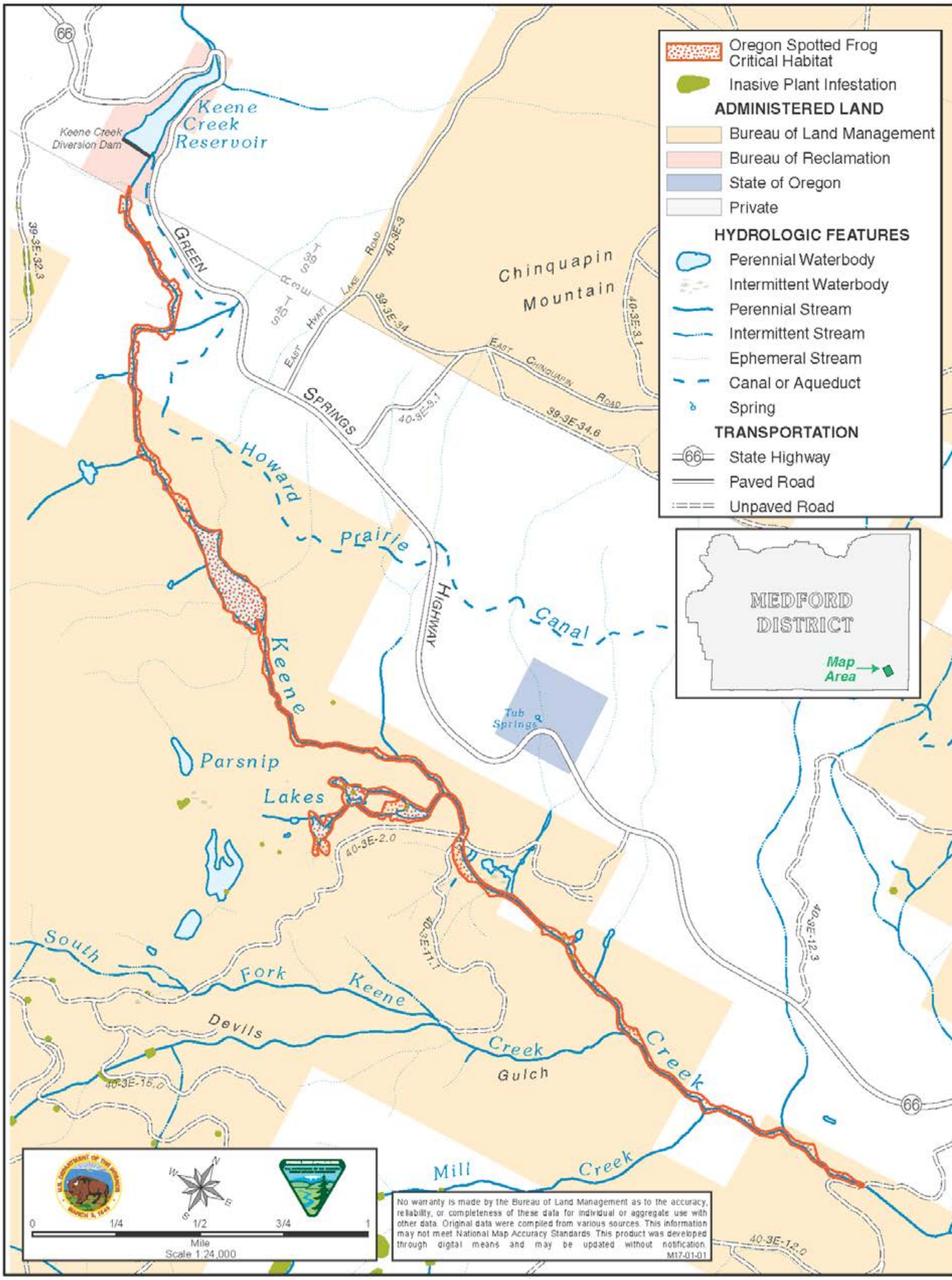
Oregon spotted frogs are federally listed as threatened. They are almost always found in or near a perennial body of water that includes zones of shallow water and abundant emergent or floating aquatic plants that the frogs use for basking and escape cover. The Final Rule to list the Oregon spotted frog describes habitat as a perennial body of water at least 2.5 acres in size (USDI 2014). There are approximately 3,223 acres within the Upper Klamath Subbasin on the Medford District that meet these conditions. Approximately 402 of these acres are located in the Cascade-Siskiyou National Monument, which includes approximately 28 acres at Parsnip Lakes. Parsnip Lakes is the only known occupied habitat on the District and is contained entirely in the Cascade-Siskiyou National Monument. Designated critical habitat for Oregon spotted frog in and near the Medford District is within the Upper Klamath River Critical Habitat Unit, which includes the Parsnip Lakes and Keene Creek. Keene Creek and its riparian areas pass through a mix of Federal and private ownership (see Figure 3-3, *Oregon Spotted Frog Habitat*).

Many factors are believed to have caused Oregon spotted frogs to decline and continue to threaten this species, including loss of habitat, invasive plants, and the introduction of exotic predators such as bullfrogs. Over 95 percent of historic marsh habitat, and consequently Oregon spotted frog habitat, has been lost in the Willamette and Klamath basins where the spotted frog was known to occur. Changes in hydrology (due to construction of ditches and dams) and water quality, development, and improper grazing continue to result in habitat loss, alteration, and / or fragmentation. Nonnative plant invasions by such aggressive species as reed canarygrass (*Phalaris arundinacea*), and succession of plant communities from marsh to meadow also threaten this species' existence (USDI 2016g).

Oregon spotted frogs are highly aquatic (Watson et al. 2003), only rarely venturing beyond the water's edge. There are currently only six submerged and floating aquatic invasive plant species targeted for herbicide treatment in Alternative 3 (Table 2-13), none of which have been observed in the Parsnip Lake area. Therefore, no aquatic infestations would be treated in this area and no direct effects are anticipated to Oregon spotted frogs[55]. Terrestrial applications of herbicides (including in riparian habitats) would occur in the Proposed Action and Alternative 3. Several small infestations of Canada thistle are mapped on a total of 0.1 riparian acres of critical habitat; otherwise, the current need for invasive plant treatment appears very limited in Oregon spotted frog habitat. The majority of the terrestrial treatment areas are anticipated to occur outside of the current range of the Oregon spotted frog on the District. Treatments in Oregon spotted frog habitat would follow all Project Design Criteria from the *Biological Assessment FY2017-FY2022 Programmatic Activities That May Affect the Northern Spotted Owl, Marbled Murrelet, Vernal Pool Fairy Shrimp, and Oregon Spotted Frog for the Medford District* (USDI 2017b), which includes herbicide buffers from listed species habitat.

[55] If an aquatic invasive plant appeared in Oregon spotted frog habitat in the future, treating the site would require additional consultation with U.S. Fish and Wildlife Service.

Figure 3-3. *Oregon Spotted Frog Habitat*



How would treatment methods affect vernal pool fairy shrimp?

Vernal pool fairy shrimp (*Branchinecta lynchi*) are small invertebrates that breed and live in small freshwater vernal pools. They are federally listed as threatened. The fairy shrimp are translucent slender crustaceans that swim on their backs by waving swimming legs. They are unusual in using these same legs for breathing and feeding. They feed on algae, bacteria, protozoa, rotifers, and bits of detritus within the vernal pool. Since they are defenseless, they occupy temporary wetlands where predators cannot survive. Adult vernal pool fairy shrimp live a single season, while water is present in the pools. Toward the end of their brief lifetime, female fairy shrimp deposit thick-shelled eggs (cysts) in the bottom of the pool. These eggs are specially adapted to withstand heat, cold, and prolonged drying. When the pools refill after the fall rains begin, some of the eggs may hatch.

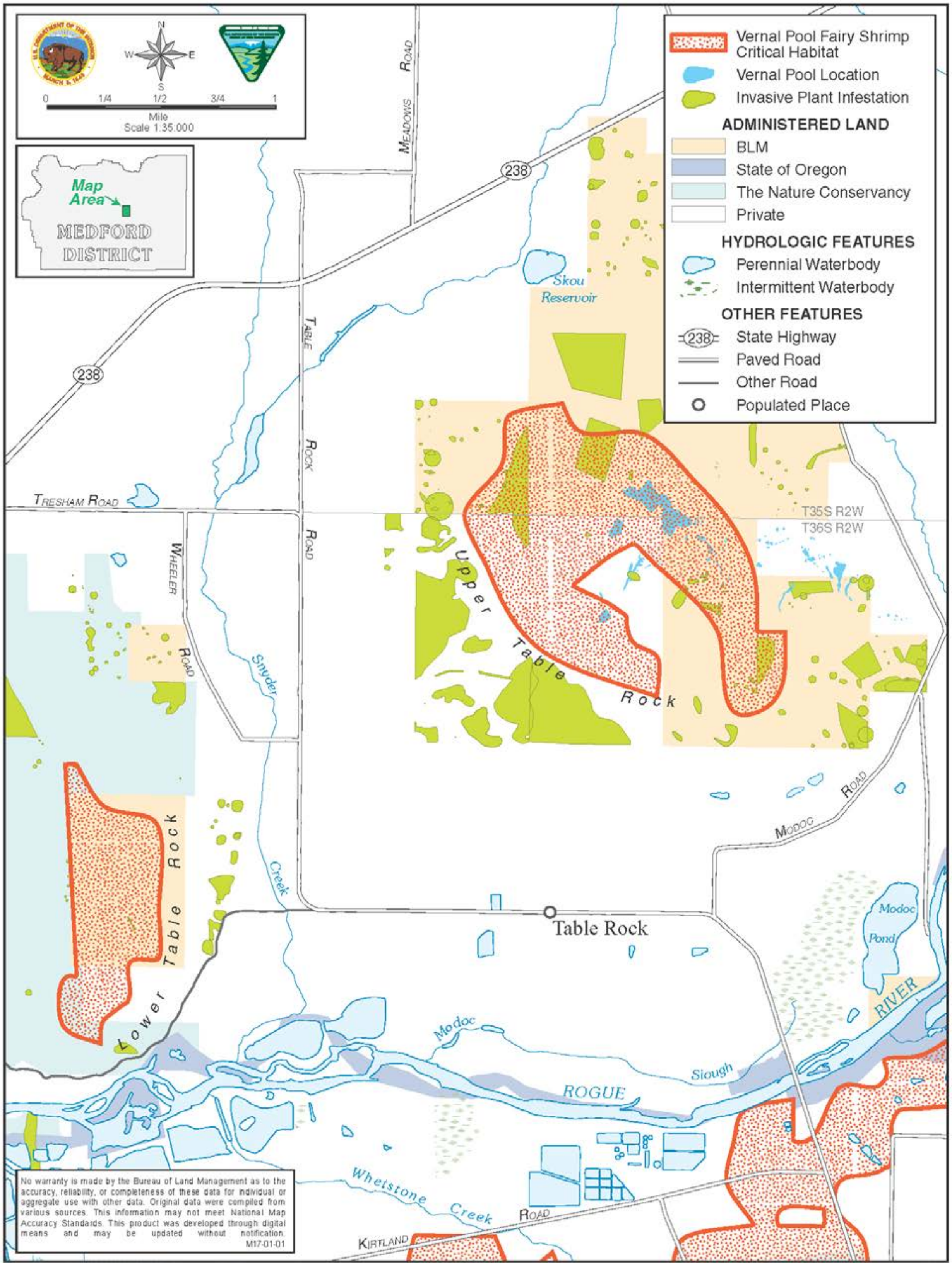
Vernal pools are shallow depressions, which fill with water during the wet season and dry up during the summer when the weather turns hot and dry. There are approximately 422 acres of designated critical habitat for vernal pool fairy shrimp on the Medford District, which all occur on Table Rocks in Jackson County (see Figure 3-4, *Vernal Pool Fairy Shrimp Habitat*) (USDI 2003b). In the Rogue Valley, vernal pool fairy shrimp have been found in vernal pools on private lands in the Agate Desert and on Federal lands atop Upper and Lower Table Rock in the mounded prairie ground. There are approximately 195 acres of vernal pool fairy shrimp habitat on the Medford District, all located on BLM managed lands on Upper Table Rock and Lower Table Rock within an Area of Critical Environmental Concern (ACEC). These are the only known suitable vernal pool habitat in the Medford BLM District.

The BLM conducted a baseline vernal pool survey of Upper and Lower Table Rocks during the wet winter seasons from December 2004 to January of 2006 (ESA 2006) to determine the presence or absence of vernal pool fairy shrimp. The presence of vernal pool fairy shrimp was recorded in eight of the 38 pools surveyed. The survey noted that the area where vernal pool fairy shrimp occurred received minimal disturbance year-round from hikers (and dogs) or grazing wildlife. The current trend for vernal pool fairy shrimp on BLM land is believed to be stable. There has been no substantial change to habitat on either Upper or Lower Table Rock (USDI 2013b).

Threats to the vernal pools on the Table Rocks are primarily as a result of recreation use: human trampling in the wet areas near pools and potential change in subsurface or surface flow runoff patterns due to trail construction and / or improvement. Invasive plants are also a threat to vernal pool habitat. Medusahead rye has recently increased in abundance in vernal pool and mound habitat on Table Rocks ACEC (Gray and Bahm 2016), where the invasive grass threatens southern Oregon endemics, including dwarf meadow-foam and southern Oregon buttercup. Other invasive plant species of concern in the ACEC are brome grasses, hedgehog dogtail grass, bulbous bluegrass, and yellow starthistle (USDI and TNC 2013).

Herbicides may have adverse effects to fairy shrimp and / or their cysts. Individuals may be killed directly or suffer reduced fitness through physiological stress or a reduction in their food base (USDI 2011). However, the herbicides that would be used to treat invasive plants on Table Rocks in the Proposed Action were chosen in part because they were unlikely to have adverse effects to wildlife (USDI 2010a:245). Additionally, the BLM would implement Project Design Criteria to avoid treatments and direct impacts in occupied vernal pools. The *Biological Assessment FY2017-FY2022 Programmatic Activities That May Affect the Northern Spotted Owl, Marbled Murrelet, Vernal Pool Fairy Shrimp, and Oregon Spotted Frog for the Medford District* (USDI 2017b) states that herbicide treatments as described in the Proposed Action may affect, but are not likely to adversely affect vernal pool fairy shrimp (USDI 2017b). Aquatic invasive plant species (targeted for treatment in Alternative 3) are not expected to ever spread to vernal pools at Table Rocks, as these areas are only wet for a few months each year. Therefore, no aquatic infestations would be treated in these areas and no direct effects are anticipated to vernal pool fairy shrimp. Herbicide treatments would have long-term beneficial effects by reducing the spread of nonnative vegetation that could negatively affect the vernal pool habitat in the future.

Figure 3-4. *Vernal Pool Fairy Shrimp Habitat*



Treatments in vernal pool fairy shrimp habitat on Upper and Lower Table Rocks, the only known suitable fairy shrimp habitat on the Medford District, would follow all Project Design Criteria from the *Biological Assessment FY2017-FY2022 Programmatic Activities That May Affect the Northern Spotted Owl, Marbled Murrelet, Vernal Pool Fairy Shrimp, and Oregon Spotted Frog for the Medford District* (USDI 2017b), which includes herbicide buffers from listed species habitat. Project Design Criteria specify that treatments would only occur during dry seasons and that herbicide treatments will not occur within the vernal pools (see Appendix A for a complete list of Project Design Criteria)

How would treatments affect birds (Special Status species, migratory birds, birds of conservation concern, and game birds below desired conditions) that may use potential treatment areas, especially during the nesting season?

The U.S. Fish and Wildlife Service in the *Migratory Bird Program Strategic Plan 2004-2014* (USDI 2008e) includes a list of “Western BLM Bird Species of Conservation Concern” (Migratory Birds of Conservation Concern) and “Game Birds Below Desired Condition.” Eleven of the birds on these lists and eight additional Bureau Sensitive or federally listed birds are known to occur within the Medford District BLM (see Table 3-11).

The Oregon FEIS determined that birds would generally avoid the treatment area during treatment because of noise and activity (USDI 2010a:253-254). 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); the herbicides proposed in this EA have a very short active period where wildlife toxicity could occur. Some pre-fledgling birds could be restricted to the treatment area and could be adversely affected by broad scale treatments using herbicides with moderate toxicity[56] (USDI 2010a:246-250). However, herbicide treatments on the Medford District have usually been done with a backpack sprayer and applied selectively (treatments are not broad scale) and are not likely to result in such a direct spray scenario. The 2016 PEIS identified no risk to birds from the use of aminopyralid, fluroxypyr, or rimsulfuron under any scenario at either the typical and maximum rates.

Specific to nesting birds, the potential for adverse effects from treatment methods (including non-herbicide treatment methods) is also minimized by the following Standard Operating Procedure:

- Minimize treatments during nesting and other important periods for birds and other wildlife.

How would herbicide treatments proposed in meadows or grasslands affect Special Status wildlife species that are dependent on these habitats?

Meadow and grassland habitat exists on the Medford District that may support a variety of Special Status wildlife species (See *Native Vegetation* Issue 2). The two Special Status wildlife species most closely tied to this habitat include two insects: the Mardon skipper (*Polites mardon*) and the Siskiyou short-horned grasshopper (*Chloealtis aspasma*). The Mardon skipper is a rare butterfly found only in grassland and open meadows, endemic to the states of Washington, Oregon, and California. The subspecies *P. m. klamathensis* only occurs in a small geographic area to the east of the City of Ashland in the Cascade Mountains of southern Oregon. The Mardon skipper in this region is known from less than 20 sites. They are weak fliers and usually unable to disperse more than a few hundred yards (Black et al. 2010). They are strongly averse to Scotch broom and because they do not fly well, are particularly dependent on habitat quality, making them more susceptible to invasive plant infestations (Black and Vaughan 2005). The Siskiyou short-horned grasshopper is associated with open grassland with an elderberry shrub component. The species has been observed on the Ashland Resource area and is suspected within the Butte Falls Resource Area.

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[56] Triclopyr, 2,4-D, and dicamba at the maximum rate have a moderate risk to birds in certain Risk Assessment scenarios; all other scenarios are low or no risk. See Appendix C, *Herbicide Risk Assessment Summaries*.

The Risk Assessments indicate that, for fluroxypyr, there is a low risk under typical and maximum rates to susceptible pollinators under the 100 percent absorption scenario (direct spray). Therefore, the following Mitigation Measure adopted with the 2016 PEIS would also be applied to treatments on the Medford District and would minimize the potential for adverse effects:

- When conducting herbicide treatments in or near habitats used by Special Status and listed terrestrial arthropods, design treatments to avoid the use of fluroxypyr, where feasible. If pre-treatment surveys determine the presence of listed terrestrial arthropods, do not use fluroxypyr to treat vegetation.

Conservation Measures were identified in the 2007 and 2016 Biological Assessments for Special Status wildlife to eliminate the potential for all significant effects, including the following for Special Status butterflies[57].

- To protect host and nectar plants from herbicide treatments, follow recommended buffer zones and other Conservation Measures for TEP [threatened, endangered, and proposed for listing] 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, imazapyr, picloram, and triclopyr.
- If conducting manual spot applications of glyphosate or triclopyr to vegetation in TEP butterfly or moth habitat, utilize the typical, rather than the maximum, application rate.

While no Conservation Measures were identified for other insect species, the following ***Project Design Feature*** adopted with the Proposed Action and Alternative 3 would minimize the potential for effects to other Special Status insects (such as the Siskiyou short-horned grasshopper):

- Conservation Measures applicable to butterflies and moths[58] will be applied, as appropriate, for other Special Status insects.
- Do not use fluroxypyr at known mardon skipper sites.

The Proposed Action would target a small percentage of meadow / grassland habitat (see *Native Vegetation* Issue 1). If more extensive habitat restoration work were needed, separate site-specific habitat restoration NEPA analyses would be completed.

How would herbicide use affect pollinators, especially Special Status pollinators?

Pollinators include bees, bats, birds, and insects. They play an important role in flowering plant reproduction and the production of most fruits and vegetables. Habitat loss, disease, parasites, and environmental contaminants have all contributed to the decline of many species of pollinators. Effects from herbicides to pollinators would generally be related to habitat loss, not to the pollinators themselves; herbicides are formulated to work specifically on plants by disrupting the metabolic processes inherent in plants and not in other organisms. Several Special Status wildlife species may serve as pollinators on the Medford District (See Table 3-11).

As described above, this issue is not analyzed in detail because, as described in the Oregon FEIS, effects are likely to be minimal, and there is no meaningful difference between the alternatives. In addition, 95 percent (Proposed

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[57] Language in these conservation measures refer to threatened, endangered, and proposed for listing butterflies and moths. Mitigation measures adopted in the 2007 and 2016 PEIS make Conservation Measures applicable to all Special Status species. The Medford District has no Special Status moths.
[58] Conservation Measures for butterflies can be found in Appendix A. These include limits on which herbicides can be used, how they can be applied as well as survey requirements.

Action) to 99 percent (No Action Alternative) of herbicide treatments would be spot treatments to target specific plants, so that effects to non-target species can be kept to a minimum. The herbicides analyzed in this EA were chosen in part because they were unlikely to have adverse effects to wildlife, including pollinators (USDI 2010a:245). The Oregon FEIS describes that adult honeybees are used as a surrogate for all invertebrates in Risk Assessments. Honeybees are nonnative and have been shown to favor nonnative plant species and can differentially allow the nonnative vegetation to compete against native plants (Goulson 2003 in USDI 2010a). The Risk Assessments (see Appendix C) indicate that there is low risk to bees or other insects in certain direct spray or vegetation consumption scenarios involving clopyralid, fluroxypyr, glyphosate, and triclopyr at typical (fluroxypyr and glyphosate) or maximum (clopyralid and triclopyr) rates and no risk from all other herbicides evaluated in this EA (the effects of 2,4-D and dicamba to insects were not evaluated as part of the Risk Assessment process). Additional information summarized from the Oregon FEIS is provided in Table 3-12.

The 2016 PEIS states that treatments that remove nonnative species that inhibit the growth of native plant species used by pollinators or limit native forb diversity would be expected to benefit pollinators. The PEIS cites Federal guidance identifying the removal of invasive species as an effective way to increase pollinator abundance and diversity (USDI 2016a:4-54). Neither aminopyralid nor rimsulfuron, analyzed in the 2016 PEIS, were shown to have any risk under any of the modeled exposure scenarios to pollinators (USDI 2016a:4-56). Habitat modification is often the main risk to wildlife (including pollinators) from herbicide use and in the short term, but in general the long-term effects of more effective methods to remove invasive species would improve wildlife habitat (USDI 2016a:4-54-56).

As described in Chapter 1, the alternatives would not be in conflict with recommendations from the 2014 Presidential Pollinator Task Force. Standard Operating Procedures and Mitigation Measures for pollinators outlined in Appendix A conform to the Strategy. Conservation Measures were identified in the 2007 and 2016 Biological Assessments for Special Status wildlife to eliminate the potential for all significant effects, including the following for Special Status insect pollinators:

- 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, imazapyr, picloram, and triclopyr.
- If conducting manual spot applications of glyphosate, or triclopyr to vegetation in TEP butterfly or moth habitat, utilize the typical, rather than the maximum, application rate.
- When conducting herbicide treatments in or near habitats used by Special Status and listed terrestrial arthropods, design treatments to avoid the use of fluroxypyr, where feasible. If pre-treatment surveys determine the presence of listed terrestrial arthropods, do not use fluroxypyr to treat vegetation.

Therefore, there would be no effects to Special Status insect pollinators from the use of herbicides.

Wildlife Issue 2 (Not Analyzed in Detail)

What are the effects of using biological control agents to insects, especially Special Status insects and pollinators?

Biocontrol agents have been infrequently used under the No Action Alternative. It is expected that their use would increase under the Proposed Action and Alternative 3. However, this issue is not analyzed in detail because adverse effects to other insects would be negligible and not vary between the alternatives. Detailed analysis would not lead to a reasoned choice between the alternatives.

The *Biological Control Agents* section of Chapter 2 describes four potential species of invasive plants where biocontrols may be used: Scotch broom, meadow knapweed, yellow starthistle, and rush skeletonweed. This is based on infestation size and availability of approved biocontrol agents.

Biological control (biocontrol) involves the reduction of invasive plant populations using natural enemies such as parasitoids, predators, pathogens, antagonists, or competitors to suppress populations. The concern related to the issue is that there may be potential effects to insects because biological control agents are competing with other insects for habitat, which could include native or nonnative plants.

As described in Chapter 2, biological control agents are usually acquired from the same ecosystems where the target invasive plant originated. Nonnative plant species can become invasive because the parasitoids, predators, pathogens, antagonists, or competitors in their native environment that normally control their population are not present in the plant community to which they have been introduced. Biocontrols are rigorously tested by the Federal Animal and Plant Health Inspection Service (APHIS) Plant Protection and Quarantine Program to ensure that they are host specific and feed only on the target invasive plant and not on crops or native flora. Potential biocontrol agents often undergo five or more years of rigorous testing to ensure that host specificity requirements are met and that the biological control agent does not affect non-target vegetation (Winston et al. 2014). The Oregon Department of Agriculture's Noxious Weed Control Program coordinates releases and monitors populations. In addition to ensuring that the invasive plant population is widespread enough to support the biological control agent, they also check for nearby native plant species in the same genus as the invasive plant species being targeted. Thus, it is unlikely that a biocontrol agent would compete with a native insect species for habitat that includes native vegetation.

Native insects, especially Special Status insects and native pollinators, tend to prefer native species and are generally adversely affected by invasive plants (USDI 2010a:241-242). Since the biological control agents are not successful unless there are enough invasive plants for them to feed upon, typically only large infestations of invasive plants are targeted. Populations of biocontrols rise and fall with the availability of the target plant species. When the biocontrol agent is successful in reducing the invasive plant infestation, their numbers naturally decline along with the loss of host species. If the invasive plant species reestablishes or spreads from a nearby site, the biocontrol agent population will increase over the course of several years as its food source (the target invasive plant) becomes more available. Such a cycle has been documented by the Oregon Department of Agriculture with the control of tansy ragwort in western Oregon (ODA and OSU 2011).

Biocontrols never eradicate an entire invasive plant species out of an area; the goal of using biological control agents is to "manage" the invasive plant population at an acceptable level. A native insect may incidentally use invasive plant habitat if other habitat is unavailable, especially in areas where large infestations of invasive plants exist. However, when biocontrols are successful at reducing an invasive plant population to an acceptable level, that process occurs over the course of a few years (Erin McConnell, Oregon BLM State Weed Coordinator, 2017 personal communication), which allows the reemergence of desirable native vegetation.

Human Health

Human Health Issue 1 (Not Analyzed in Detail)

What are the effects to human health from incidentally coming into contact with herbicides used on BLM-managed lands?

This issue was not analyzed in detail because effects were previously described in the analysis for the Oregon FEIS and the 2007 and 2016 PEISs (USDI 2010a:345-358, USDI 2007a:4-174 to 4-196, USDI 2016a:4-87 to 4-103) and there are no new circumstances or information at the site-specific level that would change the effects anticipated for this EA.

As described in the *Recreation* Issue later in this Chapter, over a million recreators visit the Medford District's recreation sites annually. Local tribes have treaty rights on BLM-managed lands which allow them to hunt, fish, gather, trap on the District, and other tribes without specific off-reservation reserved rights gather natural resources for traditional or cultural purposes (USDI 2010a:284). People collect mushrooms and berries on BLM-administered lands and swim in streams and lakes. People live and work on or near the Medford District or drive on roads or hike on trails across the District.

Herbicides are formulated to affect plant growth; some mimic plant hormones (auxins), others affect photosynthesis, amino acid, or lipid synthesis, or disrupt cell membranes. While they are selective for plants, they have the potential to affect human health if used improperly (Appendix C and USDI 2010a:345). Exposure scenarios for human health effects for the public were analyzed in human health Risk Assessments for direct spray, dermal exposure from contaminated vegetation, consumption of contaminated water, acute exposure from spills, consumption of contaminated fish, and consumption of contaminated vegetation (USDI 2010a:347).

Tables 3-8 and 3-9 display a summary of information presented in the 2007, 2010, and 2016 EISs, showing the herbicides that have some level of risk (greater than 0) to the public in one or more Risk Assessment-modeled scenario. All other herbicides had no risk for any of the modeled scenarios of public exposure, including incidental handling, consumption, and contact with the skin.

***Table 3-13**. Human Health Herbicide Risk Summary, Public*

Herbicides	**Risk Category** (worst-case scenario, one or more scenarios)				**Treatment Acres (over life of plan)**		
	Typical rate	**Maximum rate**			**No Action**	**Proposed Action**	**Alternative 3**
		Direct Spray	*Dermal Exposure*	*Contaminated Fruit or Water[2]*			
Herbicides available under all alternatives							
2,4-D[3]	0	L[1]	0[1]	0[1,2]	9,645	2,545	2,545
Dicamba	0	0	0	L (water)	424	424	424
Glyphosate[3]	0	0	0	L (water)	10,768	4,668	4,668
Herbicides available under the Proposed Action and Alternative 3							
Clopyralid	0	0	0	L (water)	0	1,273	1,273
Dicamba + Diflufenzopyr	0	0	0	0[2]	0	849	849
Triclopyr[3]	0	L[1]	L[1]	L[1,2] (water and fruit)	0	2,334	2,342

1. Limited by Mitigation Measures to typical rate where feasible.
2. All scenarios that involved human health and the consumption of contaminated fish resulted in 0 risk. The consumption of contaminated wildlife was not evaluated for human health; large mammalian carnivores had non-0 risk in scenarios that involved 2,4-D (low at typical and maximum rates), triclopyr (low at maximum rates), and dicamba + diflufenzopyr (low at typical rate and moderate at maximum rate, under chronic exposure scenarios).
3. Where different formulations exist, risks reported are the most conservative.

Table 3-14. Effects of Herbicides[1] (Human Health)

Additional information about the risk ratings discussed below can be found in Appendix C, *Herbicide Risk Assessment Summaries*.

Herbicides available under all alternatives	
2,4-D	The public faces zero risk from all modeled scenarios except one; there is low risk to a child being sprayed over their entire body at maximum application rate. In the human health Risk Assessment conducted to support the reregistration of 2,4-D (USEPA 2004), the EPA concluded that there is not sufficient evidence that 2,4-D is an endocrine disrupting chemical.
Dicamba	The public faces zero risk from all modeled scenarios except one; there is low risk to the public from the consumption of water from a pond contaminated with a spill.
Glyphosate	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 associated with accidental exposure to glyphosate through consumption of contaminated water after an herbicide spill at the maximum rate into a small pond. See also *Human Health* Issue 3.
Herbicides available under the Proposed Action and Alternative 3	
Dicamba + Diflufenzopyr	(See dicamba, above. Diflufenzopyr poses no risk to human health under any scenario.)

Triclopyr	There is low risk to the public from triclopyr BEE applications at the maximum rate under four acute or accidental scenarios: 1) direct spray to the lower legs; 2) dermal contact with contaminated vegetation; 3) 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 (TEA) 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.

1. Table does not include herbicides with no measurable risk. Herbicide information summarized from the 2010 Oregon FEIS (USDI 2010a:345-358), the 2007 PEIS (USDI 2007a:4-174 to 4-196), and the 2016 PEIS (USDI 2016a:4-87 to 4-103).

Ratings are based on various exposure scenarios. Standard Operating Procedures and Mitigation Measures including limitation on the herbicide types and doses, handling procedures, application methods, drift minimization, and timing of application are designed to greatly reduce the likelihood that the modeled exposure scenarios described below would actually occur, and thus reduce the described adverse effects. As shown in Tables 2-12 and 2-13 (*Treatment Key*), these herbicides would never be used at the maximum rate, and their use above the typical rate would be rare (less than one percent of the time). Ninety-five percent of herbicide treatments on the Medford District would be spot treatments, generally done with a backpack sprayer, to target specific plants, so that effects to non-target species can be kept to a minimum.

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. 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[59].
- Use the typical application rate, where feasible, when applying 2,4-D, fluridone, and triclopyr to reduce risk to workers and the public.
- 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.
- Proposals to boom 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.
- Establish a buffer between treatment areas and human residences based on guidance given in the Human Health Risk Assessment, with a minimum buffer of 100 feet for ground applications, unless a written waiver is granted.
- 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.

The type of actions and the amount of treatments under all alternatives would be consistent with the actions analyzed in the 2010 Oregon FEIS and the 2007 and 2016 PEISs. All Standard Operating Procedures and Mitigation Measures analyzed in those documents would be applied to all alternatives. Additional information about specific scenarios and effects from herbicides can be found in subsequent sections. The conclusions presented above regarding human health apply to the discussion in the following sections.

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[59] A Project Design Feature adopted for this analysis states that Annual Treatment Plans will be presented to the tribes showing planned treatments as well as survey and treatment areas. Any resultant coordination will identify where treatments can be delayed, where cultural features must be avoided or protected, and where posting would help tribe members avoid areas (see the *Traditional and Cultural Uses* Issue 1).

What are the human health effects to people who regularly consume or come in contact with contaminated vegetation, water, or wildlife? How would herbicide use affect the health of people gathering, handling, ingesting plants, fish, or wildlife or handling fossils or artifacts that are in or near the area of herbicide use? What are the human health and safety hazards to those harvesting and consuming special forest products, such as greenery, herbs, berries, and mushrooms?

This issue was not analyzed in detail because effects were previously described in the analysis for the Oregon FEIS and 2007 and 2016 PEISs and there are no new circumstances or information at the site-specific level that would change the effects anticipated for this EA.

Treatments in this EA are targeted towards invasive plants, which – with some exceptions – are generally not plant species being collected or ingested. Triclopyr could be used on blackberry plants (and other woody species) on the District, applied via foliar, cut-stump, or basal spray methods at typical rates. However, while blackberries are widespread on the District, treatments would generally only occur in areas where they threaten Special Status plants or where forest management projects have recently contributed to the spread of invasive plants, neither of which are generally collection areas. In addition, treatments typically happen before fruit is present. The Treatment Keys (Tables 2-12 and 2-13) indicate that none of the herbicides with a low risk under maximum rates would ever be used at maximum rates. With the exception of triclopyr (described above), the herbicides that are low risk under maximum rates in contaminated water scenarios (see Table 3-13) are unlikely to contaminate water, as they are not registered for aquatic use and hence, would not be used in riparian areas where they could contaminate water. No herbicides present moderate or high risks to human health under any scenario. There is no risk to human health under any scenario for consuming contaminated fish. The consumption of contaminated wildlife by humans was not evaluated, but large mammalian carnivores only had risks greater than zero in scenarios that involved 2,4-D (low at typical and maximum rates), triclopyr (low at maximum rates), and dicamba + diflufenzopyr (low at typical rate and moderate at maximum rate, under chronic exposure scenarios). However, the potential for actual effects is negligible. As described in the *Wildlife* Issue 1, larger animals (such as deer, rabbits, or birds) are unlikely to remain in a treatment area while treatments are occurring. These animals may return to the treatment site and consume treated vegetation, but as 95 percent of herbicide treatments would be spot treatments, it would be difficult for an animal to consume enough treated vegetation to reach the levels analyzed in the Risk Assessment scenarios. As described above, triclopyr would only be applied at maximum rates using a cut / inject method, which is unlikely to contaminate wildlife consumed by humans and dicamba + diflufenzopyr would not be applied at maximum rates (see Tables 2-12 and 2-13*, Treatment Key*). Furthermore, the potential for risk is likely to be less under the Proposed Action and Alternative 3 with a 74 percent reduction in the use of 2,4-D when compared to the No Action Alternative.

What are the human health hazards to susceptible members of the public (including children, pregnant women, the elderly, sick people, and those with chemical-sensitive conditions) associated with herbicide applications?

This issue was not analyzed in detail because effects were previously described in the analysis for the Oregon FEIS and 2007 and 2016 PEISs and there are no new circumstances or information at the site-specific level that would change the effects anticipated for this EA.

The Oregon FEIS describes that the Risk Assessments apply uncertainty factors (multiplying the lowest observable effects by a factor of 10, 100, or even a 1,000 to get a level of concern), which are included to account for hypersensitive individuals and otherwise accommodate uncertainties into the measurements. Thus, herbicide exposure to a healthy (not susceptible) individual to a dose identified as having a risk would likely have no effect. Nevertheless, the low rating indicates that the potential for risk starts at that level of concern (USDI 2010a:91).

Therefore, the general assessment of the possible effects to humans in the *Human Health* sections of those documents includes those with chemical sensitivities. Risk Assessments scenarios include scenarios with children and women (see Appendix C).

The Treatment Keys (Tables 2-12 and 2-13) indicate that none of the herbicides with a low risk under maximum rates would ever be used at maximum rates. At the maximum rate, only 2,4-D and triclopyr pose risk to the public from direct spray or dermal exposure. The use of 2,4-D would drop by 74 percent under the Proposed Action and Alternative 3, and as described above, the use of triclopyr would be unlikely to come into contact with the public, except at very low rates.

Herbicide use under all alternatives would be scattered and infrequent and not comparable to industrial uses on neighboring farms or timberlands (USDI 2010a:744). As described in the *Neighboring Lands Pesticide Use* section in Chapter 2, BLM use of herbicides is a small fraction (0.01 percent) of the pounds of pesticides used in the water basins containing Medford District-managed lands. Herbicides would not be sprayed aerially and drift reduction strategies would be applied to spot and broadcast treatments.

What are the human health effects of herbicides applied near natural springs, private wells, and irrigation sources?

This issue was not analyzed in detail because effects were previously described in the analysis for the Oregon FEIS and 2007 and 2016 PEISs and there are no new circumstances or information at the site-specific level that would change the effects anticipated for this EA. Tables 3-8 and 3-9 show that four herbicides (dicamba, glyphosate, triclopyr BEE, and clopyralid) have some level of risk (greater than 0) at maximum application rates to the public in one or more Risk Assessment-modeled scenarios involving contaminated water. All of the scenarios with some amount of risk involved accidental spills. Specific to spills, the following Standard Operating Procedures minimize the potential for spills:

- Prepare an operational and spill contingency plan in advance of treatment.
- Conduct mixing and loading operations in an area where an accidental spill would not contaminate an aquatic body.

In addition, a variety of Standard Operating Procedures and Mitigation Measures reduce the potential for herbicides to contaminate water that may be consumed by humans. These include, but are not limited to:

- 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 Mitigation Measure).
- Proposals to boom 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 Mitigation Measure).
- Use appropriate herbicide-free buffer zones for herbicides not labeled for aquatic use based on Risk Assessment guidance, with minimum widths from water of 25 feet for vehicle, and 10 feet for hand spray applications.

Human Health Issue 2 (Not Analyzed in Detail)

What are the hazards to workers treating invasive plants?

This issue was not analyzed in detail because effects were previously described in the analysis for the Oregon FEIS and the 2007 and 2016 PEISs (USDI 2010a:345-358, USDI 2007a:4-174 to 4-196, USDI 2016a:4-87 to 4-103) and there are no new circumstances or information at the site-specific level that would change the effects anticipated for this EA.

Manual, mechanical, and chemical treatments can all present health hazards to workers. Hazards could include falling objects (especially when cutting trees[60]), tripping or slipping on hazards on the ground, protruding objects such as branches and twigs, poisonous plants and insects, and dangerous wildlife. Workers are subject to heat-related illness (potentially exacerbated by safety equipment such as chainsaw chaps or face guards) or hypothermia when working in extreme weather conditions, and may incur musculoskeletal injuries related to improper body mechanics (USDI 2010a:343-345). Table 3-10 shows herbicides that have some level of risk (greater than 0) to applicators in one or more Risk Assessment-modeled scenario.

Table 3-15*. Human Health Herbicide Risk Summary, Workers*

Herbicides	Risk Category (worst-case scenario, one or more scenarios)			Treatment Acres (over life of plan)		
	Typical rate	Maximum rate	Accidental Exposure	No Action Alternative	Proposed Action	Proposed Action: Sub-Alternative: Aquatics
2,4-D	L	L[1]	M	9,645	2,545	<1
Chlorsulfuron	0	L	0	0	212	0
Dicamba	0	L	0	424	424	0
Fluridone	0	0[1]	L-H	0	0	<1
Rimsulfuron	0	0	M-H	0	2,122	0
Triclopyr	0	L[1]	L	0	2,334	8

1. Limited by Mitigation Measures to typical rate, where feasible.

As described in the Oregon FEIS and 2007 and 2016 PEISs, modeled scenarios indicate that:

- For 2,4-D and triclopyr, workers face moderate risk from wearing contaminated gloves for an hour (USDI 2010a:349-350).
- Chlorsulfuron and dicamba at the maximum rate can cause temporary skin and / or eye irritation to applicators (USDI 2007a:4-184, USDI 2010a:350)
- Fluridone and rimsulfuron both have risks in accidental scenarios. Both cause reversible eye irritation. Long-term exposure at high rates (repeated accidental exposure) to rimsulfuron can cause health effects targeting multiple organs (USDI 2010a:348, USDI 2017a:4-102).

Further information about these modeled scenarios can be found in each herbicide's human health Risk Assessment.

The Treatment Keys (Tables 2-12 and 2-13) indicate that none of the herbicides with a low risk under maximum rates would ever be used at maximum rates by the Medford District BLM. The majority of the time that 2,4-D is used, it is used at 0.02 lbs. / acre, which is far below the typical rate of 1 lb. / acre. The use of 2,4-D decreases 74 percent under the Proposed Action, but no injuries to herbicide applicators from herbicide exposure have been recorded for at least the past 20 years on BLM-managed lands in Oregon (Erin McConnell, Oregon BLM State Weed Coordinator, 2017 personal communication).

The potential for an injury (from manual, mechanical, or chemical treatments) is exacerbated if 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 potential for worker injury and illness. Compliance with Standard Operating Procedures, Mitigation Measures, and Occupational Safety and Health Administration (OSHA) standards, along with industry and manufacturers' recommendations reduces potential exposure and injury to workers (USDI 2010a:344-345). Herbicide treatments on BLM-managed lands in Oregon are

[60] Treatments for woody species, such as tree of heaven, locust, and saltcedar, are included in treatment group D12 (see Table 2-12).

done only by BLM certified or state licensed applicators or persons working under their direct supervision (USDI 2010a:85). BLM certifications are renewed every three years and involve completing a one-week training course.

The type of actions and the amount of treatments under all alternatives would be consistent with the actions analyzed in the 2010 Oregon FEIS and the 2007 and 2016 PEISs. All Standard Operating Procedures and Mitigation Measures analyzed in those documents would be applied to all alternatives.

Human Health Issue 3 (Not Analyzed in Detail)

What are effects to human health of using glyphosate, which the International Agency for Research on Cancer (IARC) recently declared a cancer hazard and California lists as cancer causing?

This issue is not analyzed in detail because effects would be too small to measure. Glyphosate was analyzed in the 2010 Oregon FEIS to which this EA tiers (USDI 2010a:350), and even considering recent research, effects are not likely to change at the site-specific level.

As stated in the Oregon FEIS:

> "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 2003). The Risk Assessment calculated no risk for all but one of the tested scenarios. There is low risk to children associated with accidental exposure to glyphosate [through] consumption of contaminated water after an herbicide spill into a small pond[61].
>
> "Endocrine disruption and glyphosate was studied by SERA in 2002[62]. SERA reported, "Three specific tests on the potential effects of glyphosate on the endocrine system have been conducted and all of these tests reported no effects. The conclusion that glyphosate is not an endocrine disruptor is reinforced by epidemiological studies that have examined relationships between occupational farm exposures to glyphosate formulations and risk of spontaneous miscarriage, fecundity, sperm quality, and serum reproductive hormone concentrations… the approach taken in the Risk Assessment is highly conservative and no recent information has been encountered suggesting that this Risk Assessment is not adequately protective of any reproductive effects that might be associated with glyphosate exposure." However, a recent study by Benachour and Seralini (2008) shows potential endocrine disruption, DNA damage, and toxicity of POEA and possibly alpha-amino-3-hydroxy-5-methyl-4- isoxazolepropionic acid (AMPA, the major glyphosate degradate) in human cell cultures. This is a single study and scientists rely on the weight of evidence of multiple studies, which have not identified these adverse effects. These new findings need to be confirmed by other studies (see also the *Adjuvants* subsection later in this section)." (USDI 2010a:350).

In March 2015, the IARC, the specialized cancer agency of the World Health Organization (WHO), added glyphosate to Group 2A, *probably carcinogenic to humans*. In May 2016, the Food and Agriculture Committee of the WHO held their regular Joint Meeting on Pesticide Residues (JMPR), where they found that glyphosate was "unlikely to pose carcinogenic risk from exposure through diet." The WHO also stated that the conclusions arrived at by the

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[61] As further explained in the glyphosate Risk Assessment, the accidental spill scenario assumes that a young child consumes contaminated water shortly after an accidental spill of a field solution into a small pond. Because this scenario is based on the assumption that exposure occurs shortly after the spill, no dissipation or degradation is considered. Since this exposure scenario is based on assumptions that are somewhat arbitrary and highly variable, it may overestimate exposure. The actual chemical concentrations in the water would vary according to the amount of compound spilled, the size of the water body into which it is spilled, the time at which water consumption occurs relative to the time of the spill, and the amount of contaminated water consumption. To reflect the variability inherent in this exposure scenario, a spill volume of 100 gallons (range of 20-200 gallons) is used to reflect plausible spill events.

[62] The results from a 2011 Risk Assessment, also done by SERA, includes similar results (SERA 2011a).

JMPR and the IARC were "different, yet complementary" and that "the IARC reviews published studies to identify potential cancer hazards, it does not estimate the level of risk to the population associated with the hazard." That is, the IARC defines a cancer *hazard* as an agent that is capable of causing cancer under some circumstances, while a cancer *risk* is an estimate of the carcinogenic effects expected from exposure to that substance. The distinction between 'hazard' and 'risk' is important. The IARC identifies cancer hazards even when risks are very low at current exposure levels. Their list of carcinogens describes the level of evidence that something can cause cancer, not how likely it is that something will cause cancer in any particular person. Other agents listed in Group 2A include drinking hot beverages (over 149° F), eating red meat, and indoor emissions of burning wood (IARC 2015, JMPR 2016).

However, in June 2016, Reuters reported that court documents from an ongoing legal case against Monsanto show the scientist leading the IARC's review of glyphosate knew of data showing no link between glyphosate and cancer. The agency did not take the information into account because it had yet to be published in a scientific journal. In a deposition given in connection with the case, Aaron Blair said the data would have altered IARC's analysis and made it less likely that glyphosate would meet the agency's criteria for being classed as "probably carcinogenic" (Kelland 2017).

In July 2017, California's Office of Environmental Health Hazard Assessment added glyphosate to their list of chemicals known to cause cancer. However, Monsanto (the maker of RoundUp herbicide products) plans to challenge the decision as "unwarranted on the basis of science and the law" (Plum 2017). Also in July 2017, the European Food Safety Administration and European Chemicals Agency conducted detailed evaluations and found insufficient evidence that glyphosate causes cancer. These evaluations were done in response to a request from the European Commission regarding their evaluation of the carcinogenicity of glyphosate (EFSA 2017).

The Oregon FEIS describes that it is difficult to quantify the likelihood of some agent causing cancer due to the long-time interval between exposure and diagnosis, personal behavior patterns, job changes, and exposure to other carcinogens (USDA 2010a:344). This remains true for the analysis in this EA.

Soil

Soil Issue 1

Do invasive plant treatments lead to increased soil compaction and erosion?

Analytical Methods

The analysis area includes lands within the Medford District boundary for which soil orders have been mapped by the Natural Resources Conservation Service (NRCS) in their Soil Survey Geographic (SSURGO) database. This excludes lands managed by the U.S. Forest Service for which soil orders have not been mapped. In addition, conclusions described below are based on the review of existing data (e.g., NISIMS) and other data including spatial data; utilization of professional research and literature; and use of expertise, both internal and external, that is based on documented, substantiated professional rationale.

Impacts are sometimes described using ranges of potential impacts or in qualitative terms, if appropriate. When impacts are positive, it is so stated. The intensities of impacts are also described, where possible, using the following guidance:

Negligible: The amount of soil loss or erosion, or changes in soil characteristics would be at or below the level of detection for an individual plant or cluster of plants.

Minor: The amount of soil loss or erosion, or changes in soil characteristics would be small (local), as would the size of the area affected.

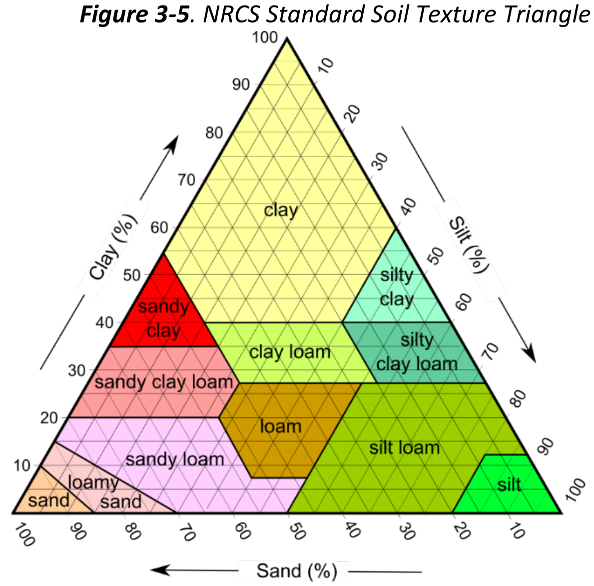
<u>Spatial Scale</u>
Local: The immediate area of treatment
Watershed: Watershed (10-digit HUC)
Widespread: Subbasin (8-digit HUC) or larger

<u>Temporal Scale</u>
Short-term: Anticipated effects occur within 1 year of project implementation.
Long-term: Anticipated effects occur over longer than 1 year.

Factors Influencing Soil Erosion

The following factors influence how likely a soil is to erode.

Figure 3-5*. NRCS Standard Soil Texture Triangle*



Soil texture (see Figure 3-5 and Table 3-16): The relative proportion of clay, silt, and sand. Texture influences the degree of percolation of water through the soil and the stability of the soil. Soil with high proportions of sand drain well and are less likely to produce runoff. Sand particles are heavy and less easily moved by wind and water compared to silty soils, which are light. With greater proportions of clay, the size of the pore space decreases and risk of runoff increases. Soils with less clay are less stable and at greater risk of erosion from water and wind. Clay and organic matter provide structure to the soil that allows air and water to move freely through the soil, making them less prone to erosive forces.

Vegetative Cover: Vegetation controls both wind and water erosion because it intercepts precipitation, improves infiltration, reduces rainfall impact, slows overland flow, and reduces wind velocity. Conversely, removal of the native vegetation often initiates a process of soil degradation, causing the site to become less productive (Marchent and Sherlock 1984).

Table 3-16*. General Soil Texture Characteristics*

Soil Texture Characteristics	Sand	Silt	Clay
Compactability	Low	Medium	High
Drainage rate	High	Slow to Medium	Slow
Water holding	Low	Medium to High	High
Potential for Water Erosion	Fine sand erosive, coarse sand less so	High	Low if aggragated[1], otherwise high.

Source: Brady and Weil (2004)
1. Combined with other soil textures

Climate: Wet soils have greater risk of runoff. Runoff occurs when rainfall intensity exceeds infiltration rate and the soil becomes saturated at the surface. Wind can also cause erosion, but tends not to be a problem on the District given the soil types and presence of vegetation that traps the airborne soil particles.

Topography: Steep slopes can cause water to runoff at a rapid rate. This is aggravated where water infiltration rates are slow. Slopes that are steeper are generally more prone to soil movement, especially soils that are sandy or loamy with little soil development.

Invasive Plants: The way in which invasive plants interact with soils has cascading effects. Bare or compacted soils can be colonized by invasive plants more readily than native plants, as invasive plants tend to be more adapted to establishing on such altered sites. Invasive plants can directly deplete soil nutrients and water at higher rates or earlier in the growing season than native species (Olson 1999 in USDI 2010a:186), which in turn leads to more erosion. The removal of soil and nutrients through erosion perpetuates a cycle that further stresses native plants, encourages invasive plants, and leads to increased erosion (Brady and Weil 1999).

Factors Influencing Soil Compaction

Soil compaction occurs when soil particles are pressed together, reducing pore space between them. Heavily compacted soil contains few large pores and has a reduced rate of both water infiltration and drainage from the compacted layer. Compaction in soil horizons below the surface also can prevent roots from growing through the soil or growing with reduced capacity, which usually lowers plant growth and productivity. Soil compaction decreases soil pore space and increases soil density, reducing the ability of the soil to infiltrate water. Decreased infiltration means more water running across the surface, eroding soils, and potentially moving herbicides off site. By reducing water infiltration into the soil, compaction can lead to increased runoff and erosion from sloping land or waterlogged soils in flatter areas.

The potential for compaction is influenced by **soil texture**, **organic matter content**, and **level of water saturation**. Soils with low organic matter content are more susceptible to compaction because the soil particles are not strongly bound together. Clay particles are easily compacted because the particles are small and plate-like and easily aligned, especially when wet. Sandy soils are less easily compacted because their particles are large and cubic. However, any soil type is most easily compacted when saturation rates are high; however, when fully saturated, all pores are filled with water, which is not compressible. Under drier conditions, the soil-bearing strength increases, reducing the compactibility of the soil.

Soils are either naturally compacted (heavy, clay soil) or compaction is caused by management activities. The size and intensity of a management activity affects the degree of compaction. Larger, heavier equipment weighing hundreds or thousands of pounds will compact soils much more than a person wearing a backpack sprayer. The frequency or repetition of passes in the same area also influences compaction. Where foot traffic may cause compaction along a trail where many people pass over the same area repeatedly, the force of a single person walking over an area once or twice would not cause lasting compaction.

Affected Environment

The Natural Resources Conservation Service (NRCS) differentiates soils by soil orders that reflect how they were formed. Soils on the Medford District are primarily Inceptisols, Alfisols, Mollisols, and Ultisols (see Table 3-17). Soil types on the Medford District are distributed in small patches relative to one another making it difficult to characterize saturation or erosion rates. Inceptisols are the most widely distributed soils, present on 47 percent of the District. They have high infiltration rates and low amounts of clay. Alfisols and Mollisols are each present on roughly one-fifth of the District. Alfisols are present in semiarid to moist areas where weather has leached clay from surface layers into the subsoil, allowing them to hold moisture and nutrients. Mollisols are rich in organic matter and are found in the southern Siskiyou Mountains. Ultisol soils are less common (12 percent of the District). They have high amounts of clay, organic matter, and good drainage and are typical of forested areas. Vertisols and Entisols are present on 1 percent or less of the District.

Table 3-17. *Soil Order Properties and Extent*

Soil Order	Average % Organic Matter[1]	Average % Clay[1]	Average T Factor[2] (Range)	Average K Factor (Water Erosion) Risk Rating[3] (L / M / H)	Estimated Acres (Percent of Total)
Inceptisols	11.89	19.3	2.4 (1-5)	0.06 (L)	412,091 (47%)
Alfisols	10.48	20.8	3.5 (2-5)	0.09 (L)	186,817 (21%)
Mollisols	11.35	23.6	2.9 (1-5)	0.15 (L)	159,749 (18%)
Ultisols	20.62	20.9	4.5 (2-5)	0.02 (L)	106,301 (12%)
Vertisols	2.54	55.0	3.0 (2.5)	0.12 (L)	6,726 (1%)
Entisols	6.03	17.3	2.8 (1-5)	0.03 (L)	2,967 (<1%)

1. Average organic material and clay contents derived from A horizon for all soils within the order, not the entire profile
2. T Factor: Tolerable amount of soil loss (tons per acre per year) prior to reduced productivity.
3. K Factor Erosion Risk Rating: Low = 0.05 to 0.2, Medium = 0.21 to 0.40, High = 0.41+. Erosion factor K appears in the Universal Soil Loss Equation (Wischmeier and Smith 1978) as a relative index of susceptibility of bare cultivated soil to particle detachment and transport by rainfall.

Soils on the District are either heavily skewed to coarse texture (26 percent are sand or gravel), which are highly permeable and / or are high in organic matter (55 percent), meaning that they would be able to infiltrate or absorb water and resist erosion and compaction. Loams, a combination of sand, clay, and silt in varying proportions, is the dominant soil type on 40 percent of the District. Because of their composition and high organic matter content, loamy soils tend to hold moisture but also drain well, making them resistant to compaction and erosion. Of the currently mapped NRCS acres, there are 471,617 acres (18 percent) of the District where the clay content is higher than 25 percent and compaction and erosion would be more likely. A very small percent (0.2 percent) of the District is bedrock or gravel, stones, and cobble, which do not compact or erode.

The soils in the river valleys and adjacent slopes form in alluvium (water-moved material) of mixed sources that tend towards coarse sand gravel and cobbles to fine grained sands and silts depending on the force of the water that deposited them. Floodplains that are actively reached by floodwaters on a semi-regular basis are disturbed with every flood. Although such floods are a natural process, the floods often carry invasive plant seeds, which colonize the disturbed floodplain. Generally, on BLM-managed land, floodplains are narrow and well shaded by native vegetation. Residual compaction and displacement from past management actions including timber management, grazing, and road construction occurs across the District.

Overall, the Medford District is not prone to erosion, with low average water erosion risk ratings for all soil types on the District (see K-factor, Table 3-17). Areas more prone to chronic erosion include South Fork Little Butte (11,000 acres) and Evans Creek watersheds (143,360 acres) where soils are composed largely of volcanic clays or decomposing granitics, respectively, which are prone to mass movement and erosion. The steep topography and volcanic or granitic rock of the Klamath Mountains and the Cascade Mountains are also prone to erosion. The topography of the High Cascades has broad plateaus and moderate slopes with less erosion. (Granitics on the Medford District are unique in that they are almost exclusively sandy in texture and have very little clay. As a result, these soils are highly erosive.)

The Rogue, Bear Creek, Applegate, and Illinois valleys that cross the District are the driest areas west of the Cascades. The rain shadow effect of the Siskiyou and Coast ranges results in relatively light annual rainfall, generally occurring in late fall, winter, and early spring. Precipitation ranges from an annual average of 12 inches in the arid southeastern part of the District, and over 100 inches in the northwestern part of the District. Summer months can be dry without measureable precipitation for two months.

Treatments Planned Related to the Issue

Common to All Alternatives

Treatments that have the potential to contribute to compaction, displacement of upper surface layers, and erosion are those that disturb the soil surface or create large areas of bare ground. Under all alternatives, most herbicide treatments are selectively applied on small sites (95 percent in the Proposed Action and Alternative 3, and 99 percent in the No Action) and would not be expected to create large unvegetated areas. Many of these applications would be made from roads and other previously disturbed surfaces. Competitive seeding and planting would be used under all alternatives to help prevent soil erosion from treatment sites, but the extent of use would not change between the alternatives.

No Action Alternative

Manual treatment methods would make up 40 percent of all treatments, roughly 125 net acres annually. Mechanical treatments would be used roughly 1 percent of all treatments or 334 acres over the life of the plan. Most herbicide treatments would be with glyphosate and 2,4-D, with limited use (less than 1 percent of treatable acres) of dicamba and picloram. Nearly all herbicide treatments would be spot treatments.

Proposed Action

As new herbicides are available that are selective and effective for a larger range of invasive plants, manual treatments would decrease, making up 24 percent of all treatments (3,300 fewer acres over the life of the plan compared to the No Action Alternative). Approximately 95 percent of herbicide treatments would be spot treatments and 5 percent would be broadcast treatments (e.g., use of the selective herbicide imazapic on invasive annual grasses). Mechanical treatments would decrease slightly to 212 acres, still less than 1 percent of all treatments. Targeted grazing would not be a preferred treatment method, but would be used in limited situations to remove biomass, with cattle being used for grasses and goats for forbs and woody vegetation. Grazing treatments would often be followed by competitive seeding and planting.

Alternative 3

In addition to the treatments described under the Proposed Action, Alternative 3 would also include the treatment of submerged and floating invasive plant species with herbicides or manual removal with rakes or other hand-operated tools.

Standard Operating Procedures and Mitigation Measures for All Alternatives Relevant to the Issue

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

- Time treatments to avoid intense rainstorms.
- Time treatments to encourage rapid recovery of vegetation.
- Minimize soil disturbance and compaction.
- Further facilitate revegetation by seeding or planting following treatment.
- Minimize use of targeted grazing if removal of vegetation may cause significant soil erosion or impact.
- Closely monitor timing and intensity of biological control with livestock.
- Avoid grazing on wet soil to minimize disturbance, compaction, and subsequent erosion.

Environmental Consequences

Direct and Indirect Effects

Common to All Alternatives

There may be minimal amounts of soil compaction from foot traffic associated with all methods of treatment (including foot traffic with backpack herbicide sprayers) and tool use associated with manual and mechanical methods, but not to the extent that soil function would be reduced or erosion potential would be increased regardless of the site characteristics. Repetitive foot traffic would not occur with any methods of treatment including herbicide application. Invasive plant treatments result in a dispersed pattern of foot traffic over the treatment area for short periods of time (a day or two) during the treatment. Foot traffic only results in lasting effects to soils when it is continuous and concentrated in one area, such as with a footpath or trail. In addition, invasive plants are likely to occur in previously disturbed areas that may already have some level of compaction from the activity that caused the initial disturbance. However, Medford soils are generally not prone to compaction due to their low levels of clay and high organic matter.

Manual digging and pulling of invasive plants are expected to result in negligible, short-term disturbance primarily due to compaction from foot traffic and ground disturbance from hand tool use. Only the upper-most soil horizons (top 1 to 3 inches) will experience effects, which are expected to last one growing season. Manual treatments are only practical for small infestations and would often be used to complement herbicide treatments. For example, mature reproductive plants would be pulled, but dense patches of seedlings in the same area would be sprayed. With this approach, bare ground, and thus the potential for soil erosion, is minimized.

Mechanical control methods, including the use of string trimmers, chainsaws, and mowers, would result in negligible, localized, short-term effects on soil compaction and erosion. Mechanical methods tend to disturb little or no soil, removing the plant at the base, but leaving the roots intact. As such, mechanical methods have little potential to contribute to erosion. Compaction may occur associated with foot traffic or the use of off-highway vehicles to transport equipment or workers. Similar to manual methods, foot traffic associated with mechanical treatments would not result in soil compaction. Mechanical treatments would occur mainly along roadsides, utility corridors, recreation areas, and other previously disturbed areas; thus, use of off-highway vehicles to transport workers would have negligible effects on compaction.

There is a potential for herbicide to create unvegetated areas that would lead to increased erosion, particularly if the herbicide is non-selective and removes both target and non-target vegetation. Eighty-six percent of Category I sites treated with herbicides are small, less than 0.5 acres (see Table 2-2, *Summary of Invasive Plants Documented in NISISMS by Infestation Size*), and the method of application is a backpack sprayer that allows the applicator to treat individual plants or small groups of plants. If a site were large enough that there would be potential for other invasive plants to move back in before native vegetation could reestablish, the site would be competitively seeded or planted and mulched, which would have the indirect effect of reducing erosion and adding organic matter. Under all alternatives, a goal of the treatment is to minimize the effects to non-target plants to increase the treatment success and reduce the need to retreat; if less vegetation is removed, it is more likely that native vegetation will fill in the void left by the treated plant, negating the need for competitive seeding.

By removing invasive plants, the normal soil protection processes and vegetation and soil armoring are returned over the long term. Improved effectiveness in treating invasive plants and retention of larger amounts of non-target vegetation will inhibit further invasive plant establishment.

No Action Alternative

The No Action Alternative would have more potential for soil erosion due to 3,330 acres more manual treatments over the life of the plan compared to the Proposed Action or Alternative 3. However, the potential for soil erosion at each site is minimized by small treatment size. Treatment of small areas distributed across the spatial extent of the District would not create areas of bare soil that would lead to increased levels of soil erosion. Protection Measures are designed to avoid the loss of finer-sized soil particles, such as timing treatments to avoid periods of heavy precipitation and encouraging rapid recovery of the remaining vegetation.

Proposed Action

Manual treatments would decrease in comparison with the No Action Alternative, from 40 percent down to 24 percent of all treatments (13,681 acres down to 9,974 acres over the life of the plan). Herbicide treatments would increase with the use of herbicides that are more selective. The total estimated acres on which BLM would use glyphosate and 2,4-D would decrease by 72 percent and 75 percent, respectively in favor of more selective herbicides that only remove the target invasive plant and leave surrounding vegetation unharmed to hold on to the soil and reestablish in the bare area. As a result, there will be less soil disturbance associated with the Proposed Action and smaller unvegetated areas that could lead to soil erosion.

Targeted grazing effects on soil erosion and compaction would vary by the size and grazing behavior of the animal (goat or cow), season of use, length of grazing period, and number of grazing animals. Soil compaction from goats is not expected due to their hoof size and body weight. Soil compaction from cattle, if it occurs, would be shallow, generally confined to the upper horizons (usually the top 2 inches of soil, but occasionally as deep as 12 inches depending on soil type and moisture content), and limited in area (Greenwood and McKenzie 2001). Dry-season grazing would avoid potential damage to fine-textured soils and treatments would be monitored to control the timing and intensity of grazing, moving the animals off the site before conditions were prone to erosion. Targeted grazing with goats (for forbs and woody vegetation) and cattle (grasses) would not be a preferred treatment method for any treatment group, and are proposed for less than one percent of treatments. Given the extremely limited use and the application of Protection Measures that would prevent effects that result from intensive grazing, there would be negligible short-term adverse effects to soil erosion and compaction on the District.

Treatment of some small invasive plant sites may call for the use of spot treatments utilizing a hand held propane torch. Treatments would be limited to individual plants, and used primarily in parking lots, cobble bars and other sparsely vegetated areas. Because of the limited use and site conditions, propane torches would not affect erosion and compaction.

Alternative 3

Effects for terrestrial treatments would be same as those described under the Proposed Action.

Herbicide and manual treatments of submerged and floating aquatic vegetation would occur with a worker accessing the site on foot, working during low flow or dry conditions when the probability of soil detachment and transport are low. Given the limited area and nature of disturbance, and application of Protection Measures, in-stream turbidity and sediment delivery would be minimized. As also described in the *Fish and Aquatic Organisms* Issue 3, sediment depositions and turbidity would be short term. There could be small localized short duration increases in turbidity, as pulling of the weeds could disturb fine sediment already in the aquatic substrate. This sediment would rapidly (within minutes) settle out of solution and be deposited back on the stream / pond bed. As this sediment is already in the aquatic system, it would not be an addition of fine sediment, just a temporary displacement of it. Expected long-term benefits of improved channel complexity, aquatic connectivity, and bank stabilization to aquatic habitat and species would far outweigh potential short-term adverse effects.

Summary of Effects

Table 3-18. *Summary of Effects (Soil)*

<table>
<tr><th rowspan="2">Alternative</th><th colspan="2">Direct Effects</th><th rowspan="2">Indirect Effects</th></tr>
<tr><th>Compaction</th><th>Erosion</th></tr>
<tr><td>No Action Alternative</td><td rowspan="3">There would be negligible compaction because of invasive plant treatments; foot traffic associated with all methods of treatment would be unlikely to result in compaction, and while goats and cattle can temporarily compact soil, short-term effects would be negligible. Five (No Action) to nine (Proposed Action and Alternative 3) percent of treatments are from off-highway vehicles. While this could have the potential to cause compaction, this would occur along previously disturbed areas.</td><td>The No Action Alternative would have more potential for soil erosion due to 3,330 acres more manual treatments over the life of the plan compared to the Proposed Action or Alternative 3. Treatment of small areas distributed across the spatial extent of the District would not create areas of bare soil that would lead to increased levels of soil erosion.</td><td rowspan="3">By removing invasive plants, the normal soil protection processes and vegetation and soil armoring are returned over the long term. Improved effectiveness in treating invasive plants and retention of larger amounts of non-target vegetation will inhibit further invasive plant establishment.</td></tr>
<tr><td>Proposed Action</td><td>Selective herbicides could result in retention of more non-target plants and less bare ground. Fewer manual treatments (25 percent of treatments) would result in less ground disturbance. Targeted grazing is not a preferred method of treatment and effects would be minimized by Standard Operating Procedures. Propane torches would have no effect.</td></tr>
<tr><td>Alternative 3</td><td>Given the limited area and nature of disturbance, and application of Protection Measures, in-stream turbidity and sediment delivery would be minimized.</td></tr>
</table>

Cumulative Effects

Across the analysis area (lands within the Medford District boundary) invasive plants are more likely to invade an area after disturbance associated uses such as roads, timber production, recreation sites, or mining. These activities involve the use of heavy, tracked vehicles, soil excavation, and large volumes of human traffic. As such, the soils have already experienced soil compaction or disturbance far greater than what would be associated with invasive plant treatment methods.

Within western Oregon, 139,299 acres (or 6 percent) of the area analyzed in the *Resource Management Plan for Western Oregon* have experienced detrimental soil disturbance from past timber harvest, road construction, and fuel reduction treatments (USDI 2016e:764). Levels of disturbance in the interior / south districts (including the Medford District) have been roughly 33 percent higher than those in the coastal / north districts (e.g., the Coos Bay and Northwest Oregon Districts). Zeimer (1982) cites Harr et al. (1975) in using a threshold of 12 percent of the watershed area being compacted as the point at which peak flows are affected from increased surface runoff. All reasonably foreseeable management actions (see Table 2-16) would include provisions for lessening soil compaction and erosion such as decommissioning roads, working when soils are not wet or adding organic matter to the soil. These actions may still may lead to small incremental increases in soil compaction and erosion, but not to the extent that 12 percent of the District would experience soil disturbance. Because most treatments would take place from roads or other previously disturbed areas, and because 85.5 percent of invasive plant treatment sites are less than half an acre, all alternatives would contribute negligible amounts of erosion and compaction to other reasonably foreseeable actions.

Soil Issues 2 and 3 (Not Analyzed in Detail)

How do herbicides break down and move through soils?
Do herbicides affect soils?

Because both issues discuss how soil characteristics influence the way in which they interact with herbicides, these issues are discussed together. These issues were not analyzed in detail because effects were previously described in the analysis for the Oregon FEIS and the 2007 and 2016 PEISs (USDI 2010a:178-187, USDI 2007a:a4-16, USDI 2016a:4-10 to 4-13) and there are no new circumstances or information at the site-specific level that would change the effects anticipated for this EA. Additional analysis at this site-specific level would not change the conclusions from the Oregon FEIS and the 2007 and 2016 PEISs.

As described in the Oregon FEIS as well as the previous *Soil* Issue, soil consists of varying levels of sand, silt and clay particles, organic matter, and soil organisms. Soil filters, buffers, degrades, immobilizes, and detoxifies organic and inorganic materials, including herbicides (USDA 1997 as cited in USDI 2010a:174). The ability of soils to hold and break down herbicides is affected by biological processes (organisms and plant uptake), physical parameters (adsorption, volatilization, hydrolysis, and leaching), and other parameters (climate and vegetative cover). Soils in the Medford District have a wide variety of parent material (described in previous Issue) that weathers unevenly and includes everything from ancient lava flows, granitic sands, and acidic serpentine clays, to weathered volcanic clays. Soils on the District are heavily skewed to coarse texture (26 percent are sand or gravel), which are highly permeable. However, the soils on the District generally have a high organic component (55 percent). The adsorption affinity of these two conditions are in contrast to one another. Therefore, it can be assumed that the adsorption affinity across the District varies widely, but in general is moderate. Although soils of the Medford District contain concentrations of microorganisms, they rarely, if ever, develop biologic crusts; winter storms are too wet and erode soils too quickly for biologic crusts to develop. Table 3-19 shows the fate of herbicides in soils; that is, how long these herbicides would be expected to remain in soil (USDI 2010a:59-61, 181, USDI 2007a:4-15 to 4-21, USDI 2016a:4-10 to 4-13). While herbicides are generally not expected to affect the attributes of soil except as described below, this information is presented as context for other resources (e.g., water, vegetation, and fish) which could be exposed to herbicides attaching to or persisting in soil. In the cases where herbicide could move down through the soil, the main concern is groundwater contamination (discussed further in *Water* Issue 1).

Pseudomonas fluorescens and fluazifop-P-butyl, proposed for use in limited areas for research and demonstration, were not analyzed in the EISs to which this document tiers. Neither would be expected to have short or long term soil effects, due to their known characteristics and because each can only be used on limited areas. *Pseudomonas fluorescens* is a naturally and widely occurring soil bacterium that is already known in the Pacific Northwest and it is not anticipated to replace or disrupt other microbial species (Skipper et al 1996, Kennedy no date, Parejko et al. 2013). The Risk Assessment for fluazifop-P-butyl says it could have adverse effects on terrestrial arthropods at the treated site, but functional recovery (i.e., repopulation) within one year would be expected and no effects would be expected at a distance of 100 feet from the treated site, indicating highly localized, temporary effects (SERA 2014).

The Oregon FEIS describes that herbicides probably affect few soil organisms directly (USDI 2010a:178). While there are varying amounts of information available for each herbicide, three (chlorsulfuron, picloram, and metsulfuron methyl) may reduce the presence of soil biota for a period of up to three weeks, and the remaining have no or slight adverse effect (USDI 2010a:182-185, USDI 2007a:a4-16, USDI 2016a:4-11 to 4-13). When effects were noted (diflufenzopyr, imazapic, or imazapyr), it was at application rates many times higher than those used by the BLM (USDI 2010a:178).

The type of actions and the amount of treatments under all alternatives would be consistent with the actions analyzed in the 2010 Oregon FEIS and the 2007 and 2016 PEISs. All Standard Operating Procedures and Mitigation Measures analyzed in those documents would be applied to all alternatives.

Treatments would be primarily applied to foliage (spot treatment will account for 99 percent of No Action Alternative herbicide use, and 95 percent of the Proposed Action) and thus would not be directly applied to soils. The vegetation would absorb the herbicide and any that might come in contact with the soils would be minimal. The combined treatment areas of chlorsulfuron and metsulfuron methyl, which may reduce populations of microorganisms for a few days to a few weeks, is 636 acres and thus would have a negligible effect on soil as treatments would be dispersed and organisms would easily recolonize within several weeks.

Only five percent of herbicide treatments of the Proposed Action would be broadcast applications where contact with the soil could be expected. These treatments would occur with imazapic, glyphosate, and rimsulfuron on invasive annual grasses. Imazapic is persistent in acidic soils (see Table 3-19) but is expected to persist for no longer than the growing season it is applied in. Glyphosate rapidly degrades in soils through microbial degradation. Rimsulfuron breaks down rapidly in soils through aerobic degradation.

The herbicides that would be most used under the Proposed Action are aminopyralid, imazapic, and glyphosate (though the use of glyphosate would drop by 57 percent when compared to the No Action Alternative). Aminopyralid is rated as non-persistent to persistent depending on soil type with low to intermediate potential for leaching or runoff. All other herbicides would be used on 5 percent or less of treatments (25 acres or less a year, on sites distributed throughout the District). Given the small quantity used and the distribution across the District, localized effects to soil function from all other herbicides would be negligible.

Picloram, which has been shown to affect soil microorganisms, would no longer be used for any treatments under the Proposed Action or in Alternative 3.

Table 3-19. *Fate of Herbicides in Soil*

Herbicide	Soil Half-life[1] *Aerobic (Anaerobic)*	Soil Adsorption (K_{oc})[2]	Fate in Environment (Persistence Rating[3])	SPISP II[4] Ratings (potential)		
				Leaching (PLP)[5]	*Solution Runoff (PSRP)*[6]	*Adsorbed Particle Runoff (PARP)*[7]
Available under all alternatives						
2,4-D	10 *(333)*	Acid / Salt: 20 mL/g Ester: 100 mL/g	Rapid microbial degradation within 1-4 weeks. (Non-Persistent)	Inter-mediate	Inter-mediate	Inter-mediate
Dicamba	14 *(141)*[8]	2 mL/g	Mobile in soil but is easily degraded by microbes. (Non-Persistent)	High	Inter-mediate	Low
Glyphosate	47 *(12 to 70)*	24,000 mL/g	Tightly adsorbed to soil and rapidly degraded by microbes, thus no soil activity. (Moderately Persistent)	Very Low	Inter-mediate	Low
Only available under the No Action Alternative						
Picloram	20-300 *(> 500)*	16 mL/g	Very slow microbial degradation and some photo-decomposition. Picloram is persistent for a year or more. (Moderate to Persistent)	High	High	Inter-mediate
Only available under the Proposed Action and Alternative 3						
Aminopyralid	32 to 533 *(462 to 990)*	1.05 to 24.3 mL/g	Broken down in the soil by microbes and sunlight. Main mode of degradation is microbial metabolism in soils, which can be slow in some soils, especially at lower soil depths and very slow in aquatic systems. Weakly sorbed to soil, so unlikely to be transported off-site by wind-blown soil. High potential for surface water runoff. Leaching has not been documented at levels below 30 centimeters. (Non-Persistent to Persistent, depending on soil type)	Low	Inter-mediate	Inter-mediate
Chlorsulfuron	40 *(109 to 263)*	40 mL/g	Relatively rapid degradation by microbial and chemical actions, trace amounts have extreme bioactivity. (Moderately Persistent)	High	High	Inter-mediate
Clopyralid	40 *(> 1000)*	6 mL/g, ranges to 60 mL/g	Biodegradation is rapid in soil, reducing the potential for leaching or runoff. Degraded primarily by microbial metabolism. Resistant to degradation by sunlight, hydrolysis, or other chemical degradation. Water-soluble, does not bind strongly with soils, and has the potential to be highly mobile in soils, especially sandy soil. Not highly volatile. Possible release of herbicide from decaying plants with uptake by other plants. (Moderately Persistent)	High	Inter-mediate	Low
Diflufenzopyr	2 to 14 *(20)*	18 to 156 mL/g (aver. 87)	Biodegradation, photo degradation, and hydrolysis are the primary mechanisms that remove diflufenzopyr from soil. (Non-Persistent)	Low	Inter-mediate	Low
Fluroxypyr	7 to 23 *(3.5 to 14)*	50 to 136 mL/g	Mobile to very mobile in soil, but its movement is reduced by its quick initial microbial degradation. Degrades first to the pyridine and then to the methoxypyridine, which is persistent and has a high tendency to adsorb to soil, and is slowly degraded by microbial degradation and volatilization. Generally not found below a soil depth of 6 inches; varies depending on soil type (may be found deeper in coarser soils) and rainfall. (Not Persistent)	Inter-mediate	High	Low
Imazapic	120 to 140 *(> 1000)*	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)	Inter-mediate	Inter-mediate	Low

Herbicide	**Soil Half-life**[1] *Aerobic (Anaerobic)*	**Soil Adsorption (K_{oc})**[2]	**Fate in Environment (Persistence Rating**[3]**)**	**SPISP II**[4] **Ratings (potential)**		
				Leaching (PLP)[5]	*Solution Runoff (PSRP)*[6]	*Adsorbed Particle Runoff (PARP)*[7]
Imazapyr	25 to 141 *(> 500)*	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	Inter-mediate
Metsulfuron methyl	30 *(338)*	35 mL/g	Hydrolysis and microbial degradation, with the latter being the only major pathway in alkaline soils. (Non-Persistent)	High	High	Inter-mediate
Rimsulfuron	5 to 40 *(18)*	19 to 74 mL/g	Breaks down rapidly in soil, with aerobic metabolism the primary route of degradation. Its mobility in soil ranges from moderate in clay and silt loams to very mobile in sandy loams. Its tendency to adsorb to soil varies by soil type, and is greatest in soils with high organic matter or clay content. Rimsulfuron has a low risk of leaching to groundwater. (Not Persistent to Moderately Persistent)	Inter-mediate	Inter-mediate	Low
Sulfometuron methyl	20 *(60)*	78 mL/g	Relatively rapid microbial and chemical degradation. However, trace amounts can be have an impact due to extreme bioactivity. (Non-Persistent)	Inter-mediate	High	Low
Triclopyr	46 *(< 1)*	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	Inter-mediate
Proposed for Research and Demonstration Under the Proposed Action and Alternative 3						
Fluazifop-P-butyl	15 *(> 2)*	5700 mL/g	Degraded primarily through microbial metabolism and hydrolysis, but not degraded readily by sunlight. Binds strongly with soils, so it is not highly mobile (Non-Persistent)	Low	Inter-mediate	Inter-mediate
Pseudomonas fluorescens[9]	20 *(unknown)*	3500 mL/g	Decomposes readily and does not persist in the soil (Non-Persistent)	Low	Inter-mediate	Inter-mediate
Only available under Alternative 3						
Fluridone	21 *(4 to 270)*	1,000 mL/g	Adsorption to soil increases with clay content, organic matter content, cation exchange capacity, surface area, and decreasing pH. (Non-Persistent)	Low	Inter mediate	Inter mediate

1. Half-life in days. Aerobic soils are drier and anaerobic soils are wetter (e.g., in riparian areas).
2. 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.
3. Persistence based on aerobic half-life. Non Persistent: less than 30 days; Moderately Persistent: 30 to 100 days; and Persistent: greater than 100 days (defined by Extoxnet Pesticides)
4. The source for this data is SPISP II = Soil Pesticide Interaction Screening Procedure version II
5. 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.
6. PSRP: 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.
7. 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.
8. Source: USEPA (2006)
9. Unknown Pseudomonas fluorescens D7 ratings; SPISP II rating listed here based on Pseudomonas fluorescens A506.

Water

Water Issue 1

Would domestic, livestock, or irrigation water sources be affected by herbicides moving through groundwater?

Analytical Methods

Conclusions described below are based on the review of existing data, including spatial data; utilization of professional research and literature; and use of expertise, both internal and external, that is based on documented, substantiated professional rationale. The BLM used information from the NRCS about depth to water (see Map 3-2), groundwater transmissivity (see Table 3-20 and Map 3-1), and pesticide movement (Table 3-21) to evaluate whether herbicides would be able to move into groundwater and information from Risk Assessments (see Appendix C) to evaluate how water sources would be affected if an herbicide were to leach into groundwater.

Regional groundwater gradients and aquifer systems are not well studied on the Medford District. Groundwater data are limited and are based on small isolated studies and well logs, and then extrapolated across larger areas, as shown in Map 3-2. Map 3-2 shows estimated depth to the water table (the saturated zone in the soil); true aquifers would be deeper.

The geology of the area is highly variable; water-bearing properties of the formations largely depend on faults, fractures, joints, etc. The rate and quantity of groundwater movement depends on the hydraulic conductivity of the geologic formation and the hydraulic gradient. Map 3-1 shows the saturated hydraulic conductivity on the District; that is, the ease and speed with which a fluid can move through pore spaces or fractures. Saturated hydraulic conductivity on the Medford District falls between 0.2 and 413 micrometers / second, as shown in Table 3-20.

***Table 3-20**. Saturated Hydraulic Conductivity (K) values*[1]

***K** (micrometers / second)*	10^{6}	10^{5}	10^{4}	***1,000***	***100***	***10***	***1***	***0.1***	***0.01***	10^{-3}	10^{-4}	10^{-5}	01^{-6}
Percentage of Acres on District[1]	0	0	0	0	10%	54%	32%	4%	0	0	0	0	0
Relative Permeability	Pervious				Semi-Pervious				Impervious				
Transmissivity of Aquifer	Good					Poor				None			
Soil Texture													
Unconsolidated Clay & Organic Material	Not Applicable[2]				Peat		Layered Clay			Unweathered Clay			
Unconsolidated Sand & Gravel	Well Sorted Gravel		Well Sorted Sand or Sand and Gravel			Very Fine Sand, Silt, Loess, Loam				Not Applicable[2]			
Consolidated Rocks	Highly Fractured Rocks				Oil Reservoir Rock			Sandstone		Limestone, Dolomite		Granite	

1. Acres where K value falls above the value listed in header, but less than the value listed to the left of the value in the header; e.g., 54 percent of acres within the Medford District boundary (all ownerships), is greater than or equal to 10 but is less than 100.
2. Not applicable; this soil texture would not present in areas with this K value.

***Table 3-21**. Pesticide Movement Rating and Half Life*

Herbicide	Movement Rating
2,4-D	Moderate
Aminopyralid	Moderate
Chlorsulfuron	Moderate
Clopyralid	Moderate
Dicamba	Moderate
Diflufenzopyr	Low
Fluridone	Low
Fluroxypyr	Low
Fluazifop-P-butyl	Very Low
Glyphosate	Moderate
Imazapic	High
Imazapyr	Moderate
Metsulfuron methyl	Moderate
Picloram	Moderate
Pseudomonas fluorescens	Unknown
Rimsulfuron	Low
Sulfometuron methyl	Low
Triclopyr	Moderate

As described in the 2010 Oregon FEIS and the 2007 and 2016 PEISs, the BLM also used the Groundwater Ubiquity Score (GUS), an empirically derived value that relates pesticide persistence (half-life) and ability to attach to soil (sorption coefficient, Koc). The GUS may be used to rank pesticides for their potential to move toward groundwater. GUS = log10 (half-life) x [4 - log10 (Koc)]. The Pesticide Movement Rating shown in Table 3-21 is derived from the GUS. Pesticides with a GUS less than 0.1 are considered to have an extremely low potential to move toward groundwater. Values of 1.0-2.0 are low, 2.0-3.0 are moderate, 3.0-4.0 are high, and values greater than 4.0 have a very high potential to move toward groundwater (Vogue et al. 1994, USDI 2010a:199, USDI 2007a:4-28, USDI 2016a:4-17).

In addition, the BLM used ODEQ GIS data and information on drinking water protection to describe municipal water sources, water rights, and the regulatory framework.

The analysis area includes all subbasins located within the boundary of the Medford District (see Table 3-22).

***Table 3-22**. Subbasins on the Medford District*

Subbasin	Land Ownership			Stream Network Information	Communities	Roads	Historic / Ongoing Land Uses
	BLM	Forest Service	Other[1]				
South Umpqua	38%	13.3%	48.7%	Well drained, intermittent, and well shaded	Glendale, Azalea	I-5, county, logging	Historic placer mining, forestry, agriculture
Upper Rogue	20.5%	33.2%	46.3%	Well drained, erosive, and well shaded	Shady Cove, Eagle Point, Butte Falls, Prospect	State highways 62, 140, 227, county, logging	Forestry, grazing
Middle Rogue	23.9%	4.4%	71.7%	Well drained, erosive, and altered by development and grazing	Grants Pass, Medford, Ashland	I-5, State highways 62, 66, 99, 234, 273, county, logging	Urban areas, forestry, grazing
Lower Rogue	56.2%	8.6%	35.2%	Well drained, high precipitation, well-shaded, deeply incised, and flashy	Merlin, Wolf Creek, Galice	I-5, State Hwy 260, county, logging	Historic placer mining
Applegate	34.2%	32.9%	32.9%	Well drained, lowest precipitation on District, intermittent and muted streamflow responses	Ruch, Applegate, Williams	State Hwy 238, county, logging	Forestry, agriculture, historic placer mining
Illinois	12.8%	65.5%	21.7%	Well drained, substantial precipitation, limited vegetation, and flashy streamflow response	Cave Junction, Selma, Kirby	US Hwy 199, State Hwy, 46, county, logging	Historic placer mining, forestry, agriculture
Upper Klamath[2]	46.2%	0.7%	53.1%	Well drained, snow-driven, highly erosive, cut down to bedrock, intermittent, well shaded, and muted response to precipitation	Pinehurst, Lincoln	I-5, State Hwy 66, 96, county, logging	Forestry, grazing

1. Including private lands.
2. Most of the Upper Klamath subbasin is located out of the bounds of the Medford District.

Impacts on groundwater resources are assessed both quantitatively and qualitatively. Beneficial impacts are those that maintain or improve water quality to meet beneficial uses, while adverse impacts are those that degrade water quality, with larger effects causing an inability to meet beneficial uses. Impacts are sometimes described using ranges of potential impacts or in qualitative terms. The factors that influence the temporal scale are how long an herbicide takes to break down (persistence rating), the depth to water table, and the transmissivity of the soil. This varies by herbicide and location of treatment. For example, triclopyr breaks down in less than a day in soils commonly found in riparian areas, but imazapic would take more than 1,000 days in the same conditions[63] (see Table 3-19 in *Soil* Issue 2). Short-term effects for these two herbicides would vary from less than one day (triclopyr) to a few years (for imazapic); long-term effects would be greater than a day for triclopyr and greater than 3 years for imazapic.

Affected Environment

Groundwater

Groundwater occurs as both confined and unconfined aquifer systems. Unconfined alluvial aquifers vary in size and yield from one stream to another. These aquifers are important as transient storage systems to move groundwater to or from streams and the deeper, confined aquifers. Unconfined perched aquifers occur between stream valleys and can usually be identified by the occurrence of springs on hillsides (USGS 1998). As described in the *Analytical Methods* section, little is known of the extent or depth of deep, confined bedrock aquifer systems on the Medford District. Volcanic flows and faults mean that there is not a uniform regional groundwater gradient on the Medford District and water will move through the ground at differing rates; flows and faults may become preferred conduits or barriers to flow.

The largest known confined aquifer in the Rogue Basin is the Big Butte Aquifer in the Upper Rogue Subbasin where deep water fed by snowpack in the Cascade Range percolates down through fractured bedrock from ancient lava flows. The aquifer has many outlets including most natural streams and numerous springs, such as Big Butte Springs. The Medford Water Commission uses Big Butte Springs to provide reliable, high quality drinking water for the City of Medford and the surrounding communities, a total service population of 131,000. During peak summer months, water is supplemented from the Rogue River. Nineteen percent of the Big Butte watershed is managed by the BLM, 37 percent by the U.S. Forest Service, and 44 percent is in private ownership. The water table may be more than 1,000 feet deep beneath topographically high areas, but is much shallower beneath major valleys and perched water is common. Recharge to groundwater systems occurs mainly at higher elevations where precipitation from snow percolates through volcanic soils before running off or evaporating (USDA 1995a).

Some springs begin in stream channels. Others contribute to small ponds, marshy areas, lakes, or reservoirs that in turn drain into channels. Some springs and seeps form their own channels that eventually become flowing streams, but other springs lose their surface expression and recharge alluvial fill material or permeable stratum. Water from springs differs from that of overland runoff in that it is generally cooler, more constant in temperature, and lower in dissolved oxygen - especially close to the source. Mineral content in water varies from spring to spring along stream courses depending upon the geochemistry of the substrata through which it flows (USGS 1999). Springs and seeps are important to aquatic habitats because many provide a perennial base flow essential to a stream. In summer, the outflow from perennial springs usually helps to maintain lower water temperatures. Some springs and seeps on the District have been disturbed by historic management activities such as livestock grazing, domestic use, recreation use, and road construction (Hosten and Whitridge 2007, USDA 1995a). Many hundreds of natural springs have been surveyed by the BLM; most are undeveloped and have not been claimed by water users

[63] Imazapic is not registered for use in riparian areas

as they typically are remote and produce low volumes of water. Many hundreds of springs remain unsurveyed across the Medford District.

During winter months on the Medford District, soils can be nearly saturated and shallow springs are abundant. However, only 21,360 acres (0.7 percent) within the District have a high-water table (less than 25 centimeters; see Map 3-2). In general, these areas are isolated and associated with alluvial drainages located near floodplains.

Municipal Water Sources, Water Rights, and Regulatory Framework

Public water supplies are sources of water that are utilized for public consumption and are divided into two categories: surface and ground. Most municipal water supplies are diverted from surface water. Community water systems treat and distribute water from the source and deliver it to consumers.

In addition to municipal water supplies, individuals may apply for or already possess water rights issued by the State of Oregon (Oregon Water Resources Department). Demands on water resources have increased in Oregon over the past few decades for domestic water supply, fish habitat, irrigation, and livestock watering. As more people make the Rogue Basin their home, the demand for surface water may exceed a stream's capacity. Most streams on the Medford District are already "fully allocated" and no further water is available for new surface water rights. If a person cannot obtain water from surface water, they must either have water delivered or rely on a groundwater well.

Shallow groundwater wells are common across the Medford District and can be located at natural springs. Nearly every residence beyond city limits and municipal water delivery capacity, utilizes these shallow groundwater wells. Often, residences will have several wells. Even within city limits, such as in the City of Grants Pass, private groundwater wells separate from municipal jurisdiction are common. These wells provide their users with water for a number of uses including domestic, irrigation, and livestock watering. The number of groundwater wells on the District is unknown as many wells were dug or drilled many years ago – often without notification of the proper authorities – but is estimated to be many thousands. Furthermore, if a natural spring is located on a property, but does not flow off the property as surface water, the landowner can develop that spring and be exempt from securing a water right from the State. Some wells have been dug or drilled on BLM-managed lands and are subsequently conveyed to private property via ditch or pipeline. Usually these wells are low volume (less than 0.1 cubic feet per second) and their development is minimal (ODEQ 2016).

Treatments Planned Related to the Issues

No Action Alternative

The District would treat approximately 180-300 acres (net) annually with herbicides (60 percent of all invasive plant treatments), primarily with 2,4-D and glyphosate, and extremely limited use of picloram and dicamba (less than one percent of all treated acres).

Proposed Action

Herbicides would be used for 75 percent of all treatments, or approximately 225-375 acres (net) annually. Aminopyralid, imazapic, glyphosate, rimsulfuron and triclopyr would be those most commonly used. All others would be used on 10 acres or less per year.

Alternative 3

In addition to the treatments described under the Proposed Action, there are 32 treatment acres of aquatic invasive plants on the District. Herbicides would be used for 36 percent of aquatic treatments. Aquatic formulations of 2,4-D, fluridone, glyphosate, imazapyr and triclopyr would be used on treatments of submerged and floating aquatic invasive plant species. Triclopyr would be used most frequently, with all other herbicides being used on less than one percent of the treatable acres.

Standard Operating Procedures and Mitigation Measures for All Alternatives Relevant to the Issue[64]

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

- 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 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.
- 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.
- Proposals to boom 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.
- Conduct mixing and loading operations in an area where an accidental spill would not contaminate an aquatic body. Take into account the different types of application equipment and methods, where possible, to reduce the possibility of contamination of non-target food and [livestock] water sources.
- 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.
- 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.

Environmental Consequences

Direct and Indirect Effects

Common to All Alternatives

Herbicide impacts to the groundwater are determined by application method (and whether the herbicide makes contact with the soil), the application rate, and how a specific herbicide reacts with the surface and subsurface soil and is transported (leached) to the water below the ground surface. In most treatments, the herbicide will have little opportunity to make contact with the soil. Ninety-five percent of herbicide treatments would be spot treatments, usually with a backpack sprayer that allows for the herbicide to be applied the leaves of individual

[64] Manual-directed standard operating procedures and other standing direction are often referred to as Best Management Practices when they are applied to water.

plants. Even if an herbicide makes contact with the soil and has potential to leach and has a long half-life (as described in the Table 3-19), the likelihood of it reaching groundwater depends on the depth to groundwater, the amount of precipitation and soils present on the site. It is estimated that 21,360 acres (0.7 percent) within the District have a high-water table (see Map 3-2). As shown in Table 3-20, the soils on the Medford District are semi-pervious and transmissivity of aquifers is poor. In addition, applicators making site-specific use decisions based upon the Standard Operating Procedures, Project Design Features, and product labels, would prevent adverse effects to groundwater. Standard Operating Procedures that would be applied to use of all herbicides under all alternatives require that domestic water sources, areas with shallow groundwater, and areas of groundwater-surface water interaction be identified to reduce the risk that herbicides would be able to leach into groundwater. These areas would be identified during preparation of the Annual Treatment Plan, so that appropriate treatment methods can be used. Given these conditions, it is unlikely that any herbicides would reach groundwater. However, should they reach groundwater, Table 3-23 is a summary of the potential risks to groundwater for herbicides considered in this analysis.

Table 3-23. *Effects of Herbicides available under All Alternatives[1] (Water)*

2,4-D	Some forms of 2,4-D are registered for use in aquatic systems. 2,4-D is a known groundwater contaminant although potential for leaching into groundwater is moderated 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). 2,4-D amine is the preferred form and it is not persistent under most environmental conditions (Jervais et al. 2008).
Glyphosate	While glyphosate is very water soluble, it is unlikely to enter waters through surface runoff or subsurface flow because it binds strongly to soil particles, 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).
Dicamba	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).

1. Adapted from the Oregon FEIS (USDI 2010a:194-198) and the herbicide Risk Assessments.

No Action Alternative

The four herbicides used under this alternative include three (picloram, dicamba, and 2,4-D) that have been known to contaminate groundwater, although potentially in different soils or scenarios than found on the Medford District. As described above, glyphosate remains tightly bound to soil particles and is unlikely to make it in to groundwater. In terrestrial applications, 2,4-D has a moderate potential to leach, but this would be lessened by Protection Measures described above. Picloram (see Table 3-24) and dicamba (see Table 3-23) would be used on 10 acres or less a year (in the past, dicamba has only been used once or twice a decade and picloram has been used in only three of the last six years) and the potential for effects would be minimized by the application of Protection Measures that prevent application on areas where herbicides have the potential to leach through soils and reach groundwater. In the short term, if herbicides were to reach groundwater, picloram, 2,4-D, and dicamba could contaminate groundwater. Even if herbicides available for this alternative did reach groundwater sources used for domestic, livestock, or irrigation purposes despite Protection Measures, Risk Assessments for consumption of contaminated water show no risk to small mammals or humans under long term exposure for any of the herbicides available under this alternative. Given their larger body mass, similar risks would be expected for large mammals, such as livestock. See *Human Health* and *Wildlife* Issues for additional detail. In the long term, if these herbicides were in the groundwater, they would break apart, and there would be no potential for effects.

Table 3-24. *Effects of Herbicides only available under the No Action Alternative[1] (Water)*

Picloram	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 groundwater, even over several years (USEPA 1995).

1. Adapted from the Oregon FEIS (USDI 2010a:194-198) and the herbicide Risk Assessments.

Proposed Action and Alternative 3

None of the herbicides available only under the Proposed Action and Alternative 3 (see Table 3-25) have been known to contaminate groundwater, though they may have the potential to do so based on their characteristics. Clopyralid, diflufenzopyr, fluroxypyr, and fluazifop-P-butyl do not pose a risk to groundwater due to their interactions with soil and water. The remaining herbicides have some level of potential to leach or runoff; however, Standard Operating Procedures would minimize risks to groundwater through actions such as minimizing treatment areas in shallow groundwater and areas of surface water and groundwater interaction. In the short term, if herbicides were to reach groundwater, they would contaminate the groundwater. Even if herbicides available under these alternatives did reach groundwater sources used for domestic, livestock, or irrigation purposes despite Protection Measures, Risk Assessments for consumption of contaminated water show no risk to small mammals or humans under long term exposure for most of these herbicides[65]. In the long term, if these herbicides were in the groundwater, they would break apart, and there would be no potential for effects.

With the addition of the herbicides available under the Proposed Action, BLM would use less 2,4-D and picloram. Most noticeably, 2,4-D use would decrease from 9,009 acres over the life of the plan under the No Action to 2,545 acres under the Proposed Action and Alternative 3. Picloram would not be used at all.

The effects from *Pseudomonas fluorescens* are unknown; however, it would be limited in use (up to 45 acres dispersed throughout the District) and applied on invasive annual grasses that do not grow in areas with shallow groundwater.

Table 3-25. *Effects of Herbicides available under the Proposed Action and Alternative 3[1] (Water)*

Aminopyralid	Aminopyralid is moderately persistent and has high mobility in most soils because of its low soil adsorption values (USEPA 2005a). Therefore, it is transported to surface water and groundwater. Breakdown by microbes in soil is the primary form of dissipation. Aminopyralid's mobility and high water solubility suggest that the herbicide is prone to leaching (Lindenmeyer 2012). However, in past studies, leaching of aminopyralid has not been documented at levels below 1 foot (USEPA 2005b).
Chlorsulfuron	Chlorsulfuron is not known to be a groundwater contaminant, but has a high potential to leach into the groundwater.
Clopyralid	Clopyralid 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 (Dow AgroSciences 1998).
Diflufenzopyr	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. The expected half-life of diflufenzopyr 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 (USEPA 1999).
Fluazifop-P-butyl	Because it binds strongly with soils, it is not highly mobile in soils and does not pose a substantial risk of groundwater contamination (WSSA 1994 cited in Tu et al. 2001)
Fluroxypyr	Based on soil adsorption characteristics, fluroxypyr is expected to have a high mobility in soil. However, it has a low potential for movement to groundwater because it is rapidly broken down by microbes in the

65 See *Human Health* Issue 1 and *Wildlife* Issue 1 for further information about specific risks to humans and mammals from herbicide use.

	soil (soil half-life is 1 to 3 weeks; California Department of Pesticide Regulation 2005; National Library of Medicine 2011). In field studies submitted to the EPA, fluroxypyr was generally not found below a soil depth of 6 inches (USEPA 1998), although this may vary depending on soil type and amount of rainfall. In sandy soils, the potential to leach to groundwater is much higher, and has been identified as a concern (NYSDEC 2006). Factors that influence the rate of fluroxypyr degradation in soils include soil microbes, organic matter, temperature, and soil moisture (Tao and Yang 2011).
Imazapic	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).
Imazapyr	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.
Metsulfuron methyl	Metsulfuron methyl is not known to be a groundwater contaminant, although it has a high potential to leach into the groundwater.
Pseudomonas fluorescens	Effects are unknown.
Rimsulfuron	Rimsulfuron is unstable in soil, and therefore likely has a low risk of leaching to groundwater. The pH of the site conditions is likely a factor, with rimsulfuron less mobile in acidic conditions. Its metabolites may have a greater likelihood of contaminating groundwater, particularly the second metabolite, which is not readily degraded (Metzger et al. 1998). There is little available information about rimsulfuron and its metabolites in terms of groundwater and surface water contamination. One study in sandy soils found no rimsulfuron in groundwater following an herbicide application, but did find the first metabolite in the soil water at a depth of 3.3 feet, for as long as 3 years, in concentrations unsafe for drinking water. Concentrations of the second metabolite were much lower (Rosenbom et al. 2010). However, neither rimsulfuron nor its two metabolites are included on the EPA's list of drinking water contaminants (USEPA 2013).
Sulfometuron methyl	Degrades quickly by hydrolysis in acidic water but is stable in neutral water. Aquatic dissipation half-lives are estimated at 1 to 3 days to 2 months in aerobic systems and several months in anaerobic sediments (Extoxnet 1996). It 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.
Triclopyr	Triclopyr does not bind tightly to soil particles and is highly mobile in the environment, with the potential to contaminate groundwater, particularly where soils are permeable or where the water table is shallow.

1. Adapted from the Oregon FEIS (USDI 2010a:194-198), the 2007 PEIS (USDI 2007a:4-16), the 2016 PEIS (USDI 2016a:4-11 to 4-13) and the herbicide Risk Assessments.

Alternative 3

In addition to treatments described under the Proposed Action, under Alternative 3, herbicides would be applied directly into surface water. However, to reach groundwater, these herbicides would still have to leach through soils and into the water table. Being applied directly into an aquatic environment would not change the potential for groundwater contamination described above for imazapyr, triclopyr, glyphosate, and 2,4-D. Table 3-26 describes the potential of fluridone to leach to groundwater.

Table 3-26. *Effects of Herbicides available only under Alternative 3*[1] *(Water)*

Fluridone	Fluridone has low potential to leach to groundwater and is not known to contaminate groundwater.

1. Adapted from the Oregon FEIS (USDI 2010a:194-198) and the herbicide Risk Assessments.

Summary of Effects

Table 3-27. *Summary of Effects (Water)*

<table>
<tr><th>Alternative</th><th>Direct Effects</th><th>Indirect Effects</th></tr>
<tr><td>No Action Alternative</td><td rowspan="3">Regional groundwater gradients and aquifer systems are not well studied on the District; data are limited and based on isolated studies and well logs and then extrapolated across larger areas.

However, given estimated depth to the water table, types of soils on the District, movement ratings for the herbicides proposed for use, and Standard Operating Procedures, it is unlikely that any herbicides would ever reach groundwater.</td><td>In the short term, if herbicides were to reach groundwater, picloram, 2,4-D, and dicamba could contaminate groundwater. However, as described in the Wildlife and Human Health sections, consumption of contaminated water shows no risk to mammals or humans under most scenarios.

In the long term, if these herbicides were in the groundwater, they would break apart, and there would be no potential for effects.</td></tr>
<tr><td>Proposed Action</td><td rowspan="2">None of the herbicides added under the Proposed Action or Alternative 3 are known groundwater contaminants, however based on their characteristics, some of them potentially could be. In the short term, if herbicides were to reach groundwater, they would contaminate the groundwater.

However, as described in the Wildlife and Human Health sections, consumption of contaminated water shows no risk to mammals or humans under most scenarios. Picloram would no longer be available and the use of these additional herbicides would reduce the use of 2,4-D and dicamba, therefore reducing any potential risk to humans or mammals.

In the long term, if these herbicides were in the groundwater, they would break apart, and there would be no potential for effects.</td></tr>
<tr><td>Alternative 3</td></tr>
</table>

Cumulative Effects

As described in the *Ongoing and Reasonably Foreseeable Actions* section in Chapter 2, outside of the invasive plant program analyzed in this EA, other pesticide use on BLM administered lands on the Medford District is generally less than an acre annually. Potential effects to groundwater from this other use would only occur in the case of an accidental spill, but like the Invasive Plant Management program, precautions and restrictions are in place to prevent spills from occurring and minimize spills that may occur. Because no other activities on the District have the potential to introduce herbicides into groundwater, the cumulative effects on BLM managed lands of herbicide use that has the potential to contaminate groundwater is the same as the direct / indirect effects discussed above.

The Medford BLM uses about 0.01 percent of the pounds of pesticides used in the Southern Oregon Coast water basin (see *Ongoing and Reasonably Foreseeable Actions* in Chapter 2). As shown in Table 3-22, land ownership across subbasins on the District varies. While it is possible that contamination of groundwater from herbicides may occur on private and other lands in this basin, this is unlikely for the same reasons as described in this groundwater section; it is difficult for herbicides to move to groundwater because of the depth to the water table and groundwater transmissivity. For surface water, no streams in the basin are 303(d) listed for pesticide contamination (see Table 3-28), and there is no evidence of adverse effects to water quality from herbicide use on neighboring lands.

Forest management projects described in Table 2-16, *Reasonably Foreseeable Actions*, have the potential to beneficially affect groundwater on the District. The six projects described in Table 2-16 take place on approximately 21,000 acres distributed across the District. Harr et al. (1982) found that timber harvest increases annual water yield, thus allowing greater amount of water infiltration to recharge aquifers. This could potentially dilute any concentrations of herbicides in groundwater if they were to contaminate groundwater.

Water Issue 2 (Not Analyzed in Detail)

Will terrestrial invasive plant treatments impair aquatic habitat (water quality) by changing the quantity, timing, and duration of surface water runoff to stream or other water bodies?

This issue was not analyzed in detail because effects were previously described in the analysis for the Oregon FEIS and the 2016 PEIS (USDI 2010a:230, USDI 2016a:4-19) and there are no new circumstances or information at the site-specific level that would change the effects anticipated for this EA. The risk of adverse effects is further minimized as a result of Project Design Features adopted for the Proposed Action and Alternative 3.

Section 303 of the *Clean Water Act* requires that Total Maximum Daily Loads (TMDLs) be developed for all waters on the 303(d) list. A TMDL defines the amount of pollution that can be present in the waterbody without violating water quality standards. A Water Quality Restoration Plan is developed to describe a strategy for reducing water pollution to the level prescribed in the TMDL. Each watershed on the District has a Water Quality Restoration Plan that has been accepted by ODEQ and approved by the EPA. Treatments would be consistent with the TMDLs established for the Umpqua and Rogue Basins and the Upper Klamath Subbasin.

The Medford District contains 4,560 miles of streams and other waterbodies (reservoirs, lakes, etc.) on the 303(d) list across all ownerships (see Table 3-28; for a complete list of 303d-listed water by basin, see the *Water Quality Assessment* section of the ODEQ's website). Much of this mileage is duplicative as some of the approximately 550 streams are listed for multiple pollutants. Urban and agricultural development of the valley low lands has increased surface water runoff and erosion rates during precipitation events, and lands cleared adjacent to streams now contribute more sediment to the aquatic system than under natural conditions. Roads in particular have altered sediment budgets, as large portions of existing road networks are hydrologically connected with aquatic habitat, facilitating transport of eroded fine sediment to aquatic habitat (Luce and Black 1999, Reid and Dunne 1984). Temperature is the most widespread water quality impairment on the District and similarly, it is the most extensively monitored pollutant by BLM staff. Once a stream reaches a distance from its inception point, regardless of land ownership, it is almost certain to exceed State-defined stream temperature standards as prolonged exposure to solar radiation raises the temperature of the stream.

Table 3-28. *Stream pollutants on the 303(d) list found on the Medford District*

Pollutant	Miles on District
Ammonia	2.8
Aquatic weeds or algae	43.0
Chlorophyll α	8.8
Dissolved oxygen	407.8
E. coli	248.8
Fecal coliform	505.2
Flow modification	704.5
Habitat modification	442.1
Mercury	4.8
pH	142.5
Phosphorus	32.4
Sedimentation	66.9
Temperature	1,950.1

The Oregon FEIS describes that 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[66] and minor[67]. Depending on the scale of treatment, pulling substantial numbers of large plants or treating large riparian areas with motorized hand tools (e.g., string trimmers) may moderately increase the risk to fish (USDI 2010a:230). The Oregon FEIS also describes that efforts to restore watersheds including managing and controlling noxious weeds and other invasive plants would help to reduce erosion and sedimentation and restore native plant communities. Restoration of native vegetation should improve riparian habitat and moderate stream temperatures and the quantity, timing, and duration of water flows (USDI 2010a:230). Similarly, the 2016 PEIS says removal of invasive species can help to restore a more complex vegetative and physical structure and natural levels of processes such as sedimentation and erosion (USDI 2016a:4-41).

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[66] Impacts are seen on a stream or reach of a stream.
[67] Changes to water quality would be detectable, but would be within historical or desired water quality conditions or occur at a local scale.

The type of actions and the amount of treatments under all alternatives would be consistent with the actions analyzed in the 2010 Oregon FEIS and 2016 PEIS. All Standard Operating Procedures and Mitigation Measures analyzed in those documents would be applied to all alternatives.

Sediment delivery to streams is particularly unlikely when erosion features are greater than ten meters from the channels (Rashin et al. 2006). Therefore, treatments in riparian areas would have the most potential to contribute sediment. Manual treatments (in particular hand pulling) have been and would continue to be a preferred treatment methodology for use in Riparian Reserves on the Medford District. Manual methods are only practical on small sites and thus would not create large areas of bare ground adjacent to a stream. Standard Operating Procedures state that treatments that could result in large continuous patches of bare soil would be stabilized by seeding / replanting prior to the onset of the wet season. For these reasons, it is not anticipated that mechanical treatments would have any potential to increase sediment delivery to aquatic habitat. Large infestations would be treated with herbicides. Herbicide treatments are unlikely to create bare ground; even if a non-selective herbicide is used, dead vegetation remains long enough to provide soil cover that would prevent an increase in runoff until new vegetation emerges. It is not expected that herbicide treatments under any alternative would change the quantity, timing, and duration of surface water runoff events.

Targeted grazing in Riparian Reserves would be limited to goats; cattle would not be allowed in riparian areas due to their larger size and greater potential to increase turbidity and destabilize stream banks. Goats may be particularly useful as an initial treatment targeting blackberry infestations. Streambanks adjacent to most natural watercourses on BLM-managed lands are generally well armored by alluvial substrates such as boulders, cobbles, and gravels. These substrates are resilient to trampling such as may occur by small hoofed mammals like deer and goats. A small percentage of streams on the District are less resilient. These are typically low gradient, wet meadow systems where post holing and bank shear are possible results of grazing. Goats would not be allowed in these sensitive areas to avoid effects to water resources per a ***Project Design Feature*** included in the analysis of the Proposed Action and Alternative 3:

- In Riparian Reserves, targeted grazing will only occur with goats on armored banks. In low gradient, wet meadow systems where post holing and bank shear are possible, keep goats 25 feet away from the wetted channel to eliminate the potential for bank erosion.

A variety of Standard Operating Procedures and Mitigation Measures reduce the potential for invasive plant treatments to generate runoff and erosion. Some of the ones most pertinent to reducing potential for sediment input to aquatic habitat include:

- Minimize removal of desirable vegetation near residential and domestic water sources. [manual treatments]
- Following treatment, reseed or replant with native vegetation if the native plant community cannot recover and occupy the site sufficiently.
- Limit access of domestic animals to streams and other water bodies to minimize sediments entering water and potential for damage to fish habitat.

Additional ***Project Design Feature*s** included in the analysis of the Proposed Action and Alternative 3 would further minimize potential effects:

- If treatment leaves areas of bare soil adjacent to watercourses, mulch disturbed areas prior to the onset of fall precipitation.
- Treatments that may affect 303(d)-listed streams will be noted on the Annual Treatment Plan. Where invasive plant control would remove plants contributing to bank stability or stream shading, control would be delayed or phased as necessary in order to make treatments consistent with 303(d) restoration plans.

Air Quality

Air Quality Issue 1 (Not Analyzed in Detail)

How would the alternatives affect air quality?

This issue was not analyzed in detail because effects were previously described in the analysis for the Oregon FEIS and the 2016 PEIS (USDI 2010a:166-172, USDI 2016a:4-9) and there are no new circumstances or information at the site-specific level that would change the effects anticipated for this EA.

The American Lung Association has ranked the Medford / Grants Pass metropolitan area as 11th in their annual State of the Air report's list of *People at Risk In 25 U.S. Cities Most Polluted by Year-Round Particle Pollution (Annual $PM_{2.5}$*; ALA 2017*)*. The combination of weather patterns and topography of western Oregon contributes to regional air quality problems. Poor air quality can develop when a major polluting activity or event combines with temperature inversions and strong high-pressure systems that create stagnant air. Valleys can trap and concentrate pollutants, exacerbating the effects of stagnant air. Wildfires tend to be the primary contributor to air quality concerns on the District. Large spikes in July and August are caused by wildfires, while moderate air quality in September through January is primarily from woodstoves with some smoke from pile burning (USDI 2016e:155-157).

The Oregon FEIS showed that emissions from invasive plant treatments on *all* Oregon BLM-administered lands would be less than 0.1 percent of statewide emissions of carbon monoxide (CO), nitrogen oxides (NOx), sulfur dioxide (SO_2), and Volatile Organic Compound (VOCs) and 0.2 percent of particulate matter (PM) (USDI 2010a:167). As described in the Oregon FEIS, emissions from prescribed fire were the primary air quality concern in an integrated invasive plant management program (USDI 2010a:165, USDI 2007d); the herbicides analyzed in the 2010 Oregon FEIS contribute less than 1 percent of the aforementioned SO_2, less than 0.1 percent of the CO, and less than 0.2 percent of the NOx, VOCs, and PM (USDI 2010a:167). The 2016 PEIS states that annual emissions nationwide from a program that included the three additional herbicides would be similar to the program without those three herbicides (USDI 2016a:4-9).

The type of actions and the amount of treatments under all alternatives would be consistent with the actions analyzed in the 2010 Oregon FEIS and the 2016 PEIS. All Standard Operating Procedures and Mitigation Measures analyzed in those documents would be applied to all alternatives.

On the Medford District, effects from herbicide applications on local and regional air quality would be undetectable. The amount of herbicides used would be within the amount analyzed in the Oregon FEIS and prescribed fire is not part of the Proposed Action or Alternative 3. All Alternatives would be relatively benign to air quality, or would reduce the effects of wildfire, thereby slowing or preventing the degradation of air quality (see *Fire* Issue).

Air Quality Issue 2 (Not Analyzed in Detail)

How would the alternatives affect climate change, including greenhouse gas emissions and carbon storage?

This issue was not analyzed in detail because effects were previously described in the analysis for the Oregon FEIS and the 2007 and 2016 PEISs (USDI 2010a:166-172, USDI 2007a:4-9 and 4-10, USDI 2016a:4-9) and there are no new circumstances or information at the site-specific level that would change the effects anticipated for this EA.

Along with the general lack of detailed information concerning existing carbon storage and storage capacity, climate responses to changes in greenhouse gas emissions and carbon storage rates are non-linear, making any assessment of potential effects of the alternatives on climate largely speculative (USDI 2010a:172-173).

The Oregon FEIS discusses that emissions from biocontrols, targeted livestock grazing, and seeding or planting are considered to have a negligible effect on climate change (USDI 2010a:166). Acres of mechanical treatments are expected to decline under the Proposed Action and Alternative 3 (from 334 acres [No Action Alternative] to 212 acres [Proposed Action] or 214 acres [Alternative 3] over the life of the plan) and associated fugitive dust and exhaust emissions would decline as well. However, the BLM does not have adequate data to quantify potential greenhouse gas emissions from that change.

The 2016 PEIS states that none of the herbicides analyzed in the 2007 or 2016 PEISs were expected to have an adverse effect on greenhouse gas emissions given the relatively low amount of greenhouse gas emissions associated with herbicide treatments, and the role of invasive plant control in reducing the extent, frequency and severity of wildfires (a contributor to greenhouse gas emissions) (USDI 2016a:4-9). Effects did not differ because of the herbicide used; rather, levels of effects were related to the acres treated and associated trip distance, vehicle exhaust, and fugitive dust. A quantitative analysis of carbon sequestration was not completed, as there is no appropriate protocol for evaluating impacts (USDI 2016a:4-6).

The type of actions and the amount of treatments under all alternatives would be consistent with the actions analyzed in the 2010 Oregon FEIS and the 2007 and 2016 PEISs. All Standard Operating Procedures and Mitigation Measures analyzed in those documents would be applied to all alternatives.

Alternatives that control or reduce invasive plants maintain or enhance net carbon storage capacity. Alternatives that allow invasive plants to spread reduce net carbon storage capacity (USDI 2010a:172). Since the annual acres treated would remain the same under all alternatives (2,000 gross acres or 300-500 net acres), there would be no difference in carbon storage between the alternatives. The Proposed Action and Alternative 3 would reduce invasive plant spread, so there would be a net carbon storage capacity increase associated with those alternatives (USDI 2010a:173-174).

Emissions are also discussed above, in *Air Quality* Issue 1.

Fire

Fire Issue 1

How would the treatments of invasive plants affect fuel profiles that contribute to increased wildfire hazard and altered fire regimes in grasslands, oak woodlands, and oak savannas?

Analytical Methods

The BLM used the Fire Effects Information System, an online collection of reviews of the scientific literature about fire effects on plants and animals and about fire regimes of plant communities in the United States, to evaluate whether an invasive plant species was likely to alter a fire regime and fuel profile. In addition, Scott and Burgan's (2005) *Standard Fire Behavior Fuel Models: A Comprehensive Set for Use with Rothermel's Surface Fire Spread Model* was used to calculate rate of spread and flame length based on the potential plant communities in grasslands and oak woodlands.

In addition, conclusions described below are based on the review of existing data (e.g., NISIMS) and other data including spatial data; utilization of professional research and literature; and use of expertise, both internal and external, that is based on documented, substantiated professional rationale.

The analysis area includes grasslands, oak savannas, and oak woodlands on BLM-managed lands on the Medford District. Effects are assessed based on acres of those plant communities that are infested with invasive annual grasses and other species likely to alter fuel profiles and fire regimes (see Tables 3-18 and 3-19) and projected treatment acres under all alternatives. The intensity and duration of effects are described using the following parameters:

> *Short-term*: A change in a resource or its condition would generally last less than 5 years.
> *Long-term*: A change in a resource or its condition would last longer than 5 years.
>
> *Negligible:* The impact would not be detectable or measurable. Threats to people, property or sensitive resources from wildland fire would not change. Ability to implement a management response to wildland fires and implementation of hazardous fuels treatments would not be affected.
>
> *Minor localized effect*: Both short and long-term changes to fire regime and wildfire hazard would be measurable or perceptible, in the localized, relatively small areas where invasive plant treatments have occurred (85.5 percent of mapped invasive plant sites are less than 0.5 acres; see Table 2-2, *Summary of Invasive Plants Documented in NISIMS by Infestation Size*). These effects could be adverse or beneficial. However, threats to people, property, or sensitive resources from wildfire would be minimally unchanged. Few changes in wildfire management response and fuels management would occur.

Affected Environment

The potential for invasive plants to affect fire behavior is dependent on the species-specific structure and flammability of the invasive plants as well as the abundance and arrangement of native plant fuels within the native plant community. Invasive plants may alter fuels in ways that suppress the spread of fire in ecosystems where fire is desirable; or they may increase fire intensity and change the timing and frequency of fire beyond natural ranges in other ecosystems (Brooks et al. 2004).

Oak savanna, oak woodlands, and grasslands were once the prominent vegetation types at valley floor and foothill low elevations (2,500 to 3,500 feet) of the Rogue River Basin in southern Oregon. Because these areas are also where population centers established, human influence (conversion, development, grazing, and burning) has diminished their extent and integrity (Duren et al. 2012). Oak woodlands and grassland habitats currently cover an estimated 44,000 and 11,000 acres, respectively, of Medford District BLM-managed lands (USDI 2012a:37), or 6 percent of all Medford District BLM-managed lands. The sparsely wooded character and plant diversity of these areas was historically maintained by frequent low-severity surface fires that maintained low understory and surface fuel loadings.

Based on the location of these plant communities and their proximity to population centers (USDI 2016e:253), human caused ignitions are possible at times other than when fires would have historically occurred. From 1984 to 2013, there was an annual average of 175 human-caused ignitions in proximity to the Wildland Developed Area[68] within the Medford District, relative to an annual average of 17 ignitions beyond the Wildland Developed Area (USDI 2016e:254, Map 3-34). Comparatively, for this same time, there was an average of 72 lightning ignitions annually (USDI 2016e:227).

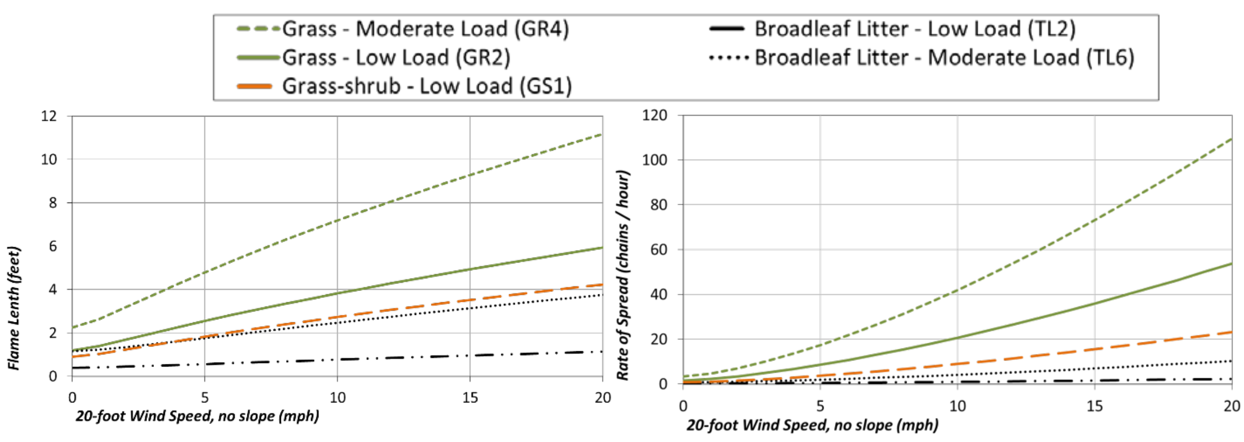
[68] A delineation of where people live in the wildland, classifying a minimum of one structure per 40 acres as a developed area.

Invasive annual grasses and yellow starthistle are known to alter fuel profiles and fire regimes. Annual grasses create homogenous flammable fuel profiles, which can alter the timing, frequency, and intensity of fires. These fine fuels cure completely, leaving continuous extremely flammable horizontal fuel profiles. In many cases, these invasive plants cure weeks earlier than typical of native plants, potentially altering the seasonality of fire occurrence and enabling fire spread at a time of year other than when native plants have developed fire-adaptations. The thatch from invasive annual grasses builds up over time compounding the wildfire hazard potential. Invasion can initiate a cycle where a nonnative grass colonizes an area and provides the fine fuel necessary for the initiation and propagation of fire. Fires then increase in frequency, area, and possibly severity. Following these grass-fueled fires, nonnative grasses recover more rapidly than native species and perpetuate the cycle, compromising the native component of the plant community (see Table 3-30).

For other invasive plant species, it is unclear how their presence would alter the fire regime of a given site (see Table 3-30). Some invasive plant species can slow the rate of fire spread because they have higher moisture content and coarse structure relative to native vegetation like bunch grasses. However, even if these species do not alter the fire regime at a site, they compete with growing space and resources, causing a decline in native plant populations, which affects the abundance and arrangement of native plant fuels. The Fire Effects Information System shows that many of the invasive plants on the District were not known to occur under natural frequent low-intensity fire regimes and have established since the onset of effective fire exclusion.

As shown in Table 3-29 and Figure 3-6, fires in invasive annual grasses have a longer flame length and a faster rate of spread compared to native vegetation that includes grass-shrub or broadleaf litter. For example, in 10 mile-per-hour wind speed (20-foot wind speed[69]), which would equate to 4-6 mile-per-hour eye level winds in fuel types with low canopy cover, the predicted flame length for an invasive annual grass fuel profile would be 4 feet or greater (see Figure 3-6). Flame lengths greater than four feet exceed line personnel direct attack capabilities and necessitate ground or aerial resources. Conversely, native fuels would result in 3 foot or less flame lengths under the same conditions. Invasive annual grass fuel beds at least double predicted rates of wildfire spread over native fuel profiles under 10 mile-per-hour (mph) 20-foot wind speeds.

***Figure 3-6**. Flame Length and Rate of Spread in Plant Communities[1]*



1. Calculated in surface fuel models under a dry fire weather scenario (3, 4, 5 percent dead moisture, 60 percent herb, 90 percent woody and low tree cover (5-10 percent) for various 20-foot wind speeds. 1 chain = 22 yards.

[69] Defined as sustained winds averaged over a 10-minute period and measured 20 feet above the average height of nearby vegetation. This is the standard reported by the Remote Automated Weather Stations owned by land management agencies and used in the National Fire Danger Rating System.

***Table 3-29**. Representative Surface Fire Behavior Fuel Models*

Fuel Profile / Plant Community	Representative Surface Fuel Model	
Invasive annual grasses	Nearly pure grass and / or forb type. Arid to semiarid climate (rainfall deficient in summer). Extinction moisture content is 15%.	Moderately coarse continuous grass, average depth about 2 feet. Spread rate very high; flame length high (*GR4: Grass-Moderate Load*)
		Moderately coarse continuous grass, average depth about 1 foot. Spread rate high; flame length moderate (*GR2: Grass - Low Load*)
Native oak and grassland vegetation	Dead and down woody fuel (litter) beneath a forest canopy. Fuelbed not recently burned. Fuelbed composed of broadleaf (hardwood) litter	Low load, compact. Spread rate very low; flame length very low (*TL2: Broadleaf Litter – Low Load*)
		Moderate load, less compact. Spread rate moderate; flame length low (*TL6: Broadleaf Litter – Moderate Load*)
	Mixture of grass and shrub, up to about 50% shrub coverage. Arid to semiarid climate (rainfall deficient in summer). Extinction moisture content is 15%.	Shrubs are about 1 foot high, low grass load. Spread rate moderate; flame length low (*GS1: Grass-shrub – Low Load*)

Treatments Planned Related to the Issue

There are an estimated 19,000 gross acres of fuel profile and fire regime-altering Category I and II invasive plants (yellow starthistle and invasive annual grasses) in need of treatment on the District (see Table 3-30). These sites range from less than 0.1 acres to 5,000 acres.

The Annual Treatment Plan (Table 2-5) indicates that treatment sizes (of all invasive plants species) range from 1 acre to 1,500 acres and treatment areas are dispersed across the District. Many of these project areas would include sites of yellow starthistle and invasive annual grasses. The BLM would treat approximately 2,000 gross acres (300-500 net acres) District-wide annually. Grasslands, oak savannas, and oak woodlands are approximately 6 percent of the District. *Native Vegetation* Issue 2 describes these areas as being among the most invaded plant communities on the District.

Under the No Action Alternative, cheatgrass and dogtail cannot be treated because they are not noxious weeds. In addition, other invasive annual grasses (such as the noxious weed medusahead rye) cannot be effectively treated because there is no herbicide that is selective to these grasses available. Under the No Action Alternative, treatment effectiveness for noxious weeds that can be treated is estimated to be 60 percent. All species listed in Table 3-30 could be treated under the Proposed Action and Alternative 3, and treatment effectiveness is estimated to be 80 percent.

***Table 3-30.** Category I and II Invasive Plants Common in Oak Habitats and Grasslands*

Invasive Plant	Treatment Acres
Likely to Alter Fire Regime and Fuel Profile[1]	
Yellow starthistle	10,000
Cheatgrass	1,000
Dogtail	3,000
Medusahead rye	5,000
Total:	*19,000*
Unknown Fire Regime and Fuel Profile Alteration[1]	
Spotted knapweed	1,000
Rush skeletonweed	1,000
Meadow knapweed	1,000
Dyer's woad	1,000
St. Johnswort	1,000
Scotch broom	2,000
Canada thistle	1,000
Bull thistle	1,000
Houndstongue	3,000
Total:	*12,000*

1. Information from the Fire Effects Information System (Zouhar 2001, 2002a,b, 2003, 2004, 2005, 2009)

Environmental Consequences

Direct and Indirect Effects

Common to All Alternatives

As described in *Invasive Plant* Issue 1, quantifying the effectiveness of treatments varies depending both on species but also on number of acres of that species treated (see Table 3-1). However, assuming an annual treatment of 2,000 gross acres per year District-wide, under the No Action Alternative, the effective annual rate of change District-wide in infested acres of noxious weeds (including yellow starthistle and medusahead rye) in year 20 would *increase* by 8.8 percent. (This does not account for the non-noxious dogtail and cheatgrass, which would not be treated and would continue to spread by an estimated 12 percent per year.) Under the Proposed Action, at 20 years this changes to a *decrease* of 1.0 percent in infested acres of invasive plants. This increase and decrease in the infestations is not specific to oak woodlands, oak savannas, and grasslands.

While there would be a difference in the effectiveness of treatments between the alternatives as described above, it is unknown if some invasive plants that are widespread in oak habitats and grasslands (such as Scotch broom) affect fire regime and fuel profiles (see Table 3-30).

As described in the Oregon FEIS, the direct effects of invasive plant treatments in reducing fire behavior characteristics would be localized to the areas treated (USDI 2010a:276). Given the relatively small size of sites (85.5 percent of invasive plant sites are 0.5 acres or less), any treatments on Category I (mapped sites) and II (unmapped sites) invasive plants would have a negligible effect in restoring fire resilience (e.g., fire regime) or fuel profiles to within natural ranges of variation across the landscape under any alternative. This is true for all Category I and II sites with species that are likely to alter fuel profile and fire regime, as well as species where their ability to alter these characteristics is unknown.

No Action Alternative

The 9,000 acres of invasive annual grasses in Categories I (mapped sites) and II (unmapped sites) would not be treated and would continue to compete with native vegetation. As described in the Oregon FEIS, invasive annual grasses alter fuel profiles, creating highly flammable homogenous fuel beds (see Table 3-30 and Figure 3-6), with the potential to increase risk to community and firefighter safety, property, or highly valued resources (USDI 2010a:277). These infestations would spread at an estimated 12 percent a year (Category III; spread from mapped and unmapped sites) within these oak woodlands and grasslands. As shown in Figure 3-6 and Table 3-29, there are potentially high rates of spread and fire intensity in these areas, which could be problematic for gaining control of the fire. Coupled with increased fire intensity, these invasive annual fuel beds often burn at different times of the year, which could affect the seasonality of burning and fire regime conditions that native plants have adapted to over millennia, and would thus disrupt desirable native vegetation processes and perpetuate the existence of invasive plants. As described in the Chapter 2 description of Category III, this disturbance would increase opportunities for additional invasive plant spread, including additional invasive annual grasses.

The No Action Alternative does not reduce current invasive plant infestations that create wildfire hazard by altering fuel profiles and modifying fire regimes. This is due to the small extent of annual individual treatments and limited treatment tools. It would not reduce the continued spread of invasive annual grasses. Yellow starthistle (10,000 acres) would also spread at an estimated 12 percent per year.

Proposed Action and Alternative 3

Given the relatively small size, treatments on Category I and II invasive plants would have little to no effect in restoring fire resilience or fuel profiles and subsequent fire behavior to within natural ranges of variation across the landscape. However, there would be minor localized reductions in the expansion of annual grasses (Category III). This reduction in spread provides growing space for native plants, and moves fuel profile and fire regime to within the natural range of variability: heterogeneous fuel arrangements and varied and reduced rates of spread and flame length.

While the Proposed Action would result in few changes in wildfire hazard and fire regime in the short term, as described in the Oregon FEIS, the ability to use herbicides such as imazapic on invasive annual grasses with native seeding could improve the long-term effectiveness of the ongoing hazardous fuel management program and wildfire emergency stabilization and rehabilitation program (USDI 2010a:278). The expansion of treatments to include control of invasive plants and the ability to use a wider range of herbicides, increasing overall effectiveness to an estimated 80 percent (vs. 60 percent for the No Action Alternative), provides additional tools to restore fuel profiles and fire return intervals to within historic ranges, which would be a beneficial, long-term, minor, localized effect.

Summary of Effects

Table 3-31. *Summary of Effects (Fire)*

<table>
<tr><th>Alternative</th><th>Direct Effects</th><th>Indirect Effects</th></tr>
<tr><td>No Action Alternative</td><td rowspan="3">The direct effects of invasive plant treatments in reducing fire hazard or altering the fire regime would be negligible, as most invasive plant infestations are small.</td><td>In the short term, treatments to invasive annual grasses would not be done and there would be little to no effect to wildfire hazard and fire regime. In the long term, invasive annual grasses and other species likely to continue an altered fire regime outside the range of natural variability and fuel profiles would continue to spread. Indirect adverse effects would be minor and localized.</td></tr>
<tr><td>Proposed Action</td><td rowspan="2">In the short term, treatments to invasive annual grasses and other species would have little to no effect to wildfire hazard and fire regime. In the long term, invasive annual grasses and other species likely to alter fire regime and fuel profiles could be effectively treated to return acres of infestations to a fire regime that is within the natural range of variability. Indirect beneficial effects would be minor and localized.</td></tr>
<tr><td>Alternative 3</td></tr>
</table>

Cumulative Effects

The analysis area includes grasslands, oak savannas, and oak woodlands on BLM-managed lands on the Medford District. Actions occurring off of BLM-managed lands can have major effects to wildfire hazard and fire regimes on the District, but effects from invasive plant treatments on the District would generally be localized to the areas treated, and would contribute negligibly to wildfire hazard and fire regimes throughout the southwestern Oregon region.

All alternatives would contribute to negligible and minor localized effects. Under the No Action Alternative, these effects would be adverse (e.g., total acres of noxious weeds increasing by 8.8 percent after 20 years and other invasive grasses increasing by 12 percent per year) and under the Proposed Action and Alternative 3, they would be beneficial (e.g., total acres of invasive plants decreasing by 1.0 percent after 20 years). While treating invasive annual grasses under the Proposed Action and Alternative 3 could enhance the District's ongoing hazardous fuels management program[70] and wildfire emergency stabilization and rehabilitation program,[71] which could further reduce the risk of wildfire hazard and restore a more natural fire regime, invasive plant treatment effects would generally be localized to the areas treated, and would not substantially alter these parameters.

Prescribed burning is a large part of the Medford BLM fuels management program. For example, from 2003 to 2014, approximately 25,000 acres of underburning and broadcast burning were implemented to reduce fuel loading and re-introduce fire in frequent fire adapted systems; a portion of these acres occurred in plant communities such as oak woodlands. The use of prescribed fire has been shown to be most successful at invasive plant control (particularly disturbance-dependent annuals) when paired with other restoration management

[70] Such as constructing or maintaining fuel breaks and altering fuel bed characteristics to reduce potential wildlife behavior and spread direction through mechanical and manual removal and alteration of vegetation, as well as the application of prescribed fire. See forest management projects listed in Table 2-16, *Reasonably Foreseeable Actions*.
[71] Following a wildfire, re-seeding and planting, erosion control (for example, by felling trees perpendicular to slope to trap sediment or modifying channels to prevent flooding), and closure of areas so that they are not subject to further disturbance are all done as part of the wildfire emergency stabilization and rehabilitation program.

actions that reduce the competitive balance between invasive plants and natives (Keeley 2006). Under the Proposed Action and Alternative 3, the expansion of treatments to include invasive plants and the ability to use a wider range of herbicides, provides additional tools to increase the effectiveness of future prescribed fire projects at restoring fuel profiles and subsequent fire behavior to within the historic range of variability. In areas where invasive plant treatments and fuels management projects occur in combination, treatments should reduce potential flammability, slow potential rates-of-spread under all but extreme burning conditions, and promote conditions favorable for native plants. Additionally, many studies have documented that the most rapid environmental changes arising from changing climate occur following a high-severity or stand-replacing disturbance, such as wildfire. Without the ability to treat invasive annual grasses, the potential for continued altered fuel profiles and fire regimes could persist or intensify with the spread of invasive annuals, particularly following large-scale high-severity wildfire. The availability of additional management tools to treat invasive plants under the Proposed Action and Alternative 3 in conjunction with wildfire emergency stabilization and rehabilitation measures could contribute to reducing or controlling the infestation of invasive plants following a wildfire. These effects would ultimately reduce wildfire hazard and return fuel profiles and fire regimes to within the natural range of variability at localized scales.

Paleontological Resources

Paleontological Resources Issue 1 (Not Analyzed in Detail)

How would the treatment of invasive plants affect fossils?

This issue was not analyzed in detail because effects were previously described in the analysis for the Oregon FEIS and the 2016 PEIS (USDI 2010a:293-295, USDI 2016a:4-76 and 4-77) and there are no new circumstances or information at the site-specific level that would change the effects anticipated for this EA. The risk of adverse effects is further minimized as a result of Project Design Features adopted for the Proposed Action and Alternative 3.

A number of relatively important paleontological finds have been recorded in the region. The majority of these fossils have been found in discontinuous exposures of the Hornbrook formation that forms a northwest-trending band extending from Yreka, California, along the valleys of Cottonwood and Bear Creeks to Grave Creek, Oregon (Peck et al. 1956). The Hornbrook Formation includes fossils of cephalopods, gastropods, and other marine fauna in an extremely hard sandstone matrix (Nilsen 1984). While the majority of fossils appear to be plants dating to the Tertiary period (65 million to 2 million years ago), invertebrates and mammalian fossils have also been discovered in Jackson County. Ammonites (marine mollusks) have been found in the Ashland area, while a mammalian fossil of the family Equidae was recovered in Applegate Creek near Jacksonville.

The Oregon FEIS describes that with the exception of some prescribed fire (not proposed in the Proposed Action or Alternative 3) or mechanical methods, impacts to fossil resources are unlikely to be substantial (USDI 2010a:285). Direct impacts can result from the use of off-road vehicles crushing or displacing fossils. Indirect impacts can result from activities that contribute to erosion of fossil bearing sediments. Most invasive plant treatments involving ground-disturbing activities tend to be located near roads, trails, or access routes that have been previously disturbed and would only disturb the upper few inches of sediment. Potential effects would be reduced by pre-disturbance review and inventory of treatment areas to reduce inadvertent or incidental impacts to fossil sites (USDI 2010a:285). The 2016 PEIS describes similar effects and concludes that herbicide treatments are more likely to affect researchers, students or other field personnel conducting research than the fossil resources themselves (USDI 2016a:4-72). (See *Human Health* Issue 1 for further information.)

The type of actions and the amount of treatments under all alternatives would be consistent with the actions analyzed in the 2010 Oregon FEIS and the 2016 PEIS. All Standard Operating Procedures and Mitigation Measures analyzed in those documents would be applied to all alternatives.

As described in Chapter 2, Annual Treatment Plans are reviewed by an interdisciplinary team. This happens, in part, to confirm that required authorizations, obligations, and commitments (such as paleontological surveys) are completed prior to implementation. It is unknown if herbicides can negatively affect fossils. However, given the relatively low distribution of suitable paleontological locales on the Medford District and the relatively small size of herbicide treatment areas, it is unlikely that there would be any adverse effects to paleontological resources that would be outside of the effects analyzed in the Oregon FEIS or 2016 PEIS. Manual or mechanical methods could break up or disperse fossils, but the potential of this occurring is minimized by existing Standard Operating Procedures and Mitigation Measures (see Appendix A). These include, but are not limited to:

- 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.

Mitigation may be accomplished, for example, by collection of data or fossil material, by obtaining representative samples of the fossils, by avoidance, or in some cases by no action (USDI 1998b:3). BLM Handbook H-8270-1 (Paleontological Resource handbook) describes Condition 1 areas that are known to contain vertebrate fossils or noteworthy occurrences of invertebrate or plant fossils and Condition 2 areas as areas with exposures of geological units or settings that have high potential to contain vertebrate fossils or noteworthy occurrences of invertebrate or plant fossils (USDI 1998b).

Additional ***Project Design Features*** adopted by this analysis for the Proposed Action and Alternative 3 further minimize the potential effects in these areas:

- If possible, avoid fossil locales when spraying herbicides. In fossil locales where herbicides are needed, avoid drift or accidental direct spray on fossils.
- Avoid ground and surface disturbance (like digging, planting, or mowing) in Condition 1 and Condition 2 paleontological areas. If possible, invasive plants in these areas should be removed by hand.

Archeological and Cultural Resources

Archeological and Cultural Resources Issue 1 (Not Analyzed in Detail)

How would treatment of invasive plants affect historic and prehistoric cultural sites?

This issue was not analyzed in detail because effects were previously described in the analysis for the Oregon FEIS and the 2016 PEIS (USDI 2010a:286-289, USDI 2016a:4-71 and 4-72) and there are no new circumstances or information at the site-specific level that would change the effects anticipated for this EA. The risk of adverse effects is further minimized as a result of Project Design Features adopted for the Proposed Action and Alternative 3.

Occupation of southwestern Oregon dates back at least 10,000 years based on archaeological evidence. Tribal groups that occupied south central Oregon included the Shasta, various Athabascan groups, and the Upland Takelma. The Klamath also made use of the region, although their territory lies primarily east of the Cascades. The Karuk occupied areas in the western portion of the Illinois Valley but had familial and trade ties to other southern Oregon Tribes. The Umpqua occupied areas to the north but were tied to the area through marriage as well as through trade networks. Exploration into the North Pacific by Europeans began in the early part of the 16th century, but increased into the late 18th century with maritime exploration along the southwest Oregon coast. However, the interior remained relatively unknown to European explorers until the early part of the 19th century. Gold mining in the Siskiyou Mountains, along with farming and raising livestock formed the economic mainstay of early-day southwestern Oregon.

To date, over 1,700 recorded archaeological sites are located within the Medford District area. Most of these sites are historic in nature and are often associated with mining operations. Typically, historic sites on the District contain structural, household, or mining materials that are susceptible to damage from various management activities. There are also a number of previously recorded prehistoric sites located within the District. These sites are associated with Native American use of the region and range in size from small task-specific locales to major village sites.

Proposed invasive plant treatments can be divided into two groups: ground disturbing and non-ground disturbing actions (see Table 3-32). Non-ground disturbing actions are considered "exempt" under the 2015 State Protocol between the Oregon-Washington BLM and the State Historic Preservation Office (Protocol) which governs the way cultural resource compliance work is conducted on BLM-managed lands in Oregon. Appendix E of the Protocol lists specific projects or activities that are conditionally exempt from field survey and consultation with the State Historic Preservation Office, and includes herbicide application / treatment by spraying "where it is unlikely to affect rock art or traditional Native American gathering areas" (Oregon SHPO and USDI 2015).

Table 3-32. *Ground Disturbing / Non-Ground Disturbing Actions*

Ground Disturbing Actions	Non-Ground Disturbing Actions
Manual (pulling and grubbing) Competitive seeding (when soil preparation required) and planting Biological (targeted grazing)	Mechanical (mowing and string trimmers) Biological control agents (insects) Herbicide application Competitive seeding (when soil preparation not required)

A Standard Operating Procedure applicable to all alternatives states:

- 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.

The *National Historic Preservation Act* requires agencies to take into consideration the effects of their actions on properties listed or eligible for listing on the National Register of Historic Places (NRHP). As described in Chapter 2, Annual Treatment Plans are reviewed by an interdisciplinary team. This happens, in part, to confirm that required authorizations, obligations, and commitments (such as archeological surveys) are completed prior to implementation. Potential effects from ground disturbing treatments under the Proposed Action and Alternative 3 will be assessed and adverse effects will be resolved or minimized through avoidance of discovered sites and the use of Project Design Features prior to project implementation.

Both the Oregon FEIS and 2016 PEIS describe that herbicide applications can increase soil acidity and advance artifact deterioration or the surfaces of masonry structure, pictographs, or petroglyphs (USDI 2010a:286, USDI 2016a:4-72). In addition, cultural resources often occur on or near the ground surface and can be damaged by ground disturbing activities such as mechanical invasive plant treatments (USDI 2010a:288-289). Standard Operating Procedures have been established to address these potential effects.

The type of actions and the amount of treatments under all alternatives would be consistent with the actions analyzed in the 2010 Oregon FEIS and the 2016 PEIS. All Standard Operating Procedures and Mitigation Measures analyzed in those documents would be applied to all alternatives. An additional ***Project Design Feature*** included in the analysis of the Proposed Action and Alternative 3 would further minimize potential effects:

- Avoid getting herbicides (through drift or accidental direct spray) on rock art or wooden / metal structures or artifacts at NRHP listed or eligible sites.
- Avoid repeated use of livestock (more than one grazing episode annually) at NRHP listed or eligible sites.

Traditional and Cultural Uses (Native American Interests)[72]

Traditional and Cultural Uses Issue 1 (Not Analyzed in Detail)

How would the treatment of invasive plants with affect plant resources used by Native Americans for medicinal, subsistence, ceremonial, or other use purposes, given that these plants (or their locations) may not be known by the BLM?

This issue was not analyzed in detail because effects were previously described in the analysis for the Oregon FEIS and the 2016 PEIS (USDI 2010a:286-289, USDI 2016a:4-71 and 4-72) and there are no new circumstances or information at the site-specific level that would change the effects anticipated for this EA. The risk of adverse effects is further minimized as a result of Project Design Features adopted for the Proposed Action and Alternative 3.

The descendants of the Takelma and Shasta are included in the Confederated Tribes of Grand Ronde and the Confederated Tribes of the Siletz, both headquartered in northwestern Oregon. The Cow Creek Tribe has maintained ties to their ancestral lands and now has a Tribal headquarters in Roseburg. The Karuk still occupy much of their traditional territory along the Klamath River in northern California, with their Tribal headquarters in Happy Camp, California. The Klamath Tribe still occupies much of their traditional territory near Chiloquin, Oregon. All of these tribes take an active role in the management of their ancestral lands. Many areas within the District are locales for culturally significant plants. Tribal members gather plants for edible, medicinal, ceremonial, and utilitarian purposes. The Karuk Tribe has an interest in the management of gathering areas to maintain and enhance the quality of these plant communities to best meet the needs of current and future generations. The Siletz Tribe has expressed an interest in the management of culturally significant plant communities; in particular, patches of camas and other geophytes (e.g., roots, tubers, and bulbs) are of considerable importance as food items. They are also concerned about plants used for basketry such as beargrass and hazel, and conservation and protection of traditional huckleberry patches. The Siletz have provided the BLM with a list of culturally significant plants that are found on the Medford District. The Klamath Tribe has indicated a particular interest in concentrations of willow, camas, yampa (*Perideridia* spp.), and all types of berries.

Traditionally gathered plants may occur near invasive plant treatments areas. These traditionally gathered plants might be exposed to incidental contamination from drift when herbicides are used on invasive plants. The Oregon FEIS concluded that having the broader mix of herbicides would increase the options for appropriately managing invasive plants while minimizing the risk to humans, including Native Americans gathering traditional resources near the treatment areas (USDI 2010a:289). The *Human Health* Issues address the potential risk to human health associated with exposure to herbicide treatments; while there is a measurable risk under Risk Assessment modeled scenarios involving some of the herbicides analyzed in this EA (see *Human Health* Issue 1 and Table 3-13), the actual effects would be minimal because of how the herbicides are applied under all alternatives (generally spot sprayed at lower rates than analyzed in the Risk Assessments) and because of Standard Operating Procedures and Mitigation Measures described in Appendix A that are applicable to all alternatives. These include posting

[72] Consultation with the tribes on this program is ongoing. Additional issues affecting tribes may be developed through the consultation process, as well as additional information about potential effects.

treated areas with appropriate signs at common public access areas and consulting with tribes to identify areas of vegetation of tribal significance. The 2016 PEIS stated that aminopyralid, fluroxypyr, and rimsulfuron have low to no risk, even under worst case accidental exposures, and would result in less use of other herbicides, such as 2,4-D, that have more human health risks (USDI 2016a:4-74; see *Human Health* Issues for more information). It is expected that the treatment of invasive plants would improve the habitat for traditionally gathered plants, as treatments would reduce habitat competition.

The type of actions and the amount of treatments under all alternatives would be consistent with the actions analyzed in the 2010 Oregon FEIS and the 2016 PEIS. All Standard Operating Procedures and Mitigation Measures analyzed in those documents would be applied to all alternatives. Additional ***Project Design Features*** included in the analysis of the Proposed Action and Alternative 3 would minimize the potential for invasive plant treatments affecting plants that may be important to Native Americans:

- At least one month prior to beginning treatments, Annual Treatment Plans will be presented to the tribes showing planned treatments and treatment areas. Any resultant consultation will identify where timing of treatments can be modified, where cultural features should be avoided or protected, and where posting would help tribe members avoid areas. Maps of known invasive plant infestations (see Map 2-1A, *Invasive Plants Documented in NISIMS,* for example) can also be shared with the tribes at this time.
- Where coordination with the tribes about the Annual Treatment Plan identifies areas where herbicide use would not be consistent with cultural values and uses, alternative control methods will be implemented where feasible.

Additional information about the effects of treatment methods on non-target vegetation can be found in the *Native Vegetation* Issues and effects from the consumption of treated vegetation can be found in the *Human Health* Issues.

Environmental Justice

Environmental Justice Issue 1 (Not Analyzed in Detail)

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

This issue was not analyzed in detail because effects were previously described in the analysis for the Oregon FEIS and the 2016 PEIS (USDI 2010a:333, USDI 2016a:4-86) and there are no new circumstances or information at the site-specific level that would change the effects anticipated for this EA.

Jackson and Josephine Counties are considered to be environmental justice populations due to their low-income status. Josephine County is more vulnerable to effects because it has the greatest proportion of Federal and BLM-managed land, the lowest per capita income, and the highest proportion of individuals living below the poverty levels.

The Oregon FEIS analysis found a potential for contract and other crews to include a small disproportionate number or minority and / or poor individuals (defined as below Federal poverty standards), and that, “American Indian and visitors from other racial, ethnic, or low-income backgrounds participating in subsistence or cultural uses could be adversely affected by herbicide exposure, or by inadvertent effects to non-target culturally important plants, or to wildlife species of value to these groups” (USDI 2010a:333). However, that analysis noted such effects would be partially mitigated by treatment designs that attempt to minimize exposure of non-target food and water sources, and Standard Operating Procedures requiring consultation with tribes to locate any areas of vegetation that are significant to the tribes and that might be affected by herbicide treatments. The *Human Health* Issues address the potential risk to human health from exposure to herbicide treatments; while there is a measurable risk to workers under Risk Assessment modeled scenarios involving some of the herbicides analyzed in this EA (see *Human Health* Issue 2 and Table 3-15), the actual effects would be minimal because of how the herbicides are used under all alternatives (generally spot sprayed at lower rates than analyzed in the Risk Assessments) and because of Standard Operating Procedures and Mitigation Measures described in Appendix A including using protective equipment as required by the herbicide label, and providing materials safety data sheets and other information in languages spoken by the work crews implementing treatments. These measures were analyzed in the Oregon FEIS and / or 2016 PEIS and are applicable to all alternatives. Three additional herbicides were analyzed in the 2016 PEIS, which states that the potential for disproportionate adverse effects to minority populations and children would continue to be low, similar to the program without those three herbicides (USDI 2016a:4-86).

The Oregon FEIS analysis also noted that the natural resources used for cultural or subsistence purposes would be adversely affected by the spread of invasive plants, which would be greater under the No Action Alternative (USDI 2010a:333).

The type of actions and the amount of treatments under all alternatives would be consistent with the actions analyzed in the 2010 Oregon FEIS and the 2016 PEIS. All Standard Operating Procedures and Mitigation Measures analyzed in those documents would be applied to all alternatives.

Socioeconomics

Socioeconomics Issue 1

What are the economic impacts of invasive plants on the Medford District on local area timber production, crops, livestock, and recreation?

Analytical Methods

The District has documented 69 invasive plant species on 16,796 sites, totaling 13,211 infested acres. The cost of treating these acres depends on density of the invasive plant infestation as well as the treatment method, but varies from $19 an acre (for spot treatments of herbicides from an off-highway vehicle mounted with a handgun treating a roadside where the invasive plants are low density) to $990 an acre (hand cutting and mechanically chipping a high density woody invasive plant species)[73]. There is potential for invasive plants to move back and forth between BLM-managed lands and private lands given the public-private checkerboard of land ownership. Invasive plants on BLM-managed lands may spread to adjacent non-BLM-managed lands, increasing control costs for affected landowners and degrading agricultural, timber, and rangeland values. Loss of productivity may be measured in terms of decreased economic activity as well as increased costs for prevention and control programs.

It is difficult to quantify the economic impact of the Medford District's actions to control invasive plants on specific industries. Economic analysis of the cost of invasive species is typically done at a national or state-scale. Many studies cite the limitations of the analysis to fully capture all costs due to lack of quality empirical data or complexities of economic activities. The States of Washington and Oregon have released reports that quantify the statewide economic impacts of invasive species, including loss of productivity and cost of control on rangeland, forestland, and agriculture. The results of these studies are discussed and used to qualitatively compare the effectiveness of the alternatives on the Medford District in minimizing economic costs. While the economic loss that would occur under the alternatives are not quantified, it is possible to compare the acres effectively treated and forecast the size of invasive plant infestations on the District. Increased acres of invasive plants present on the District would translate to a greater likelihood of spread to private lands and thus, greater economic loss.

[73] Estimated costs for fiscal year 2017.

Unless otherwise noted, other data in this issue come from the Economic Profile System (EPS-HDT 2017), which compiles data from a number of existing Federal sources including the Census Bureau, Bureau of Economic Analysis, and Bureau of Labor Statistics. The District boundary is generally consistent with the boundaries of Josephine and Jackson Counties, with only small portions falling in Coos, Curry, or Douglas County. Therefore, the conclusions in this section are based on socioeconomic data for Josephine and Jackson County. The temporal scale of the analysis is twenty years, the expected life of this plan.

Affected Environment

The Medford District manages approximately 866,000 acres located primarily in Jackson and Josephine Counties with small portions in Coos, Douglas, and Curry Counties. In Jackson County, 52 percent of the land is Federal with 27 percent managed by the BLM. Josephine County contains a higher percentage of Federal lands (67 percent) and a slightly higher percentage of BLM-managed lands (29 percent).

In 2015, the population in Jackson County was 208,000, up about 15 percent from 2000 and considerably higher than Josephine County's 83,000, which had grown by about 10 percent in the past 15 years. The population in both counties was older than that statewide, with a median age of 43 in Jackson County and 48 in Josephine, compared to 39 for the State. Both counties contain lower proportions of Hispanic / Latino residents and higher proportions of white residents than are present statewide.[74] Just under 12 percent of Jackson County residents are Hispanic / Latino, compared to 7 percent in Josephine and just over 12 percent statewide. About 82 percent of Jackson County residents are white alone (not Hispanic / Latino), compared to 88 percent of Josephine County residents and 72 percent statewide. Just under one percent (0.8 percent) of Jackson County residents are Native Americans, compared to 1.2 percent in Josephine County and 1.2 percent statewide.

In 2015, per capita income was lower in Jackson ($24,605) and Josephine ($22,470) than the statewide median ($27,684). It is therefore not surprising that both counties have a higher proportion of residents living below the poverty level (Jackson's rate is 19 percent and Josephine's 20 percent) than does the state as a whole (16.5 percent). Given the two counties' age and income characteristics, they both have households receiving higher proportions of income from social security, lower proportions from labor, and higher proportions from Supplemental Nutrition Assistance Program (SNAP) than residents of Oregon as a whole. Just under 26 percent of Jackson County residents have an education level of Bachelor's degree or higher, compared to 17 percent of Josephine County residents and 31 percent statewide. According to State of Oregon Employment Department, Jackson County's unemployment rate in 2016 was 4.6 percent, compared to 5.1 percent in Josephine County and 4.9 percent in Oregon (OED 2017). The State of Oregon Business Development Department conducts economic assessments to determine which counties, cities, communities, or other geographic areas qualify as 'distressed.' Pursuant to Oregon Administrative Rules (OAR) 123-024-0031, the Department defines 'distressed' areas based on indicators that take into account unemployment rates, per capita personal income, change in average covered payroll per worker over 3 years and change in the county's weighted average employment change over 2 years. As of March 2017, the Department identifies 23 of Oregon's 36 counties as distressed, including Jackson and Josephine, as well as Coos, Curry, and Douglas (Business Oregon 2017). In 2016, the Oregon Secretary of State identified Josephine, Curry, and Douglas Counties being in a financial condition that may indicate a higher risk of distress than other counties (Oregon Secretary of State 2016). In the two-county area in 2015, 17 percent of jobs were in non-service industries, with the largest shares in construction and manufacturing. Of the 73 percent of jobs in the service industry sector, the largest shares were in retail trade, health care and social assistance, and accommodation and food services. Just over 9 percent of jobs were in government, a 3 percent drop from 2010.

[74] The Census Bureau considers race (White, Black, American Indian, Asian, Hawaiian / other Pacific Islander, other, two or more races) independently from ethnicity (Hispanic / Latino or non-Hispanic / Latino). Race and ethnicity Information is self-reported by individuals.

The total timber harvest (from all lands) is three times greater in Jackson County – 103 million board feet, creating 4,674 jobs in 2016 -- compared to 33 million board feet and 1,775 jobs in Josephine County (OFRI 2017). However, the percentage of county employment in timber is higher in Josephine County at 5.8 percent compared to 4.7 percent in Jackson County. Total timber harvest (both lumber and plywood) for the State of Oregon in the same year was 7.9 billion board feet, with 60,010 jobs created (OFRI 2017).

Jackson County has 1,722 farms (31 of which are certified organic) with a market value of products sold estimated at $64 million; livestock represents $27.1 million of that figure. Josephine County has 617 farms (26 certified organic) with a market value of $18.8 million (livestock value not reported but livestock inventory ranging from ⅓ to ¼ of that found in Jackson County) (USDA 2012).

The outdoor recreation industry has become a more important part of the regional economy. The Medford District estimates the economic value of its recreation program at $53 to $70 million, contributing 525 jobs and $15 million in wages (USDI 2016h). A 2009 report by ECONorthwest estimated the economic activity of river-based recreation on the Rogue River in Josephine County at no less than $30 million annually in total economic output, including $15.4 million in personal income and 445 full and part time jobs. Visitors to the Wild and Scenic Rogue accounted for three out of every four lodging guests in the local area during the five-month Wild Rogue permit season (May 15 through October 15). According to the outfitters surveyed in the preparation of this report, many of their guests said they had chosen the Wild Rogue for their vacation because of its scenery, fishing, wildlife, and water quality. Any decrease in the quality of the water, wildlife habitat, or scenery would likely affect the decision of many would-be-visitors about floating the Wild Rogue (ECONorthwest 2009). Invasive plants are a particular problem along the Rogue River and are a priority for treatment because of its resource value and the fact that waterways are prime locations for invasive plants to spread.

Standard Operating Procedures and Mitigation Measures for All Alternatives Relevant to the Issue

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

- Coordinate with and / or notify neighboring landowners who may want to treat, or are already treating, adjacent lands.
- Notify the public of the project to improve coordination and avoid potential conflicts and safety concerns during implementation of the treatment.

Environmental Consequences

Economic Effects of Invasive Plants

Invasive plants can result in direct economic losses and control costs. On agriculture and timber lands, invasive plants provide competition to the crop species, lost harvest and land value, and costs of increased need for weed control. Livestock can suffer from decreased forage quality and in some cases, like tansy ragwort, toxicity to the grazing animal. Invasive plants can limit recreation access and degrade the resource that the recreation relies on (e.g., water, wildlife, etc.). *Rogue Weeds*, the website for the Jackson County and Josephine Cooperative Weed Management Areas, notes, “Invasive plants cause massive amounts of economic damage to agriculture. They can harm or kill crops, clog equipment, and contaminate produce. Some invasive plants can even cause direct harm to humans or domestic animals” (Rogue Weeds 2017).

A recent report described the direct negative economic impacts associated with noxious weeds in the state of Oregon, the additional costs associated if noxious weeds expand to new areas, and the positive return on investment associated with control (The Research Group, LLC 2014). That study estimated annual losses of $83.5 million to the State's economy from 25 noxious weed species. If left uncontrolled, potential annual losses could reach $1.8 billion in personal income and 40,800 jobs (The Research Group, LLC 2014). Two of the 25 selected noxious weeds, Armenian blackberry and Scotch broom (the latter being a particular problem in forests), are widespread and contribute $79.6 million to the current overall economic impact. The remaining 23 species are limited in distribution and are under intensive management thus contributing to less than five percent of total current impacts.

A similar analysis found that in Washington State, invasive species created losses of $239.5 million on crops, $120 million in the livestock industry, $125 million in the timber industry, and $20 million in recreation. Rush skeletonweed and Scotch broom, two species that are prevalent on the District were found to be the most costly plant species (Community Attributes Inc. 2017). While neither of these studies is specific to the Medford District, they demonstrate that invasive species can have an economic effect on valued resources, lands, and opportunities.

In the 1970s, tansy ragwort became a regional problem in Oregon. Losses from livestock poisoning, lost forage, and money spent on control were estimated at almost $5 million. The Oregon Department of Agriculture undertook a concerted effort to control the plant, releasing three different biocontrols that were successful in reducing the population. By the mid-1980s, tansy infestations were in sharp decline and cattle deaths were reduced by more than 90 percent. A study assessing the benefits of the control efforts determined a benefit cost ratio of 13:1 ($13 of economic benefit for every $1 spent in controlling the invasive plant) (Coombs et al. 1996).

Infestations of aquatic invasive plants, specifically water primrose and parrot feather watermilfoil, occur in small patches from Whitehorse Park and are scattered downstream to the end of the BLM-managed section of the Rogue River at the Rogue River Ranch. Populations of water primrose occur in the main stem of the Rogue River in side channels often with little to no flowing water from mid to late summer. In Eugene, a water primrose appeared in 2007 and overtook some of the Delta Ponds within just 5 years (Holts 2013). Water primrose could spread in slack-water sections, side channels, and sloughs, including at some boat ramps of the Rogue River. The same is true for the Applegate River, although water primrose has not been documented there. In both rivers, large infestations could affect fishing, boating, and rafting, although the extent is unknown. Another target under Alternative 3 is a Category IV species; *Ludwigia grandiflora* (large-flower primrose willow) has the ability to form dense stands that reduce floodwater retention (Okada et al. 2009) and has been observed in France to cause extensive damage including blocking slow-moving waterways, interfering with navigation, and impeding irrigation and drainage in lakes, ponds and ditches (Ruaux et al. 2009). It affects recreation by obstructing navigation and interfering with recreational activities, both directly and through decreasing aesthetics (CABI 2009). While *L. grandiflora* has not been found on the Medford District, it is known to occur to the north in the Northwest Oregon BLM District, and to the south in California near Shasta Lake (GBIF 2016).

Direct and Indirect Effects

Common to All Alternatives

Existing Department of the Interior policy directs the BLM to accomplish pest management through cost-effective means that pose the least risk to humans, natural and cultural resources, and the environment. This helps to protect local area timber production, crops, livestock, and recreation resource values, while also reducing the level of risk of invasive plant infestations negatively affecting these resources. Adjacent landowners, county, State, and other Federal lands benefit from the BLM having a broader range of herbicides available for consideration. Having more herbicides available would enhance the BLM’s ability to prevent the spread of invasive plants from Federal lands to private, county, State, and other Federal lands.

The potential for direct adverse herbicide-related effects is minimized for all 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.
- Coordinate with and / or notify neighboring landowners who may want to treat, or are already treating, adjacent lands.
- Establish a buffer between treatment areas and human residences based on guidance given in the Human Health Risk Assessment, with a minimum buffer of 100 feet for ground applications, unless a written waiver is granted.

The amount of money spent on invasive plant control on the District is not expected to vary based on alternative. However, as further described under each alternative, treatment effectiveness varies from 60 percent (No Action Alternative) to 80 percent (Proposed Action and Alternative 3). This would allow additional acres to be treated with the same budget; an area where a treatment was 60 percent effective would need more follow up treatments (thus costing more) than an area where a treatment was 80 percent effective (thus costing less).

No Action Alternative

Neighboring landowners expect the BLM to control invasive plants and prevent their spread to private lands. Therefore, the No Action Alternative would negatively affect adjacent private and public lands, and resource uses such as timber, crops, livestock, and recreation and their associated economic benefits, by denying some treatments that would be more effective in limiting the 12 percent spread of invasive plants. Aquatic invasive plants would not be treated, and thus have the potential to interfere in recreation activities on the Rogue River. The threat of spread downstream would be high, since waterways are prime routes of spread, particularly ones such as the Rogue that have high levels of human use.

Limited treatment efficacy would affect the distribution and abundance of invasive plants across all ownerships within and surrounding the Medford District. The inability to effectively control species on BLM-managed lands would result in the spread of infestations to other landowners. Even if those landowners have more effective treatment options, their long-term success would be reduced because infestations on BLM would continue to reinvade treated sites. As described in other issues in this EA, the existing availability of only four herbicides limits the BLM's ability to target specific infestations with the most cost-effective, least-risk treatment, when compared to the Proposed Action. Under this alternative, noxious weeds are expected to continue spreading at about 12 percent per year (USDI 2010a:133). Given a 12 percent rate of spread and annual treatment of 2,000 gross acres per year at a 60 percent effective treatment rate, the 13,211 acres of mapped infestations would spread to 40,974 acres over the next twenty years.

Category IV includes species that are documented on neighboring lands but not known to occur on the District. Of the 60 species currently identified in this Category, 25 are species that are not listed as noxious weeds and could not be treated if they were to spread to BLM-managed lands.

Proposed Action

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 cooperatively controlling plants so they do not infest or re-infest adjacent lands. Under this alternative, eradication is a more feasible objective, particularly for small infestations (see *Invasive Plant* Issue 1 earlier in this chapter). The Proposed Action would be expected to allow the BLM to be a more effective partner with groups such as the Cooperative Weed Management Areas that work with landowners to identify and treat invasive plants on both private and public lands. However, as under the No Action Alternative, aquatic infestations of invasive plants would not be treated and thus have the potential to interfere in recreation activities on the Rogue River.

Given a 12 percent rate of spread and annual treatment of 2,000 gross acres per year at an 80 percent effective treatment rate, the 13,211 acres of mapped infestations would be reduced to 12,911 acres after 20 years of treatment, which is 28,063 fewer acres than under the No Action Alternative. With a reduction in mapped infestation acreage (albeit small), a slight net economic benefit would be realized from implementing the Proposed Action. There would be a 1.0 percent effective annual rate of decrease in infested acres in year 20, compared to an 8.8 percent increase under the No Action Alternative.

Alternative 3

The treatment of an additional 34 acres (over the life of the plan) in the Rogue River would lessen the risk of effects due to invasive aquatic species on the highly valued Rogue River and its system, although the degree of the change is unknown. A majority of herbicide use would be aquatic formulations of triclopyr to treat approximately 11 acres of water primrose and parrotsfeather, the two Category I aquatic invasive plants on the District. Under Alternative 3, assuming a 12 percent rate of spread and 80 percent treatment effectiveness, the combined 11 acres of water primrose and parrotsfeather treated with triclopyr on the District would be at a maintenance level (0.1 acre) by the fifth year of treatment, if all acres were treated each year. Under the No Action Alternative, these infestations would continue to grow, occupying 106 acres by year 20, eventually reaching a size exceeding the District's capacity for annual treatment. Both species have the potential to form dense mats that degrade fish habitat, alter stream conditions, and prevent access.

Most studies of the economic effect of aquatic weeds in particular have been done in states where they have been present for some time, have spread widely, and as a result have become a serious economic threat to important industries. Recreation benefits are the most commonly estimated of all the benefits of aquatic weed control. These treatments would occur during the late summer, when many of these areas would be isolated from the main channel due to low flows. Aquatic weeds would occur mostly in the side channel and backwater areas where water is slow enough to allow invasive plants to establish. Treatments themselves would not affect recreationists directly as people are less likely to be in back channel / low flow areas since most of the recreation is water based.

Other effects remain as described in the Proposed Action.

Summary of Effects

Table 3-33. *Summary of Effects (Socioeconomics)*

Alternative	Direct Effects	Indirect Effects
No Action Alternative	Increased risk of invasive plants spreading to neighboring lands and affecting other resource uses there as well as on BLM-managed lands.	Risk of slight decreases in economic values associated with timber production, crops, livestock, and recreation due to spread of invasive plants.
Proposed Action	Decreased risk of invasive plants spreading to neighboring lands and affecting other resource uses there as well as on BLM-managed lands.	Less risk of decreases in economic values associated with timber production, crops, livestock, and recreation.
Alternative 3	Treatment of aquatic invasive plants decreases risk slightly to Rogue River system recreational uses. Other effects remain as described in the Proposed Action.	Less risk of decreases in economic values associated with Rogue River system recreational uses. Other effects remain as described in the Proposed Action.

Cumulative Effects

Combined with the BLM's actions, invasive plant management by the U.S. Forest Service, Army Corps of Engineers, National Park Service, Oregon Department of Agriculture, Oregon Parks and Recreation Department, Oregon Department of Transportation, and many others, would limit the cumulative spread of invasive plants across the District.

As described in Chapter 2, *Ongoing and Reasonably Foreseeable Actions*, invasive plants exist across all ownerships in Jackson and Josephine Counties, and these invasive plants spread as described in *Category IV, Spread from Existing Plant Sites*. Ongoing and reasonably foreseeable activities on BLM lands on the Medford District that could contribute to the spread of invasive plants on the Medford District include abandoned mine land remediation, quarry operations, mining and mineral exploration, grazing and range operations, hazard fuel management, wildfire suppression, timber harvesting, silvicultural treatments, permitting for rights-of-way, road construction, road maintenance and decommissioning, recreation, and watershed restoration. For all projects, the BLM conducts risk assessments that consider the likelihood and consequences of invasive plant introduction and spread and then, where that risk is moderate or high, prescribes prevention measures, project design features, modifications to the proposed action, and / or monitoring (USDI 1992b). Despite the District's emphasis on invasive plant prevention, some projects would increase at least the transitory (2-3 years) presence of invasive plants above the typical baseline rate within project areas.

Under the No Action Alternative, collaborative cross-boundary invasive plant management would be less effective, meaning that treatment objectives would be met less frequently and across fewer acres, resulting in increased adverse effects from invasive plants, compared to the Proposed Action and Alternative 3. However, the risk of decreases in economic values associated with timber production, crops, livestock, and recreation due to spread of invasive plants, coupled with other reasonable and foreseeable actions, would remain very low.

Under the Proposed Action and Alternative 3, collaborative cross-boundary invasive plant management would be more effective, meaning that treatment objectives would be met more frequently and across more acres, resulting in fewer adverse effects from invasive plants, compared to the No Action Alternative. By following the treatment prioritization process in Figure 2-1, the BLM would either treat infestations to below the damage level or would treat to contain their further spread, depending on whether treatment objectives are achievable. Under Alternative 3, treatment of aquatic invasive plants decreases risk slightly to Rogue River system recreational uses. Given that the river system is protected to some extent by its Wild and Scenic status, and that other rivers on the District are high-priority resources with other protection mechanisms, the cumulative impact would be very small, but positive (decreasing the risk to recreational values, but only slightly).

Socioeconomics Issue 2 (Not Analyzed in Detail)

Given the checkerboard land ownership pattern, what is the potential for herbicide contamination of yards, gardens, organic farms, vineyards, and bee hives on private lands?

This issue is not analyzed in detail because effects were previously described in the analysis for the Oregon FEIS and the 2016 PEIS (USDI 2010a:309, USDI 2016a:4-81) and there are no new circumstances or information at the site-specific level that would change the effects anticipated for this EA. The type of actions and the amount of treatments under all alternatives would be consistent with the actions analyzed in the 2010 Oregon FEIS and 2016 PEIS. All Standard Operating Procedures and Mitigation Measures analyzed in those documents would be applied to all alternatives.

Herbicide applications would occur on BLM-managed lands only, not on private lands. The Oregon FEIS stated that residential lands and agricultural lands, where crops (including orchards, vineyards, and pastures) are grown are protected from drift of BLM applied herbicides by Standard Operating Procedures that include no-spray buffers, drift reduction measures, and other practices that minimize or eliminate herbicide drift or off site movement (USDI 2010a:145). Those same Standard Operating Procedures were also included in the 2007 and 2016 PEISs and are common to all alternatives.

County residents can obtain a "No Spray" permit issued by the State or 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. 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 without written permission from the owner.

The herbicides that the BLM uses have very low vapor pressures and would not be found at a distance of 9 to 27 meters downwind of the application site (Vencill et al. 2002). Further, herbicide application methods used on the District are not those that are prone to drift. In the previous five years, the Medford District has done 95 percent of their treatments with a backpack sprayer. This would continue to be the case under the Proposed Action and Alternative 3. The remaining treatments have been done with a sprayer mounted on an off-highway vehicle. Aerial applications have not and would not be used. Drift and methods for control are discussed further in Appendix C.

Bees are unlikely to be affected by the BLM's herbicide use; the effects from herbicides to pollinators would generally be related to habitat (vegetation) loss and treatments proposed under the alternatives are generally small (see Table 2-2, *Summary of Invasive Plants Documented in NISIMS by Infestation Size*: 85.5 percent of known sites are less the 0.5 acres). The effects of herbicides on pollinators are addressed in *Wildlife* Issue 1 and the effects of herbicides on vegetation are described in the *Native Vegetation* Issues.

Socioeconomics Issue 3 (Not Analyzed in Detail)

How would the alternatives affect permitted land uses, including rights-of-way and administrative site grant and leaseholders?

This is not analyzed in detail because there is no effect to permitted land uses. As described in the Purpose and Need, the alternatives are solely intended to evaluate options for improving invasive plant control methods, thereby assisting the BLM in meeting its obligation to manage public lands for multiple uses consistent with the *Federal Land Policy and Management Act*. The alternatives do not propose changes to land uses.

All three alternatives apply to all invasive plant control activities conducted on BLM-managed lands within the Medford District, including those undertaken by grant holders and lessees. Grant and leaseholder responsibility for control of noxious weeds (not all invasive plants) would continue, but additional herbicides could be used. The addition of invasive plants to the species that can be controlled would enable grant and leaseholders to more effectively manage the right-of-way and conduct maintenance. In cases 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. Holders of long, linear rights-of-way crossing multiple jurisdictions would benefit by being able to use the same herbicides over long expanses rather than changing each time they enter BLM-managed lands.

Livestock Grazing

Livestock Grazing Issue 1 (Not Analyzed in Detail)

Would herbicide treatments of invasive plants cause adverse effects to livestock health?

This issue was not analyzed in detail because effects were previously described in the analysis for the Oregon FEIS and the 2007 and 2016 PEISs (USDI 2010a:264, USDI 2007a:4-51, USDI 2016a:4-36 and 4-37) and there are no new circumstances or information at the site-specific level that would change the effects anticipated for this EA. The type of actions and the amount of treatments under all alternatives would be consistent with the actions analyzed in the 2010 Oregon FEIS and the 2007 and 2016 PEISs. All Standard Operating Procedures and Mitigation Measures analyzed in those documents would be applied to all alternatives.

Authorized grazing west of the Cascades is limited to Josephine and Jackson County and accounts for only 1.5 percent of Animal Unit Months (AUMs) available in the State of Oregon. Grazing occurs on 17 percent of the District and all grazing allotments on the Medford District are for cattle.

Risk Assessments (created or adopted with the 2007 and 2016 PEISs, adopted with the 2010 Oregon FEIS, and summarized in Appendix C) indicate that three herbicides analyzed in this EA have moderate or high risk to large mammals consuming contaminated vegetation (dicamba, dicamba + diflufenzopyr, and triclopyr; USDI 2010a:261-263). All other available herbicides have either low or no risk under this scenario (see Appendix C, USDI 2007a:4-51, USDI 2010a:96-99, USDI 2016a:4-55). Reaching an Ecological Risk Assessment-identified risk level is unlikely unless the animal forages exclusively within the treatment area for an entire day (USDI 2010a:269). Dicamba, dicamba + diflufenzopyr, and triclopyr would not be used on invasive plant species that cattle have preference towards consuming; rangeland cattle primarily consume grass and these herbicides would be used on broadleaf species (see *Treatment Key*, Table 2-12). Cattle may eat invasive grasses, but these would generally be treated with imazapic or rimsulfuron, both of which have no risk to mammals in all Risk Assessment scenarios (USDI 2010a:265, 2016a:4-66, Appendix C).

In addition, the potential for adverse herbicide-related livestock health effects is minimized by existing Protection Measures (see Appendix A). These include, but are not limited to:

- Whenever possible and whenever needed, schedule [herbicide] 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 [lessees] of the herbicide treatment project to improve coordination and avoid potential conflicts and safety concerns during implementation of the treatment.
- Provide alternative forage sites for livestock, if possible.
- Do not apply 2,4-D, dicamba, Overdrive® [dicamba + diflufenzopyr], picloram, or triclopyr across large application areas, where feasible, to limit impacts to livestock, particularly through contamination of food items.

As shown in the analyses in the Oregon FEIS and 2007 and 2016 PEISs, there is negligible risk from herbicides to livestock. The risk of adverse effects to livestock is further minimized as a result of existing Protection Measures.

Livestock Grazing Issue 2 (Not Analyzed in Detail)

Would herbicide treatments of clopyralid and aminopyralid negatively affect non-target vegetation on BLM grazing allotments?

This issue was not analyzed in detail because label restrictions (see Appendix B), as well as Standard Operating Procedures (see Appendix A), minimize the potential for livestock consuming clopyralid or aminopyralid-treated vegetation. While Risk Assessments (see Appendix C) indicate that these two herbicides have no risk to livestock, these herbicides can pass through a digestive tract without breaking down, and manure and urine from animals that have grazed treated forage can harm non-target plants.

The Oregon FEIS and 2016 PEIS discuss the ability of clopyralid and aminopyralid to persist in urine and manure of livestock and also describe that grazing restrictions should be applied to prevent this from affecting non-target vegetation (USDI 2010a:263, USDI 2016a:4-65).

Label restrictions on aminopyralid and clopyralid products state:

- After grazing herbicide-treated forage, livestock must graze for 3 days in an untreated pasture [or allotment] without desirable broadleaf plants before returning to an area where desirable broadleaf plants are present.

Clopyralid product labels also state:

- Do not use plant residues, including hay or straw from treated areas, or manure or bedding straw from animals that have grazed or consumed forage from treated areas, for composting or mulching, where susceptible plants may be grown the following season.
- Do not spread manure from animals that have grazed or consumed forage or hay from treated areas on land used for growing susceptible broadleaf crops, ornamentals, orchards, or other susceptible desirable plants.

The following Standard Operating Procedures would further reduce effects:

- Whenever possible and whenever needed, schedule [herbicide] treatments when livestock are not present in the treatment area. Design treatments to take advantage of normal livestock grazing rest periods, when possible.
- Notify permittees [or lessees] of the herbicide treatment project to improve coordination and avoid potential conflicts and safety concerns during implementation of the treatment.

As a result of these label restrictions and Standard Operating Procedures there would be no potential for clopyralid or aminopyralid treated vegetation to affect non-target vegetation because of consumption by livestock.

Livestock Grazing Issue 3 (Not Analyzed in Detail)

Would invasive plant treatments decrease or increase forage quality or volume?

This issue was not analyzed in detail because effects were previously described in the analysis for the Oregon FEIS and the 2016 PEIS (USDI 2010a:264, USDI 2016a:4-36 and 4-37) and there are no new circumstances or information at the site-specific level that would change the effects anticipated for this EA.

The Oregon FEIS showed that it is likely that forage quality and volume would increase under the Proposed Action as the treatment of invasive plants would improve ecosystem health (USDI 2010a:264, see *Native Vegetation* Issues earlier in this Chapter for more information). Healthy plant communities support higher levels of livestock grazing than degraded plant communities. Non-palatable invasive plants reduce forage abundance and quality for livestock, degrade plant community health, and result in reduced capacity to sustain grazing levels. As described in the Oregon FEIS, range conditions would generally benefit from the control of invasive plants and any adverse effects would disappear within one or two growing seasons after treatment (USDI 2010a:264). The Oregon FEIS did not discuss the effects of aminopyralid, fluroxypyr, or rimsulfuron. The effects of these three herbicides were discussed in the 2016 PEIS, where it states that impacts to desirable vegetation nationwide from a program that included these three herbicides would be similar to the program without those three herbicides (USDI 2016a:4-36) but that it was possible there could be an improvement in the effectiveness of certain treatments when compared to a program without these herbicides (USDI 2016a:4-37).

The type of actions and the amount of treatments under all alternatives would be consistent with the actions analyzed in the 2010 Oregon FEIS and the 2007 and 2016 PEISs. All Standard Operating Procedures and Mitigation Measures analyzed in those documents would be applied to all alternatives.

Authorized grazing west of the Cascades is limited to Josephine and Jackson County and only accounts for only 1.5 percent of Animal Unit Months (AUMs) available in the State of Oregon. Under all alternatives, the BLM would treat approximately 2,000 gross acres a year throughout the District. Grazing occurs on 17 percent of the District, which means that treatments on average may account for 350 gross acres of treatments annually in grazing allotments. These treatments are estimated to be 80 percent effective under the Proposed Action and 60 percent effective under the No Action Alternative, which means that there are potentially 70 additional acres annually of improved forage habitat under the Proposed Action, depending on species treated. However, treatments are generally small (85.5 percent of known invasive plant sites are smaller than 0.5 acres; see Table 2-2, *Summary of Invasive Plants Documented in NISIMS by Infestation Size*), and these areas would be scattered across all grazing allotments. Cattle consume invasive grasses (especially in the spring when they are green and palatable) but rangeland that contains brushy plants (like yellow starthistle) can reduce carrying capacity more than 50 percent (USDI 2010a:264). BLM would not use herbicides for the production of livestock forage. Alternative 3 treatments and effects would be the same as those described under the Proposed Action.

Recreation

Recreation Issue 1 (Not Analyzed in Detail)

How would herbicide treatments at recreation sites affect visitor access and recreational experiences?

This issue is not analyzed in detail because effects were previously described in the analysis for the Oregon FEIS and the 2016 PEIS (USDI 2010a:309, USDI 2016a:4-81) and there are no new circumstances or information at the site-specific level that would change the effects anticipated for this EA.

As described in the Oregon FEIS, manual methods would continue to be the primary form of treatment of invasive plants in developed recreation sites (USDI 2010a:309). When herbicides are used (in undeveloped recreation sites or in instances where manual methods of treatment are ineffective in developed recreation sites), there could also be short-term closures, potentially inconveniencing public land visitors, but reducing herbicide exposure. Access to a site treated with an herbicide 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, the duration of the exclusion, and nearby alternative recreation areas that would provide substantially similar recreation opportunities. A Standard Operating Procedure states, "Post treated areas with appropriate signs at common public access areas" (see Protection Measures in Appendix A) (USDI 2010a:309). The Oregon FEIS also notes that the additional herbicides 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 effects of herbicide use on the recreational resource and reducing the chance for accidental exposure to recreationists" (USDI 2010a:308-9). The Oregon FEIS did not discuss the effects of aminopyralid, fluroxypyr, or rimsulfuron. The effects of these three herbicides were discussed in the 2016 PEIS, where it states that impacts to recreation nationwide from a program that included these three herbicides would be similar to the program without those three herbicides (USDI 2016a:4-81).

The type of actions and the amount of treatments under all alternatives would be consistent with the actions analyzed in the 2010 Oregon FEIS and the 2016 PEIS. All Standard Operating Procedures and Mitigation Measures analyzed in those documents would be applied to all alternatives.

Recreation sites on the District include Rogue Wild and Scenic River, Table Rocks, Wood Rat Mountain Hang Gliding Area, Pacific Crest National Scenic Trail, Cathedral Hills Trail System, Mountain of the Rogue Trail System, and Hyatt Lake. In addition, there are six developed campgrounds, 95 developed camp units, and 33 developed picnic sites. The District has over a million visitors a year (USDI 2015d). The majority of BLM-administered lands on the District are managed to accommodate and provide for a multitude of developed, semi-developed, and dispersed recreation uses. Manual and mechanical treatments would be primary treatment methods in developed camping and picnic sites. Treatments with herbicides in developed camping areas would be rare; for example, in 2016, a small site of Canada thistle was treated at a Rogue River campground, but all other invasive plant treatments in developed camping areas on the Grants Pass Resource Area were manual or mechanical treatments. When treatments with herbicides occur, the vast majority would be spot treatments (95 percent in the Proposed Action and 99 percent in the No Action Alternative) to target specific plants, which would limit potential exposure to recreators.

The effects of herbicides on human health in situations that are applicable to recreators are discussed in the *Human Health* Issue 1 earlier in this EA and the effects of recreation to the spread of invasive plants is described in *Invasive Plants* Issue 1. Recreation is also discussed in *Socioeconomic* Issue 1.

Special Areas

Special Areas Issue 1 (Not Analyzed in Detail)

How would treatments of invasive plants affect the qualities for which Cascade Siskiyou National Monument was created?

This issue is not analyzed in detail because, as described in the analysis for the *Cascade Siskiyou National Monument Resource Management Plan* (USDI 2008c), adverse effects are likely to be minimal because of Mitigating Measures (Protection Measures) included in that Plan.

The Cascade Siskiyou National Monument was created to protect a diverse range of biological, geological, aquatic, archeological, and historic objects. The establishment of the Monument recognized the high number of native species and plant community richness of the area (USDI 2008c:17). Invasive plants are discussed as a management concern in the *Cascade Siskiyou National Monument Resource Management Plan* (USDI 2008c:28, 45) because invasive plants displace native vegetation (USDI 2008c:19, 56).

The Monument's Resource Management Plan includes Mitigating Measures to treat noxious weeds and other invasive grasses to protect the qualities for which the monument was created, and these measures are included as Protection Measures in this EA (see Appendix A), applicable to the Cascade Siskiyou National Monument. Appendix F of the C*ascade-Siskiyou Resource Management Plan* presents a *Strategy for Controlling the Spread of Noxious Weeds and Other Invasive Grasses* (USDI 2008c) that includes the use of manual, mechanical, biological control agents, targeted grazing, and native seedings. Management objectives (see Chapter 1) and mitigating measures (see Appendix A) specify that invasive plant treatments will be conducted in a manner that supports the Monument's unique ecology and biodiversity. For example, herbicides would not be applied within 10 feet of water when using backpack sprayers or 25 feet with boom sprayers and herbicides would not be sprayed when weather conditions would exacerbate the potential for drift (e.g., winds greater than 5 mph or temperatures greater than 80 degrees). Because of these measures, adverse effects from all alternatives would be too small to measure and there would be no measurable difference in effects between the alternatives. The Proposed Action and Alternative 3 would allow for more effective control of invasive plants, particularly medusahead rye, a widespread noxious weed in the Monument for which there is no effective herbicide available under the No Action Alternative. Addition of the herbicides aminopyralid and imazapic would provide effective treatment for invasive plants such as thistles, starthistles, knapweeds, and bulbous bluegrass, allowing the District to better meet Resource Management Plan objectives. Due to the lack of potential for adverse effects, this issue was not analyzed in detail. A more detailed discussion of the potential effects to vegetation and other resources for which the Monument was created are addressed in other issues in this Chapter.

Special Areas Issue 2 (Not Analyzed in Detail)

How would treatments of invasive plants affect the Outstandingly Remarkable Values for which the Rogue National Wild and Scenic River was designated?

This issue was not analyzed in detail because effects were previously described in the analysis for the Oregon FEIS and the 2016 PEIS (USDI 2010a:300-301, USDI 2016a:4-79) and there are no new circumstances or information at the site-specific level that would change the effects anticipated for this EA.

The Oregon FEIS describes that, for special areas such as Wild and Scenic Rivers, treatments could have short-term and usually negligible negative effects for the first year following treatment, but that in the long term, effects would be beneficial to special area values because of the return of native vegetation (USDI 2010a:301). The short-term negative effects of treatments would vary based on which herbicide is applied and how it is applied but when herbicides are applied using a backpack sprayer or wicking method, the effect is not easily discernable (USDI 2010a:294). The Oregon FEIS also states that with a broader array of herbicides, the BLM would have the opportunity to substitute more effective and / or selective herbicides than those currently being used in special areas (USDI 2010a:303). A Standard Operating Procedure applicable to all alternatives states that control of invasive plant infestations shall be carried out in a manner compatible with the intent of Wild and Scenic River Management objectives; that is, only treatments that protect and enhance the Outstandingly Remarkable Values of the Wild and Scenic River would be allowed and therefore, adverse effects from treatment methods would be negligible (USDI 2010a:300-301). The Oregon FEIS did not discuss the effects of aminopyralid, fluroxypyr, or rimsulfuron. The effects of these three herbicides were discussed in the 2016 PEIS, where it states that impacts to wilderness and other special areas (such as Wild and Scenic Rivers) nationwide from a program that included these three herbicides would be similar to the program without those three herbicides; the strict guidelines for vegetation treatments would prevent actions that would degrade the quality, character, and integrity of special management areas (USDI 2016a:4-77 to 79).

The type of actions and the amount of treatments under all alternatives would be consistent with the actions analyzed in the 2010 Oregon FEIS and the 2016 PEIS. All Standard Operating Procedures and Mitigation Measures analyzed in those documents would be applied to all alternatives, resulting in a net benefit to the Outstandingly Remarkable Values of the Wild and Scenic River.

The segment of the Rogue River that is designated as a Wild and Scenic River extends from the mouth of the Applegate River (about 6 miles downstream from Grants Pass) to the Lobster Creek Bridge (about 11 miles upstream from its mouth), a total distance of 84 miles. The BLM manages the eastern 47 miles of this, and the remainder is managed by the U.S. Forest Service. The Outstandingly Remarkable Values for which the river is designated wild and scenic are “natural scenic,” “fisheries,” and “recreation.” Because of its special designation, the Rogue River is a priority for treatment and invasive plant inventories have been regularly conducted along the river. As detailed in Table 2-1, 38 invasive plant species have been mapped along the Rogue River and another 23 species are known to occur (Table 2-3). In 2016, treatments were conducted on known infestations along the bars, banks and floodplain of brooms, knapweeds, yellow flag iris, yellow starthistle, Japanese knotweed, dyer's woad, garlic mustard, and shining geranium. Terrestrial treatments of invasive plants would be similar under all alternatives; manual treatments would target specific invasive plants, 95 percent of herbicide treatments would be spot treatments, and when broadcast spraying is done, selective herbicides would be used. Treatment methods would ensure that adverse effects to non-target species can be kept to a minimum. However, the Proposed Action and Alternative 3 would result in more effective control of invasive plants (80 percent effective compared to 60 percent effective under the No Action Alternative). In addition, Alternative 3 includes treatment of submerged and floating aquatic invasive plants, which would allow the District to treat water primrose and parrotsfeather known to occur on the Rogue with aquatic formulations of triclopyr, glyphosate, or imazapyr. As described in *Invasive Plants* Issue 1, under Alternative 3, assuming a 12 percent rate of spread and 80 percent treatment effectiveness, the combined 11 acres of aquatic invasive plants on the Rogue River would be at a maintenance level (0.1 acre) by the fifth year of treatment, if all acres were treated each year. Under the No Action Alternative and the Proposed Action, these infestations would continue to grow, occupying 106 acres by year 20.

Additional information about potential effects to the Outstandingly Remarkable Values that the river is designated for can be found in the *Invasive Plants, Native Vegetation*, *Fish and Aquatic Organisms*, *Socioeconomic*, *Visual*, and *Recreation* Issues in this Chapter.

Special Areas Issue 3 (Not Analyzed in Detail)

How would treatments of invasive plants affect the Designated Wilderness on the Medford District?

This issue is not analyzed in detail because effects are likely to be minimal, as previously described in the analysis for the Oregon FEIS and the 2016 PEIS (USDI 2010a:300-304, USDI 2016a:4-79). There are no new circumstances or information at the site-specific level that would change the effects anticipated for this EA.

The Oregon FEIS describes that, for special areas such as Wilderness, treatments could have short-term and usually negligible negative effects for the first year following treatment, but that in the long term, effects would be beneficial to special area values because of the return of native vegetation (USDI 2010a:301). The short-term negative effects of treatments would vary based on which herbicide is applied and how it is applied but that when herbicides are applied using a backpack sprayer or wicking method, the effect is not easily discernable (USDI 2010a:294). On the Medford District, manual treatments would target specific invasive plants, 95 percent of herbicide treatments would be spot treatments, and when broadcast spraying is done, selective herbicides would be used. The Oregon FEIS also states that with a broader array of herbicides, the BLM would have the opportunity to substitute more effective and / or selective herbicides than those currently being used in special areas (USDI 2010a:303). The Oregon FEIS did not discuss the effects of aminopyralid, fluroxypyr, or rimsulfuron. The effects of these three herbicides were discussed in the 2016 PEIS, where it states that impacts to wilderness nationwide from a program that included these three herbicides would be similar to the program without those three herbicides; the strict guidelines for vegetation treatments would prevent actions that would degrade the quality, character, and integrity of special management areas (USDI 2016a:4-77 to 79).

The type of actions and the amount of treatments under all alternatives would be consistent with the actions analyzed in the 2010 Oregon FEIS and the 2016 PEIS. All Standard Operating Procedures and Mitigation Measures analyzed in those documents would be applied to all alternatives. The result of an invasive plant management program with more effective herbicides under the Proposed Action and Alternative 3 (80 percent effective compared to 60 percent effective under the No Action Alternative) would allow the District to selectively treat invasive plants with fewer retreatments. BLM Manual 6340 – *Management of Designated Wilderness* (USDI 2012b) provides guidance for Wilderness management including:

- **General principles.** Generally, Wilderness Areas must, at a minimum, be managed to maintain the baseline degree of wilderness character that existed when the area was designated by Congress. When possible, management activities should emphasize enhancement of wilderness character over time. Natural processes should always be favored to restore disturbed vegetation in order to maintain the

Untrammeled, Natural, and Undeveloped qualities of wilderness character, as well as outstanding opportunities for Solitude or Primitive and Unconfined Recreation. However, in some cases, restoration management activities may be needed to restore vegetation and to preserve or enhance the area's wilderness character, despite the effects of such activities on the untrammeled quality of wilderness character. The need for active restoration and the alternatives available for conducting restoration activities are analyzed using the Minimum Requirements Decisions Guide.

- **Vegetation.** Whenever possible, the BLM would rely on natural processes to maintain native vegetation and to influence natural fluctuations in populations within Wilderness. Natural disturbance processes, including fire, insect outbreaks, and droughts, are important shapers of the ecosystem. In some cases, vegetation in a Wilderness has been altered by past human activities. Fire suppression, livestock grazing, and introduction of invasive plants are examples of activities that may have changed the vegetative composition within the Wilderness. Manipulation of vegetation through prescribed fire, herbicide application, mechanical treatment, or introduced biological agents, is normally not permitted. Exceptions may include emergencies, actions taken to recover a federally listed threatened or endangered species, *control of nonnative species*, and restoration actions where natural processes alone cannot recover the area from past human intervention. All management activities must be designed to strive towards natural vegetative composition and processes that reflect what would likely have developed with minimal human influence.

There are two Designated Wildernesses on the Medford District: the Soda Mountain Wilderness and a portion of the Wild Rogue Wilderness. The Soda Mountain Wilderness is 24,700 acres located entirely within the Cascade Siskiyou National Monument. Populations of dyer's woad and yellow starthistle are located in the Wilderness Area. The Wild Rogue Wilderness provides watershed protection for the Wild portion of the Rogue National Wild and Scenic River. The Wilderness is administrated and managed by the U.S. Forest Service; its 35,806 acres include 27,111 acres on the Rogue River Siskiyou National Forest and 8,695 acres on the Medford District. There are no known invasive plant infestations on the Medford District portion.

Additional information about the effects to the Soda Mountain Wilderness can also be found in *Special Areas* Issue 1.

Visual

Visual Issue 1 (Not Analyzed in Detail)

Would the use of herbicides affect the visual quality of the landscape with large stands of dead, brown vegetation?

This issue was not analyzed in detail because effects were previously described in the analysis for the Oregon FEIS and the 2016 PEIS (USDI 2010a:293-295, USDI 2016a:4-77) and there are no new circumstances or information at the site-specific level that would change the effects anticipated for this EA.

The lands administered by the District contain many outstanding scenic landscapes. As described in the BLM's Visual Resources Contrast Rating Manual Handbook, visual resources in these landscapes consist of land, water, vegetation, and other natural or human-caused features. The BLM is responsible for ensuring that the scenic values of public lands are considered before allowing uses that may have negative visual impacts. Scenic values are evaluated at the broader viewshed level as viewed from observation points frequented by visitors, not at the individual plant level (USDI 1986).

The Oregon FEIS describes that treatments could have short-term negative effects for the first year following treatment, but that in the long term, effects would be beneficial because of the return of native vegetation (USDI 2010a:296). The short-term negative effects of treatments would vary based on which herbicide is applied and how it is applied but that when herbicides are applied using a backpack sprayer or wicking method, the effect is not easily discernable (USDI 2010a:294). The Oregon FEIS did not discuss the effects of aminopyralid, fluroxypyr, or rimsulfuron. The effects of these three herbicides were discussed in the 2016 PEIS, where it states that impacts to visual resources nationwide from a program that included these three herbicides would be similar to the program without those three herbicides (USDI 2016a:4-77).

The type of actions and the amount of treatments under all alternatives would be consistent with the actions analyzed in the 2010 Oregon FEIS and the 2016 PEIS. All Standard Operating Procedures and Mitigation Measures analyzed in those documents would be applied to all alternatives. On the Medford District, treatments would not be noticeable at the viewshed scale; 95 percent of herbicide treatments would be spot treatments to target specific plants (so that effects to non-target species can be kept to a minimum). When broadcast spraying is done, selective herbicides would be used; only target invasive plants would be killed, leaving remaining native vegetation unharmed. Standard Operating Procedures (Appendix A) include requirements for project designs that blend with topographic forms, do not attract attention, and are restored to repeat existing line and color. Because of these measures, herbicide treatments under all alternatives would not result in large patches of dead invasive plants that would be noticeable at the landscape (viewshed) level. Due to the temporary nature of any discernable visual contrast introduced by invasive plant treatments, conformance with assigned Visual Resource Management Class objectives would be ensured, as projects have up to 5 years to come into conformance with visual objectives.

Consultation and Coordination

The EA has been made available for a 30-day comment period.

List of Preparers

Core Team	
Team Lead / Medford District Botanist and Invasive Plant Coordinator	Bryan Wender
Botanist (Medford)	Stacy Johnson
Planning and Environmental Coordinator (Medford)	Anthony Kerwin
Management Representative / Ashland Resource Area Field Manager	Kristi Mastrofini
Project Manager / Oregon State Office Invasive Plant Coordinator	Erin McConnell
Planner (Oregon State Office)	Anne Boeder
GIS Specialist (Oregon State Office)	Maria Fiorella
Denton and Denton Environmental (Contractor)	Christi Denton
Denton and Denton Environmental (Contractor)	Carolyn Sharp

Other Specialists (all Medford District unless otherwise specified)	
Socioeconomic Specialist	Stewart Allen (Oregon State Office)
Archaeologist	Cheryl Foster Curley
Supervisory Geographic Information Specialist	Mark Metevier
Hydrologist and Soil Scientist	Jonas Parker
Cartographer	Gabriel Rousseau (Oregon State Office)
Wildlife Biologist	Robin Snider
Range Specialist	Jason Tarrant
Fish Biologist	Christopher Volpe
Fire Ecologist	Jena Volpe

Reviewers

Thanks to Katheryn Lloyd, Phil Lanni, Steve Haney, Brent D'Angelo, Diana Clifton, Diane Parry, Jim Whittington, John Lulich, John Wright, Scott Loos, Susan Lee, and Tami Jebb in the Medford District Office, Lee Folliard, Mike Kinsey, Mark Mousseaux, Scott Lightcap, Bruce Hollen, Angel Dawson, Robert Hopper, Mike Brown, Albert Doelker (retired), Jerry Magee, Leanne Mruzik, Dave Johnson, and Kristin Martine in the Oregon State Office, Jeanne Standley in the Coos Bay District Office, and Claire Hibler in the Northwest Oregon District Office.

Review Opportunity

The EA and Finding of No Significant Impact (FONSI) were made available for a 30-day review period (August 2017) on BLM's ePlanning website. A legal notice was also published in the Medford Mail Tribune and the Grants Pass Daily Courier announcing the availability of the documents for review and the comment period end date. Agencies, Native American tribes, and interested members of the public were notified of the availability of the EA and FONSI for review. The mailing list is contained in the project record file.

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 equivalent (a. e.): that portion of a formulation that theoretically could be converted back to the corresponding or parent acid. Or, the theoretical yield of parent acid from an active ingredient that has been formulated as a derivative (esters, salts, and amines are examples of derivatives).

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.

Administrative site: A reservation of public land for use as a site for a public building or other administrative facility. On BLM-administered lands in Oregon, this may include seasonal fire stations, wild horse corrals, rock quarries, bilk material and equipment storage areas, seed orchards, BLM-administered airstrips and helipads, BLM range improvements and water source developments, sanitary systems, BLM communication sites, remote automated weather stations, etc.

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.

Aerobic: Life or processes that require, or are not destroyed by, the presence of oxygen (Also see anaerobic).

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 quality: The composition of air with respect to quantities of pollution therein. Used most frequently in connection with “standards” of maximum acceptable pollutant concentrations.

Allelopathic: Suppression of growth of a plant by a toxin released from a nearby plant of the same or another species.

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.”

Anaerobic: Life or processes, such as the breakdown of organic contaminants by microorganisms, which take place without oxygen. Anaerobic soils are generally found in riparian areas.

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.

Aquatic: Growing, living in, frequenting, or taking place in water; used to indicate habitat, vegetation, or wildlife in freshwater.

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.

Best management practices: 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 nonnative 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.

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 effect that a treatment or action on one area might have on another area.

Candidate species: Plants and animals for which the U.S. Fish and Wildlife Service or National Marine Fisheries 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.

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 0.002 mm in diameter.

Conservation Measures: Measures adopted with the *2007 Vegetation Treatments using Herbicides on BLM Lands in 17 Western States Biological Assessment* to prevent or reduce herbicide effects to federally listed species. A Mitigation Measure adopted at the Oregon FEIS level also applies these measures to any species in the Special Status Species Program. These measures include (but are not limited to) herbicide-by-herbicide buffer distances from special status species, dependent on taxa and application method.

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 under Section 106 of the *National Historic Preservation Act*).

Control: Eradicating, suppressing, or reducing vegetation; a population that is not exposed to the potentially toxic agent in toxicology or epidemiology studies.

Critical habitat: 1) Specific areas within a species' habitat that are critically important to its life functions; an area designated by the US Fish and Wildlife Service 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.

Drift: That part of a sprayed herbicide that is moved from the target area by wind while it is still airborne.

Ecological amplitude: The limits of environmental conditions within which an organism can live and function.

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 National Marine Fisheries Service 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 National Marine Fisheries Service on Federal actions that may affect these species or their designated critical habitat.

Endemic: being unique to a defined geographic location, such as an island, nation, country or other defined zone, or habitat type.

Endocrine: Relating to several glands that secrete hormones or products directly into the bloodstream.

Entrainment: The unintentional loss of freshwater fish during water diversions.

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 contains 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.

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 frequency: The number of times that fires occur within a defined area and time period.

Fire hazard: Fire hazard refers to the ease of ignition and resistance to control of the fuel complex, defined by the volume and arrangement of several strata, including surface, ladder, and canopy fuels.

Fire regime: Quantification of the patterns of wildfire occurrence, frequency, extent, severity, and seasonality for a given ecosystem or landscape. A fire regime is a generalization based on fire histories at individual sites.

Fire return interval: The average time between fires in a given area.

Flame length: The distance between the flame tip and the midpoint of the flame depth at the base of the flame (generally the ground surface), an indicator of fire intensity.

Fuel profile: The vertical and horizontal arrangement of (vegetation) surface fuels, ladder fuels and canopy fuels.

Forage: Vegetation eaten by animals, especially grazing and browsing animals.

Forb: Small broad-leafed plant; broad-leaved herb other than a grass.

Formulation: The commercial mixture of an herbicide that includes both the active and inactive (inert) ingredients.

Fungi: Molds, mildews, yeasts, mushrooms, and puffballs, a group of organisms that lack chlorophyll and therefore are not photosynthetic.

Gastropod: A class of mollusks typically having a one-piece coiled shell and flattened muscular foot with a head bearing stalked eyes; includes snails, slugs, limpets and cowries.

Goal: A broad statement of a desired outcome. Goals are usually not quantifiable and may not have established time frames for achievement.

Good water quality: Water that contains needed substances and where pollutants are not present**.**

Gravel: In soil, particle sizes between 2 and 64 mm in diameter.

Granitic: A common, coarse-grained, light-colored, hard igneous rock consisting chiefly of quartz, orthoclase or microcline, and mica, used in monuments and for building. Granitics on the Medford District are heavily weathered or decomposed, resulting in coarse sand made up of the quartz components. Unlike other areas with decomposing granitic soils, these granitics are almost exclusively sandy in texture and have very little clay. This makes them highly erosive.

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 large 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.

Groundwater transmissivity: The rate at which groundwater flows horizontally through an aquifer.

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.

Herd Management Area: Public land under the jurisdiction of the BLM that has been designated for the maintenance of an established wild horse and burro herd.

Hydrologic: The properties, distribution, and effects of water on the earth's surface, in the soil and underlying rocks, and in the atmosphere.

Inerts: Ingredients that are added to the commercial product (formulation) of an herbicide and are not herbicidally active.

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.

Integrated vegetation / weed management (IVM / IWM): 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 Forest Service collaboration to coordinate record keeping and other management of the Bureau Special Status and Forest Service Sensitive species programs. See also *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: Nonnative, aggressive plants with the potential to cause significant damage to native ecosystems and / or cause significant economic losses. *This Oregon FEIS definition differs from the 2007 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_{oc}: Organic carbon-water partition coefficient. A measure of a material's tendency to adsorb to soil particles. High K_{oc} values indicate a tendency for the material to be adsorbed by soil particles rather than remain dissolved in the soil solution. Strongly adsorbed molecules will not leach or move unless the soil particle to which they are adsorbed moves (as in erosion).

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 percent 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.

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 *Endangered Species Act*. Designations are made by the U.S. Fish and Wildlife Service or National Marine Fisheries Service.

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.

Maximum application rate: The maximum application rate analyzed in risk scenarios in the Risk Assessments. The rate may be the rate on the label of the formulated product, but in certain cases, the maximum application rate is lower. For example, the label for Plateau, the formulated product that has imazapic as its active ingredient, 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 application rate is 0.1875 lb. a.i. / acre. However, herbicide products that include 2,4-D list 4 lbs. / acre as the rate, but Risk Assessments analyze a maximum application rate of 2 lbs. / 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).

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.

Mitigation Measures: Measures adopted with the 2007 *Vegetation Treatments using Herbicides on BLM Lands in 17 Western States* EIS and Record of Decision, the 2016 *Vegetation Treatments using Aminopyralid, Fluroxypyr, and Rimsulfuron* PEIS and Record of Decision, or the 2010 *Vegetation Treatments using Herbicides on BLM Lands in Oregon* FEIS and Record of Decision to prevent or reduce herbicide effects. These measures all apply to this analysis and are included in Appendix A.

Monoculture: a population dominated by a single species; a prevailing culture marked by homogeneity

Monitoring: The orderly collection, analysis, and interpretation of resource data to evaluate progress toward meeting management objectives.

Nematode: Any of a phylum (*Nematoda* or *Nemata*) of elongated cylindrical worms parasitic in animals or plants or free-living in soil or water —also called 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.

Parent material: The unconsolidated and more or less chemically weathered mineral or organic matter from which the soil has developed.

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.

Perched aquifer: An aquifer that occurs above the regional water table. This occurs when there is an impermeable layer above the main water table / aquifer but below the surface of the land.

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.

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.

Post-emergent (herbicide): Herbicide used to kill weeds after they have germinated and are growing.

Pre-emergent (herbicide): An herbicide applied to the soil to keep seeds from germinating.

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.

Project Design Features: Features adopted as part of this analysis to prevent adverse effects from Invasive Plant Treatments.

Propagule: A part of a plant, e.g., a bud, spore, or root fragment, capable of producing a new plant.

Propagule pressure: the quantity, frequency of introduction, and diversity of invasive species that are introduced to an area. Also known as introduction effort.

Proposed threatened or endangered species: Plant or animal species proposed by the U.S. Fish and Wildlife Service or National Marine Fisheries 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.

Rate of spread: The speed with which a fire moves in a horizontal direction across the landscape, usually expressed in chains per hour or feet per minute.

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., suckers or chubs) on or near a specific location.

Residue: Herbicide or its metabolites remaining in or on soil, water, plants, animals, or surfaces.

Restricted Use Pesticide: A classification assigned by the EPA to prevent unreasonable adverse effects from a pesticide product. The classification restricts a product, or its uses, to use by a certified applicator or someone under the certified applicator's direct supervision. They are not available to the general public.

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 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 buffer: A strip of vegetation planted along the bank of a body of water that slows the rate of flow of runoff from adjoining uplands, causing sediment and other materials to deposit onto the land before the runoff enters and pollutes the body of water.

Riparian habitat: Areas adjacent to rivers and streams with a high density, diversity, and productivity of plant and animal species relative to nearby uplands.

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 C.

Risk quotient: 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.

Runoff: Overland flow; the 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.

Safety data sheet (SDS): 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.

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.

Secondary invasion: an increase in abundance of non-target invasive plants following treatment of targeted invasive plants

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 BLM 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.

Serpentine soil / substrate: derived from ultramafic rocks, in particular serpentinite, a rock formed by the hydration and metamorphic transformation of ultramafic rock from the Earth's mantle. Serpentine soils are unique for their low amounts of calcium and high amounts of magnesium, high concentrations of metals, and low levels of nitrogen.

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 0.002 and 0.05 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.

Special Status species: Federally listed threatened, endangered, proposed, or candidate species, and species managed as sensitive species by the BLM.

Sporocarp: In fungi, the fruiting body or multicellular structure on which spores are produced.

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: Procedures that would be followed by the BLM to ensure that risk 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. When specific to water, they 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 acetolactate synthase (ALS), 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.

Target species: A species (in this EA, a plant species) that is a target or goal of a treatment or control effort.

Targeted grazing: The carefully controlled grazing of livestock, such as cattle, sheep, or goats, to accomplish specific vegetation management objectives. Livestock can be 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.

Transmissivity: See **Groundwater Transmissivity**.

Treaty rights: Tribal rights or interests reserved in treaties, by American Indian 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.

Twenty foot wind speed: The wind speed measured 20 feet above any fuel (vegetation) or obstruction, typically by a Remote Automated Weather Station.

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-administered 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 cheatgrass. 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.

Ultramafic rock: An igneous rock with a very low silica content and rich in minerals such as hypersthene, augite, and olivine.

Uncertainty factor: A multiplier used in risk assessments to compensate for unknown risks due to limitations in the research.

Vernal pool: Seasonal pools that are covered by shallow water for variable periods from winter to spring, but may be completely dry for most of the summer and fall.

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.

Wetlands: An area that is saturated by surface or ground water with vegetation adapted for life under those soil conditions, as swamps, bogs, fens, marshes, and estuaries.

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.

Wildfire: Unplanned ignitions or prescribed fires that are declared wildfires. Wildfires may be managed to meet one or more objectives as specified in Resource Management Plans and the objectives can change as the fire spreads across the landscape.

Wildland fires: Fires occurring on wildlands, regardless of ignition source, damages, or benefits, and including wildfire and prescribed fire.

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Appendix A – Protection Measures

Information included in this Appendix is a compilation of information originally presented in:

- Chapters 2 and 3 of this EA;
- the 2007 *Vegetation Treatments Using Herbicides on BLM Lands in 17 Western States PEIS* (USDI 2007a), *Record of Decision* (USDI 2007b), and *Biological Assessment* (USDI 2007c);
- the *Vegetation Treatments on BLM Lands in 17 Western States Programmatic Environmental Report* (USDI 2007d);
- the 2010 Oregon FEIS (USDI 2010a) and Record of Decision (USDI 2010b); and,
- the 2016 *Vegetation Treatments Using Aminopyralid, Fluroxypyr, and Rimsulfuron PEIS* (USDI 2016a), *Record of Decision* (USDI 2016b), and *Biological Assessment* (USDI 2016c);
- the 2013 National Marine Fisheries Service's Aquatic Restoration Biological Opinion II (ARBO II, NMFS 2013)
- the 2013 *Biological Assessment of activities that may affect the federally listed plant species, Gentner's Fritillary, Cook's Lomatium, and Large-flowered Woolly Meadowfoam, on Bureau of Land Management, Medford District and Cascade-Siskiyou National Monument* (USDI 2013b).
- the 2017 *Biological Assessment FY2017-FY2022 Programmatic Activities That May Affect the Northern Spotted Owl, Marbled Murrelet, Vernal Pool Fairy Shrimp, and Oregon Spotted Frog* (USDI 2017b)
- the 2008 *Cascade-Siskiyou National Monument Resource Management Plan* (USDI 2008c)

Project Design Features

The following Project Design Features are adopted for this analysis to reduce effects of the Proposed Action and Alternative 3:

Bureau Sensitive Species (Plants, Fish, and Wildlife)

- Follow the Bureau Sensitive Species Treatment Conditions flowchart (Figure 3-1) when working in potential habitat for Bureau Sensitive species.

Special Status Plants:

- In Gentner's fritillary and Cook's lomatium habitat, follow all Project Design Criteria outlined in the *Biological Assessment of activities that may affect the federally listed plant species, Gentner's Fritillary, Cook's Lomatium, and Large-flowered Woolly Meadowfoam, on Bureau of Land Management, Medford District and Cascade-Siskiyou National Monument* (USDI 2013b) (later in this Appendix).
- Restrict mowing within Special Status plant habitat to the dormant season, unless mowing during the growing season has demonstrated beneficial effects on the Special Status species and its habitat.
- Before using targeted grazing within federally listed plant sites, develop grazing prescriptions and conservation measures in cooperation with the U.S. Fish and Wildlife Service.
- Ensure that seeding and planting prescriptions for Special Status plant habitats use only local genetically appropriate native plant materials from species that are typical components of the Special Status species' habitat, and planted at rates and patterns that reflect typical relative abundance and distribution.
- Do not apply herbicides within Special Status fungi sites if sporocarps are visible, unless protective measures can be implemented to prevent herbicide exposure.
- If broadcast herbicide treatments are deemed necessary within federally listed plant sites, develop prescriptions and conservation measures in cooperation with the U.S. Fish and Wildlife Service.
- To ensure that *Pseudomonas fluorescens* would not affect federally listed plants, do not locate demonstration plots within Fritillaria Management Areas, Cook's lomatium critical habitat, or within 1,500 feet of any known sites.

Special Plant Communities

- Ensure the availability of genetically appropriate local native seed and plant materials before implementing treatments that require subsequent revegetation.
- Ensure that seeding and planting prescriptions for special plant communities use only local genetically appropriate native plant materials from species that are typical components of that community, and planted at rates and patterns that reflect typical relative abundance and distribution.

Fish and Aquatic Organisms

- For waterbodies that contain federally threatened or endangered fish species or provide Critical Habitat, all Project Design Criteria outlined in the *Aquatic Restoration Biological Opinion II* (ARBO II, NMFS 2013) from the National Marine Fisheries Service would be applied (later in this Appendix). If a treatment project cannot be covered by ARBO II, additional consultation with NMFS would occur before treatment.
- Do not use fluazifop-P-butyl, fluroxypyr, rimsulfuron, or *Pseudomonas fluorescens* in Riparian Reserves, or within 1,500 feet of Coho Critical Habitat, due to lack of consultation coverage and / or uncertainty in potential effects to aquatic habitat from these untested agents. In addition, the label for fluazifop-P-butyl states that it is toxic to aquatic organisms, has a high potential to reach surface water through runoff or leaching into groundwater, and the threat of runoff may persist for several months. For these reasons, use of fluazifop-P-butyl will be confined to flat dry ground located greater than 1,500 feet from any aquatic features.

Project Design Features Applicable to Alternative 3

- All Project Design Criteria identified in potential future consultations with the National Marine Fisheries Service will be incorporated into all treatments in aquatic habitats.
- Delay treating side channels and backwaters until they are disconnected from the mainstem river during low flow periods.
- For treatments proposed along the lower Rogue River, limit the treatment window to the late summer, after native smolts have migrated to the estuary, and when water temperatures are high (generally July and August) so that native salmonids would be unlikely to be present in these disconnected or slow water habitats during the treatment period.
- When using aquatic 2,4-D, glyphosate, imazapyr, or triclopyr in closed aquatic systems with heavy infestations, consider a phased treatment (treating less than 50 percent at a time) to reduce the likelihood of all of the aquatic plants dying at the same time, which could result in a rapid depletion of dissolved oxygen.

Wildlife

- In listed species habitat, follow all Project Design Criteria outlined in the *Biological Assessment FY2017-FY2022 Programmatic Activities That May Affect the Northern Spotted Owl, Marbled Murrelet, Vernal Pool Fairy Shrimp, and Oregon Spotted Frog for the Medford District* (USDI 2017b) (later in this Appendix).
- Conservation Measures applicable to butterflies and moths will be applied, as appropriate, for other Special Status insects.
- Do not use fluroxypyr at known mardon skipper sites.

Water

- In Riparian Reserves, targeted grazing will only occur with goats on armored banks. In low gradient, wet meadow systems where post holing and bank shear are possible, keep goats 25 feet away from the wetted channel to eliminate the potential for bank erosion.
- If treatment leaves areas of bare soil adjacent to watercourses, mulch disturbed areas prior to the onset of fall precipitation.

- Treatments that may affect 303(d)-listed streams will be noted on the Annual Treatment Plan. Where invasive plant control would remove plants contributing to bank stability or stream shading, control would be delayed or phased as necessary in order to make treatments consistent with 303(d) restoration plans.

Paleontological Resources
- If possible, avoid fossil locales when spraying herbicides. In fossil locales where herbicides are needed, avoid drift or accidental direct spray on fossils.
- Avoid ground and surface disturbance (like digging, planting, or mowing) in Condition 1 and Condition 2 paleontological areas. If possible, invasive plants in these areas should be removed by hand.

Archeological and Cultural Resources
- Avoid getting herbicides (through drift or accidental direct spray) on rock art or wooden / metal structures or artifacts at NRHP listed or eligible sites.
- Avoid repeated use of livestock (more than one grazing episode annually) at NRHP listed or eligible sites.

Traditional and Cultural Uses (Native American Interests)
- At least one month prior to beginning treatments, Annual Treatment Plans will be presented to the tribes showing planned treatments and treatment areas. Any resultant consultation will identify where timing of treatments can be modified, where cultural features should be avoided or protected, and where posting would help tribe members avoid areas. Maps of known invasive plant infestations (see Map 2-1A, *Invasive Plants Documented in NISIMS,* for example) can also be shared with the tribes at this time.
- Where coordination with the tribes about the Annual Treatment Plan identifies areas where herbicide use would not be consistent with cultural values and uses, alternative control methods will be implemented where feasible.

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.

<u>Standard Operating Procedures</u> 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.[75] 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 "use herbicides of low toxicity to wild horses and burros, where feasible" would not need to be applied to treatments where wild horses and burros are not expected to occur.

<u>2007 PEIS Mitigation Measures</u> (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* (USDI 2007a), and adopted by its Record of Decision. In other words, no potentially significant adverse effect identified in the 17

[75] 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.

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 would decide if their application is unnecessary to achieve the intended purpose or protection.

2016 PEIS Mitigation Measures (marked as 2016 MMs in the list below) were identified for all potential adverse effects identified for herbicide applications in the *Vegetation Treatments Using Aminopyralid, Fluroxypyr, and Rimsulfuron PEIS* (USDI 2016a), and adopted by its Record of Decision. In other words, no potentially significant adverse effect identified in the 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 would 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.

Additional guidance, direction, orders, and protection measures can be found in numerous other BLM or Department of the Interior handbooks, manual, and management plans. Exclusion from this Appendix does not indicate that these additional measures are not also potentially applicable. BLM manuals and handbooks are available online.

Since Standard Operating Procedures, Conservation Measures, and some Mitigation Measures are taken from national level documents, not all attributes are applicable. For example, Alaska Natives would not be consulted with (see *Social and Economic Values Standard Operating Procedures*) and Alaskan crab and scallop habitat does not exist on the District (see *Fish Conservation Measures*). However, reference to herbicides analyzed in the 2007 or 2016 PEISs (i.e., bromacil, diquat, diuron, hexazinone, or tebuthiuron) and application methods (i.e., aerial herbicide application) that are not proposed for use on the Medford District have been removed, as appropriate, to avoid confusion with the alternatives proposed in this EA. For example, the reference to aerial application was removed from the following Standard Operating Procedure:

- 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.

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.
- 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.
- Take precautions to minimize drift by not applying herbicides when winds exceed >10 mph 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

- 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

Standard Operating Procedures for air quality are taken from BLM's Soil, Water, and Air Management Manual (7000).

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 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

Standard Operating Procedures for soil resources are taken from BLM's Soil, Water, and Air Management Manual (7000).

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.
- 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.
- Prevent oil and gas spills to minimize damage to soil.

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.

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 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

Standard Operating Procedures for water resources are taken from BLM's Soil, Water, and Air Management Manual (7000).

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 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 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 25 feet for vehicle, and 10 feet for hand spray applications.
- See mitigation for Water Resources and Vegetation. (MM)

Vegetation

Standard Operating Procedures for vegetation are taken from Handbook H-4410-1 (National Range Handbook), and manuals 5000 (Forest Management) and 9015 (Integrated Weed Management).

General

- Use weed-free feed for horses and pack animals. Use weed-free straw and mulch for revegetation and other activities.

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.
- 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.
- Identify and implement any temporary domestic livestock grazing and / or supplemental feeding restrictions needed to enhance desirable vegetation recovery following treatment.

Manual

- 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.

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.
- 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)
- When necessary to protect Special Status plant species, implement all Conservation Measures for plants presented in the *2007 Vegetation Treatments on Bureau of Land Management Lands in 17 Western States and* 2016 *Vegetation Treatments Using Aminopyralid, Fluroxypyr, and Rimsulfuron Biological Assessments* (see *Conservation Measures* later in this Appendix). (MM, 2016 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 Risk Assessments prepared for the PEIS for more specific information on appropriate buffer distances under different soil, moisture, vegetation, and application scenarios. (MM)
- Use Table A-4 to establish herbicide-specific buffer zones around downstream water bodies, and associated habitats and non-target plant species / populations of interest for aminopyralid, fluroxypyr, and rimsulfuron. Consult the Risk Assessments for more specific information on appropriate buffer distances under different soil, moisture, vegetation, and application scenarios. (2016 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 Aquatic Organisms

Standard Operating Procedures for fish and other aquatic organisms are taken from BLM Manuals, including 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 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 *2007 Vegetation Treatments on Bureau of Land Management Lands in 17 Western States and* 2016 *Vegetation Treatments Using Aminopyralid, Fluroxypyr, and Rimsulfuron Biological Assessments* (see *Conservation Measures* later in this Appendix). (MM, 2016 MM)
- Establish appropriate herbicide-specific buffer zones for water bodies, habitats, or fish or other aquatic species of interest (Table A-3 and recommendations in individual Ecological Risk Assessments). (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

Standard Operating Procedures for wildlife resources are taken from BLM Manuals, including 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.

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, 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 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)
- To protect Special Status wildlife species, implement Conservation Measures for terrestrial animals presented in the *2007 Vegetation Treatments on Bureau of Land Management Lands in 17 Western States and* 2016 *Vegetation Treatments Using Aminopyralid, Fluroxypyr, and Rimsulfuron Biological Assessments* (see *Conservation Measures* later in this Appendix). (MM, 2016 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)
- When conducting herbicide treatments in or near habitats used by special status and listed terrestrial arthropods, design treatments to avoid the use of fluroxypyr, where feasible. If pre-treatment surveys determine the presence of listed terrestrial arthropods, do not use fluroxypyr to treat vegetation. (2016 MM)

Threatened and Endangered Species

Standard Operating Procedures for threatened and endangered species are taken from BLM 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

Standard Operating Procedures for livestock are taken from BLM Handbooks H-4120-1 (Grazing Management) and H-4130, Authorizing Grazing Use.

General

- 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.
- Minimize potential risks to livestock by applying glyphosate 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 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

General

- Avoid critical periods and minimize impacts to critical habitat that could adversely affect wild horse or burro populations.

Fire Use

- Minimize potential hazards to horses and burros by ensuring adequate escape opportunities.

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 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 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® 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, 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

Standard Operating Procedures for paleontological and cultural resources are taken from BLM 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) and the State Protocol between the Oregon-Washington State Director of the Bureau of Land Management (BLM) and The Oregon State Historic Preservation Officer (SHPO) regarding the manner in which the Bureau of Land Management will meet its responsibilities under the *National Historic Preservation Act* and the National Programmatic Agreement among the

BLM, the Advisory Council on Historic Preservation, and The National Conference of State Historic Preservation Officers (2015).

General

- 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 opportunities to meet tribal cultural use plant objectives for projects on public lands.

Fire Use

- Identify cultural resource types at risk from fire use and design inventories that are sufficient to locate these resources. Provide measures to minimize impacts. Monitor significant paleontological and cultural resources for potential looting of materials where they have been exposed by fire.

Mechanical

- Identify cultural resource types at risk from mechanical treatments and design inventories that are sufficient to locate these resources. Provide measures to minimize impacts.
- 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

- Identify cultural resource types at risk from manual treatments and design inventories that are sufficient to locate these resources. Provide measures to minimize impacts.
- 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

- 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

- 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, and triclopyr in known traditional use areas. (MM)

Visual Resources

Standard Operating Procedures for visual resources are taken from BLM handbooks H-8410-1 (Visual Resource Inventory) and H-8431-1 (Visual Resource Contrast Rating), and Manual 8400 (Visual Resource Management).

General

- At areas such as visual overlooks, leave sufficient vegetation in place, where possible, to screen views of vegetation treatments.
- Design activities to repeat the form, line, color, and texture of the natural landscape character

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. Avoid use of fire near agricultural or densely populated areas, where feasible.

- Lessen visual effects in Class I and Class II visual resource areas.

Mechanical
- Minimize dust drift, especially near recreational or other public use areas.
- Minimize loss of desirable vegetation near high public use areas.
- Minimize earthwork and locate away from prominent topographic features.
- Revegetate treated sites.
- Lessen visual effects in Class I and Class II visual resource areas.

Manual
- Minimize dust drift, especially near recreational or other public use areas.
- Minimize loss of desirable vegetation near high public use areas.
- Lessen visual effects in Class I and Class II visual resource areas.

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.

Chemical
- Minimize the use of broadcast foliar applications in sensitive watersheds to avoid creating large areas of browned vegetation.
- 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[76]

Standard Operating Procedures for Designated Wilderness, Wilderness Study Areas, and Wild and Scenic Rivers are taken from BLM Manuals, including Manuals 6330 (Management of Wilderness Study Areas (WSAs)), 6340 (Management of Designated Wilderness Areas), and 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[77] 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.

[76] Note that the Soda Mountain Wilderness is in the Cascade-Siskiyou National Monument. Protection Measures for the Monument are listed below in the *Mitigating Measures for Noxious Weeds in the Cascade-Siskiyou National Monument* section.
[77] By policy, weed-free hay and straw is required on all BLM lands in Oregon and Washington. In addition, the Soda Mountain Wilderness Stewardship Plan (USDI 2012c) states that weed-free feed is required in the Soda Mountain Wilderness.

- Provide educational materials at trailheads and other Wilderness entry points to educate the public on the need to prevent the spread of weeds.
- 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.
- 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.

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
- 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.
- Revegetate sites with native species if there is no reasonable expectation of natural regeneration.
- Maintain adequate buffers for Wild and Scenic Rivers.

Manual
- Revegetate sites with native species if there is no reasonable expectation of natural regeneration.
- Maintain adequate buffers for Wild and Scenic Rivers.

Biological
- 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. 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 Aquatic Organisms, Wildlife Resources, Recreation, and Human Health). (MM)

Recreation

Standard Operating Procedures for recreation are taken from BLM Handbook H-1601-1 (Land Use Planning Handbook).

General
- Notify the public of treatment methods, hazards, times, and nearby alternative recreation areas.

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.

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.

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.

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.
- 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 Aquatic Organisms, Wildlife Resources, and Human Health). (MM)

Social and Economic Values

General
- 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
- 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

General

- 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.

Fire Use

- Manage burns under powerlines so as to avoid negative impacts to the powerline.

Mechanical

- Apply appropriate safety measures when operating equipment within utility ROW corridors.
- Minimize exposed soil areas during treatment.
- Keep operations within prescribed ROW.

Manual

- Always use appropriate safety equipment and operating procedures.
- Utilize methods for disposal of vegetation that prevent spreading or reinfestation of unwanted vegetation.

Chemical

- Use only herbicides that are approved for use in ROW areas.

Human Health

General

- Wear appropriate safety equipment and clothing, and use equipment that is properly maintained.

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.
- 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

- 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

- Cut all brush and tree stumps flat, where possible, to eliminate sharp points that could injure a worker or the public.

Chemical

- Establish a buffer between treatment areas and human residences based on guidance given in the HHRA, with a minimum buffer of 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, and triclopyr to reduce risk to workers and the public. (MM)
- Limit application of chlorsulfuron via ground broadcast applications at the maximum application rate. (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	Diflufenzopyr + dicamba	Sulfometuron methyl
Buffer Distance (feet) from Non-target Aquatic Plants					
Typical Application Rate					
Low Boom[1]	0	NE	0	100	900
High Boom[1]	0	NE	0	900	900
Maximum Application Rate					
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					
Low Boom[1]	900	NE	0	0	0
High Boom[1]	900	NE	0	100	0
Maximum Application Rate					
Low Boom[1]	1,000	NE	0	100	0
High Boom[1]	1,000	NE	0	100	0
Buffer Distance (feet) from Threatened, Endangered, and Sensitive Plants					
Typical Application Rate					
Low Boom[1]	1,000	NE	0	100	1,100
High Boom[1]	1,000	NE	0	900	1,000
Maximum Application Rate					
Low Boom[1]	1,050	NE	0	900	1,100
High Boom[1]	1,000	NE	0	900	1,000

1. 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	Imazapyr	Metsulfuron methyl	Picloram	Triclopyr
Buffer Distance (feet) from Susceptible Plants[1]								
Typical Application Rate								
Low Boom	NE	300	900	50	900	900	>900	300
Maximum Application Rate								
Low Boom	NE	900	1 000	300	>900	>900	>900	>900
Buffer Distance (feet) from Tolerant Terrestrial Plants								
Typical Application Rate								
Low Boom	NE	0	0	25	25	25	25	NE
Maximum Application Rate								
Low Boom	NE	0	25	25	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 Fish and Aquatic Invertebrates from Off-Site Drift of BLM-Evaluated Herbicides (*minimum buffer distances in feet*)

Application	Chlorsulfuron	Fluridone	Imazapic	Overdrive	Sulfometuron methyl
Typical Application Rate					
Low boom	0	NA	0	0	0
High boom	0	NA	0	0	0
Maximum Application Rate					
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 (in feet) to Minimize Risk to Non-target Vegetation from Off-site Drift

Application Scenario	Aminopyralid	Fluroxypyr	Rimsulfuron
Buffer Distance (feet) from Non-Target Terrestrial Plants			
Typical Application Rate			
High Boom[1]	200	400	400
Low Boom[1]	25	100	100
Maximum Application Rate			
High Boom	400	600	700
Low Boom	100	400	400
Buffer Distance (feet) from Terrestrial Threatened, Endangered, and Sensitive Plants			
Typical Application Rate			
High Boom	400	400	400
Low Boom	100	100	100
Maximum Application Rate			
High Boom	600	700	700
Low Boom	400	600	400
Buffer Distance (feet) from Non-Target Aquatic Plants[3]			
Typical Application Rate			
High Boom	NA	NA	200
Low Boom	NA	NA	100
Maximum Application Rate			
High Boom	NA	NA	300
Low Boom	NA	NA	100

1. High boom is 50 inches above ground and low boom is 20 inches above ground.
NA means that no buffers are required, since direct spray of plants was not predicted to result in adverse effects. However, a direct spray into an aquatic habitat is not an approved use of these herbicides. 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.

Invasive Plant Prevention Measures

Invasive Plant Prevention Measures are 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:2-23). 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.

As stated in the BLM's *Partners Against Weeds - An Action Plan for the BLM* (USDI 1996), prevention and public education are the highest priority weed management activities. Priorities are as follows:

- Priority 1: Take actions to prevent or minimize the need for vegetation control when and where feasible, considering the management objectives of the site.
- Priority 2: Use effective nonchemical methods of vegetation control when and where feasible.
- Priority 3: Use herbicides after considering the effectiveness of all potential methods or in combination with other methods or controls.

Prevention is best accomplished by ensuring the seeds and vegetatively reproductive plant parts of new weed species are not introduced into new areas. The BLM is required to develop a noxious weed risk assessment when it is determined that an action may introduce or spread noxious weeds or when known habitat exists (USDI 1992b). If the risk is moderate or high, the BLM may modify the project to reduce the likelihood of weeds infesting the site, and to identify control measures to be implemented if weeds do infest the site. To prevent the spread of weeds, the BLM takes actions to minimize the amount of existing non-target vegetation that is disturbed or destroyed during project or vegetation treatment actions. During project planning, the following steps are taken:

- Incorporate measures to prevent introduction or spread of weeds into project layout, design, alternative evaluation, and project decisions.
- During environmental analysis for projects and maintenance programs, assess weed risks, analyze potential treatment of high-risk sites for weed establishment and spread, and identify prevention practices.
- Determine prevention and maintenance needs, to include the use of herbicides if needed, at the onset of project planning.
- Avoid or remove sources of weed seed and propagules to prevent new weed infestations and the spread of existing weeds.

During project development, weed infestations are prioritized for treatment in project operating areas and along access routes. Weeds present on or near the site are identified, a risk assessment is completed, and weeds are controlled as necessary. Project staging areas are weed free, and travel through weed-infested areas is avoided or minimized. Examples of prevention actions to be followed during project activities include cleaning all equipment and clothing before entering the project site; avoiding soil disturbance and the creation of other soil conditions that promote weed germination and establishment; and using weed-free seed, hay, mulch, gravel, soil, and mineral materials on public lands where there is a state or county program in place.

Conditions that enhance invasive species abundance should be addressed when developing mitigation and prevention plans for activities on public lands. These conditions include excessive disturbance associated with road maintenance, poor grazing management, and high levels of recreational use. If livestock grazing is managed to maintain the vigor of native perennial plants, particularly grasses, the chance of weeds invading rangeland is much less. By carefully managing recreational use and educating the public on the potential impacts of recreational activities on vegetation, the amount of damage to native vegetation and soil can be minimized at high use areas, such as campgrounds and OHV trails. Early detection in recreation areas is focused on roads and trails, where much of the weed spread occurs.

The BLM participates in the National Early Warning and Rapid Response System for Invasive Plants. The goal of this System to minimize the establishment and spread of new invasive species through a coordinated framework of public and private processes by:

- Early detection and reporting of suspected new plant species to appropriate officials;
- Identification and vouchering of submitted specimens by designated specialists;
- Verification of suspected new state, regional, and national plant records;
- Archival of new records in designated regional and plant databases;
- Rapid assessment of confirmed new records; and
- Rapid response to verified new infestations that are determined to be invasive.

Project Planning Prevention Measures

- 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 Prevention Measures

- 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 Prevention Measures

- 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.

Mitigating Measures for Noxious Weeds in the Cascade-Siskiyou National Monument

The following Protection Measures were taken from the 2008 *Cascade-Siskiyou National Monument Resource Management Plan* (USDI 2008c):

RODEO® (glyphosate) would be used as the primary herbicide in efforts to control noxious weeds listed by Oregon Department of Agriculture in the monument. Manual and biological treatments may also occur in conjunction with the control efforts. Treatment operations would generally occur between March 15 and October 31.

The following mitigating measures apply to noxious weed treatments in the monument:

- **Human buffer** – None of the products may be applied within 500 feet of any residence or other place of human occupation unless the occupant or resident gives their consent in writing.
- **Cropland buffer** – Commercial products will not be applied within 100 feet of any cropland.

- **25-foot water buffer** – Commercial products applied by ground vehicles equipped with boom sprayers will not be applied within 25 feet of any water, flowing / moist (i.e., not dry) streams, springs, and wetlands (saturated ground).
- **10-foot water buffer** – Spot treatments with vehicle-mounted handguns or with backpack sprayers will not be applied to within 10 feet of water. To add an extra measure of security, a ten-foot buffer "no spray" buffer will be respected along all flowing / moist (i.e., not dry) streams, springs, and wetlands. This will eliminate the potential for any drift entering waters (Hatterman-Valenti et al. 1995). Ground application within 10 feet of any flowing / moist waters will only be done by hand-wicking, wiping, or painting.
- **Spraying Prohibitions** – Spraying operations will be prohibited when wind velocity exceeds 5 mph; when temperatures exceed 80 degrees; when air turbulence would affect spray pattern; or in the event of any other kind of adverse weather conditions that could cause the glyphosate to impact non-target plants. These requirements would eliminate the potential for spray drift entering the stream channels.
- **Dry season application** – The herbicide treatment would occur only during months with little rain. These months will almost always be June - September; however, during some years, May can be hot and dry and weeds will ripen and begin to set seed early. Moreover, every few years, April can be almost rainless with weeks of temperatures in the high 70s. In such situations, glyphosate may be applied during April or May.
- **Weather Monitoring** – During application, weather conditions will be monitored periodically by trained personnel at spray sites. Weather will be monitored frequently during the first days of a prolonged project, especially projects within Riparian Reserves. Additional weather monitoring will occur whenever a weather change may affect safe placement of the herbicide on the target area. The intent is to ensure that weather conditions are within the parameters of this document and / or other regulatory restrictions
- **Communication** – Prior to beginning treatment each year, the District Weed Specialist and / or Resource Area staff will provide the Resource Area Fisheries Biologists with the following information:
    - Locations to be treated
    - Riparian Reserves and approximate acres to be treated
    - Application method
    - Herbicide to be used
    - Approximate date of treatment
- **"No rain" rule** – Glyphosate would never be applied when weather reports predict precipitation within 24 hours of application, before or after. This ensures that glyphosate would not be washed off by precipitation into small rivulets, or enter ground water. From a practical perspective, glyphosate would not be as effective if sprayed when rain could wash it off.
- **Mixing and Loading Restrictions** – Herbicides will be mixed and loaded into tanks at least 100 feet from any stream channel or surface water or at a location where an accidental spill would not flow into or contaminate a stream or body of water.
- **Tank Washing and Disposal** – Spray tanks will not be washed or rinsed within 100 feet of any waters. All chemical containers will be disposed of at sites approved by the Oregon State Department of Environmental Quality.
- **Application Concentrations** – RODEO® and ACCORD® will be applied at or below concentrations allowable on the labels.
- **Quality Control** – Regular testing on field calibration and calculation will take place to prevent gross application errors. A licensed / certified herbicide applicator will oversee all spray projects. Dye or a similar method will be used to ensure that chemical application occurs only in target areas. (See "Monitoring" below.)
- **Spill Safety** – The BLM contract inspector will review the BLM spill response procedures outlined in the BLM manual 9011-1 with each applicator before commencing herbicide application operations. All hand-operated application equipment must be leak- and spill-proof.
- **Parsimony Rule** – Only the minimum area necessary for the control of noxious weeds will be treated.

- **Monitoring** – Spray cards, dye, or other type of indicator to monitor chemical drift will be used at the water's edge on a small sample (no less than five sites) of riparian treatment areas. These indicators will provide visual verification that the application methods are minimizing risk to listed fish species.

Protection Measures for Federally Listed Species

The Medford District has five federally listed species that are known to occur on the District that have the potential to be affected by invasive plant management. This includes two plant species (Gentner's fritillary and Cook's lomatium), the vernal pool fairy shrimp, the Oregon spotted frog, and the Coho salmon (Oregon Coast and Southern Oregon / Northern California Coast Evolutionary Significant Units). Formal and informal consultation that covers herbicides and other invasive plant treatments on the Medford District has occurred with the U.S. Fish and Wildlife Service (FWS) and National Marine Fisheries Service (NMFS) on numerous occasions (see Table A-5).

Table A-5. *Endangered Species Act Consultation*

Program / Biological Assessment	Treatment Methods	Agency / Area	Year	Consultation
Vegetation Treatments Using Herbicides on BLM Lands in 17 Western States PEIS (USDI 2007a) and Vegetation Treatments on BLM Lands in 17 Western States Programmatic Environmental Report (USDI 2007d) and Vegetation Treatments on BLM Lands in 17 Western States Biological Assessment (USDI 2007c)	Integrated Invasive Plant Management. Includes all herbicides in this EA except aminopyralid, fluroxypyr, and rimsulfuron.	BLM - 17 Western States	2007	Letter of Concurrence (FWS) Biological Opinion (NMFS)
Vegetation Treatments Using Herbicides on BLM Lands in Oregon (USDI 2010a) and Vegetation Treatments on BLM Lands in 17 Western States Biological Assessment (USDI 2007c)	Integrated Invasive Plant Management. Includes all herbicides in this EA except aminopyralid, fluroxypyr, and rimsulfuron.	BLM - Oregon	2010	Letter of Concurrence (FWS) Biological Opinion (NMFS)
Biological Assessment for fish habitat restoration activities affecting ESA-Listed animal and plant species and their designated or proposed critical habitat and designated essential fish habitat under MSA found in Oregon, Washington and parts of California, Idaho and Nevada. (ARBA II) (USDA et al. 2013)	Integrated Invasive Plant Management. Includes all herbicides in this EA except fluridone, fluazifop-P-butyl, *Pseudomonas fluorescens*, fluroxypyr, and rimsulfuron	BLM, Forest Service, and Bureau of Indian Affairs - OR, WA, plus parts of CA, NV, and ID	2013	Aquatic Restoration Biological Opinion (ARBO II – NMFS[1])
Biological Assessment of activities that may affect the federally listed plant species, Gentner's Fritillary, Cook's Lomatium, and Large-flowered Woolly Meadowfoam, on Bureau of Land Management, Medford District and Cascade-Siskiyou National Monument (USDI 2013b)	Integrated Invasive Plant Management consistent with most current NEPA; includes all herbicides	BLM - Medford District	2013	Biological Opinion (FWS)
Vegetation Treatments Using Aminopyralid, Fluroxypyr, and Rimsulfuron PEIS (USDI 2016a) and Biological Assessment (USDI 2016c)	Aminopyralid, fluroxypyr, and rimsulfuron.	BLM - 17 Western States	2015 / 2016	Letter of Concurrence (FWS) Biological Opinion (NMFS)
Biological Assessment FY2017-FY2022 Programmatic Activities That May Affect the Northern Spotted Owl, Marbled Murrelet, Vernal Pool Fairy Shrimp, and Oregon Spotted Frog (USDI 2017b)[1]	Integrated Invasive Plant Management. Includes all herbicides except picloram; includes treatment of submerged and floating aquatic invasive plants.	BLM-Medford District	2017	Biological Opinion (FWS)

1. U.S. Fish and Wildlife Service also prepared an Aquatic Restoration Biological Opinion in response to the Biological Assessment, but it is not applicable to this analysis. However, it is referenced in the 2017 Medford District Wildlife Biological Assessment (USDI 2017b).

Endangered Species Act consultation with U.S. Fish and Wildlife Service and the National Marine Fisheries Service occurred at the national level with the 2007 and 2016 PEISs and at the Oregon level with the 2010 Oregon FEIS. Consultation has also been done with the Services for aquatic restoration work in Oregon and Washington and portions of neighboring states for the BLM and the Forest Service, resulting in the Aquatic Restoration Biological Opinion (ARBO II). In addition, the Medford District has consulted with the U.S. Fish and Wildlife Service on District-level management actions that may affect federally listed plants (2013) and wildlife (2017).

For the 2007 PEIS, the BLM consulted with the U.S. Fish and Wildlife Service and National Marine Fisheries Service as required under Section 7 of the *Endangered Species Act*. The BLM prepared the *Biological Assessment for Vegetation Treatments on Bureau of Land Management Lands in 17 Western States* (USDI 2007c), with a determination of "may affect, not likely to adversely affect." That Biological Assessment evaluated the likely impacts to federally listed species, species proposed for listing, and critical habitats from the proposed use of herbicides and other treatment methods, and identified management practices (see *Conservation Measures* later in this Appendix) to minimize impacts to these species and habitats.

The FWS concurred that the proposed action as described in the 2007 PEIS and Biological Assessment, with all Standard Operating Procedures and PEIS Mitigation Measures, would not likely adversely affect any federally listed species under the jurisdiction of the FWS. In addition, the FWS recognized that any future site-specific actions carried out under the PEIS would undergo additional consultation as appropriate (USDI 2007b). In 2010, the FWS reviewed the 2010 Oregon FEIS and 2007 Biological Assessment (USDI 2007c) and issued a similar Letter of Concurrence (USDI 2010b). In 2016, after reviewing the 2016 PEIS and Biological Assessment, the FWS issued a similar Letter of Concurrence (USDI 2016b).

The Biological Opinion issued by the NMFS in 2007 concluded that the proposed action as described in the 2007 PEIS and Biological Assessment was not likely to jeopardize the continued existence of listed anadromous fish. There is no incidental take[78] identified or exempted by the Biological Opinion. If take is anticipated for site-specific treatments then the amount or extent of take will be identified during subsequent consultation for those proposed treatments. Similarly, the Biological Opinion issued by the NMFS in 2010 – based on the 2010 Oregon FEIS and 2007 Biological Assessment – concluded that the proposed action was not likely to jeopardize the continued existence of listed anadromous fish in the State or result in the destruction or adverse modification of designated critical habitat. The Biological Assessment stated that incidental take is likely but not precisely quantifiable (USDI 2010b:143). Hence, the NMFS concluded that, "vegetation treatments within a 1,500 feet buffer will undergo a site-specific consultation. Vegetation treatments outside of the 1,500-foot buffer should not result in take if minimization measures are used" (USDI 2010b:143). Similar to the 2007 Biological Opinion, the 2016 Biological Opinion concluded that herbicide use was not likely to jeopardize the continued existence of endangered and threatened salmon and trout, threatened green sturgeon, and threatened southern resident killer whales and did not identify any incidental take.

The effects from terrestrial invasive plant control actions on the listed anadromous fish species present on the District were also analyzed in the *Aquatic Restoration Biological Assessment II* (ARBA II), with a determination of "may affect, likely to adversely affect" and were provided *Endangered Species Act* and *Magnuson-Stevens Fishery Conservation Act* coverage under the National Marine Fisheries Service's Aquatic Restoration Biological Opinion (ARBO II, NMFS 2013).

In ARBO II, NMFS determined that the proposed action was not likely to jeopardize the continued existence of the Coho salmon (threatened, Oregon Coast and Southern Oregon / Northern California Coast Evolutionary Significant Units) or result in the destruction or adverse modification of designated critical habitat. Project design criteria for invasive plant control outlined in NMFS's ARBO II were fully incorporated into Project Design Features of this EA,

[78] "Take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct (16 U.S.C. 1532(19).

and the extent of take authorized in ARBO II correlates to the extent of treated areas outlined in the project design criteria of ARBO II (i.e., less than, or equal to, 10 percent of the acres in a riparian reserve within a sub-watershed, or 6th field Hydrologic Unit Code (HUC) / year).

ARBO II does not cover the use of fluazifop-P-butyl, fluroxypyr, *Pseudomonas fluorescens*, or rimsulfuron (four of the herbicides proposed for use under the Proposed Action) or treatment on submerged or floating aquatic plants (Alternative 3). However, all other herbicide treatments included in ARBO II are consistent with those included in the Proposed Action; therefore, ARBO II provides consultation coverage for most treatments. If use of these four herbicides needed to occur within the 1,500-foot buffer described by NMFS in their 2010 Biological Opinion or if the BLM adopts Alternative 3 in listed anadromous fish habitat, additional consultation with NMFS would occur.

The effects of management activities, including invasive plant management, on federally listed plant species were assessed in a 2013 *Biological Assessment of activities that may affect the federally listed plant species, Gentner's Fritillary, Cook's Lomatium, and Large-flowered Woolly Meadowfoam, on Bureau of Land Management, Medford District and Cascade-Siskiyou National Monument* (USDI 2013b). The Biological Assessment includes project design criteria for treating near or within listed plant occurrences, including that invasive plants would be treated when natives are dormant with hand-pulling, spot spraying, wicking or direct injection of herbicide, and roadside spray would not occur within 50 feet of known occurrences. BLM made a determination of "may affect, not likely to adversely affect" for Cook's lomatium and its critical habitat, as well as Gentner's fritillary. The U.S. Fish and Wildlife Service concurred with that determination January 21, 2014, and agreed on March 21, 2017 that the Proposed Action of this EA was consistent with the Biological Assessment and determination, provided that project design criteria from that Biological Assessment were fully incorporated into Project Design Features of this EA.

In 2017, the BLM prepared a Biological Assessment (USDI 2017b) addressing effects of routinely occurring management activities on the Medford District, including invasive plant management. BLM determined that these management activities were determined to "may affect, not likely to adversely affect" the Oregon spotted frog (threatened) and the vernal pool fairy shrimp (threatened). No effects are anticipated to the northern spotted owl or marbled murrelet. The Fish and Wildlife Service concurred with this determination on July 11, 2017 in a Biological Opinion. No additional measures were identified to protect the northern spotted owl or marbled murrelet because Project Design Features, Conservation Measures, and Standard Operating Procedures included in the Proposed Action adequately minimize potential effects. Incidental take is not anticipated for any listed species.

These consultations resulted in the identification of Conservation Measures and Project Design Criteria to protect Medford District listed species from treatments, listed below.

Conservation Measures from the 2007 and 2016 PEISs Biological Assessments

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 2007c). Those Conservation Measures are presented here for use with Special Status species as needed. Conservation Measures for mammals, birds, arthropods, and terrestrial mollusks are generally species specific. Special Status species with Conservation Measures are included below; not all Bureau Sensitive species have Conservation Measures. However, Conservation Measures for similar species can be found in the 2007 and 2016 PEIS Biological Assessments (for example, there are no Conservation Measures to protect the Bureau Sensitive American white pelican, but, when necessary, implementation of Conservation Measures for the brown pelican may be appropriate).

Given the low toxicity of aminopyralid, fluroxypyr, and rimsulfuron to fauna; likely uses of the herbicides; and, Standard Operating Procedures for minimizing the risk of spills, no new aquatic or terrestrial animal Conservation Measures have been developed for herbicide treatments using aminopyralid, fluroxypyr, or rimsulfuron. Additional plant Conservation Measures were adopted as part of the *Biological Assessment for Vegetation Treatments Using Aminopyralid, Fluroxypyr, and Rimsulfuron* (USDI 2016c) and are included below.

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[79] 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

[79] Federally listed as threatened or endangered, or proposed for such listing.

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 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 Ecological Risk Assessments, and are designed to provide protection to TEP plants. Some Ecological Risk Assessments 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 Ecological Risk Assessments, using information in Ecological Risk Assessments 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.

Aminopyralid

- If using a low boom at the typical application rate, do not apply within 100 feet of TEP terrestrial plants[80].
- If using a low boom at the maximum application rate or a high boom at the typical application rate, do not apply within 400 feet of TEP terrestrial plants.
- If using a high boom at the maximum application rate, do not apply within 600 feet of TEP terrestrial plants.

[80] Note that buffers for terrestrial plants may be appropriate for plant species that root in water but have foliage extending above the surface of the water.

- In areas where wind erosion is likely, do not apply within 1.2 miles of TEP plant species (an alternative suitable buffer may be developed at the local level based on an analysis of site conditions).

Chlorsulfuron
- Do not apply by ground methods within 1,200 feet of terrestrial TEP species.
- Do not apply by ground methods 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.

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 feet of terrestrial TEP species.
- Do not apply by ground methods at the typical application rate 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.

Fluroxypyr
- If using a low boom at the typical application rate, do not apply within 100 feet of TEP terrestrial plants.
- If using a low boom at the maximum application rate, do not apply within 600 feet of TEP terrestrial plants.
- If using a high boom at the typical application rate, do not apply within 400 feet of TEP terrestrial plants.
- If using a high boom at the maximum application rate, do not apply within 700 feet of TEP terrestrial plants.
- In areas where wind erosion is likely, do not apply within 1.2 miles of TEP plant species (an alternative suitable buffer may be developed at the local level based on an analysis of site conditions).

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.

Imazapic

- Do not apply by ground methods within 25 feet of terrestrial TEP species or aquatic habitats where TEP plant species occur.

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 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 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 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 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 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.

Rimsulfuron

- If using a low boom at the typical application rate, do not apply within 200 feet of TEP terrestrial plants.
- If using a low boom at the maximum application rate or a high boom at the typical application rate, do not apply within 400 feet of TEP terrestrial plants.
- If using a high boom at the maximum application rate, do not apply within 700 feet of TEP terrestrial plants.

- In areas where wind erosion is likely, do not apply within 1.2 miles of TEP plant species (an alternative suitable buffer may be developed at the local level based on an analysis of site conditions).
- Do not use in watersheds where annual precipitation exceeds 50 inches.
- In watersheds where annual precipitation exceeds 10 inches, prior to use of rimsulfuron conduct a local-level analysis of site conditions and develop suitable conservation measures for protection of TEP plant species from surface runoff.

Sulfometuron Methyl

- Do not apply by ground 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.
- 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 ground 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 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.

If a tank mix of one of these chemicals with another approved herbicide is desired, an additional assessment of potential effects to non-target TEP species must be made with the assumption that effects of the herbicides are at a minimum additive. Larger buffers may be warranted. At the local level, the BLM must make determinations as to the suitability of herbicide 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 treatment. When information about species tolerance is unavailable or is inconclusive, local offices must assume an adverse effect to plant populations, and protect those populations from direct or indirect 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.

The information provided in Table 4-4 (of the 2007 PEIS Biological Assessment, USDI 200c:4-113-126) 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 [cheatgrass] 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, nonnative 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 the 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 the 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 Measures are outside the scope of the 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 1995b). 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. 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.

Conservation Measures for Site Access and Fueling / Equipment Maintenance

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.
- 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).
- 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 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. (Note: the Forest Service did not determine appropriate

buffer distances for TEP fish and aquatic invertebrates when evaluating herbicides in Forest Service Ecological Risk Assessments; 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.
- 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, 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 Ecological Risk Assessments. 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 Ecological Risk Assessments 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 Ecological Risk Assessments when developing project-level Conservation Measures.

Conservation Measures Related to Prescribed Fire

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.

Conservation Measures Related to Mechanical Treatments

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 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.

Terrestrial Animals

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.
- 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, imazapyr, picloram, and triclopyr.
- If conducting manual spot applications of glyphosate, 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.

- 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, 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, 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, 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.

Bird Conservation Measures

Mature-forest Nesters: Marbled Murrelet, Northern Spotted Owl

- Survey for marbled murrelets and northern spotted owls (and their nests) on suitable proposed treatment areas, prior to developing treatment plans.
- Delineate a 100-acre buffer around nests prior to mechanical treatments or prescribed burns.
- Do not allow human disturbance within ¼ mile of nest sites during the nesting period (as determined by a local biologist).
- Ensure that nest sites are at least 1 mile from downwind smoke effects during the nesting period.
- Protect and retain the structural components of known or suspected nest sites during treatments; evaluate each nest site prior to treatment and protect it in the most appropriate manner.
- Maintain sufficient dead and down material during treatments to support spotted owl prey species (minimums would depend on forest types, and should be determined by a wildlife biologist).
- Do not conduct treatments that alter forest structure in old-growth stands.
- Do not use 2,4-D in marbled murrelet or northern spotted owl habitats; do not broadcast spray 2,4-D within ¼ mile of marbled murrelet or northern spotted owl habitat.
- Where feasible, avoid use of the following herbicides in northern spotted owl habitat: clopyralid, glyphosate, imazapyr, metsulfuron methyl, picloram, and triclopyr.
- Where feasible, avoid use of the following herbicides in marbled murrelet habitat: clopyralid, glyphosate, , imazapyr, metsulfuron methyl, picloram, and triclopyr.
- Do not broadcast spray clopyralid, glyphosate, picloram, or triclopyr in marbled murrelet or northern spotted owl habitat; do not broadcast spray these herbicides in areas adjacent to marbled murrelet or northern spotted owl habitat under conditions when spray drift onto the habitat is likely.
- If broadcast spraying imazapyr or metsulfuron methyl in or adjacent to marbled murrelet, northern spotted owl habitat, apply at the typical, rather than the maximum, application rate.

- If broadcast spraying bromacil or diquat in or adjacent to northern spotted owl habitat, apply at the typical, rather than the maximum, application rate.
- If conducting manual spot applications of glyphosate or triclopyr to vegetation in marbled murrelet, or northern spotted owl habitat, utilize the typical, rather than the maximum, application rate.
- Follow all instructions and SOPs to avoid spill and direct spray scenarios into aquatic habitats, particularly marine habitats where murrelets forage for prey.

Bald Eagles

The following programmatic level conservation measures are the minimum steps required of the BLM to ensure that treatment methods would not negatively affect the bald eagle or its habitat. Additional, site-specific conservation measures would also be developed at the local level, as appropriate.

- Do not allow human disturbance within a suitable buffer distance of known bald eagle nest sites during the breeding season (as determined by a qualified wildlife biologist). For active bald eagle nests in open country, buffer distances should be 1 mile. In other habitats, with a shorter line-of-site distance, buffer distances may be reduced, based on consultation with the USFWS.
- Do not allow ground disturbing activities within ½ mile of active roost sites year round,
- Avoid human disturbance within 1 mile of a winter roost during the wintering period (as determined by a qualified wildlife biologist).
- Complete treatment activities that must occur within 1 mile of a winter roost within the hours of 9 a.m. to 3 p.m., during the winter roosting period.
- Conduct prescribed burn activities in a manner that ensures that nest and winter roost sites are greater than 1 mile from downwind smoke effects.
- Do not cut trees within ¼ mile of any known nest trees.
- Do not use 2,4-D in bald eagle habitats; do not broadcast spray 2,4-D within ¼ mile of bald eagle habitat.
- Where feasible, avoid use of the following herbicides in bald eagle habitat: clopyralid, glyphosate, imazapyr, metsulfuron methyl, picloram, and triclopyr.
- Do not broadcast spray clopyralid, glyphosate, picloram, or triclopyr in bald eagle habitat; do not broadcast spray these herbicides in areas adjacent to bald eagle habitat under conditions when spray drift onto the habitat is likely.
- If broadcast spraying imazapyr or metsulfuron methyl in or adjacent to bald eagle habitat, apply at the typical, rather than the maximum, application rate.
- If conducting manual spot applications of glyphosate, or triclopyr to vegetation in bald eagle habitat, utilize the typical, rather than the maximum, application rate.

Riparian Birds

To minimize or avoid negative effects to riparian bird species (such as the yellow-billed cuckoo), the BLM would be required to implement the following programmatic-level conservation measures in habitats utilized by these three species.

- Conduct surveys prior to vegetation treatments within potential or suitable habitat.
- Where surveys detect birds, do not burn, broadcast spray herbicides, use domestic animals to control weeds, or conduct mechanical treatments.
- Do not conduct vegetation treatments within ½ mile (or further if deemed necessary to prevent smoke from inundating the nest area) of known nest sites or unsurveyed suitable habitat during the breeding season (as determined by a qualified wildlife biologist).
- Adjust spatial and temporal scales of treatments to that not all suitable habitat is affected in any given year.
- Following treatments, replant or reseed treated areas with native species, if needed.
- Closely follow all application instructions and use restrictions on herbicide labels; in wetland habitats use only those herbicides that are approved for use in wetlands.

- Do not use 2,4-D in least Bell's vireo, Inyo California towhee, or southwestern willow flycatcher habitats; do not broadcast spray 2,4-D within ¼ mile of least Bell's vireo, Inyo California towhee, or southwestern willow flycatcher habitat.
- Where feasible, avoid use of the following herbicides in least Bell's vireo, Inyo California towhee, and southwestern willow flycatcher habitat: clopyralid, glyphosate, imazapyr, metsulfuron methyl, picloram, and triclopyr.
- Do not broadcast spray clopyralid, glyphosate, picloram, or triclopyr in least Bell's vireo or southwestern willow flycatcher habitat; do not broadcast spray these herbicides in areas adjacent to least Bell's vireo or southwestern willow flycatcher habitat under conditions when spray drift onto the habitat is likely.
- Do not broadcast spray clopyralid, glyphosate, picloram, or triclopyr in Inyo California towhee habitat; do not broadcast spray these herbicides in areas adjacent to Inyo California towhee habitat under conditions when spray drift onto the habitat is likely.
- If broadcast spraying imazapyr or metsulfuron methyl in or adjacent to least Bell's vireo or southwestern willow flycatcher habitat, apply at the typical, rather than the maximum, application rate.
- If broadcast spraying imazapyr or metsulfuron methyl in or adjacent to Inyo California towhee habitat, apply at the typical, rather than the maximum, application rate.
- If conducting manual spot applications of glyphosate, or triclopyr to vegetation in least Bell's vireo, Inyo California towhee, or southwestern willow flycatcher habitat, utilize the typical, rather than the maximum, application rate.

Mammal Conservation Measures

Gray Wolf

Although the proposed vegetation treatments would not be likely to have negative effects on wolves or their habitat, the following programmatic-level conservation measures are recommended to ensure protection of the species. Additional or more specific guidance would also be provided at the project level, as appropriate.

- Avoid human disturbance and / or associated activities within 1 mile of a den site during the breeding period (as determined by a qualified biologist).
- Avoid human disturbance and / or associated activities within 1 mile of a rendezvous site during the breeding period (as determined by a qualified biologist).
- Do not use 2,4-D in areas where gray wolves are known to occur; do not broadcast spray within ¼ mile of areas where gray wolves are known to occur.
- Where feasible, avoid use of the following herbicides in gray wolf habitat: clopyralid, glyphosate, imazapyr, metsulfuron methyl, picloram, and triclopyr.
- Do not broadcast spray clopyralid, glyphosate, picloram, or triclopyr in gray wolf habitat; do not broadcast spray these herbicides in areas adjacent to gray wolf habitat under conditions when spray drift onto the habitat is likely.
- If broadcast spraying imazapyr, or metsulfuron methyl in or near gray wolf habitat, apply at the typical, rather than the maximum, application rate.
- If conducting manual spot applications of glyphosate, or triclopyr to vegetation in gray wolf habitat, utilize the typical, rather than the maximum, application rate.

Bats

In order to prevent or minimize the potential effects to bats from vegetation treatments, the following conservation measures should be followed:

- Prior to treatments, survey all potentially suitable habitat for the presence of bats or their nectar plants.
- At the local level, incorporate protection of lesser and Mexican long-nosed bats into management plans developed for proposed treatment programs.

- Instruct all field personnel on the identification of bat nectar plants and the importance of their protection.
- Protect nectar plants from modification by treatment activities to the greatest extent possible. Do not remove nectar plants during treatments. Avoid driving over plants, piling slash on top of plants, burning, and using domestic animals to control weeds.
- Do not burn within a mile upwind of known bat roosts.
- To protect nectar plants and roost trees from herbicide treatments, follow recommended buffer zones and other conservation measures for TEP plant species in areas where populations of nectar plants and roost trees occur.
- Do not use 2,4-D in lesser or Mexican long-nosed bat habitats; do not broadcast spray within ¼ mile of lesser or Mexican long-nosed bat habitat.
- Where feasible, avoid use of the following herbicides in lesser and Mexican long-nosed bat habitat: clopyralid, fluridone, glyphosate, imazapyr, metsulfuron methyl, picloram, and triclopyr.
- Do not broadcast spray clopyralid, glyphosate, picloram, or triclopyr in lesser or Mexican long-nosed bat habitat; do not broadcast spray these herbicides in areas adjacent to lesser or Mexican long-nosed bat habitat under conditions when spray drift onto the habitat is likely.
- If broadcast spraying imazapyr or metsulfuron methyl in or near lesser or Mexican long-nosed bat habitat, apply at the typical, rather than the maximum, application rate.
- If conducting manual spot applications of glyphosate, or triclopyr to vegetation in lesser or Mexican long-nosed bat habitat, utilize the typical, rather than the maximum, application rate.
- If conducting spot treatments of herbicides in lesser or Mexican long-nosed bat habitats, avoid potential roost sites.

Essential Fish Habitat 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 essential fish habitat (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.

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.

General Measures

- 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 Ecological Risk Assessments 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 Ecological Risk Assessments 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.

Prescribed Burning Treatments

- 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, to avoid wind drift or direct application of herbicides into these habitats.
- Where feasible, minimize the use of terrestrial herbicides 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.

Project Design Criteria for Listed Anadromous Fish from ARBO II (NMFS 2013)

Project Design Criteria established through consultation with NMFS for ARBO II are adopted as a Project Design Feature for federally listed fish for the analysis in this EA. The Project Design Criteria are taken from:

- National Marine Fisheries Service. 2013. *Endangered Species Act* – Section 7 Programmatic Consultation Conference and Biological Opinion and *Magnuson-Stevens Fishery Conservation and Management Act* Essential Fish Habitat Response for Reinitiation of Aquatic Restoration Activities in States of Oregon and Washington (ARBO II). NMFS Consultation Number: NWR-2013-9664 (NMFS 2013)

Text (in gray italics) was added to the ARBO II Project Design Criteria below for clarification purposes

1.3 Proposed Action

1.3.1 Program Administration

33. Nonnative Invasive Plant Control includes manual, mechanical, biological, and chemical methods to remove invasive nonnative plants within Riparian Reserves, Riparian Habitat Conservation Areas, or equivalent and adjacent uplands. In monoculture areas (*e.g.*, areas dominated by blackberry or knotweed) heavy machinery can be used to help remove invasive plants. This activity is intended to improve the composition, structure, and abundance of native riparian plant communities important for bank stability, stream shading, large wood, and other organic inputs into streams, all of which are important elements to fish habitat and water quality. Manual and hand-held equipment will be used to remove plants and disperse chemical treatments. Heavy equipment, such as bulldozers, can be used to remove invasive plants, primarily in areas with low slope values. (Invasive plant treatments included in this opinion are to serve BLM, USFS [Forest Service], and BIA administrative units until such units complete a local or provincial consultation for this activity type.)

a) **Project Extent** – Nonnative invasive plant control projects will not exceed 10% of acres within a Riparian Reserve under the Northwest Forest Plan (USDA and USDI 1994) or RHCA under PACFISH / INFISH (USDA 1995b; USDA and USDI 1995) within a 6th HUC / year.
b) **Manual Methods** – Manual treatments are those done with hand tools or hand held motorized equipment. These treatments typically involve a small group of people in a localized area. Vegetation disturbance varies from cutting or mowing to temporarily reduce the size and vigor of plants to removal of entire plants. Soil disturbance is minimized by managing group size and targeting individual plants.
c) **Mechanical Methods** – Mechanical treatments involve the use of motorized equipment and vary in intensity and impact from mowing to total vegetation removal and soil turnover (plowing and seed bed preparation). Mechanical treatments reduce the number of people treating vegetation. Impacts could be lessened by minimizing the use of heavy equipment in riparian areas, avoiding treatments that create bare soil in large or extensive areas, reseeding and mulching following treatments, and avoiding work when soils are wet and subject to compaction.
d) **Biological Methods** – Release of traditional host specific biological control agents (insects and pathogens) consists of one or two people depositing agents on target vegetation. This results in minimal impact to soils and vegetation from the actual release. Over time, successful biological control agents will reduce the size and vigor of host noxious weeds with minimal or no impact to other plant species.
e) **Chemical Methods –** Invasive plants, including state-listed noxious weeds, are particularly aggressive and difficult to control and may require the use of herbicides for successful control and restoration of riparian and upland areas. Herbicide treatments vary in impact to vegetation from complete removal to reduced vigor of specific plants. Minimal impacts to soil from compaction and erosion are expected.
    i. **General Guidance**
        1. Use herbicides only in an integrated weed or vegetation management context where all treatments are considered and various methods are used individually or in concert to maximize the benefits while reducing undesirable effects.
        2. Carefully consider herbicide impacts to fish, wildlife, non-target native plants, and other resources when making herbicide choices.
        3. Treat only the minimum area necessary for effective control.
        4. Herbicides may be applied by selective, hand-held, backpack, or broadcast equipment in accordance with state and federal law and only by certified and licensed applicators to specifically target invasive plant species.
        5. Herbicide application rates will follow label direction, unless site- specific analysis determines a lower maximum rate is needed to reduce non-target impacts.
        6. An herbicide safety / spill response plan is required for all projects to reduce the likelihood of spills, misapplication, reduce potential for unsafe practices, and to take remedial actions in the event of spills. Spill plan contents will follow agency direction.
        7. Pesticide applicator reports must be completed within 24 hours of application.

ii. **Herbicide Active Ingredients** – Active ingredients are restricted to the following (some common trade names are shown in parentheses; use of trade names does not imply endorsement by the US government):[81]

1. aminopyralid (e.g., terrestrial: Milestone VM)
2. chlorsulfuron (e.g., terrestrial: Telar, Glean, Corsair) (c) clopyralid (e.g., terrestrial: Transline)
3. clopyralid (e.g., terrestrial: Transline)
4. dicamba (e.g., terrestrial: Vanquish, Banvel)
5. diflufenzopyr + dicamba (e.g., terrestrial: Overdrive)
6. glyphosate (e.g., aquatic: Aquamaster, AquaPro, Rodeo, Accord) (g) imazapic (e.g., terrestrial: Plateau)
7. imazapic (e.g., terrestrial: Plateau)
8. imazapyr (e.g., aquatic: Habitat; terrestrial: Arsenal, Chopper)
9. metsulfuron methyl (e.g., terrestrial: Escort)
10. picloram (e.g., terrestrial: Tordon, Outpost 22K)
11. sethoxydim (e.g., terrestrial: Poast, Vantage)[82]
12. sulfometuron methyl (e.g., terrestrial: Oust, Oust XP)
13. triclopyr (e.g., aquatic: Garlon 3A, Tahoe 3A, Renovate 3, Element 3A; terrestrial: Garlon 4A, Tahoe 4E, Pathfinder II)
14. 2,4-D (e.g., aquatic: 2,4-D Amine, Clean Amine; terrestrial: Weedone, Hi-Dep)

iii. **Herbicide Adjuvants –** When recommended by the label, an approved aquatic surfactant would be used to improve uptake. When aquatic herbicides are required, the only surfactants and adjuvants permitted are those allowed for use on aquatic sites, as listed by the Washington State Department of Ecology: http://www.ecy.wa.gov/programs/wq/pesticides/regpesticides.html. (Oregon Department of Agriculture also often recommends this list for aquatic site applications). The surfactants R-11, Polyethoxylated tallow amine (POEA), and herbicides that contain POEA (*e.g.*, Roundup) will not be used.

iv. **Herbicide Carriers –** Herbicide carriers (solvents) are limited to water or specifically labeled vegetable oil.

v. **Herbicide Mixing –** Herbicides will be mixed more than 150 feet from any natural waterbody to minimize the risk of an accidental discharge. Impervious material will be placed beneath mixing areas in such a manner as to contain any spills associated with mixing / refilling. Spray tanks shall be washed further than 300 feet away from surface water. All hauling and application equipment shall be free from leaks and operating as intended.

vi. **Herbicide Application Methods** – Liquid forms of herbicides will be applied as follows:

1. Broadcast spraying using booms mounted on ground-based vehicles (this consultation does not include aerial applications).
2. Spot spraying with hand held nozzles attached to back pack tanks or vehicles and hand-pumped sprayers to apply herbicide directly onto small patches or individual plants.
3. Hand / selective through wicking and wiping, basal bark, frill (“hack and squirt”), stem injection, or cut-stump.
4. Dyes or colorants, (*e.g.*, Hi-Light, Dynamark) will be used to assist in treatment assurance and minimize over-spraying within 100 feet of live water.

[81] The use of trade, firm, or corporation names in this opinion is for the information and convenience of the action agency and applicants and does not constitute an official endorsement or approval by the U.S. Department of the Interior or U.S. Fish and Wildlife Service of any product or service to the exclusion of others that may be suitable.

[82] *Sethoxydim is not proposed for use in this analysis.*

vii. **Minimization of Herbicide Drift and Leaching –** Herbicide drift and leaching will be minimized as follows:

1. Do not spray when wind speeds exceed 10 miles per hour to reduce the likelihood of spray / dust drift. Winds of 2 mph or less are indicative of air inversions. The applicator must confirm the absence of an inversion before proceeding with the application whenever the wind speed is 2 mph or less.
2. Be aware of wind directions and potential for herbicides to affect aquatic habitat area downwind.
3. Keep boom or spray as low as possible to reduce wind effects. (d) Avoid or minimize drift by utilizing appropriate equipment and settings (*e.g.*, nozzle selection, adjusting pressure, drift reduction agents, *etc.*). Select proper application equipment (*e.g.*, spray equipment that produces 200-800 micron diameter droplets [Spray droplets of 100 microns or less are most prone to drift]).
4. Follow herbicide label directions for maximum daytime temperature permitted (some types of herbicides volatilize in hot temperatures).
5. Do not spray during periods of adverse weather conditions (snow or rain imminent, fog, *etc.*). Wind and other weather data will be monitored and reported for all pesticide applicator reports.
6. Herbicides shall not be applied when the soil is saturated or when a precipitation event likely to produce direct runoff to fish-bearing waters from a treated site is forecasted by NOAA National Weather Service or other similar forecasting service within 48 hours following application. Soil-activated herbicides can be applied as long as label is followed. Do not conduct any applications during periods of heavy rainfall.

viii. **Herbicide buffer distances –** The following no-application buffers— which are measured in feet and are based on herbicide formula, stream type, and application method—will be observed during herbicide applications (Table 4). Herbicide applications based on a combination of approved herbicides will use the most conservative buffer for any herbicide included. Buffer widths are measured as map distance perpendicular to the bankfull for streams, the upland boundary for wetlands, or the upper bank for roadside ditches.

Table 4. No-application buffer widths[1] in feet for herbicide application, by stream types and application methods.

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	0	0
Aquatic Triclopyr-TEA	***Not Allowed***	15	waterline	***Not Allowed***	0	0
Aquatic 2,4-D (amine)	100	waterline	waterline	50	0	0
Low Risk to Aquatic Organisms						
Aminopyralid	100	waterline	waterline	50	0	0
Dicamba	100	15	15	50	0	0
Dicamba + diflufenzopyr	100	15	15	50	0	0
Imazapic	100	15	bankfull elevation	50	0	0
Clopyralid	100	15	bankfull elevation	50	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
Metsulfuron methyl	100	15	bankfull elevation	50	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	15	bankfull elevation
High Risk to Aquatic Organisms						
Triclopyr-BEE	***Not Allowed***	150	150	***Not Allowed***	150	150
Picloram	100	50	50	100	50	50
Sethoxydim[1]	100	50	50	100	50	50
2,4-D (ester)	100	50	50	100	50	50
Not Addressed in ARBO II						
Fluazifop-P-butyl	*Not allowed within 300 feet of water bodies that contain federally threatened or endangered fish or provide critical habitat (Not addressed in ARBO II)*					
Fluridone[2]						
Fluroxypyr						
Rimsulfuron						
Pseudomonas fluorescens						

1. Not proposed for use in this analysis.
2. Fluridone is an aquatic herbicide that requires prolonged plant contact, so it can only be used on aquatic plants in still water. It would not be used in rivers or streams and thus would not be applied where listed fish are likely to occur.

Project Design Criteria for Listed Plants (USDI 2013b)

Project Design Criteria established through consultation with the US Fish and Wildlife Service are adopted as a Project Design Feature for federally listed plants for the analysis in this EA. The PDC are taken from:

- 2013 *Biological Assessment of activities that may affect the federally listed plant species, Gentner's Fritillary, Cook's Lomatium, and Large-flowered Woolly Meadowfoam, on Bureau of Land Management, Medford District and Cascade-Siskiyou National Monument* (USDI 2013b).

Project Design Criteria (PDC) are conservation measures incorporated into a project to minimize or avoid negative effects to listed plants and designated critical habitat. If a project area is outside of a listed species' range or does not include listed plant sites, suitable habitat, or designated critical habitat, then PDC are not required. PDC may include modifying the prescription or activity method, changing the timing of the action, establishing no-activity buffers around plant sites, or dropping portions of project units. Additional discretionary PDC can be proposed during the interdisciplinary team process to further reduce effects. BLM also has discretion to halt or modify projects, anywhere in the process, should adverse impacts to federally listed species appear imminent. Implementation of prescribed PDC is mandatory. If mandatory PDC cannot be incorporated for a project that has the potential to adversely affect listed plants or critical habitat, then the project must be analyzed under separate consultation and will not be covered under this programmatic BA.

General Project Design Criteria

Project Notifications

Communication between project leaders, botanists, planners, and line officers is essential to completing projects that are in compliance with this BA and associated Biological Opinion (BO). The following notification procedures will contribute to this goal:

1. Project leaders will notify project botanists of the intent to initiate a project, allowing for sufficient time to plan and complete clearance surveys.
2. Project planners and line officers will ensure that procedures clearing projects for implementation include direct notification of all prescribed PDC to the project leader.
3. Project leaders will notify project botanists of the intent to begin the project, allowing for sufficient time to plan and implement applicable PDC.
4. The project botanist will coordinate with the project leader to ensure that all parties—including contractors and agency work crews—clearly understand all prescribed PDC, including the locations of buffered plant sites and a description of how the sites are marked on the ground.
5. All parties will be notified that departures from clearance survey protocols and other PDC are not permitted and could trigger emergency consultation.

Clearance Surveys

Unless otherwise noted, for activities in suitable habitat and within the known ranges of listed plant species, qualified botany personnel must complete pre-disturbance surveys for listed plant species following the protocols described in Appendix A [of the Biological Assessment]. The project botanist is responsible for determining whether a project is within a listed species' range or near known occurrences. The project botanist will review the BLM geographic biotic observations database (GeoBOB); the Natural Heritage Data System, managed by the Oregon Biodiversity Information Center (ORBIC); and other relevant sources. Surveys must occur prior to signing a decision document for an action. Effects of the action will be documented in the NEPA document (Categorical Exclusion, EA, or EIS). Once the decision is signed, the clearance surveys for that project and those acres are valid, even if implementation does not occur immediately. Clearance surveys are valid for 10 years following the year of survey. If any other BLM special status plant species are listed under ESA during the life of this BA, then all existing survey data for those species are also valid for 10 years. If a project area is not within a listed species' range or does not contain suitable habitat (as determined by the project botanist), then clearance surveys are not required.

Inconclusive Surveys

If indeterminate vegetative leaves strongly resembling a listed species are found during a survey in suitable habitat or near other occurrences of that species, then one or more of the following discretionary PDC are recommended:

1. Buffering the vegetative plants through the life of the project or until a species determination is made.
2. Changing the prescription or timing of the action to reduce potential impacts.
3. Monitoring of the site during and after the action, with documentation of impacts if a determination is made that the affected species was listed.

Marking and Buffering

Prior to project implementation, listed plant sites (unique occurrences of plants, separated by > 300 feet) must be marked on the ground using the Medford District's standard marking protocol. Buffers of various sizes are required for specific project types. Listed in the project-specific PDC below are minimum distances used to protect the occupied site from various activities. For certain activities, prescribed buffers may be larger than those listed, depending on site-specific recommendations made to the line officer from the project botanist. Buffers are a set distance that extends from the perimeter of the hypothetical polygon boundary of an occurrence. For a single plant, a buffer would extend the prescribed distance from that point. For a patch of closely spaced plants, the buffer would extend from a polygon that delineates the boundary of the patch. In cases where there is a scattered distribution of patches of plants in suitable habitat, these patches may all be delineated and buffered as separate occurrences, or they may be aggregated and buffered accordingly. This determination will be made by the project botanist, with consideration for the project type, the spatial arrangement of patches, and the separation distance between patches. Patches more than 150 feet apart will typically not be buffered as a single patch unless the project involves heavy equipment.

Project Activities during Dormancy

Certain activities that are excluded from critical habitat or plant sites during the growing season may be allowed during the dormancy period for the affected species, if the resulting activity is deemed neutral or beneficial to the species. Use of heavy equipment will not be allowed within plant sites, regardless of season. Relevant PDC will still apply as deemed necessary by the project botanist.

Use of Heavy Equipment

For all projects involving the use of heavy equipment, plant sites must be protected by a 100-foot radius buffer. The use of heavy equipment is not permitted within this buffer. Heavy equipment includes tractors, dozers, loaders, graders, excavators, cranes, skid steers, and similar equipment. Pick-up trucks, ATVs, UTVs, and similar soft-wheeled vehicles may be permitted within a plant site on a limited basis in dry conditions in the dormant season, if authorized by the project botanist.

All projects involving heavy equipment use near plant sites require pre-disturbance surveys for non-native invasive plants. Project botanists will prescribe appropriate invasive plant treatments.

All heavy equipment used within Cook's desert parsley (lomatium) critical habitat or near listed plant sites will be cleaned prior to entering BLM lands. All dirt and vegetation must be washed from the equipment exterior, including any unattached accessory equipment, such as augers, scoops, and blades.

Projects involving heavy equipment in Cook's desert parsley critical habitat must be evaluated by a hydrologist prior to implementation. The hydrologist will evaluate potential effects of the proposed actions on site hydrology and prescribe appropriate PDC, which may include (1) seasonal entry restrictions, (2) limiting the extent of disturbance, (3) temporary engineered solutions to reduce compaction and erosion, and (4) restoration of vegetation and hydrologic function.

Emergency Exemptions

In emergency situations, PDC may be waived at the discretion of the decision-maker, if necessary to protect public safety. USFWS will be notified of all such occurrences, and the Level 1 Team will determine if emergency consultation is required. In the event that emergency consultation is initiated, Medford District will act prudently and efficiently to complete consultation in a timely manner, preferably within 6 months of the emergency action.

Specific Project Design Criteria

Q. Non-native Invasive Plant Control

Roadside herbicide application

- Surveys are not required within existing road prisms.
- Follow Medford District's most current NEPA document that covers the use of herbicides to treat vegetation.
- When spraying within 1500 feet of known plant sites, treat only during the dormant season or otherwise protect listed plants by:
    - Instructing contract crews on identification of listed plants that may occur within project areas.
    - Maintaining a minimum 50-foot buffer around known plant sites.
    - Limiting spraying to when there is no measurable wind.
    - Using only spot treatments (no broadcast treatments).
    - Using selective equipment (backpack sprayers, hand bottles, wicks) and techniques (cut-stump, hack-and-squirt, direct inject, foliar spot spray).

Herbicide application in natural communities and plantations

- Surveys are not required when work is being conducted by trained BLM botanists and cooperators; however, one-year surveys are required for treatments performed by contract weed crews (excluding direct-inject and hack-and-squirt methods), unless the workers will be accompanied by a trained botanist.
- Follow Medford District's most current NEPA document that covers the use of herbicides to treat vegetation.
- For treatments within or immediately adjacent to plant sites:
    - Work will be supervised by a trained BLM botanist with weed treatment experience.
    - Treat primarily during the dormant season using spot treatments of post-emergent herbicides applied by backpack sprayers, spray bottles, wicks, and other selective equipment and techniques (e.g., cut-stump, hack-and-squirt, direct inject).
    - Use post-emergent herbicides during the growing season only if dormant season treatments are not effective and when there is no measurable wind. Protect listed plants by implementing these types of protective measures:
        - Within the treatment site, visibly mark all listed plants or patches with pin flags or similar markers.
        - Use only spot treatments (no broadcast treatments).
        - Use selective equipment (backpack sprayers, hand bottles, wicks) and techniques (cut-stump, hack-and-squirt, direct inject, foliar spot spray).
        - In the case of foliar spot treatments, use spray shields or cover listed plants with tarps or buckets during application.
    - Use pre-emergent herbicides only in controlled experiments coordinated with USFWS until effects are fully known and full-scale implementation is approved by USFWS.
    - Monitor the effects of all herbicide use for a period of two growing seasons and report findings annually to USFWS.

Project Design Criteria for Listed Wildlife (USDI 2017b)

Adopted as a Project Design Feature for federally listed wildlife. Taken from

- 2017 *Biological Assessment FY2017-FY2022 Programmatic Activities That May Affect the Northern Spotted Owl, Marbled Murrelet, Vernal Pool Fairy Shrimp, and Oregon Spotted Frog* (USDI 2017b)

Project Design Criteria (PDC) are conservation measures applied to project activities designed to reduce and minimize potential detrimental effects to listed species. In some cases, use of PDC may result in a determination of *not likely to adversely affect* (NLAA) for a project which may have otherwise been determined to be a *may affect, likely to adversely affect* (LAA).

The PDC apply to all proposed activities described in the consultation unless a particular activity is expressly exempted from a particular PDC. As such exemptions (if any) will be described in the BA.

The District retains discretion to halt and modify all projects, anywhere in the process of project completion, should new information regarding effects to proposed and listed threatened or endangered species, or their critical habitat, arise. Minimization of impacts will then, at the least, include the application of an appropriate seasonal restriction to minimize disruption impacts; and could include clumping of retention trees around nest trees, establishment of buffers, dropping unit(s) or portions of units, or dropping entire projects. Also, should such a situation arise, the level one team will be convened to determine whether reinitiating consultation will be necessary

If new listed species sites are located during surveys, biologists will review PDCs and the consultation to confirm the ESA analysis remains valid. If the impacts to the new site are no longer consistent with the analysis, the project will be stopped until the BLM completes one or more of the following:

- Modifies the proposed action to ensure that impacts remain as described in the consultation documents.
- Imposes seasonal protections (if necessary).
- Reinitiates or completes new consultation.

The following general PDC are expected to be implemented to the fullest extent practicable:

- Wildlife biologists will review proposed activities through current resource area project tracking procedures, which may include field reviews. The purpose of this involvement is to ensure the project minimizes impacts to listed species and the project is carried out as described in this consultation and supporting documents, including implementing seasonal restrictions and other PDC.
- The planning and implementation of projects will be consistent with the District's Guide for Planning and Implementing Vegetation Management Projects (USDI BLM 2015).
- The District will provide the Level 1 Team with more site specific information and analysis for Salvage, Rights-of-Way, and Mining projects. The Team will review the projects for consistency with this consultation. If the Team determines the Project(s) are not consistence with this consultation, the District will modify or reinitiate consultation of the project as appropriate.

Year-end monitoring will ensure that actual levels of effect resulting from implementation of the proposed actions do not exceed the levels anticipated in this consultation, whether from habitat modification, or impacts to critical habitat. The District shall inform the Interagency Level 1 Team and re-initiate consultation, as appropriate, with the Service before exceeding an anticipated level of effect. The District will complete informal project implementation monitoring each year for the may affect, not likely to adversely affect actions included in this Assessment. This monitoring information will be shared with the Service through the Level 1 Team.

Vernal Pool Fairy Shrimp

The following PDC were designed to help reduce impacts to vernal pool fairy shrimp and are focused on Upper and Lower Table Rocks because these are the only known occupied suitable vernal pool fairy shrimp habitat in the Medford BLM District:

- Vernal pools would be assumed occupied unless surveys indicate otherwise. Non-herbicide invasive plant treatments (propane torch, hand pulling, or string trimmer) in or adjacent to vernal pools will only occur during the dry season, which is when fairy shrimp have not hatched and are non-reproductive. This period generally occurs between April and November.
- The seasonal restriction and buffer distance may be waived if surveys determine the specific pool or pools are unoccupied by vernal pool fairy shrimp and the project is done in coordination with the Service.
- Herbicide treatments will not occur within the vernal pools. Treatments adjacent to the vernal pools will only occur during the dry season and will only occur outside of a 30 foot buffer around the margin of the pools.
- Standard Operating Procedures, Mitigation Measures, or other Protection Measures from the Medford District Integrated Invasive Plant Management Environmental Assessment will be implemented.
- Fire lines for prescribed fire will not be constructed through vernal pools.
- Prescribed fire will occur in the fall when vernal pools are dry and outside of the reproductive season for fair shrimp.
- Designated trails will be restricted to existing or “hard surfaced” trails to reduce impacts to vernal pool systems and fairy shrimp.
- As funding permits, vernal pools and associated flora and fauna species would be monitored every five years in coordination with the Nature Conservancy and US Fish and Wildlife Service.
- Increase public awareness through education materials on potential impacts to sensitive wildlife habitat associated with recreational use on Upper and Lower Table Rocks.

Oregon Spotted Frog

The following PDC are designed to help reduce impacts to Oregon spotted frogs:

- No herbicide treatments will be applied within the water bodies at the Parsnip Lake site or in Keene Creek. Buffer widths will be implemented based on herbicide and site-specific conditions listed from the Aquatic Restoration Biological Opinion (ARBO II) to minimize impacts to water bodies and listed species. Widths range from 15 to 150 feet or at the waterline for spot spraying (USDI 2013a).
- Standard Operating Procedures, Mitigation Measures, or other Protection Measures from the Medford District Integrated Invasive Plant Management Environmental Assessment (DRAFT) will be implemented, including, but not limited to these measures:
    - Use a selective herbicide and a wick or backpack sprayer
    - Do not spray if precipitation is occurring or is imminent (within 24 hours).
    - Do not broadcast spray when wind velocity exceeds 10 mph.

Appendix B – The Herbicides, Formulations, and Adjuvants

The Herbicides - The herbicides proposed for use in Oregon 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 2-8 in Chapter 2 shows the herbicides with some sample trade names, common plant targets, plant types it is selective for, how it is used, land types it is registered for, typical and maximum rates, and whether it can be applied aerially. **Table B-1 - *General Constraints from Herbicide Labels*** supplements the Table 2-9 information by listing a summary of general label constraints.

Herbicides can be categorized as selective or non-selective (see Table 2-8). Selective herbicides kill only a specific type of plant. For example, an herbicide selective for a broadleaf plant 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 plant 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 2-9).

Herbicides are classified as either "general use" or "restricted use" by the EPA. Restricted use means that a product, or its uses, may have higher risks of adverse effects and thus can only be used by a certificated pesticide applicator with the appropriate training or under the direct supervision of a certified applicator (defined in 40 CFR 152.175). A license is required to purchase and apply the product and the label on the herbicide must clearly state that it is a "Restricted Use Pesticide." A general use pesticide, when applied in accordance with its directions for use, will generally not cause unreasonable adverse effects to humans or the environment, and thus is not restricted to certified applicators. They can be purchased and used by the public. Picloram (available under the No Action Alternative) is the only restricted use herbicide analyzed in this EA.

Table B-2 – *Herbicide Formulations Approved for use on BLM-Administered 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 C) and otherwise suitable for wildland use.

Table B-3 – *Adjuvants Approved for Use on BLM Administered Lands* displays the adjuvants approved for use on BLM-administered lands nationally. This list is also reviewed at least annually. This list identifies adjuvants that are known to be consistent with the formulations analyzed in the Risk Assessments (see Appendix C) and are 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 B-3 also identifies those adjuvants identified by the U.S. Fish and Wildlife Service and the National Marine Fisheries 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* (USDI 2013a, NMFS 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 B-1. General Constraints from Herbicide Labels

Herbicides	General Constraints from Labels *(follow all label requirements)*
2,4-D	• Some formulations are toxic to aquatic invertebrates. • Only use approved formulations for streamside and aquatic applications. • Drift or runoff from terrestrial applications 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.
Aminopyralid	• After grazing aminopyralid-treated forage, livestock must graze for 3 days in an untreated pasture without desirable broadleaf plants before returning to an area where desirable broadleaf plants are present. • 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 or rinsate. • Do not treat inside banks or bottoms of irrigation ditches, either dry or containing water, or other channels that carry water that may be used for irrigation or domestic purposes.
Chlorsulfuron	• Do not apply more than 1.33 oz. / acre per year in pasture, range, and Conservation Reserve Program 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	• Do not apply where soils have a rapid to very rapid permeability close to aquifers. • 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. • After grazing clopyralid-treated forage, livestock must graze for 3 days in an untreated pasture without desirable broadleaf plants before returning to an area where desirable broadleaf plants are present. • Do not use plant residues, including hay or straw from treated areas, or manure or bedding straw from animals that have grazed or consumed forage from treated areas, for composting or mulching, where susceptible plants may be grown the following season. • Do not spread manure from animals that have grazed or consumed forage or hay from treated areas on land used for growing susceptible broadleaf crops, ornamentals, orchards, or other susceptible desirable plants.
Dicamba	• 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 that 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	• Do not load, mix, or apply within 50 feet 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 that favor runoff. Do not apply to soils that classify as sand. • Be cognizant of leaching where soils are permeable or where water table is shallow.
Fluridone	• Do not apply in tidewater / brackish water.

Herbicides	General Constraints from Labels ***(follow all label requirements)***
Fluroxypyr	• Do not apply directly to water, to areas where surface water is present or to intertidal areas below the mean high water mark. • Do not contaminate water when cleaning equipment or disposing of equipment washwaters. • Do not apply where drift may be a problem due to proximity to susceptible crops or other non-target broadleaf plants.
Glyphosate	• Only use approved aquatic formulations for aquatic applications. • Do not contaminate water when cleaning equipment or disposing of equipment washwaters. • Treatment of aquatic weeds can result in oxygen depletion or loss due to decomposition of plants that can cause fish suffocation. • This is a non-selective herbicide. • Avoid drift.
Imazapic	• 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 within 48 hours.
Imazapyr	• 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	• 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. Non-target plants may be adversely affected from drift and run-off.
Picloram	• Do not use manure from animals grazing treated areas or feeding on treated hay on land used for growing broadleaf crops, ornamentals, orchards or other susceptible, desirable plants. Manure may contain enough picloram to cause injury to susceptible plants. • Do not use grass or hay from treated areas for composting or mulching of susceptible broadleaf plants or crops. • Do not transfer livestock from treated grazing areas (or feeding of treated hay) onto sensitive broadleaf crop areas without first allowing 7 days of grazing on an untreated grass pasture (or feeding of untreated hay). Otherwise, urine and manure may contain enough picloram to cause injury to sensitive broadleaf plants. • Restricted use. May injure susceptible, non-target plants. This herbicide is injurious to plants at extremely low concentrations. Non-target 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 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. • Do not apply within the root zone of desirable trees unless such injury can be tolerated.
Rimsulfuron	• Do not graze treated sites or cut for forage or hay for a minimum of 1 year after application in order to allow newly emerged grasses sufficient time to become established. • 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 by cleaning of equipment or disposal of equipment washwaters or rinsate. • Rainfall or irrigation is needed for herbicide activation.
Sulfometuron methyl	• 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.

Herbicides	General Constraints from Labels *(follow all label requirements)*
	• Do not treat frozen soil. • Do not apply in or on irrigation ditches or canals, including their outer banks.
Triclopyr	• 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.
Herbicides analyzed for Research and Demonstration	
Fluazifop-P-butyl	• This product is toxic to fish and aquatic invertebrates. Do not apply to areas where runoff into water bodies is expected. • Do not apply when weather conditions favor drift from target areas. • Do not apply directly to water, to areas where surface water is present, or to intertidal areas below the mean high water mark. • Fluazifop-P-butyl is known to leach through soil into ground water under certain conditions as a result of label use. This chemical may leach into ground water if used in areas where soils are permeable, particularly where the water table is shallow. • This product may impact surface water quality due to runoff of rain water. This is especially true for poorly draining soils and soils with shallow ground water. • This product is classified as having high potential for reaching surface water via runoff for several months or more after application. A level, well-maintained vegetative buffer strip between areas to which this product is applied and surface water features such as ponds, streams, and springs will reduce the potential loading of fluazifop-P-butyl from runoff water and sediment. Runoff of this product will be reduced by avoiding applications when rainfall is forecasted to occur within 48 hours. • Do not treat areas while unprotected humans or domestic animals are present in the treatment areas. Do not allow entry into treated areas without protective clothing until sprays have dried. • Do not apply if rainfall is expected within 1 hour. • Do not use flood type or other spray nozzle tips that deliver coarse, large droplet sprays.
Pseudomonas fluorescens	• Harmful if inhaled. • 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. • Do not apply when weather conditions favor drift or runoff from treated areas. • Do not enter treated areas without protective clothing until sprays have dried. • Do not use with adjuvants.

Table B-2. Herbicide Formulations Approved for Use on BLM-Administered Lands[1]

Active Ingredient	Trade Name	Manufacturer	EPA Registration Number
2,4-D	2,4-D 4# Amine Weed Killer	UAP-Platte Chem. Co.	34704-120
2,4-D	2,4-D Amine	Helena Chemical Company	5905-72
2,4-D	2,4-D Amine	Setre (Helena)	5905-72
2,4-D	2,4-D Amine 4	Albaugh, Inc. / Agri Star	42750-19
2,4-D	2,4-D Amine 4	Helena Chemical Company	42750-19-5905
2,4-D	2,4-D LV 4	Albaugh, Inc. / Agri Star	42750-15
2,4-D	2,4-D LV4	Setre (Helena)	5905-90
2,4-D	2,4-D LV 6	Albaugh, Inc. / Agri Star	42750-20
2,4-D	2,4-D LV6	Helena Chemical Company	4275-20-5905
2,4-D	2,4-D LV6	Setre (Helena)	5905-93
2,4-D	2,4-D LV 6 Ester	Nufarm Americas Inc.	228-95
2,4-D	Agrisolution 2,4-D Amine 4	Agriliance, LLC	1381-103
2,4-D	Agrisolution 2,4-D Amine 4	Winflied Solutions, LLC	1381-103
2,4-D	Agrisolution 2,4-D LV4	Agriliance, LLC	1381-102
2,4-D	Agrisolution 2,4-D LV4	Winflied Solutions, LLC	1381-102
2,4-D	Agrisolution 2,4-D LV6	Agriliance, LLC	1381-101
2,4-D	Agrisolution 2,4-D LV6	Winflied Solutions, LLC	1381-101
2,4-D	Alligare 2,4-D Amine	Alligare, LLC	81927-38
2,4-D	Alligare 2,4-D LV 6	Alligare, LLC	81927-39
2,4-D	Amine 4	Wilbur-Ellis Co.	2935-512
2,4-D	Aqua-Kleen	Nufarm Americas Inc.	228-378
2,4-D	Aqua-Kleen	Nufarm Americas Inc.	71368-4
2,4-D	Barrage HF	Helena Chemical Company	5905-529
2,4-D	Barrage LV Ester	Setre (Helena)	5905-504
2,4-D	Base Camp Amine 4	Wilbur-Ellis Co.	71368-1-2935
2,4-D	Base Camp LV6	Wilbur-Ellis Co.	2935-553
2,4-D	Broadrange 55	Wilbur-Ellis Co.	2217-813-2935
2,4-D	Clean Amine	Loveland Products, Inc.	34704-120
2,4-D	Clean Crop Amine 4	UAP-Platte Chem. Co.	34704-5 CA
2,4-D	Clean Crop Low Vol 6 Ester	UAP-Platte Chem. Co.	34704-125
2,4-D	Clean Crop LV-4 ES	UAP-Platte Chem. Co.	34704-124
2,4-D	Cornbelt 4 lb. Amine	Van Diest Supply Co.	11773-2
2,4-D	Cornbelt 4# LoVol Ester	Van Diest Supply Co.	11773-3
2,4-D	Cornbelt 6# LoVol Ester	Van Diest Supply Co.	11773-4
2,4-D	D-638	Albaugh, Inc. / Agri Star	42750-36
2,4-D	De-Amine 4	Drexel Chemical Company	19713-650
2,4-D	De-Amine 6	Drexel Chemical Company	19713-651
2,4-D	De-Ester LV4	Drexel Chemical Company	19713-345
2,4-D	De-Ester LV6	Drexel Chemical Company	19713-655
2,4-D	Esteron 99C	Nufarm Americas Inc.	62719-9-71368
2,4-D	Five Star	Albaugh, Inc. / Agri Star	42750-49
2,4-D	Formula 40	Nufarm Americas Inc.	228-357
2,4-D	HardBall	Helena Chemical Company	5905-549
2,4-D	Hi-Dep	PBI / Gordon Corporation	2217-703
2,4-D	Lo Vol-4	Wilbur-Ellis Co.	228-139-2935
2,4-D	Low Vol 4 Ester Weed Killer	Loveland Products, Inc.	34704-124
2,4-D	Lo Vol-6 Ester	Wilbur-Ellis Co.	228-95-2935
2,4-D	Low Vol 6 Ester Weed Killer	Loveland Products, Inc.	34704-125
2,4-D	Opti-Amine	Helena Chemical Company	5905-501
2,4-D	Phenoxy 088	Winfield Solutions, LLC	42750-36-9779
2,4-D	Platoon	Nufarm Americas Inc.	228-145
2,4-D	Rugged	Winfield Solutions, LLC	1381-247

Active Ingredient	Trade Name	Manufacturer	EPA Registration Number
2,4-D	Saber	Loveland Products, Inc.	34704-803
2,4-D	Salvo	Loveland Products, Inc.	34704-609
2,4-D	Salvo LV Ester	UAP-Platte Chem. Co.	34704-609
2,4-D	Savage DS	Loveland Products, Inc.	34704-606
2,4-D	Savage DS	UAP-Platte Chem. Co.	34704-606
2,4-D	Shredder 2,4-D LV4	Winfield Solutions, LLC	1381-102
2,4-D	Shredder Amine 4	Winfield Solutions, LLC	1381-103
2,4-D	Shredder E-99	Winfield Solutions, LLC	1381-195
2,4-D	Solution Water Soluble	Nufarm Americas Inc.	228-260
2,4-D	Solve 2,4-D	Albaugh, Inc. / Agri Star	42750-22
2,4-D	Unison	Helena Chemical Company	5905-542
2,4-D	Weedar 64	Nufarm Americas Inc.	71368-1
2,4-D	WEEDestroy AM-40	Nufarm Americas Inc.	228-145
2,4-D	Weedone LV-4	Nufarm Americas Inc.	228-139-71368
2,4-D	Weedone LV-4 Solventless	Nufarm Americas Inc.	71368-14
2,4-D	Weedone LV-6	Nufarm Americas Inc.	71368-11
2,4-D	Whiteout 2,4-D	Loveland Products, Inc.	34704-1032
Aminopyralid	Milestone	Dow AgroSciences	62719-519
Aminopyralid + Metsulfuron Methyl	Chaparral	Dow AgroSciences	62719-597
Aminopyralid + Metsulfuron Methyl	Opensight	Dow AgroSciences	62719-597
Chlorsulfuron	Alligare Chlorsulfuron	Alligare, LLC	81927-43
Chlorsulfuron	Chlorsulfuron 75	Alligare, LLC	81927-43
Chlorsulfuron	Chlorsulfuron E-Pro 75 WDG	Nufarm Americas Inc.	79676-72
Chlorsulfuron	Nufarm Chlorsulf SPC 75 WDG Herbicide	Nufarm Americas Inc.	228-672
Chlorsulfuron	Telar DF	DuPont Crop Protection	352-522
Chlorsulfuron	Telar XP	Bayer Environmental Science	432-1561
Chlorsulfuron	Telar XP	DuPont Crop Protection	352-654
Clopyralid	CleanSlate	Nufarm Americas Inc.	228-491
Clopyralid	Clopyralid 3	Alligare, LLC	42750-94-81927
Clopyralid	Clopyralid 3	Alligare, LLC	81927-14
Clopyralid	Pyramid R&P	Albaugh, Inc.	42750-94
Clopyralid	Reclaim	Dow AgroSciences	62719-83
Clopyralid	Spur	Albaugh, Inc.	42750-89
Clopyralid	Stinger	Dow AgroSciences	62719-73
Clopyralid	Transline	Dow AgroSciences	62719-259
Clopyralid + 2,4-D	Cody Herbicide	Alligare, LLC	81927-28
Clopyralid + 2,4-D	Commando	Albaugh, Inc.	42750-92
Clopyralid + 2,4-D	Curtail	Dow AgroSciences	62719-48
Clopyralid + 2,4-D	Cutback	Nufarm Americas Inc.	71368-72
Dicamba	Banvel	Arysta LifeScience N.A. Corp.	66330-276
Dicamba	Banvel	Micro Flo Company	51036-289
Dicamba	Clarity	BASF Corporation	7969-137
Dicamba	Cruise Control	Alligare, LLC	42750-40-81927
Dicamba	Diablo	Nufarm Americas Inc.	228-379
Dicamba	Dicamba DMA	Albaugh, Inc. / Agri Star	42750-40
Dicamba	Kam-Ba	Drexel Chemical Company	19713-624
Dicamba	Rifle	Loveland Products, Inc.	34704-861
Dicamba	Sterling Blue	Winfield Solutions, LLC	7969-137-1381
Dicamba	Vanquish	Syngenta Professional Products	100-884
Dicamba	Vanquish Herbicide	Nufarm Americas Inc.	228-397

Active Ingredient	Trade Name	Manufacturer	EPA Registration Number
Dicamba	Vision	Albaugh, Inc.	42750-98
Dicamba	Vision	Helena Chemical Company	5905-576
Dicamba + 2,4-D	Brash	Winfield Solutions, LLC	1381-202
Dicamba + 2,4-D	Brush-Rhap	Helena Chemical Company	5905-568
Dicamba + 2,4-D	Dicamba + 2,4-D DMA	Alligare, LLC	81927-42
Dicamba + 2,4-D	KambaMaster	Nufarm Americas Inc.	71368-34
Dicamba + 2,4-D	Latigo	Helena Chemical Company	5905-564
Dicamba + 2,4-D	Outlaw	Helena Chemical Company	5905-574
Dicamba + 2,4-D	Range Star	Albaugh, Inc. / Agri Star	42750-55
Dicamba + 2,4-D	Rifle-D	Loveland Products, Inc.	34704-869
Dicamba + 2,4-D	Weedmaster	BASF Ag. Products	7969-133
Dicamba + 2,4-D	Weedmaster	Nufarm Americas Inc.	71368-34
Dicamba + 2,4-D	Veteran 720	Nufarm Americas Inc.	228-295
Dicamba + Diflufenzopyr	Distinct	BASF Corporation	7969-150
Dicamba + Diflufenzopyr	Overdrive	BASF Corporation	7969-150
Fluridone	Alligare Fluridone	Alligare, LLC	81927-45
Fluridone	Avast!	SePRO Corporation	67690-30
Fluridone	Fluridone 4L	Albaugh, LLC	42750-280
Fluridone	Sonar AS	SePRO Corporation	67690-4
Fluridone	Sonar Precision Release	SePRO Corporation	67690-12
Fluridone	Sonar Q	SePRO Corporation	67690-3
Fluridone	Sonar SRP	SePRO Corporation	67690-3
Fluroxypyr	Alligare Fluroxypyr	Alligare, LLC	66330-385-81927
Fluroxypyr	Comet Selective	Nufarm Americas Inc.	71368-87
Fluroxypyr	Vista XRT	Dow AgroSciences	62719-586
Glyphosate	Accord Concentrate	Dow AgroSciences	62719-324
Glyphosate	Accord SP	Dow AgroSciences	62719-322
Glyphosate	Accord XRT	Dow AgroSciences	62719-517
Glyphosate	Accord XRT II	Dow AgroSciences	62719-556
Glyphosate	Agrisolutions Cornerstone	Winfield Solutions, LLC	1381-191
Glyphosate	Agrisolutions Cornerstone 5 Plus	Winfield Solutions, LLC	1381-241
Glyphosate	Agrisolutions Cornerstone Plus	Winfield Solutions, LLC	1381-192
Glyphosate	Agrisolutions Rascal	Winfield Solutions, LLC	1381-191
Glyphosate	Agrisolutions Rascal Plus	Winfield Solutions, LLC	1381-192
Glyphosate	Aqua Neat	Nufarm Americas Inc.	228-365
Glyphosate	Aqua Star	Albaugh, Inc. / Agri Star	42750-59
Glyphosate	Aquamaster	Monsanto	524-343
Glyphosate	AquaPro Aquatic Herbicide	SePRO Corporation	62719-324-67690
Glyphosate	Buccaneer	Tenkoz	55467-10
Glyphosate	Buccaneer Plus	Tenkoz	55467-9
Glyphosate	ClearOut 41 Plus	Chem. Prod. Tech., LLC	70829-3
Glyphosate	Credit Xtreme	Nufarm Americas Inc.	71368-81
Glyphosate	Foresters	Nufarm Americas Inc.	228-381
Glyphosate	Forest Star	Albaugh, Inc. / Agri Star	42570-61
Glyphosate	Four Power Plus	Loveland Products, Inc.	34704-890
Glyphosate	Gly Star Gold	Albaugh, Inc. / Agri Star	42750-61
Glyphosate	Gly Star Original	Albaugh, Inc. / Agri Star	42750-60
Glyphosate	Gly Star Plus	Albaugh, Inc. / Agri Star	42750-61
Glyphosate	Gly Star Pro	Albaugh, Inc. / Agri Star	42750-61
Glyphosate	Gly-4	Universal Crop Protection Alliance, LLC	42750-60-72693
Glyphosate	Gly-4 Plus	Universal Crop Protection Alliance, LLC	72693-1

Active Ingredient	Trade Name	Manufacturer	EPA Registration Number
Glyphosate	Gly-4 Plus	Universal Crop Protection Alliance, LLC	42750-61-72693
Glyphosate	Glyfos	Cheminova	4787-31
Glyphosate	Glyfos Aquatic	Cheminova	4787-34
Glyphosate	Glyfos PRO	Cheminova	67760-57
Glyphosate	GlyphoMate 41	PBI / Gordon Corporation	2217-847
Glyphosate	Glyphosate 4	Vegetation Man., LLC	73220-6-74477
Glyphosate	Glyphosate 4 +	Alligare, LLC	81927-9
Glyphosate	Glyphosate 4 PLUS	Alligare, LLC	81927-9
Glyphosate	Glyphosate 5.4	Alligare, LLC	81927-8
Glyphosate	Glypro	Dow AgroSciences	62719-324
Glyphosate	Glypro Plus	Dow AgroSciences	62719-322
Glyphosate	Honcho	Monsanto	524-445
Glyphosate	Honcho Plus	Monsanto	524-454
Glyphosate	Imitator 25% Concentration	Drexel Chemical Company	19713-628
Glyphosate	Imitator Aquatic	Drexel Chemical Company	19713-623
Glyphosate	Imitator DA	Drexel Chemical Company	19713-586
Glyphosate	Imitator Plus	Drexel Chemical Company	19713-526
Glyphosate	Imitator RTU	Drexel Chemical Company	19713-607
Glyphosate	KleenUp Pro	Loveland Products, Inc.	34704-890
Glyphosate	Mad Dog Plus	Loveland Products, Inc.	34704-890
Glyphosate	Makaze	Loveland Products, Inc.	34704-890
Glyphosate	Mirage	Loveland Products, Inc.	34704-889
Glyphosate	Mirage Herbicide	UAP-Platte Chem. Co.	524-445-34704
Glyphosate	Mirage Plus	Loveland Products, Inc.	34704-890
Glyphosate	Mirage Plus Herbicide	UAP-Platte Chem. Co.	524-454-34704
Glyphosate	Rattler	Setre (Helena)	524-445-5905
Glyphosate	Razor	Nufarm Americas Inc.	228-366
Glyphosate	Razor Pro	Nufarm Americas Inc.	228-366
Glyphosate	Rodeo	Dow AgroSciences	62719-324
Glyphosate	Roundup Custom	Monsanto	524-343
Glyphosate	Roundup Original	Monsanto	524-445
Glyphosate	Roundup Original II	Monsanto	524-454
Glyphosate	Roundup Original II CA	Monsanto	524-475
Glyphosate	Roundup PRO	Monsanto	524-475
Glyphosate	Roundup PRO Concentrate	Monsanto	524-529
Glyphosate	Roundup PRO Dry	Monsanto	524-505
Glyphosate	Roundup PROMAX	Monsanto	524-579
Glyphosate	Showdown	Helena Chemical Company	71368-25-5905
Glyphosate + 2,4-D	Campaign	Monsanto	524-351
Glyphosate + 2,4-D	Imitator Plus D	Drexel Chemical Company	19713-635
Glyphosate + 2,4-D	Landmaster BW	Albaugh, Inc. / Agri Star	42570-62
Glyphosate + 2,4-D	Landmaster BW	Monsanto	524-351
Imazapic	Nufarm Imazapic 2SL	Nufarm Americas Inc.	71368-99
Imazapic	Panoramic 2SL	Alligare, LLC	66222-141-81927
Imazapic	Plateau	BASF	241-365
Imazapic + Glyphosate	Journey	BASF	241-417
Imazapyr	Arsenal	BASF	241-346
Imazapyr	Arsenal Applicators Conc.	BASF	241-299
Imazapyr	Arsenal PowerLine	BASF	241-431
Imazapyr	Arsenal Railroad Herbicide	BASF	241-273
Imazapyr	Chopper	BASF	241-296
Imazapyr	Ecomazapyr 2SL	Alligare, LLC	81927-22

Active Ingredient	Trade Name	Manufacturer	EPA Registration Number
Imazapyr	Ecomazapyr 2 SL	Vegetation Man., LLC	74477-6
Imazapyr	Habitat	BASF	241-426
Imazapyr	Habitat Herbicide	SePRO Corporation	241-426-67690
Imazapyr	Imazapyr 2 SL	Vegetation Man., LLC	74477-4
Imazapyr	Imazapyr 2SL	Alligare, LLC	81927-23
Imazapyr	Imazapyr 4 SL	Vegetation Man., LLC	74477-5
Imazapyr	Imazapyr 4SL	Alligare, LLC	81927-24
Imazapyr	Polaris	Nufarm Americas Inc.	228-534
Imazapyr	Polaris AC	Nufarm Americas Inc.	241-299-228
Imazapyr	Polaris AC	Nufarm Americas Inc.	228-480
Imazapyr	Polaris AC Complete	Nufarm Americas Inc.	228-570
Imazapyr	Polaris AQ	Nufarm Americas Inc.	241-426-228
Imazapyr	Polaris Herbicide	Nufarm Americas Inc.	241-346-228
Imazapyr	Polaris RR	Nufarm Americas Inc.	241-273-228
Imazapyr	Polaris SP	Nufarm Americas Inc.	228-536
Imazapyr	Polaris SP	Nufarm Americas Inc.	241-296-228
Imazapyr	Rotary 2 SL	Alligare, LLC	81927-6
Imazapyr	SSI Maxim Arsenal 0.5G	SSI Maxim Co., Inc.	34913-23
Imazapyr	SSI Maxim Arsenal 5.0G	SSI Maxim Co., Inc.	34913-24
Imazapyr	Stalker	BASF	241-398
Metsulfuron methyl	AmTide MSM 60DF Herbicide	AmTide, LLC	83851-3
Metsulfuron methyl	Escort DF	DuPont Crop Protection	352-439
Metsulfuron methyl	Escort XP	Bayer Environmental Science	432-1549
Metsulfuron methyl	Escort XP	DuPont Crop Protection	352-439
Metsulfuron methyl	Metsulfuron Methyl DF	Vegetation Man., LLC	74477-2
Metsulfuron methyl	MSM 60	Alligare, LLC	81927-7
Metsulfuron methyl	MSM E-AG 60 EG Herbicide	Etigra, LLC	81959-14
Metsulfuron methyl	MSM E-Pro 60 EG Herbicide	Etigra, LLC	81959-14
Metsulfuron methyl	Patriot	Nufarm Americas Inc.	228-391
Metsulfuron methyl	PureStand	Nufarm Americas Inc.	71368-38
Picloram	Grazon PC	Dow AgroSciences	62719-181
Picloram	OutPost 22K	Dow AgroSciences	62719-6
Picloram	Picloram 22K	Alligare, LLC	81927-18
Picloram	Picloram K	Alligare, LLC	81927-17
Picloram	Tordon 22K	Dow AgroSciences	62719-6
Picloram	Tordon K	Dow AgroSciences	62719-17
Picloram	Triumph 22K	Albaugh, Inc.	42750-79
Picloram	Triumph K	Albaugh, Inc.	42750-81
Picloram	Trooper 22K	Nufarm Americas Inc.	228-535
Rimsulfuron	Laramie 25DF	Alligare, LLC	81927-57
Rimsulfuron	Matrix SG	Dupont Crop Protection	352-768
Sulfometuron methyl	Oust DF	DuPont Crop Protection	352-401
Sulfometuron methyl	Oust XP	Bayer Environmenatl Science	432-1552
Sulfometuron methyl	Oust XP	DuPont Crop Protection	352-601
Sulfometuron methyl	SFM 75	Alligare, LLC	81927-26
Sulfometuron methyl	SFM 75	Vegetation Man., LLC	72167-11-74477
Sulfometuron methyl	SFM E-Pro 75EG	Etigra, LLC	79676-16
Sulfometuron methyl	Spyder	Nufarm Americas Inc.	228-408
Triclopyr	Boulder 6.3	Alligare, LLC	81927-54
Triclopyr	Ecotriclopyr 3 SL	Vegetation Man., LLC	72167-49-74477
Triclopyr	Element 3A	Dow AgroSciences	62719-37
Triclopyr	Element 4	Dow AgroSciences	62719-40
Triclopyr	Forestry Garlon XRT	Dow AgroSciences	62719-553

Active Ingredient	Trade Name	Manufacturer	EPA Registration Number
Triclopyr	Garlon 3A	Dow AgroSciences	62719-37
Triclopyr	Garlon 4	Dow AgroSciences	62719-40
Triclopyr	Garlon 4 Ultra	Dow AgroSciences	62719-527
Triclopyr	Pathfinder II	Dow AgroSciences	62719-176
Triclopyr	Relegate	Nufarm Americas Inc.	228-521
Triclopyr	Relegate RTU	Nufarm Americas Inc.	228-522
Triclopyr	Remedy	Dow AgroSciences	62719-70
Triclopyr	Remedy Ultra	Dow AgroSciences	62719-552
Triclopyr	Renovate 3	SePRO Corporation	62719-37-67690
Triclopyr	Renovate OTF	SePRO Corporation	67690-42
Triclopyr	Tahoe 3A	Nufarm Americas Inc.	228-384
Triclopyr	Tahoe 3A	Nufarm Americas Inc.	228-518
Triclopyr	Tahoe 3A	Nufarm Americas Inc.	228-520
Triclopyr	Tahoe 4E	Nufarm Americas Inc.	228-385
Triclopyr	Tahoe 4E Herbicide	Nufarm Americas Inc.	228-517
Triclopyr	Triclopry 4	Alligare, LLC	81927-11
Triclopyr	Triclopyr 3	Alligare, LLC	81927-13
Triclopyr	Triclopyr 3 SL	Vegetation Man., LLC	72167-53-74477
Triclopyr	Triclopyr RTU	Albaugh, LLC	42750-173
Triclopyr	Triclopyr RTU	Alligare, LLC	81927-33
Triclopyr	Trycera	Helena Chemical Company	5905-580
Triclopyr	Vastlan	Dow AgroSciences	62719-687

1. Approved list as of January 6, 2017.

Table B-3. Adjuvants Approved for Use on BLM Administered Lands[1]

Adjuvant Type	Trade Name	Manufacturer	ARBO II[2]
Surfactants			
Non-ionic Surfactant	90-10 Surfactant	Brewer International	
Non-ionic Surfactant	A-90	Alligare, LLC	
Non-ionic Surfactant	Activate Plus	Winfield Solutions, LLC	
Non-ionic Surfactant	Activator 90	Loveland Products, Inc.	
Non-ionic Surfactant	Ad Spray 90	Helena Chemical Company	
Non-ionic Surfactant	Alligare Surface	Alligare, LLC	
Non-ionic Surfactant	Alligare Surface West	Alligare, LLC	
Non-ionic Surfactant	Alligare Trace	Alligare, LLC	
Non-ionic Surfactant	Aquafact	Crop Production Services	
Non-ionic Surfactant	Aqufact	Aqumix, Inc.	
Non-ionic Surfactant	Audible 80	Exacto, Inc.	
Non-ionic Surfactant	Audible 90	Exacto, Inc.	
Non-ionic Surfactant	Brewer 90-10	Brewer International	
Non-ionic Surfactant	Chempro S-820	Chemorse Ltd.	
Non-ionic Surfactant	Chempro S-910	Chemorse Ltd.	
Non-ionic Surfactant	Chemsurf 80	Chemorse Ltd.	
Non-ionic Surfactant	Chemsurf 90	Chemorse Ltd.	
Non-ionic Surfactant	Cornbelt Premier 90	Van Diest Supply Co.	
Non-ionic Surfactant	Cornbelt Trophy Gold	Van Diest Supply Co.	
Non-ionic Surfactant	Denali-EA	Wilbur-Ellis Co.	
Non-ionic Surfactant	Elite Platinum	Red River Specialties, Inc.	
Non-ionic Surfactant	EP-90	Eco-Pak, LLC	
Non-ionic Surfactant	Haf-Pynt	Drexel Chemical Company	
Non-ionic Surfactant	Hum-AC 820	Drexel Chemical Company	
Non-ionic Surfactant	Induce	Setre (Helena)	

Adjuvant Type	Trade Name	Manufacturer	ARBO II[2]
Non-ionic Surfactant	Induce	Helena Chemical Company	
Non-ionic Surfactant	Induce pH	Helena Chemical Company	
Non-ionic Surfactant	Inlet	Helena Chemical Company	
Non-ionic Surfactant	LI-700	Loveland Products, Inc.	✓
Non-ionic Surfactant	Magnify	Monterey AgResources	✓
Non-ionic Surfactant	NIS 90:10	Precision Laboratories, LLC	
Non-ionic Surfactant	NIS-EA	Wilbur-Ellis Co.	
Non-ionic Surfactant	No Foam A	Creative Marketing & Research, Inc.	
Non-ionic Surfactant	Optima	Helena Chemical Company	
Non-ionic Surfactant	PAS-800	Drexel Chemical Company	
Non-ionic Surfactant	Preference	Winfield Solutions, LLC	
Non-ionic Surfactant	R-900	Wilbur-Ellis Co.	
Non-ionic Surfactant	Rainer-EA	Wilbur-Ellis Co.	
Non-ionic Surfactant	Range Master	ORO Agri Inc.	
Non-ionic Surfactant	Red River 90	Red River Specialties, Inc.	
Non-ionic Surfactant	Red River NIS	Red River Specialties, Inc.	
Non-ionic Surfactant	Scanner	Loveland Products, Inc.	
Non-ionic Surfactant	Spec 90/10	Helena Chemical Company	
Non-ionic Surfactant	Spray Activator 85	Van Diest Supply Co.	
Non-ionic Surfactant	Spreader 90	Loveland Products, Inc.	
Non-ionic Surfactant	Spret	Helena Chemical Company	
Non-ionic Surfactant	Super Spread 90	Wilbur-Ellis Co.	
Non-ionic Surfactant	Super Spread 7000	Wilbur-Ellis Co.	
Non-ionic Surfactant	Surf-Ac 910	Drexel Chemical Company	
Non-ionic Surfactant	Surf-Ac 820	Drexel Chemical Company	
Non-ionic Surfactant	UAP Surfactant 80/20	Loveland Products, Inc.	
Non-ionic Surfactant	Wetcit	ORO Agri Inc.	
Non-ionic Surfactant	X-77	Loveland Products, Inc.	
Spreader / Sticker	Agri-Trend Spreader	Agri-Trend	
Spreader / Sticker	Attach	Loveland Products, Inc.	
Spreader / Sticker	Aqua-King Plus	Winfield Solutions, LLC	
Spreader / Sticker	Bond	Loveland Products, Inc.	✓
Spreader / Sticker	Bond Max	Loveland Products, Inc.	
Spreader / Sticker	Chempro S-196	Chemorse Ltd.	
Spreader / Sticker	Cohere	Helena Chemical Company	
Spreader / Sticker	CWC 90	CWC Chemical, Inc.	
Spreader / Sticker	Gulfstream	Winfield Solutions, LLC	
Spreader / Sticker	Insist 90	Wilbur-Ellis Co.	
Spreader / Sticker	Lastick	Setre (Helena)	
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	Onside Kick	Exacto, Inc.	
Spreader / Sticker	Pinene II	Drexel Chemical Company	
Spreader / Sticker	Protyx	Precision Laboratories, LLC	
Spreader / Sticker	R-56	Wilbur-Ellis Co.	
Spreader / Sticker	Rocket DL	Monterey AgResources	
Spreader / Sticker	Tactic	Loveland Products, Inc.	✓
Spreader / Sticker	TopFilm	Biosorb, Inc.	
Spreader / Sticker	Widespread Max	Loveland Products, Inc.	
Silicone-based	Aero Dyne-Amic	Helena Chemical Company	
Silicone-based	Aircover	Winfield Solutions, LLC	

Adjuvant Type	Trade Name	Manufacturer	ARBO II[2]
Silicone-based	Alligare OSS / NIS	Alligare, LLC	
Silicone-based	Chempro S-172	Chemorse Ltd.	
Silicone-based	Dyne-Amic	Helena Chemical Company	✓
Silicone-based	Elite Marvel	Red River Specialties, Inc.	
Silicone-based	Freeway	Loveland Products, Inc.	
Silicone-based	Kinetic	Setre (Helena)	✓
Silicone-based	Phase	Loveland Products, Inc.	
Silicone-based	Phase II	Loveland Products, Inc.	
Silicone-based	Scrimmage	Exacto, Inc.	
Silicone-based	SilEnergy	Brewer International	
Silicone-based	Sil-Fact	Drexel Chemical Company	
Silicone-based	Sil-MES 100	Drexel Chemical Company	
Silicone-based	Silnet 200	Brewer International	
Silicone-based	Silwet L-77	Loveland Products, Inc.	
Silicone-based	Speed	Precision Laboratories, LLC	
Silicone-based	Sun Spreader	Red River Specialties, Inc.	
Silicone-based	Syl-coat	Wilbur-Ellis Co.	
Silicone-based	Sylgard 309	Wilbur-Ellis Co.	
Silicone-based	Syl-Tac	Wilbur-Ellis Co.	
	Oil-based		
Crop Oil Concentrate	60/40 Crop Oil Concentrate	Chemorse Ltd.	
Crop Oil Concentrate	Agri-Dex	Helena Chemical Company	✓
Crop Oil Concentrate	Alligare Forestry Oil	Alligare, LLC	
Crop Oil Concentrate	Brewer 83-17	Brewer International	
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	Crop Oil Concentrate	Helena Chemical Company	
Crop Oil Concentrate	Crop Oil Concentrate	Loveland Products, Inc.	
Crop Oil Concentrate	CWR Herbicide Activator	Creative Marketing & Research, Inc.	
Crop Oil Concentrate	Exchange	Precision Laboratories, LLC	
Crop Oil Concentrate	Herbimax	Loveland Products, Inc.	
Crop Oil Concentrate	Maximizer Crop Oil Conc.	Loveland Products, Inc.	
Crop Oil Concentrate	Monterey M.S.O.	Monterey AgResources	
Crop Oil Concentrate	Mor-Act	Wilbur-Ellis Co.	
Crop Oil Concentrate	Peptoil	Drexel Chemical Company	
Crop Oil Concentrate	Power-Line Crop Oil	Land View Inc.	
Crop Oil Concentrate	Primary	Drexel Chemical Company	
Crop Oil Concentrate	Prime Oil	Winfield Solutions, LLC	
Crop Oil Concentrate	R.O.C. Rigo Oil Conc.	Wilbur-Ellis Co.	
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	Superb HC	Winfield Solutions, LLC	✓
Methylated Seed Oil	60/40 MSO	Chemorse Ltd.	
Methylated Seed Oil	Alligare MSO	Alligare, LLC	
Methylated Seed Oil	Alligare MSO West	Alligare, LLC	
Methylated Seed Oil	Atmos	Winfield Solutions, LLC	
Methylated Seed Oil	Conquer	Chemorse Ltd.	
Methylated Seed Oil	Cornbelt Base	Van Diest Supply Co.	
Methylated Seed Oil	Cornbelt Methylates Soy-Stik	Van Diest Supply Co.	
Methylated Seed Oil	Destiny HC	Winfield Solutions, LLC	✓
Methylated Seed Oil	Elite Supreme	Red River Specialties, Inc.	

Adjuvant Type	Trade Name	Manufacturer	ARBO II[2]
Methylated Seed Oil	Hasten	Wilbur-Ellis Co.	
Methylated Seed Oil	Hasten-EA	Wilbur-Ellis Co.	
Methylated Seed Oil	Hot MES	Drexel Chemical Company	
Methylated Seed Oil	Kixyt	Precision Laboratories, LLC.	
Methylated Seed Oil	MES-100	Drexel Chemical Company	
Methylated Seed Oil	Methylated Spray Oil Conc.	Helena Chemical Company	
Methylated Seed Oil	Monterey M.S.O.	Monterey AgResources	
Methylated Seed Oil	MSO Concentrate	Alligare, LLC	
Methylated Seed Oil	MSO Concentrate	Loveland Products, Inc.	
Methylated Seed Oil	Premium MSO	Helena Chemical Company	
Methylated Seed Oil	Persist Ultra	Precision Laboratories, LLC.	
Methylated Seed Oil	Red River Supreme	Red River Specialties, Inc.	
Methylated Seed Oil	Renegade 2.0	Wilbur-Ellis Co.	
Methylated Seed Oil	Renegade-EA	Wilbur-Ellis Co.	
Methylated Seed Oil	Sunburn	Red River Specialties, Inc.	
Methylated Seed Oil	SunEnergy	Brewer International	
Methylated Seed Oil	Sunset	Red River Specialties, Inc.	
Methylated Seed Oil	Sun Wet	Brewer International	
Methylated Seed Oil	Super Kix	Wilbur-Ellis Co.	
Methylated Seed Oil	Super Spread MSO	Wilbur-Ellis Co.	
Methylated Seed Oil + Organosilicone	Alligare MVO Plus	Alligare, LLC	
Methylated Seed Oil + Organosilicone	Syl-Tac-EA	Wilbur-Ellis Co.	
Methylated Seed Oil + Organosilicone	Turbulence	Winfield Solutions, LLC	
Vegetable Oil	Amigo	Loveland Products, Inc.	
Vegetable Oil	BeanOil	Drexel Chemical Company	
Vegetable Oil	Competitor	Wilbur-Ellis Co.	✓
Vegetable Oil	Elite Natural	Red River Specialties, Inc.	
Vegetable Oil	Motion	Exacto, Inc.	
Vegetable Oil	Noble	Winfield Solutions, LLC	
Vegetable Oil	Vegetoil	Drexel Chemical Company	
Fertilizer-based			
Nitrogen-based	Actamaster Soluble Spray Adjuvant	Loveland Products, Inc.	
Nitrogen-based	Actamaster Spray Adjuvant	Loveland Products, Inc.	
Nitrogen-based	Alliance	Winfield Solutions, LLC	
Nitrogen-based	AMS-All	Drexel Chemical Company	
Nitrogen-based	AMS-Supreme	Drexel Chemical Company	
Nitrogen-based	AMS-Xtra	Drexel Chemical Company	
Nitrogen-based	Bronc	Wilbur-Ellis Co.	
Nitrogen-based	Bronc Max	Wilbur-Ellis Co.	✓
Nitrogen-based	Bronc Max EDT	Wilbur-Ellis Co.	
Nitrogen-based	Bronc Plus Dry	Wilbur-Ellis Co.	
Nitrogen-based	Bronc Plus Dry EDT	Wilbur-Ellis Co.	✓
Nitrogen-based	Bronc Total	Wilbur-Ellis Co.	
Nitrogen-based	Cayuse Plus	Wilbur-Ellis Co.	
Nitrogen-based	Class Act NG	Winfield Solutions, LLC	✓
Nitrogen-based	Cornbelt Gardian	Van Diest Supply Co.	
Nitrogen-based	Cornbelt Gardian Plus	Van Diest Supply Co.	
Nitrogen-based	Corral AMS Liquid	Winfield Solutions, LLC	
Nitrogen-based	Dispatch	Loveland Products, Inc.	
Nitrogen-based	Dispatch 111	Loveland Products, Inc.	

Adjuvant Type	Trade Name	Manufacturer	ARBO II[2]
Nitrogen-based	Dispatch 2N	Loveland Products, Inc.	
Nitrogen-based	Dispatch AMS	Loveland Products, Inc.	
Nitrogen-based	Flame	Loveland Products, Inc.	
Nitrogen-based	Holzit	Drexel Chemical Company	
Nitrogen-based	Nitro-Surf	Drexel Chemical Company	
Nitrogen-based	Quest	Helena Chemical Company	
Nitrogen-based	TransActive HC	Helena Chemical Company	
Special Function			
Buffering Agent	Brimstone	Wilbur-Ellis Co.	
Buffering Agent	BS-500	Drexel Chemical Company	
Buffering Agent	Buffers P.S.	Helena Chemical Company	
Buffering Agent	Oblique	Red River Specialties, Inc.	
Buffering Agent	Spray-Aide	Miller Chem. & Fert. Corp.	
Buffering Agent	Tri-Fol	Wilbur-Ellis Co.	
Buffering Agent	Yardage	Exacto, Inc.	
Colorants / Dyes	Alligare Super Marking Dye	Alligare, LLC	
Colorants / Dyes	BullsEye	Milliken Chemical	
Colorants / Dyes	Elite Ruby	Red River Specialties, Inc.	
Colorants / Dyes	Elite Sapphire	Red River Specialties, Inc.	
Colorants / Dyes	Elite Sapphire WSB	Red River Specialties, Inc.	
Colorants / Dyes	Elite Splendor	Red River Specialties, Inc.	
Colorants / Dyes	Hash Mark Blue Liquid	Exacto, Inc.	
Colorants / Dyes	Hash Mark Blue Liquid HC	Exacto, Inc.	
Colorants / Dyes	Hash Mark Blue Powder	Exacto, Inc.	
Colorants / Dyes	Hash Mark Green Liquid	Exacto, Inc.	
Colorants / Dyes	Hash Mark Green Powder	Exacto, Inc.	
Colorants / Dyes	Hi-Light	Becker-Underwood	
Colorants / Dyes	Hi-Light WSP	Becker-Underwood	
Colorants / Dyes	Marker Dye	Loveland Products, Inc.	
Colorants / Dyes	Mark-It Blue	Monterey AgResources	
Colorants / Dyes	Mark-It Red	Monterey AgResources	
Colorants / Dyes	Mystic HC	Winfield Solutions, LLC	
Colorants / Dyes	Signal	Precision Laboratories, LLC	
Colorants / Dyes	SPI-Max Blue Spray Marker	PROKoZ	
Colorants / Dyes	Spray Indicator XL	Helena Chemical Company	
Colorants / Dyes	TurfTrax	Loveland Products, Inc.	
Colorants / Dyes	TurfTrax Blue Spray Indicator	Loveland Products, Inc.	
Compatibility / Suspension Agent	Blendex VHC	Setre (Helena)	
Compatibility / Suspension Agent	Convert	Precision Laboratories, LLC	
Compatibility / Suspension Agent	E Z MIX	Loveland Products, Inc.	
Compatibility / Suspension Agent	Mix	Drexel Chemical Company	
Compatibility / Suspension Agent	Support	Loveland Products, Inc.	
Defoaming Agent	Alligare Anti-Foamer	Alligare, LLC	
Defoaming Agent	Alligare Defoamer	Alligare, LLC	
Defoaming Agent	Cornbelt Defoamer	Van Diest Supply Co.	
Defoaming Agent	Defoamer	Brewer International	
Defoaming Agent	Fast Break	Winfield Solutions, LLC	
Defoaming Agent	Fighter-F 10	Loveland Products, Inc.	
Defoaming Agent	Fighter-F Dry	Loveland Products, Inc.	
Defoaming Agent	Foam Buster	Setre (Helena)	
Defoaming Agent	Foambuster Max	Helena Chemical Company	
Defoaming Agent	Foam Fighter	Miller Chem. & Fert. Corp.	
Defoaming Agent	Fome-Kil	Drexel Chemical Company	

Adjuvant Type	Trade Name	Manufacturer	ARBO II[2]
Defoaming Agent	FTF Defoamer	Wilbur-Ellis Co.	
Defoaming Agent	Gundown Max	Precision Laboratories, LLC	
Defoaming Agent	No Foam	Wilbur-Ellis Co.	
Defoaming Agent	Red River Defoamer	Red River Specialties, Inc.	
Defoaming Agent	Reverse	Exacto, Inc.	
Defoaming Agent	Suppression	Chemorse, Ltd	
Defoaming Agent	Tripleline	Creative Marketing & Research, Inc.	
Defoaming Agent	Unfoamer	Loveland Products, Inc.	
Deposition Aid	Agripharm Drift Control	Walco International	
Deposition Aid	Alligare Downforce	Alligare, LLC	
Deposition Aid	Alligare Pattern	Alligare, LLC	
Deposition Aid	Bivert	Wilbur-Ellis Co.	
Deposition Aid	Border AQ	Precision Laboratories, LLC	
Deposition Aid	Chem-Trol	Chemorse, Ltd	
Deposition Aid	Clasp	Helena Chemical Company	
Deposition Aid	Compadre	Loveland Products, Inc.	
Deposition Aid	Coverage G-20	Wilbur-Ellis Co.	
Deposition Aid	Crosshair	Wilbur-Ellis Co.	
Deposition Aid	CWC Sharpshooter	CWC Chemical, Inc.	
Deposition Aid	Cygnet Plus	Brewer International	✓
Deposition Aid	Direct	Precision Laboratories, LLC	
Deposition Aid	Droplex	Winfield Solutions, LLC	
Deposition Aid	EDT Concentrate	Wilbur-Ellis Co.	
Deposition Aid	Elite Secure Ultra	Red River Specialties, Inc.	
Deposition Aid	Exit	Miller Chem. & Fert. Corp.	
Deposition Aid	Grounded	Helena Chemical Company	
Deposition Aid	Grounded - CA	Helena Chemical Company	
Deposition Aid	Infuse	Loveland Products, Inc.	
Deposition Aid	Intac Plus	Loveland Products, Inc.	
Deposition Aid	Interlock	Winfield Solutions, LLC	✓
Deposition Aid	Liberate	Loveland Products, Inc.	✓
Deposition Aid	LOX	Drexel Chemical Company	
Deposition Aid	LOX PLUS	Drexel Chemical Company	
Deposition Aid	Mist-Control	Miller Chem. & Fert. Corp.	
Deposition Aid	Offside	Exacto, Inc.	
Deposition Aid	Pointblank	Helena Chemical Company	
Deposition Aid	Poly Control 2	Brewer International	
Deposition Aid	ProMate Impel	Helena Chemical Company	
Deposition Aid	Reign	Loveland Products, Inc.	
Deposition Aid	Reign LC	Loveland Products, Inc.	
Deposition Aid	Secure Ultra	Red River Specialties, Inc.	
Deposition Aid	Sta'-Put	Setre (Helena)	
Deposition Aid	Strike Zone DF	Helena Chemical Company	
Deposition Aid	Sustain	Miller Chem. & Fert. Corp.	
Deposition Aid	Syndetic	Chemorse, Ltd	
Deposition Aid	Volare DC	Precision Laboratories, LLC	
Deposition Aid	Weather Gard	Loveland Products, Inc.	
Diluent / Deposition Agent	Bark Oil	Crop Production Services	
Diluent / Deposition Agent	Bark Oil EC	Crop Production Services	
Diluent / Deposition Agent	Elite Premier	Red River Specialties, Inc.	
Diluent / Deposition Agent	Elite Premier Blue	Red River Specialties, Inc.	
Diluent / Deposition Agent	Hy-Grade EC	CWC Chemical, Inc.	

Adjuvant Type	Trade Name	Manufacturer	ARBO II[2]
Diluent / Deposition Agent	Hy-Grade I	CWC Chemical, Inc.	
Diluent / Deposition Agent	Improved JLB Oil Plus	Brewer International	
Diluent / Deposition Agent	In-Place	Wilbur-Ellis Co.	
Diluent / Deposition Agent	JLB Oil Plus	Brewer International	
Diluent / Deposition Agent	Red River Basal Oil	Red River Specialties, Inc.	
Diluent / Deposition Agent	Thinvert TRU	Waldrum Specialties, Inc.	
Diluent / Deposition Agent	Thinvert Concentrate	Waldrum Specialties, Inc.	
Diluent / Deposition Agent	W.E.B. Oil	Wilbur-Ellis Co.	
Foam Marker	Align	Helena Chemical Company	
Foam Marker	F.M.-160	Drexel Chemical Company	
Foam Marker	R-160	Wilbur-Ellis Co.	
Foam Marker	Red River Foam Marker	Red River Specialties, Inc.	
Foam Marker	Trekker Trax	Loveland Products, Inc.	
Foam Marker	Tuff Trax Foam Concentrate	Loveland Products, Inc.	
Invert Emulsion Agent	Redi-vert II	Wilbur-Ellis Co.	
Tank Cleaner	All Clear	Loveland Products, Inc.	
Tank Cleaner	Back Field	Exacto, Inc.	
Tank Cleaner	Cornbelt Tank-Aid	Van Diest Supply Co.	
Tank Cleaner	Elite Vigor	Red River Specialties, Inc.	
Tank Cleaner	Kutter	Wilbur-Ellis Co.	
Tank Cleaner	Neutral-Clean	Wilbur-Ellis Co.	
Tank Cleaner	Pro Tank	Winfield Solutions, LLC	
Tank Cleaner	Red River Tank Cleaner	Red River Specialties, Inc.	
Tank Cleaner	SSC-11	Wilbur-Ellis Co.	
Tank Cleaner	Tank and Equipment Cleaner	Loveland Products, Inc.	
Tank Cleaner	Wipe Out	Helena Chemical Company	
Water Conditioning	AccuQuest WM	Helena Chemical Company	
Water Conditioning	Alligare Water Conditioner	Alligare, LLC	
Water Conditioning	Blendmaster	Loveland Products, Inc.	
Water Conditioning	Breeze	Winfield Solutions, LLC	
Water Conditioning	Choice	Loveland Products, Inc.	
Water Conditioning	Choice Weather Master	Loveland Products, Inc.	
Water Conditioning	Choice Xtra	Loveland Products, Inc.	
Water Conditioning	Climb	Wilbur-Ellis Co.	
Water Conditioning	Completion	Exacto, Inc.	
Water Conditioning	Cornbelt N-Tense	Van Diest Supply Co.	
Water Conditioning	Cut-Rate	Wilbur-Ellis Co.	✓
Water Conditioning	Elite Imperial	Red River Specialties, Inc.	
Water Conditioning	Hel-Fire	Helena Chemical Company	
Water Conditioning	Import	Precision Laboratories, LLC	
Water Conditioning	Sequestra	Drexel Chemical Company	
Water Conditioning	Smoke	Helena Chemical Company	
Water Conditioning	Transport LpH	Precision Laboratories, LLC	
Water Conditioning	Transport Plus	Precision Laboratories, LLC	

1. Approved list as of January 6, 2017.
2. Approved for use near water under ARBO II

Appendix C - Herbicide Risk Assessment Summaries

See the *Human Health and Ecological Risk Assessments* section in Chapter 2 for an introduction to the Risk Assessments, and to the risk tables presented in this Appendix and used in the individual analysis in Chapter 3.

Risk[83]

EPA terms	
LD_{50}	**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**

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. Aquatic herbicides require extra testing over and above what is required for the normal registration process before they can be registered for aquatic application. This includes dissipation studies in water and aquatic sediments, accumulation in non-target organisms and fish and shellfish tolerances. 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}[84]. 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 C-1 shows the three categories that the EPA uses for classifying herbicides (USDI 1992a).

[83] Adapted from the Oregon FEIS (USDI 2010a:85-91).
[84] or LC_{50} (lethal concentration) in the case of aquatic organisms.

Table C-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 2,000	From 0.2 to 2	Over one teaspoonful to one ounce
III – Slightly Toxic	CAUTION	From 500 to 5,000	From 2,000 to 20,000	From 2 to 20	Over one ounce to one pint or one pound.

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 (USEPA 2007). 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[85] 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 herbicides analyzed in this EA. These complete Risk Assessments are included in the Oregon FEIS as *Appendix 8: Risk Assessments* (uncirculated) and the 2007 and 2016 PEISs. 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[86] 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, the 2016 PEIS, or by the Forest Service for the 2005 *Pacific Northwest Region Invasive Plant Program EIS* (see Table C-2). The Risk Assessments, related separate analyses, and the PEISs include analysis of degradates and other

[85] Lethal or sub-lethal.
[86] An ecological entity such as a human, fish, plant, or slug.

ingredients for which information is available and not constrained by confidential business information 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.

Table C-2. *Human Health and Ecological Risk Assessment Sources*

	Human Health	Ecological
2,4-D	BLM (2016)	
Aminopyralid	BLM (2016)	
Chlorsulfuron	Forest Service	BLM (2007)
Clopyralid	BLM (2016)	
Dicamba	Forest Service	
Dicamba + diflufenzopyr	NA	BLM (2007)
Diflufenzopyr	BLM (2007)	NA
Fluridone	BLM (2007)	
Fluroxypyr	BLM (2016)	
Glyphosate	Forest Service	
Imazapic	BLM (2007)	
Imazapyr	Forest Service	
Metsulfuron methyl	Forest Service	
Picloram	Forest Service	
Rimsulfuron	BLM (2016)	
Sulfometuron methyl	BLM (2007)	
Triclopyr	Forest Service	
Herbicides analyzed for Research and Demonstration		
Fluazifop-P-butyl	Forest Service[1]	
Pseudomonas fluorescens	NA	

1. Scoping / screening level risk assessment, not adopted by the BLM.

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 herbicides moving outside the treatment area. 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. 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 (2005 and 2016)

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 (USEPA 2001:51-55).

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[87] 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.

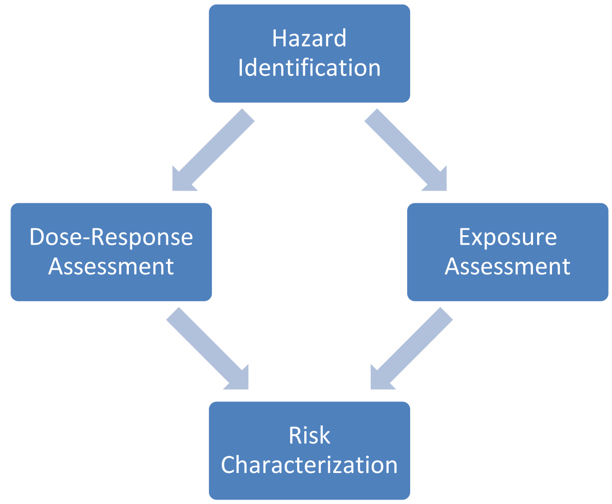
Figure C-1 shows the basis for Risk Assessments, which consists of the following parts:

- *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).

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.

[87] 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 2005:4-73). 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 2005:4-73)

Figure C-1. Basis for Risk Assessments



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 have an effect. 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 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 A-1). The low, moderate, or high human health risk categories shown on Tables C-3 through C-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 C-3 and C-6 show herbicide risks to vegetation, from BLM and Forest Service Risk Assessments respectively. Tables C-4 and C-7 show herbicide risks to wildlife, fish, and aquatic invertebrates and Tables C-5 and C-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. Table 3-8 (see Chapter 3, *Fish and Aquatic Organisms* Issue 1) shows risks to aquatic organisms (flora and fauna) from aquatic formulations of herbicides. These risk ratings may differ from risk ratings shown in Tables C-3 through C-7, as those risk ratings show the most conservative rating from all formulations (not just the aquatic formulation).

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 invasive plant 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 C-3. BLM-Evaluated Herbicide Risk Categories for Vegetation

Application Scenario	**Chlorsulfuron**		**Fluridone**		**Imazapic**		**Overdrive ©[3]**		**Sulfometuron**		**Aminopyralid**		**Fluroxypyr**		**Rimsulfuron**	
	Typ.[1]	Max	Typ.	Max	Typ.	Max	Typ.	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]	H [1:1]	H [1:1]	H [1:1]	H [1:1]	H [1:1]	H [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]	H [1:1]	H [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]	0 [2:2]	0 [4:4]	0 [2:2]	L [2:4]	H [1:2]	M [2:4]
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]	0 [2:2]	0 [2:2]	0 [2:2]	0 [2:2]	H [1:2]	H [1:2]
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]	0 [2:2]	0 [4:4]	0 [2:2]	L [2:4]	H [1:2]	M [2:4]
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]	L [10:18]	L [10:18]	L [11:18]	L [11:18]	L [9:18]	L [9:18]
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]	L [10:18]	L [10:18]	L [13:18]	L [11:18]	L [9:18]	L [8:18]
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]	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]	0 [24:36]	0 [23:36]
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]	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]	0 [24:36]	0 [23:36]
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]	0 [42:42]	0 [42:42]	0 [42:42]	0 [42:42]	0 [42:42]	0 [42:42]
Special Status	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]	0 [42:42]	0 [42:42]	0 [42:42]	0 [42:42]	0 [42:42]	0 [42:42]

Application Scenario	**Chlorsulfuron**		**Fluridone**		**Imazapic**		**Overdrive ©**[3]		**Sulfometuron**		**Aminopyralid**		**Fluroxypyr**		**Rimsulfuron**	
	Typ.[1]	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max
terrestrial plants																
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]	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]	0 [55:84]	0 [54:84]
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]	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]
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]	0 [9:9]	0 [8:9]	0 [9:9]	0 [8:9]	0 [8:9]	0 [8:9]
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]	0 [8:9]	0 [8:9]	0 [8:9]	0 [7:9]	0 [8:9]	0 [8:9]
Aquatic plants, pond	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
Aquatic plants, stream	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE

Shading denotes herbicides that are limited by 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 2005a-f, AECOM 2014a, b, 2015) 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.
3. Overdrive is a formulation of diflufenzopyr + dicamba.

Table C-4. BLM-Evaluated Herbicide Risk Categories for Wildlife, Fish, and Aquatic Species

Application Scenario	**Chlorsulfuron**		**Fluridone**		**Imazapic**		**Overdrive ©**[3]		**Sulfometuron**		**Aminopyralid**		**Fluroxypyr**		**Rimsulfuron**	
	Typ.[1]	Max[1]	Typ.	Max	Typ.	Max	Typ.	Max	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	0	0	0	0	0	0
Pollinating insect – 100% absorption	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Application Scenario	Chlorsulfuron		Fluridone		Imazapic		Overdrive ©[3]		Sulfometuron		Aminopyralid		Fluroxypyr		Rimsulfuron	
	Typ.[1]	Max[1]	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max
Small mammal – 1st order dermal absorption	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fish pond	0	0	0	0	0	0	0	0	0	0	0 [2:2]	0 [4:4]	0 [2:2]	0 [4:4]	0 [2:2]	0 [4:4]
Fish stream	0	0	0	L	0	0	0	0	0	0	0 [2:2]	0 [2:2]	0 [2:2]	0 [2:2]	0 [2:2]	0 [2:2]
Aquatic invertebrates pond	0	0	0	L	0	0	0	0	0	0	0 [2:2]	0 [4:4]	0 [2:2]	0 [4:4]	0 [2:2]	0 [4:4]
Aquatic invertebrates stream	0	0	0	L	0	0	0	0	0	0	0 [2:2]	0 [2:2]	0 [2:2]	0 [2:2]	0 [2:2]	0 [2:2]
Special Status Species																
Small mammal – 100% absorption	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pollinating insect – 100% absorption	0	0	0	0	0	0	0	0	0	0	0	0	L	L	0	0
Small mammal – 1st order dermal absorption	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fish pond	0	0	0	M	0	0	0	0	0	0	0 [2:2]	0 [4:4]	0 [2:2]	0 [2:4]	0 [2:2]	0 [4:4]
Fish stream	0	0	0	L	0	0	0	0	0	0	0 [2:2]	0 [2:2]	0 [2:2]	0 [2:2]	0 [2:2]	0 [2:2]
Aquatic invertebrates pond	0	0	0	H	0	0	0	0	0	0	0 [2:2]	0 [4:4]	0 [2:2]	0 [3:4]	0 [2:2]	0 [4:4]
Aquatic invertebrates stream	0	0	0	L	0	0	0	0	0	0	0 [2:2]	0 [2:2]	0 [2:2]	0 [2:2]	0 [2:2]	0 [2:2]
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	0	0	0	0	0	0
Pollinating insect – 100% absorption	0	0	0	0	0	0	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	0	0	0	0	0	0
Special Status Species																
Small mammal – 100% absorption	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pollinating insect – 100% absorption	0	0	0	0	0	0	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	0	0	0	0	0	0
Ingestion of Food Items Contaminated by Direct Spray																

Application Scenario	Chlorsulfuron		Fluridone		Imazapic		Overdrive ©[3]		Sulfometuron		Aminopyralid		Fluroxypyr		Rimsulfuron	
	Typ.[1]	Max[1]	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max
Non Special Status Species																
Small mammalian herbivore – acute	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small mammalian herbivore – chronic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Large mammalian herbivore – acute	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Large mammalian herbivore – chronic	0	0	0	0	0	0	L	M	0	0	0	0	0	0	0	0
Small avian insectivore – acute	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small avian insectivore – chronic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Large avian herbivore – acute	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Large avian herbivore – chronic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Large mammalian carnivore – acute	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Large mammalian carnivore – chronic	0	0	0	0	0	0	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	0	0	0	0	0	0
Small mammalian herbivore – chronic	0	0	0	L	0	0	0	0	0	0	0	0	0	0	0	0
Large mammalian herbivore – acute	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Large mammalian herbivore – chronic	0	0	0	0	0	0	L	M	0	0	0	0	0	0	0	0
Small avian insectivore – acute	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small avian insectivore – chronic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Large avian herbivore – acute	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Large avian herbivore – chronic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Large mammalian carnivore – acute	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Large mammalian carnivore – chronic	0	0	0	0	0	0	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	0 [2:2]	0 [4:4]	0 [2:2]	0 [4:4]	0 [2:2]	0 [4:4]
Aquatic invertebrates, pond	NE	0	NE	H	NE	0	NE	0	NE	0	0 [2:2]	0 [4:4]	0 [2:2]	0 [4:4]	0 [2:2]	0 [4:4]
Special Status Species																
Fish pond	NE	0	NE	M	NE	0	NE	0	NE	0	0 [2:2]	0 [4:4]	0 [2:2]	0 [2:4]	0 [2:2]	0 [4:4]
Aquatic invertebrates, pond	NE	0	NE	H	NE	0	NE	0	NE	0	0 [2:2]	0 [4:4]	0 [2:2]	0 [3:4]	0 [2:2]	0 [4:4]

Application Scenario	Chlorsulfuron		Fluridone		Imazapic		Overdrive ©[3]		Sulfometuron		Aminopyralid		Fluroxypyr		Rimsulfuron	
	Typ.[1]	Max[1]	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max
Off-Site Drift																
Non Special Status Species																
Fish, pond	0	0	NE	NE	0	0	0	0	0	0	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]
Fish, stream	0	0	NE	NE	0	0	0	0	0	0	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]
Aquatic invertebrates, pond	0	0	NE	NE	0	0	0	0	0	0	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]
Aquatic invertebrates, stream	0	0	NE	NE	0	0	0	0	0	0	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]
Special Status Species																
Fish, pond	0	0	NE	NE	0	0	0	0	0	0	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]
Fish, stream	0	0	NE	NE	0	0	0	0	0	0	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]
Aquatic invertebrates, pond	0	0	NE	NE	0	0	0	0	0	0	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]
Aquatic invertebrates, stream	0	0	NE	NE	0	0	0	0	0	0	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]
Surface Runoff																
Non Special Status Species																
Fish, pond	0	0	NE	NE	0	0	0	0	0	0	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]
Fish, stream	0	0	NE	NE	0	0	0	0	0	0	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]
Aquatic invertebrates, pond	0	0	NE	NE	0	0	0	0	0	0	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]
Aquatic invertebrates, stream	0	0	NE	NE	0	0	0	0	0	0	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]
Special Status Species																
Fish, pond	0	0	NE	NE	0	0	0	0	0	0	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]
Fish, stream	0	0	NE	NE	0	0	0	0	0	0	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]
Aquatic invertebrates, pond	0	0	NE	NE	0	0	0	0	0	0	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]

Application Scenario	Chlorsulfuron		Fluridone		Imazapic		Overdrive ©[3]		Sulfometuron		Aminopyralid		Fluroxypyr		Rimsulfuron	
	Typ.[1]	Max[1]	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max
Aquatic invertebrates, stream	0	0	NE	NE	0	0	0	0	0	0	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]

Shading denotes herbicides that are limited by 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 2005a-f, AECOM 2014a, b, 2015) 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.
3. Overdrive is a formulation of diflufenzopyr + dicamba.

Table C-5. BLM-Evaluated Herbicide Risk Categories for Human Health

Receptor	Diflufenzopyr			Fluridone[2]			Imazapic			Sulfometuron			Aminopyralid			Fluroxypyr			Rimsulfuron[3]		
	Typ[1]	Max[1]	Accid	Typ	Max	Accid	Typ	Max	Accid	Typ	Max	Accid	Typ	Max	Accid	Typ	Max	Accid	Typ	Max	Accid
Hiker / hunter (adult)	0[4]	0	0	0	0	0	NC	NC	NE	NC	NC	NE	NC	NC	NE	NC	NC	NE	0	0	0
Berry picker (child)	0	0	0	0	0	L	NC	NC	NE	NC	NC	NE	NC	NC	NE	NC	NC	NE	0	0	0
Berry picker (adult)	0	0	0	0	0	0	NC	NC	NE	NC	NC	NE	NC	NC	NE	NC	NC	NE	0	0	0
Angler (adult)	0	0	0	0	0	0	NC	NC	NE	NC	NC	NE	NC	NC	NE	NC	NC	NE	0	0	0
Residential – contaminated water (child)	0	0	0	0	0	L	NC	NC	NE	NC	NC	NE	NC	NC	NE	NC	NC	NE	0	0	0
Residential – contaminated water (adult)	0	0	0	0	0	L	NC	NC	NE	NC	NC	NE	NC	NC	NE	NC	NC	NE	0	0	0
Native American (child)	0	0	0	0	0	0	0	0	0	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	0	0	0	0	0	0	0	0	0
Swimmer (child)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NE	NE	NE
Swimmer (adult)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NE	NE	NE
Human / backpack – applicator / mixer / loader	0	0	NE	0	0	L-H	0	0	NE	0	0	NE	0	0	NE	0	0	NE	0	0	L - M
Human / horseback - applicator	0	0	NE	0	0	L-H	0	0	NE	0	0	NE	0	0	NE	0	0	NE	0	0	L - M
Human / horseback – mixer / loader	0	0	NE	0	0	L-H	0	0	NE	0	0	NE	0	0	NE	0	0	NE	0	0	L - M
Human / horseback – applicator / mixer / loader	0	0	NE	0	0	L-H	0	0	NE	0	0	NE	0	0	NE	0	0	NE	0	0	L - M
ATV – applicator[5]	0	0	NE	0	0	L-H	0	0	NE	0	0	NE	0	0	NE	0	0	NE	0	0	L - M
ATV – mixer / loader	0	0	NE	0	0	L-H	0	0	NE	0	0	NE	0	0	NE	0	0	NE	0	0	L - M
ATV – applicator / mixer / loader	0	0	NE	0	0	L-H	0	0	NE	0	0	NE	0	0	NE	0	0	NE	0	0	L - M

Receptor	Diflufenzopyr			Fluridone[2]			Imazapic			Sulfometuron			Aminopyralid			Fluroxypyr			Rimsulfuron[3]		
	Typ[1]	Max[1]	Accid	Typ	Max	Accid	Typ	Max	Accid	Typ	Max	Accid	Typ	Max	Accid	Typ	Max	Accid	Typ	Max	Accid
Truck - applicator[5]	0	0	NE	0	0	L-H	0	0	NE	0	0	NE	0	0	NE	0	0	NE	0	0	L - M
Truck – mixer / loader	0	0	NE	0	0	L-H	0	0	NE	0	0	NE	0	0	NE	0	0	NE	0	0	L - M
Truck – applicator / mixer / loader	0	0	NE	0	0	L-H	0	0	NE	0	0	NE	0	0	NE	0	0	NE	0	0	L - M
Boat - applicator	NE	NE	NE	0	0	L-H	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
Boat – mixer / loader	NE	NE	NE	0	0	L-H	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
Boat – applicator / mixer / loader	NE	NE	NE	0	0	L-H	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE

Shading denotes herbicides that are limited by 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. For all worker receptors accidentally exposed to rimsulfuron, there is low risk from exposure to solutions mixed with the typical application rate, moderate risk from exposure to solutions mixed with the maximum application rate.

4. 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); NE = Not evaluated; and NC = Not Calculated (based on toxicity assessment, no dose response values are available due to low toxicity). The reported risk category represents the typical / most common risk level for estimated risks from various time periods. See the Vegetation Treatments Programmatic EISs Human Health Risk Assessments Final Reports (ENSR 2005g, AECOM 2014c) and for the range of risk levels for each scenario.

5. ATV and Truck categories include spot and boom / broadcast application scenarios.

Table C-6. Forest Service-Evaluated Herbicide Risk Categories for Vegetation

Application Scenario	**2,4-D[1,3]**		**Clopyralid**		**Dicamba**		**Glyphosate[2,3]**		**Imazapyr[2]**		**Metsulfuron**		**Picloram[2]**		**Triclopyr[2,3]**		**Fluazifop-P-butyl[6]**	
	Typ.[4]	Max[4]	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	0.1[6]	0.375[6]
Terrestrial Plants																		
Direct spray, susceptible plants	H[5]	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	M	M
Direct spray, tolerant plants	L	L	0	L	0	0	L	M	L	L	L	M	L	M	0	L	0	0
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]	M [3:6]	H [3:6]	L [4:6]	M [4:6]	H [3:6]	H [4:6]	L [3:6]	M [3:6]	0 [6:6]	0 [5:6]
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 [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]
Off-site drift, backpack directed foliar, susceptible plants	0 [5:6]	0 [4:6]	NE	NE	NE	NE	L [3:6]	M [3:6]	M [3:6]	M [4:6]	NE	NE	M [3:6]	M [4:6]	0 [4:6]	0 [4:6]	0 [6:6]	0 [6:6]
Off-site drift, backpack directed foliar, tolerant plants	0 [6:6]	0 [6:6]	NE	NE	NE	NE	0 [6:6]	0 [6:6]	0 [6:6]	0 [6:6]	NE	NE	0 [6:6]	0 [6:6]	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	H	H	0 [21:30]	0 [18:30]	H	H	L	M	0	0
Surface runoff, tolerant plants	0 [30:30]	0 [29:30]	0 [30:30]	0 [28:30]	0 [30:30]	0 [30:30]	0	0	L	M	0 [25:30]	0 [22:30]	0	0	0	0	0	0
Aquatic Plants																		
Accidental spill, susceptible macrophytes	H	H	H	H	NE	NE	H	H	H	H	H	H	NE	NE	H	H	NE	NE
Accidental spill, susceptible algae	H	H	L	L	H	H	H	H	L	L	M	H	H	H	H	H	H	H
Accidental spill, tolerant algae	L	M	0	0	0	L	M	M	0	0	L	M	0	0	M	H	L	L
Acute exposure, susceptible macrophytes	M	H	0	0	NE	NE	L	L	M	H	L	L	NE	NE	H	H	NE	NE

Application Scenario	2,4-D[1,3]		Clopyralid		Dicamba		Glyphosate[2,3]		Imazapyr[2]		Metsulfuron		Picloram[2]		Triclopyr[2,3]		Fluazifop-P-butyl[6]	
	Typ.[4]	Max[4]	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	0.1[6]	0.375[6]
Acute exposure, susceptible algae	L	L	0	0	0	L	L	L	0	0	0	0	L	L	M	H	M	M
Acute exposure, tolerant algae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chronic exposure, susceptible macrophytes	0	L	0	0	NE	NE	0	0	M	M	0	0	NE	NE	H	H	NE	NE
Chronic exposure, susceptible algae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	L	L	M
Chronic exposure, tolerant algae	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 Mitigation Measures to typical application rates where feasible.
1. In the 2010 Oregon FEIS, 2,4-D maximum risk ratings were calculated at 4 lbs. / acre, although the Oregon FEIS stated that the BLM maximum rate was 1.9 lbs. / acre. The risk ratings in this table reflect a maximum rate of 1.9 lbs. / acre.
2. Glyphosate, imazapyr, picloram, and triclopyr risk assessments were updated in 2011. The risk ratings in this table reflect these 2011 Risk Assessments and may differ from the risk ratings shown in the 2010 Oregon FEIS.
3. Risk categories for the more toxic formulations are presented here.
4. Typ = Typical application rate; and Max = Maximum application rate.
5. 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.
6. Taken from scoping / screening level Risk Assessment Final Report (SERA 2014).

Table C-7. Forest Service-Evaluated Herbicide Risk Categories for Wildlife, Fish, and Aquatic Species

Application Scenario	2,4-D[1, 3]		Clopyralid		Dicamba		Glyphosate[2,3]		Imazapyr[2]		Metsulfuron methyl		Picloram		Triclopyr[2,3]		Fluazifop-P-butyl[6]	
	Typ[4]	Max[4]	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	0.1[6]	0.375[6]
Mammals																		
Acute / Accidental Exposures																		
Direct spray, small mammal, 1st order absorption	0[5]	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	0	0	0	L	0	0	0	L	0	0
Consumption of contaminated fruit, small mammal	L	L	0	0	0	L	0	L	0	0	0	0	0	0	0	L	0	0
Consumption of contaminated grass, large mammal	L	L	L	L	L	M	L	L	0	0	0	L	0	0	M	H	0	0

Application Scenario	2,4-D[1, 3]		Clopyralid		Dicamba		Glyphosate[2,3]		Imazapyr[2]		Metsulfuron methyl		Picloram		Triclopyr[2,3]		Fluazifop-P-butyl[6]	
	Typ[4]	Max[4]	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	0.1[6]	0.375[6]
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
Consumption of contaminated water, small mammal, stream	NE	NE	0	0	0	0	NE	NE	NE	NE	0	0	NE	NE	NE	NE	0	0
Consumption of contaminated insects, small mammal	L	L	L	L	L	M	L	L	0	0	0	L	0	0	0	L	0	0
Consumption of contaminated small mammal, predatory mammal	L	L	0	0	0	0	0	0	0	0	0	0	0	0	0	L	0	0
Chronic Exposures																		
Consumption of contaminated vegetation, small mammal, on- site	M	M	0	0	0	0	L	L	0	0	0	0	L	M	L	M	L	M
Consumption of contaminated vegetation, small mammal, off- site	NE	NE	0	0	0	0	NE	NE	NE	NE	0	0	NE	NE	NE	NE	NE	NE
Consumption of contaminated vegetation, large mammal, on- site	L	L	0	L	0	0	0	L	0	0	0	0	0	L	M	H	L	L
Consumption of contaminated vegetation, large mammal, off -site	NE	NE	0	0	0	0	NE	NE	NE	NE	0	0	NE	NE	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	0	0	0	0	0	0	L	M	0	0
Consumption of contaminated insects, small bird	0	L	0	L	L	M	0	L	0	0	0	0	0	0	L	M	0	0
Consumption of contaminated small mammal, predatory bird	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Consumption of contaminated fish, predatory bird, spill	0	0	0	0	0	0	0	0	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	L	L	M	L	M
Consumption of contaminated vegetation, large bird, off-site	NE	NE	0	0	0	0	NE	NE	NE	NE	0	0	NE	NE	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	L
Aquatic Species																		

Application Scenario	2,4-D[1, 3]		Clopyralid		Dicamba		Glyphosate[2,3]		Imazapyr[2]		Metsulfuron methyl		Picloram		Triclopyr[2,3]		Fluazifop-P-butyl[6]	
	Typ[4]	Max[4]	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	0.1[6]	0.375[6]
Acute / Accidental Exposures																		
Fish (susceptible species) – accidental spill	H	H	L	L	0	L	H	H	0	L	0	L	M	M	H	H	M	M
Fish (tolerant species) – accidental spill	L	L	0	0	0	0	M	H	NE	NE	0	0	0	L	M	H	M	M
Fish (susceptible species) – acute exposure, peak EEC	L	L	0	0	0	0	L	M	0	0	0	0	0	0	0	L	0	0
Fish (tolerant species) – acute exposure, peak EEC	0	0	0	0	0	0	0	L	NE	NE	0	0	0	0	0	0	0	0
Aquatic invertebrates – accidental spill	0	0	L	M	L	M	M	M	0	0	0	0	0	0	L	M	L	L
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	NE	NE
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	NE	NE	0	0	NE	NE	NE	NE	NE	NE
Consumption of fruit by an herbivorous insect	NE	NE	NE	NE	NE	NE	0	0	0	0	NE	NE	0	0	0	0	0	0
Consumption of broadleaf / small insects by an herbivorous Insect	NE	NE	NE	NE	NE	NE	L	L	0	0	NE	NE	0	0	0	L	0	0
Consumption of short grass by an herbivorous insect	NE	NE	NE	NE	NE	NE	L	L	0	0	NE	NE	0	0	0	L	0	0
Consumption of tall grass by an herbivorous insect	NE	NE	NE	NE	NE	NE	L	L	0	0	NE	NE	0	0	0	L	0	0

Shading denotes herbicides that are limited by Mitigation Measures to typical application rates where feasible.
1. In the 2010 Oregon FEIS, 2,4-D maximum risk ratings were calculated at 4 lbs. / acre, although the Oregon FEIS stated that the BLM maximum rate was 1.9 lbs. / acre. The risk ratings in this table reflect a maximum rate of 1.9 lbs. / acre.
2. Glyphosate, imazapyr, picloram, and triclopyr risk assessments were updated in 2011. The risk ratings in this table reflect these 2011 Risk Assessments and may differ from the risk ratings shown in the 2010 Oregon FEIS.
3. Risk levels for the more toxic formulations are presented here.
4. Typ = typical application rate; and Max = maximum application rate.
5. 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 cold-water fish, such as trout, salmon, and federally listed species. Fish tolerant species include warm water fish, such as fathead minnows.

6. Taken from scoping / screening level Risk Assessment Final Report (SERA 2014)

Table C-8. Forest Service-Evaluated Herbicide Risk Categories for Human Health

Application Scenario	2,4-D[1, 3]		Chlorsulfuron		Clopyralid		Dicamba		Glyphosate[2,3]		Imazapyr[2]		Metsulfuron methyl		Picloram		Triclopyr[2,3]		Fluazifop-P-butyl[5]	
	Typ[4]	Max[4]	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	0.1[5]	0.375[5]
Workers																				
General Exposures																				
Directed foliar and spot treatments (backpack)	L[5]	L	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	L	0	0
Broadcast ground spray (boom spray)	L	L	0	L	0	0	0	L	0	0	0	0	0	0	0	0	0	L	0	0
Aquatic applications	L	L	NE	NE	NE	NE	NE	NE	0	0	0	0	NE	NE	NE	NE	0	L	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	L	0	0
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	L	0	0
Dermal - contaminated vegetation, woman	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	L	0	0
Consumption of contaminated fruit	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	L	0	0
Consumption of contaminated water - pond, spill	NE	NE	0	0	0	L	0	L	NE	NE	NE	NE	0	0	NE	NE	NE	NE	NE	NE
Consumption of contaminated water - stream, ambient	NE	NE	0	0	0	0	0	0	NE	NE	NE	NE	0	0	NE	NE	NE	NE	NE	NE
Consumption of contaminated water - child	0	0	NE	NE	NE	NE	NE	NE	0	0	0	0	NE	NE	0	0	0	L	0	0

Application Scenario	**2,4-D[1, 3]**		**Chlorsulfuron**		**Clopyralid**		**Dicamba**		**Glyphosate[2,3]**		**Imazapyr[2]**		**Metsulfuron methyl**		**Picloram**		**Triclopyr[2,3]**		**Fluazifop-P-butyl[5]**	
	Typ[4]	Max[4]	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	0.1[5]	0.375[5]
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	L
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	L	0	0
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 Mitigation Measures to typical application rates where feasible.
1. In the 2010 Oregon FEIS, 2,4-D maximum risk ratings were calculated at 4 lbs. / acre, although the Oregon FEIS stated that the BLM maximum rate was 1.9 lbs./acre. The risk ratings in this table reflect a maximum rate of 1.9 lbs. / acre.
2. Glyphosate, imazapyr, picloram, and triclopyr risk assessments were updated in 2011. The risk ratings in this table reflect these 2011 Risk Assessments and may differ from the risk ratings shown in the 2010 Oregon FEIS.
3. Where different formulations exist, risks reported are the most conservative.
4. Typ = Typical application rate; and Max = Maximum application rate.
5. 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. Risk categories are based on comparison to the HQ of 1 for typical and maximum application rates.
6. Taken from scoping / screening level Risk Assessment Final Report (SERA 2014).

Appendix D - Invasive Plant Infestations

Table D-1. Invasive Plants Mapped in NISIMS by Infestation Size - NISIMS (described in the *Inventory* section in Chapter 2) includes 13,211 acres of documented invasive plant sites on the Medford District. These are summarized on Table 2-2, and are displayed in Maps 2-1 (maps are located at the end of this EA).Table D-1 shows invasive plants mapped in NISIMS by infestation size.

Table D-2. Species and Species Groups

Table D-3. Estimated Total Treatment Acres, Categories I and II, Including Tank Mixes and Application Rates

Table D-4. Estimated Total Treatment Acres, Categories I and II (Not Including Tank Mixes or Application Rates)

Table D-1. Invasive Plants Mapped in NISIMS by Infestation Size

Common Name	Scientific Name	NISIMS Code	< 0.1 Acres		0.1 to < 0.5		0.5 to <1		1 to < 5		5 to <20		20 to < 100		> 100	
			Acres	Sites	Acres	Sites	Acres	Sites	Acres	Sites	Acres	Sites	Acres	Sites	Acres	Sites
Russian knapweed	*Acroptilon repens*	ACRE3	0.24	19	0.51	2	0.87	1	1.25	1	-	-	-	-	-	-
Jointed goatgrass	*Aegilops cylindrica*	AECY	-	-	0.63	2	1.11	2	2.5	1	5.96	1	-		-	-
Barbed goatgrass	*Aegilops triuncialis*	AETR	-	-	0.1	1	-	-	1.1	1	-	-	-		-	-
Tree of heaven	*Ailanthus altissima*	AIAL	0.05	1	0.46	3	-	-	-	-	11.31	1	-		-	-
Garlic mustard	*Alliaria petiolata*	ALPE4	1.7	30	20.88	84	0.5	1	6.8	3	25.71	3	103.23	2	-	-
Pale alyssum	*Alyssum alyssoides*	ALAL3	-	-	-	-	0.66	1	-	-	-	-	-	-	-	-
Yellowtuft	*Alyssum corsicum, A. murale*	ALCO16, ALMU	0.04	1	2.13	8	-	-	1.32	1	17.06	2	20.21	1	-	-
Annual ragweed	*Ambrosia artemisiifolia*	AMAR2	0	1	-		-	-	4.1	3	-	-	-	-	-	-
Falsebrome	*Brachypodium sylvaticum*	BRSY	0.14	12	0.84	5	0.78	1	1.65	1	-	-	-	-	-	-
Cheatgrass	*Bromus tectorum*	BRTE	0.68	11	1.56	8	-	-	6.19	3	-	-	-	-	-	-
Musk thistle	*Carduus nutans*	CANU4	-	-	-	-	-	-	6.36	3	-	-	-	-	-	-
Italian thistle	*Carduus pycnocephalus*	CAPY2	0	1			-	-	-	-	-	-	-	-	-	-
Woolly distaff-thistle	*Carthamus lanatus*	CALA20	-	-	0.23	1	-	-	-	-	-	-	-	-	-	-
Meadow knapweed	*Centaurea × moncktonii*	CEMO6, CEDE5, CEDET	12.12	650	116.24	461	50.41	71	238.25	117	199.93	23	72.08	3	-	-
Red star thistle	*Centaurea calcitrapa*[1]	CECA2	0	1	-	-	-	-	-	-	-	-	-	-	-	-
Diffuse knapweed	*Centaurea diffusa*	CEDI3	0.51	26	8.05	32	7.93	11	24.03	11	38.47	5	-	-	-	-
Maltese starthistle	*Centaurea melitensis*	CEME2	0.18	15	0.65	4	1.18	2	3.87	2	-	-	38.92	1	-	-
Yellow starthistle	*Centaurea solstitialis*	CESO3	47.2	2207	280.88	1260	183.45	271	1041.37	441	1136.51	120	1748.11	43	985.18	6
Spotted knapweed	*Centaurea stoebe spp. micranthos*	CEST8, CESTM, CEMA4, CEBI2	1.32	78	25.11	104	9.37	14	89.82	35	53.15	6	47.43	1	646.91	1
Squarrose knapweed	*Centaurea virgata*	CEVI	0.05	3	0.49	1	-	-	-	-	-	-	-	-	-	-
Ruch skeletonweed	*Chondrilla juncea*	CHJU	3.31	151	62.78	266	40.81	58	131.8	62	61.09	7	47.43	1	-	-
Canada thistle	*Cirsium arvense*	CIAR4	17.21	1112	76.81	316	43.38	58	198.01	78	131.28	17	122.09	4	-	-
Bull thistle	*Cirsium vulgare*	CIVU	14.07	1622	115.65	562	43.49	65	160.56	82	108.77	13	-	-	163.77	1
Evergreen clematis	*Clematis vitalba*	CLVI6	-	-	0.49	1	0.57	1	-	-	-	-	-	-	-	-
Poison hemlock	*Conium maculatum*	COMA2	0.29	25	1.03	5	1.15	2	11.12	4	13.35	2	-	-	-	-
Field bindweed	*Convolvulus arvensis*	COAR4	-	-	0.36	2	-	-	-	-	-	-	-	-	-	-
Houndstongue	*Cynoglossum officinale*	CYOF	0.32	5	7.37	35	5.71	8	10.02	7	12.74	1	-	-	991.24	2
Dogtail grasses	*Cynosurus cristatus, C. echinatus*	CYEC	0.07	1	-	-	-	-	-	-	-	-	-	-	-	-
Yellow nutsedge	*Cyperus esculentus*	CYES	0	1	0.1	1	-	-	-	-	-	-	-	-	-	-
Scotch broom	*Cytisus scoparius*	CYSC4	14.9	875	174.15	729	49.58	67	282.13	123	317.24	30	362.4	9	109.35	1
Striated broom	*Cytisus striatus*	CYST7	0	1	-	-	-	-	-	-	-	-	-	-	-	-
Spurgelaurel	*Daphne laureola*	DALA11	-	-	0.26	1	-	-	-	-	-	-	-	-	-	-
Common teasel	*Dipsacus fullonum*	DIFU2	1.39	43	3.66	17	6.07	8	17.65	9	-	-	-	-	-	-
Cutleaf teasel	*Dipsacus laciniatus*	DILA4	0	1	2.66	14	2.18	3	24.12	13	58.94	6	-	-	-	-
	Dipsacus sp.	DIPSA	0.11	9	0.56	4	0.54	1	5.2	2	-	-	-	-	-	-

Common Name	Scientific Name	NISIMS Code	< 0.1 Acres		0.1 to < 0.5		0.5 to <1		1 to < 5		5 to <20		20 to < 100		> 100	
			Acres	Sites	Acres	Sites	Acres	Sites	Acres	Sites	Acres	Sites	Acres	Sites	Acres	Sites
Leafy spurge	*Euphorbia esula*	EUES	0	1	0.26	1	-	-	-	-	-	-	-	-	-	-
French broom	*Genista monspessulana*	GEMO2	0.08	4	6.38	25	1.22	2	1.22	1	-	-	23.11	1	-	-
Shiny leaf geranium	*Geranium lucidum*	GELU	-	-	0.64	2	0.54	1	7.98	2	20.68	2	21.23	1	-	-
Robert geranium	*Geranium robertianum*	GERO	0	1	-	-	-	-	-	-	-	-	-	-	-	-
English ivy	*Hedera helix*	HEHE	0.14	5	0.99	4	0.75	1	7.49	2	-	-	-	-	-	-
St. Johnswort	*Hypericum perforatum*	HYPE	0.54	39	8.1	33	0.73	1	6.06	3	18.74	2	-	-	-	-
Yellow flag iris	*Iris pseudacorus*	IRPS	0.7	8	10.66	47			5.76	3	32.86	3	-	-	-	-
Dyer's woad	*Isatis tinctoria*	ISTI	1.44	81	49.29	195	21.57	32	128.86	52	55.18	7	61.29	1	-	-
Yellow archangel	*Lamiastrum galeobdolon*	LAGA2	-	-	0.2	2	-	-	-	-	-	-	-	-	-	-
Perennial peavine	*Lathyrus latifolius*	LALA4	1.15	78	10.22	58	6.1	10	22.27	13	-	-	-	-	-	-
Field pepperweed	*Lepidium campestre*	LECA5	0.01	1	0.1	1	-	-	1.6	1	-	-	-	-	-	-
Hoary cress whitetop	*Lepidium draba*	CADR	-	-	0.6	2	0.64	1	-	-	15.07	1	-	-	-	-
Oxeye daisy	*Leucanthemum vulgare*	LEVU	-	-	-	-	-	-	3.59	1	-	-	-	-	-	-
Dalmatian toadflax	*Linaria dalmatica ssp. dalmatica*	LIDA and LIDAD	0.19	21	-	-	-	-	-	-	-	-	-	-	-	-
Yellow toadflax	*Linaria vulgaris*	LIVU2			0.58	3	0.73	1	2.35	1	-	-	-	-	-	-
Floating water primrose	*Ludwigia hexapetala, L. peploides*	LUGRH	0.21	3	2.28	10	0.56	1	1.52	1	-	-	-	-	-	-
Purple loosestrife	*Lythrum salicaria*	LYSA2	3.42	122	2.75	9	1.37	2	-	-	8.19	1	-	-	-	-
Sweetclovers	*Melilotus albus, M. officinalis*	MEAL2	0.1	1	0.5	1	-	-	-	-	-	-	-	-	-	-
Parrots feather	*Myriophyllum aquaticum*	MYAQ2	-	-	0.93	5	-	-	-	-	-	-	-	-	-	-
Scotch cotton-thistle	*Onopordum acanthium*	ONAC	-	-	-	-	-	-	2.5	1	-	-	-	-	-	-
Reed canarygrass	*Phalaris arundinacea*[2]	PHAR3	0	2	-	-	-	-	-	-	-	-	-	-	-	-
Japanese knotweed	*Polygonum cuspidatum*	FAJA2	0.75	22	44.41	186	-	-	19.8	9	27.11	3	-	-	-	-
Giant knotweed	*Polygonum sachalinense*	POSA4	-	-	0.1	1	-	-	-	-	-	-	-	-	-	-
Sulfur cinquefoil	*Potentilla recta*	PORE5	0.29	8	4.58	22	2.79	4	25.29	9	22.86	3	75.39	2	-	-
Himalayan blackberry	*Rubus armeniacus*	RUAR9	21.99	984	70.58	412	56.81	84	160.18	73	220.53	25	172.12	4	-	-
Evergreen blackberry	*Rubus laciniatus*	RULA	0.49	22	1.36	9	-	-	1.1	1	-	-	-	-	-	-
Tansy ragwort	*Senecio jacobaea*	SEJA	13.14	695	61.48	256	8.23	11	75.72	32	11.41	1	-	-	-	-
Blessed milkthistle	*Silybum marianum*	SIMA3	0.01	1	-	-	-	-	-	-	-	-	-	-	-	-
Spanish broom	*Spartium junceum*	SPJU2	0.31	38	9.49	38	-	-	10.85	3	8.13	1	-	-	-	-
Medusahead	*Taeniatherum caput-medusae*	TACA8	0.32	7	3.19	19	6.77	12	25.35	8	13.46	1	-	-	-	-
Puncturevine	*Tribulus terrestris*	TRTE	0.14	4	1.68	6	-	-	13.44	4	-	-	-	-	-	-
Common gorse	*Ulex europaeus*	ULEU	0	1	0.46	1	-	-	-	-	-	-	-	-	-	-
Moth mullein, common mullein	*Verbascum blattaria, V. thapsus*	VETH	0.02	2	1.01	6	1.37	2	25.83	10	5.48	1	-	-	-	-
Large-leaf periwinkle	*Vinca major*	VIMA	0.15	9	1.3	5	0.91	1	3.99	1	-	-	-	-	-	-
Spiny cocklebur	*Xanthium spinosum*	XASP2	-	-	0.1	1	0.95	1	3.84	2	-	-	-	-	-	-

Table D-2. Species and Species Groups

Category I	Category II	Category IV	Scientific	Common	Family	Type	Life Cycle	Treatment Group
x	x		*Cyperus esculentus*	yellow nutsedge	Cyperaceae (sedge)	Monocot	Perennial	A
x	x		*Iris pseudacorus*	yellow flag iris	Iridaceae (iris)	Monocot	Perennial	A
		x	*Isolepis setacea*	fiber-optic plant	Cyperaceae (sedge)	Monocot	Perennial	A
x	x		*Lythrum salicaria*	purple loosestrife	Lythraceae (loosestrife)	Dicot	Perennial	A
		x	*Egeria densa*	South American waterweed	Hydrocharitaceae (frogbit)	Monocot	Perennial	A-ALT
		x	*Ludwigia grandiflora*	large-flower primrose willow	Onagraceae (evening primrose)	Dicot	Perennial	A-ALT
x	x		*Ludwigia hexapetala*	water primrose	Onagraceae (evening primrose)	Dicot	Perennial	A-ALT
x	x		*Ludwigia peploides*	floating water primrose	Onagraceae (evening primrose)	Dicot	Perennial	A-ALT
x	x		*Myriophyllum aquaticum*	parrots feather	Haloragaceae (watermilfoil)	Dicot	Perennial	A-ALT
	x		*Myriophyllum spicatum*	Eurasian watermilfoil	Haloragaceae (watermilfoil)	Dicot	Perennial	A-ALT
		x	*Nymphoides peltata*	yellow floatingheart	Menyanthaceae (buckbean)	Dicot	Perennial	A-ALT
	x		*Potamogeton crispus*	curled pondweed	Potamogetonaceae (pondweed)	Dicot	Perennial	A-ALT
		x	*Abutilon theophrasti*	velvet-leaf	Malvaceae (mallow)	Dicot	Annual	D1
	x		*Agrostemma githago*	common corncockle	Caryopyllaceae (pink)	Dicot	Annual	D1
	x		*Amaranthus albus et al.*	amaranths	Amaranthaceae (amaranth)	Dicot	Annual	D1
	x		*Arabidopsis thaliana*	common wall cress	Brassicaceae (mustard)	Dicot	Annual	D1
	x		*Arenaria serpyllifolia var. serpyllifolia*	thyme leaf sandwort	Caryopyllaceae (pink)	Dicot	Annual	D1
	x		*Bassia scoparia*	kochia	Amaranthaceae (amaranth)	Dicot	Annual	D1
	x		*Brassica nigra, B. rapa*	field mustards	Brassicaceae (mustard)	Dicot	Annual	D1
	x		*Capsella bursa-pastoris*	shepherd's purse	Brassicaceae (mustard)	Dicot	Annual	D1
	x		*Cardamine hirsuta*	hairy bittercress	Brassicaceae (mustard)	Dicot	Annual	D1
	x		*Cerastium glomeratum et al.*	chickweeds	Caryopyllaceae (pink)	Dicot	Annual	D1
	x		*Dysphania botrys et al.*	Mexican tea, goosefoots	Amaranthaceae (amaranth)	Dicot	Annual	D1
	x		*Erysimum repandum*	spreading wallflower	Brassicaceae (mustard)	Dicot	Annual	D1
		x	*Euphorbia lathyris*	caper spurge	Euphorbiaceae (spurge)	Dicot	Annual	D1
	x		*Galium divaricatum et al.*	bedstraws	Rubiaceae (madder)	Dicot	Annual	D1
	x		*Herniaria hirsuta var. cinerea*	hairy rupturewort	Caryopyllaceae (pink)	Dicot	Annual	D1
	x		*Holosteum umbellatum*	jagged chickweed	Caryopyllaceae (pink)	Dicot	Annual	D1
		x	*Impatiens glandulifera*	ornamental jewelweed	Balsaminaceae (touch-me-not)	Dicot	Annual	D1
	x		*Kickxia elatine, K. spuria*	cancerworts	Plantaginaceae (plantain)	Dicot	Annual	D1
	x		*Lamium amplexicaule et al.*	deadnettles	Lamiaceae (mint)	Dicot	Annual	D1
		x	*Orobanche minor*	clover broomrape	Orobanchaceae (broomrape)	Dicot	Annual	D1
	x		*Papaver rhoeas*	corn poppy	Papaveraceae (poppy)	Dicot	Annual	D1
	x		*Petrorhagia dubia*	hairypink	Caryopyllaceae (pink)	Dicot	Annual	D1
	x		*Portulaca oleracea*	common purslane	Portulacaceae (purslane)	Dicot	Annual	D1

Category			Scientific	Common	Family	Type	Life Cycle	Treatment Group
I	II	IV						
	x		*Sagina apetala*	common pearlwort	Caryopyllaceae (pink)	Dicot	Annual	D1
	x		*Salsola tragus*	Russian-thistle	Amaranthaceae (amaranth)	Dicot	Annual	D1
	x		*Scleranthus annuus*	annual knawel	Caryopyllaceae (pink)	Dicot	Annual	D1
	x		*Sherardia arvensis*	blue fieldmadder	Rubiaceae (madder)	Dicot	Annual	D1
	x		*Sinapis arvensis*	wild mustard, charlock	Brassicaceae (mustard)	Dicot	Annual	D1
	x		*Spergula arvensis*	cornspurrey	Caryopyllaceae (pink)	Dicot	Annual	D1
	x		*Spergularia rubra*	red sand-spurrey	Caryopyllaceae (pink)	Dicot	Annual	D1
	x		*Stellaria media*	common chickweed	Caryopyllaceae (pink)	Dicot	Annual	D1
	x		*Thlaspi arvense*	fanweed	Brassicaceae (mustard)	Dicot	Annual	D1
x	x		*Tribulus terrestris*	puncturevine	Zygophyllaceae (caltrop)	Dicot	Annual	D1
	x		*Vaccaria hispanica*	cow soapwort	Caryopyllaceae (pink)	Dicot	Annual	D1
	x		*Valerianella carinata, V. locusta*	corn salads	Valerianaceae (valerian)	Dicot	Annual	D1
	x		*Veronica arvensis et al.*	annual speedwells	Plantaginaceae (plantain)	Dicot	Annual	D1
x	x		*Ambrosia artemisiifolia*	annual ragweed	Asteraceae (aster)	Dicot	Annual	D2
	x		*Anthemis cotula*	stinking chamomile	Asteraceae (aster)	Dicot	Annual	D2
	x		*Anthriscus caucalis*	bur chervil	Apiaceae (parsley)	Dicot	Annual	D2
x	x		*Carduus pycnocephalus*	Italian thistle	Asteraceae (aster)	Dicot	Annual	D2
		x	*Carduus pycnocephalus ssp. cinereus*	Turkish thistle	Asteraceae (aster)	Dicot	Annual	D2
		x	*Carduus tenuiflorus*	winged plumeless thistle	Asteraceae (aster)	Dicot	Annual	D2
x	x		*Carthamus lanatus*	woolly distaff-thistle	Asteraceae (aster)	Dicot	Annual	D2
	x		*Centaurea cyanus*	bachelor's button	Asteraceae (aster)	Dicot	Annual	D2
	x		*Datura stramonium*	jimson weed	Solanaceae (nightshade)	Dicot	Annual	D2
	x		*Filago vulgaris*	herba impia	Asteraceae (aster)	Dicot	Annual	D2
	x		*Hypochaeris glabra*	smooth cat's ear	Asteraceae (aster)	Dicot	Annual	D2
	x		*Lapsana communis*	common nipplewort	Asteraceae (aster)	Dicot	Annual	D2
	x		*Lathyrus aphaca*	yellow vetchling	Fabaceae (pea)	Dicot	Annual	D2
	x		*Matricaria discoidea, M. recutita*	pineapple weed, wild chamomile	Asteraceae (aster)	Dicot	Annual	D2
	x		*Persicaria hydropiper*	smartweed	Polygonaceae (knotweed)	Dicot	Annual	D2
	x		*Polygonum convolvulus var. convolvulus*	ivy bindweed	Polygonaceae (knotweed)	Dicot	Annual	D2
	x		*Solanum physalifolium*	hairy nightshade	Solanaceae (nightshade)	Dicot	Annual	D2
		x	*Solanum rostratum*	buffalobur	Solanaceae (nightshade)	Dicot	Annual	D2
	x		*Sonchus asper, S. oleraceus*	sowthistles	Asteraceae (aster)	Dicot	Annual	D2
	x		*Torilis arvensis*	spreading hedgeparsley	Apiaceae (parsley)	Dicot	Annual	D2
	x		*Tragopogon dubius, T. porrifolius*	salsifys	Asteraceae (aster)	Dicot	Annual	D2
	x		*Trifolium arvense et al.*	annual clovers	Fabaceae (pea)	Dicot	Annual	D2
	x		*Vicia villosa*	winter vetch	Fabaceae (pea)	Dicot	Annual	D2
x	x		*Xanthium spinosum*	spiny cocklebur	Asteraceae (aster)	Dicot	Annual	D2
x	x		*Conium maculatum*	poison hemlock	Apiaceae (parsley)	Dicot	Biennial	D3

Category			Scientific	Common	Family	Type	Life Cycle	Treatment Group
I	II	IV						
	x		*Daucus carota*	Queen Anne's lace	Apiaceae (parsley)	Dicot	Biennial	D3
	x		*Foeniculum vulgare*	sweet fennel	Apiaceae (parsley)	Dicot	Perennial	D3
	x		*Pastinaca sativa*	common parsnip	Apiaceae (parsley)	Dicot	Biennial	D3
x	x		*Acroptilon repens*	Russian knapweed	Asteraceae (aster)	Dicot	Perennial	D4
	x		*Arctium minus*	lesser burdock	Asteraceae (aster)	Dicot	Biennial	D4
		x	*Carduus acanthoides*	spiny plumeless thistle	Asteraceae (aster)	Dicot	Biennial	D4
		x	*Carduus crispus*	curly plumeless thistle	Asteraceae (aster)	Dicot	Biennial	D4
x	x		*Carduus nutans*	musk thistle	Asteraceae (aster)	Dicot	Biennial	D4
x	x		*Centaurea × moncktonii*	meadow knapweed	Asteraceae (aster)	Dicot	Perennial	D4
x	x		*Centaurea diffusa*	diffuse knapweed	Asteraceae (aster)	Dicot	Perennial	D4
		x	*Centaurea iberica*	Iberian starthistle	Asteraceae (aster)	Dicot	Perennial	D4
x	x		*Centaurea melitensis*	Maltese starthistle	Asteraceae (aster)	Dicot	Biennial	D4
x	x		*Centaurea solstitialis*	yellow starthistle	Asteraceae (aster)	Dicot	Biennial	D4
x	x		*Centaurea stoebe spp. micranthos*	spotted knapweed	Asteraceae (aster)	Dicot	Perennial	D4
x	x		*Centaurea virgata*	squarrose knapweed	Asteraceae (aster)	Dicot	Perennial	D4
x	x		*Chondrilla juncea*	rush skeletonweed	Asteraceae (aster)	Dicot	Perennial	D4
	x		*Cichorium intybus*	chicory	Asteraceae (aster)	Dicot	Perennial	D4
x	x		*Cirsium arvense*	Canada thistle	Asteraceae (aster)	Dicot	Perennial	D4
x	x		*Cirsium vulgare*	bull thistle	Asteraceae (aster)	Dicot	Biennial	D4
	x		*Conyza bonariensis*	South American conyza	Asteraceae (aster)	Dicot	Biennial	D4
	x		*Crepis capillaris et al.*	hawksbeards	Asteraceae (aster)	Dicot	Biennial	D4
	x		*Erigeron strigosus var. strigosus*	daisy fleabane	Asteraceae (aster)	Dicot	Biennial	D4
		x	*Hieracium aurantiacum*	orange hawkweed	Asteraceae (aster)	Dicot	Perennial	D4
	x		*Hypochaeris radicata*	hairy cat's ears	Asteraceae (aster)	Dicot	Perennial	D4
	x		*Lactuca saligna, L. serriola*	willow lettuce, prickly lettuce	Asteraceae (aster)	Dicot	Biennial	D4
	x		*Leontodon taraxacoides*	hairy hawkbit	Asteraceae (aster)	Dicot	Biennial	D4
x	x		*Leucanthemum vulgare*	oxeye daisy	Asteraceae (aster)	Dicot	Perennial	D4
x	x		*Onopordum acanthium*	Scotch cotton-thistle	Asteraceae (aster)	Dicot	Biennial	D4
		x	*Onopordum tauricum*	bull cottonthistle	Asteraceae (aster)	Dicot	Biennial	D4
x	x		*Senecio jacobaea*	tansy ragwort	Asteraceae (aster)	Dicot	Perennial	D4
x	x		*Silybum marianum*	blessed milkthistle	Asteraceae (aster)	Dicot	Biennial	D4
	x		*Tanacetum parthenium, T. vulgare*	feverfew, common tansy	Asteraceae (aster)	Dicot	Perennial	D4
	x		*Taraxacum officinale*	common dandelion	Asteraceae (aster)	Dicot	Perennial	D4
		x	*Tussilago farfara*	coltsfoot	Asteraceae (aster)	Dicot	Perennial	D4
		x	*Anchusa azurea*	Italian bugloss	Boraginaceae (borage)	Dicot	Perennial	D5
x	x		*Cynoglossum officinale*	houndstongue	Boraginaceae (borage)	Dicot	Biennial	D5
		x	*Echium plantagineum*	salvation jane	Boraginaceae (borage)	Dicot	Biennial	D5
	x		*Myosotis discolor*	changing forget-me-not	Boraginaceae (borage)	Dicot	Perennial	D5

Category			Scientific	Common	Family	Type	Life Cycle	Treatment Group
I	II	IV						
x	x		*Alliaria petiolata*	garlic mustard	Brassicaceae (mustard)	Dicot	Biennial	D6
x	x		*Alyssum corsicum, A. murale*	yellowtufts	Brassicaceae (mustard)	Dicot	Perennial	D6
	x		*Barbarea vulgaris*	bitter wintercress	Brassicaceae (mustard)	Dicot	Biennial	D6
	x		*Camelina microcarpa*	littlepod falseflax	Brassicaceae (mustard)	Dicot	Biennial	D6
	x		*Descurainia sophia*	flixweed	Brassicaceae (mustard)	Dicot	Biennial	D6
x	x		*Isatis tinctoria*	dyer's woad	Brassicaceae (mustard)	Dicot	Biennial	D6
x	x		*Lepidium campestre*	field pepperweed	Brassicaceae (mustard)	Dicot	Biennial	D6
	x		*Lepidium chalepense*	lens-podded whitetop	Brassicaceae (mustard)	Dicot	Perennial	D6
x	x		*Lepidium draba*	hoary cress whitetop	Brassicaceae (mustard)	Dicot	Perennial	D6
		x	*Lepidium latifolium*	perennial pepperweed	Brassicaceae (mustard)	Dicot	Perennial	D6
	x		*Lepidium strictum*	hairy whitetop	Brassicaceae (mustard)	Dicot	Perennial	D6
		x	*Lunaria annua*	annual honesty	Brassicaceae (mustard)	Dicot	Biennial	D6
	x		*Nasturtium officinale*	watercress	Brassicaceae (mustard)	Dicot	Perennial	D6
	x		*Raphanus raphanistrum, R. sativus*	radishes	Brassicaceae (mustard)	Dicot	Biennial	D6
	x		*Sisymbrium altissimum, S. officinale*	tumble mustard, hedgemustard	Brassicaceae (mustard)	Dicot	Biennial	D6
	x		*Coronilla varia*	common crown-vetch	Fabaceae (pea)	Dicot	Perennial	D7
		x	*Galega officinalis*	goatsrue	Fabaceae (pea)	Dicot	Perennial	D7
x	x		*Lathyrus latifolius*	perennial peavine	Fabaceae (pea)	Dicot	Perennial	D7
	x		*Lotus corniculatus, L. uliginosus*	bird's-foot trefoils	Fabaceae (pea)	Dicot	Perennial	D7
	x		*Medicago sativa et al.*	medicks, burclovers, alfalfa	Fabaceae (pea)	Dicot	Perennial	D7
x	x		*Melilotus albus, M. officinalis*	sweetclovers	Fabaceae (pea)	Dicot	Perennial	D7
	x		*Trifolium repens et al.*	perennial clovers	Fabaceae (pea)	Dicot	Perennial	D7
	x		*Erodium cicutarium*	storksbills	Geraniaceae (geranium)	Dicot	Biennial	D8
x	x		*Geranium lucidum*	shiny leaf geranium	Geraniaceae (geranium)	Dicot	Biennial	D8
	x		*Geranium molle et al.*	geraniums	Geraniaceae (geranium)	Dicot	Biennial	D8
x	x		*Geranium robertianum*	Robert geranium	Geraniaceae (geranium)	Dicot	Biennial	D8
x	x		*Convolvulus arvensis*	field bindweed	Convolvulaceae (morning glory)	Dicot	Perennial	D9
		x	*Cuscuta spp.*	dodder	Cuscutacea (dodder)	Dicot	Perennial	D9
	x		*Dianthus armeria*	Deptford-pink	Caryopyllaceae (pink)	Dicot	Biennial	D9
x	x		*Dipsacus fullonum*	common teasel	Dipsacaceae (teasel)	Dicot	Biennial	D9
x	x		*Dipsacus laciniatus*	cutleaf teasel	Dipsacaceae (teasel)	Dicot	Biennial	D9
x	x		*Euphorbia esula*	leafy spurge	Euphorbiaceae (spurge)	Dicot	Perennial	D9
		x	*Euphorbia myrsinites*	myrtle spurge	Euphorbiaceae (spurge)	Dicot	Perennial	D9
		x	*Ficaria verna*	fig buttercup	Ranunculaceae (buttercup)	Dicot	Perennial	D9
	x		*Glechoma hederacea*	ground-ivy	Lamiaceae (mint)	Dicot	Perennial	D9
x	x		*Hypericum perforatum*	St. Johnswort	Clusiaceae (St. Johnswort)	Dicot	Perennial	D9
x	x		*Lamiastrum galeobdolon*	yellow archangel	Lamiaceae (mint)	Dicot	Perennial	D9
	x		*Linum bienne, L. usitatissimum*	pale flax, common flax	Linaceae (flax)	Dicot	Perennial	D9

Category			Scientific	Common	Family	Type	Life Cycle	Treatment Group
I	II	IV						
	x		*Lychnis coronaria*	rose campion	Caryopyllaceae (pink)	Dicot	Perennial	D9
		x	*Lysimachia nummularia*	creeping Jenny	Primulaceae (primrose)	Dicot	Perennial	D9
		x	*Lysimachia punctata*	large yellow loosestrife	Primulaceae (primrose)	Dicot	Perennial	D9
		x	*Lysimachia vulgaris*	garden yellow loosestrife	Primulaceae (primrose)	Dicot	Perennial	D9
		x	*Lythrum hyssopifolium*	hyssop loosestrife	Lythraceae (loosestrife)	Dicot	Biennial	D9
	x		*Malva neglecta*	mallows	Malvaceae (mallow)	Dicot	Biennial	D9
	x		*Marrubium vulgare*	horehound	Lamiaceae (mint)	Dicot	Perennial	D9
	x		*Melissa officinalis*	garden balm	Lamiaceae (mint)	Dicot	Perennial	D9
	x		*Mentha × piperita, M. spicata*	peppermint, spearmint	Lamiaceae (mint)	Dicot	Perennial	D9
		x	*Nerium oleander*	oleander	Apocynaceae (dogbane)	Dicot	Perennial	D9
	x		*Phytolacca americana*	American pokeweed	Phytolaccaceae (pokeweed)	Dicot	Perennial	D9
x	x		*Potentilla recta*	sulfur cinquefoil	Rosaceae (rose)	Dicot	Perennial	D9
	x		*Poterium sanguisorba var. polygamum*	small burnet	Rosaceae (rose)	Dicot	Perennial	D9
	x		*Ranunculus arvensis*	field buttercup	Ranunculaceae (buttercup)	Dicot	Biennial	D9
	x		*Ranunculus repens*	creeping buttercup	Ranunculaceae (buttercup)	Dicot	Perennial	D9
		x	*Salvia aethiopis*	Mediterranean sage	Lamiaceae (mint)	Dicot	Biennial	D9
		x	*Salvia sclarea*	clary sage	Lamiaceae (mint)	Dicot	Biennial	D9
	x		*Saponaria officinalis*	bouncing-bet	Caryopyllaceae (pink)	Dicot	Perennial	D9
		x	*Solanum aviculare*	New Zealand nightshade	Solanaceae (nightshade)	Dicot	Perennial	D9
	x		*Solanum dulcamara*	climbing nightshade	Solanaceae (nightshade)	Dicot	Perennial	D9
x	x		*Verbascum blattaria, V. thapsus*	moth mullein, common mullein	Scrophulariaceae (figwort)	Dicot	Biennial	D9
x	x		*Vinca major*	large-leaf periwinkle	Apocynaceae (dogbane)	Dicot	Perennial	D9
	x		*Digitalis purpurea*	purple foxglove	Plantaginaceae (plantain)	Dicot	Biennial	D10
x	x		*Linaria dalmatica ssp. dalmatica*	Dalmatian toadflax	Plantaginaceae (plantain)	Dicot	Perennial	D10
x	x		*Linaria vulgaris*	yellow toadflax	Plantaginaceae (plantain)	Dicot	Perennial	D10
	x		*Plantago lanceolata, P. major*	English plantain, common plantain	Plantaginaceae (plantain)	Dicot	Perennial	D10
	x		*Veronica anagallis-aquatica*	water speedwell	Plantaginaceae (plantain)	Dicot	Biennial	D10
	x		*Veronica filiformis et al.*	perennial speedwells	Plantaginaceae (plantain)	Dicot	Perennial	D10
	x		*Polygonum aviculare*	prostrate knotweed	Polygonaceae (knotweed)	Dicot	Perennial	D11
x	x		*Polygonum cuspidatum*	Japanese knotweed	Polygonaceae (knotweed)	Dicot	Perennial	D11
		x	*Polygonum polystachyum*	cultivated knotweed	Polygonaceae (buckwheat)	Dicot	Perennial	D11
x	x		*Polygonum sachalinense*	giant knotweed	Polygonaceae (knotweed)	Dicot	Perennial	D11
		x	*Polygonum sachalinense*	giant knotweed	Polygonaceae (buckwheat)	Dicot	Perennial	D11
	x		*Rumex crispus et al.*	sheep sorrel, docks	Polygonaceae (knotweed)	Dicot	Perennial	D11
x	x		*Ailanthus altissima*	tree of heaven	Simaroubaceae (quassia)	Dicot	Perennial	D12
		x	*Buddleja davidii*	butterflybush	Buddlejaceae (butterfly bush)	Dicot	Perennial	D12
	x		*Catalpa bignonioides*	southern catalpa	Bignoniaceae (trumpet creeper)	Dicot	Perennial	D12
x	x		*Clematis vitalba*	evergreen clematis	Ranunculaceae (buttercup)	Dicot	Perennial	D12

Category			Scientific	Common	Family	Type	Life Cycle	Treatment Group
I	II	IV						
		x	*Cotoneaster spp.*	Cotoneaster	Rosaceae (rose)	Dicot	Perennial	D12
		x	*Crataegus monogyna et al.*	hawthorns	Rosaceae (rose)	Dicot	Perennial	D12
x	x		*Cytisus scoparius*	Scotch broom	Fabaceae (pea)	Dicot	Perennial	D12
x	x		*Cytisus striatus*	striated broom	Fabaceae (pea)	Dicot	Perennial	D12
		x	*Cytisus striatus*	striated broom	Fabaceae (pea)	Dicot	Perennial	D12
x	x		*Daphne laureola*	spurgelaurel	Thymelaceae (daphne)	Dicot	Perennial	D12
x	x		*Genista monspessulana*	French broom	Fabaceae (pea)	Dicot	Perennial	D12
x	x		*Hedera helix*	English ivy	Araliaceae (ginseng)	Dicot	Perennial	D12
		x	*Ilex aquifolium*	English holly	Aquifoliaceae (holly)	Dicot	Perennial	D12
		x	*Ligustrum vulgare*	European privet	Oleaceae (olive)	Dicot	Perennial	D12
		x	*Prunus avium et al.*	ornamental cherries	Rosaceae (rose)	Dicot	Perennial	D12
		x	*Pyracantha coccinea, P. fortuneana*	firethorns	Rosaceae (rose)	Dicot	Perennial	D12
		x	*Pyrus calleryana*	Callery pear	Rosaceae (rose)	Dicot	Perennial	D12
	x		*Robinia hispida, R. pseudoacacia*	bristly locust, black locust	Fabaceae (pea)	Dicot	Perennial	D12
	x		*Rosa eglanteria, R. multiflora*	sweetbrier, multiflora rose	Rosaceae (rose)	Dicot	Perennial	D12
x	x		*Rubus armeniacus*	Himalayan blackberry	Rosaceae (rose)	Dicot	Perennial	D12
x	x		*Rubus laciniatus*	evergreen blackberry	Rosaceae (rose)	Dicot	Perennial	D12
x	x		*Spartium junceum*	Spanish broom	Fabaceae (pea)	Dicot	Perennial	D12
		x	*Tamarix ramosissima*	saltcedar	Tamaricaceae (tamarisk)	Dicot	Perennial	D12
x	x		*Ulex europaeus*	common gorse	Fabaceae (pea)	Dicot	Perennial	D12
x	x		*Aegilops cylindrica*	jointed goatgrass	Poaceae (grass)	Monocot	Annual	M1
x	x		*Aegilops triuncialis*	barbed goatgrass	Poaceae (grass)	Monocot	Annual	M1
	x		*Aira caryophyllea var. caryophyllea, A. elegantissima*	silver hairgrasses	Poaceae (grass)	Monocot	Annual	M1
	x		*Anthoxanthum aristatum ssp. aristatum*	annual vernalgrass	Poaceae (grass)	Monocot	Annual	M1
	x		*Apera interrupta*	interrupted windgrass	Poaceae (grass)	Monocot	Annual	M1
	x		*Avena barbata, A. fatua*	slender wild oats	Poaceae (grass)	Monocot	Annual	M1
	x		*Briza maxima, B. minor*	quaking grasses	Poaceae (grass)	Monocot	Annual	M1
	x		*Bromus spp.*	other annual bromes	Poaceae (grass)	Monocot	Annual	M1
x	x		*Bromus tectorum*	cheatgrass	Poaceae (grass)	Monocot	Annual	M1
	x		*Crypsis alopecuroides, C. schoenoides*	pricklegrasses	Poaceae (grass)	Monocot	Annual	M1
x	x		*Cynosurus cristatus, C. echinatus*	dogtail grasses	Poaceae (grass)	Monocot	Annual	M1
	x		*Cyperus difformis*	Asian flatsedge	Cyperaceae (sedge)	Monocot	Annual	M1
	x		*Digitaria ischaemum, D. sanguinalis*	crabgrasses	Poaceae (grass)	Monocot	Annual	M1
	x		*Echinochloa crus-galli*	barnyard grass	Poaceae (grass)	Monocot	Annual	M1
	x		*Eragrostis cilianensis et al.*	annual lovegrasses	Poaceae (grass)	Monocot	Annual	M1
	x		*Hordeum marinum ssp. gussoneanum, H. murinum ssp. glaucum*	annual barleys	Poaceae (grass)	Monocot	Annual	M1

Category			Scientific	Common	Family	Type	Life Cycle	Treatment Group
I	II	IV						
	x		*Lolium multiflorum, L. temulentum*	annual ryegrasses	Poaceae (grass)	Monocot	Annual	M1
	x		*Poa annua*	annual bluegrasses	Poaceae (grass)	Monocot	Annual	M1
	x		*Polypogon monspeliensis*	rabbitsfoot grass	Poaceae (grass)	Monocot	Annual	M1
	x		*Secale cereale*	rye	Poaceae (grass)	Monocot	Annual	M1
		x	*Setaria faberi*	Japanese bristlegrass	Poaceae (grass)	Monocot	Annual	M1
	x		*Setaria pumila et al.*	annual foxtails	Poaceae (grass)	Monocot	Annual	M1
	x		*Sorghum bicolor*	sorghum	Poaceae (grass)	Monocot	Annual	M1
x	x		*Taeniatherum caput-medusae*	medusahead rye	Poaceae (grass)	Monocot	Annual	M1
	x		*Ventenata dubia*	ventenata	Poaceae (grass)	Monocot	Annual	M1
	x		*Vulpia myuros*	rattail fescue	Poaceae (grass)	Monocot	Annual	M1
	x		*Agrostis gigantea*	redtop	Poaceae (grass)	Monocot	Perennial	M2
	x		*Agrostis stolonifera*	bentgrasses	Poaceae (grass)	Monocot	Perennial	M2
	x		*Allium vineale*	wild garlic	Amaryllidaceae (amaryllis)	Monocot	Perennial	M2
	x		*Alopecurus pratensis*	meadow foxtail	Poaceae (grass)	Monocot	Perennial	M2
	x		*Anthoxanthum odoratum*	sweet vernalgrass	Poaceae (grass)	Monocot	Perennial	M2
		x	*Arum italicum*	Italian arum	Araceae (arum)	Monocot	Perennial	M2
		x	*Arundo donax*	giant reed	Poaceae (grass)	Monocot	Perennial	M2
		x	*Bambusoideae spp.*	bamboo	Poaceae (grass)	Monocot	Perennial	M2
x	x		*Brachypodium sylvaticum*	falsebrome	Poaceae (grass)	Monocot	Perennial	M2
		x	*Cortaderia jubata, C. selloana*	pampas grasses	Poaceae (grass)	Monocot	Perennial	M2
	x		*Cynodon dactylon*	bermudagrass	Poaceae (grass)	Monocot	Perennial	M2
	x		*Dactylis glomerata*	orchard grass	Poaceae (grass)	Monocot	Perennial	M2
		x	*Eichhornia crassipes*	water hyacinth	Pontederiaceae (pickerel-weed)	Monocot	Perennial	M2
	x		*Elymus repens*	quack grass	Poaceae (grass)	Monocot	Perennial	M2
	x		*Eragrostis curvula*	weeping lovegrass	Poaceae (grass)	Monocot	Perennial	M2
	x		*Festuca rubra, F. trachyphylla*	red fescue, hard fescue	Poaceae (grass)	Monocot	Perennial	M2
	x		*Holcus lanatus*	common velvetgrass	Poaceae (grass)	Monocot	Perennial	M2
	x		*Lolium perenne*	perennial ryegrass	Poaceae (grass)	Monocot	Perennial	M2
		x	*Nardus stricta*	matgrass	Poaceae (grass)	Monocot	Perennial	M2
	x		*Paspalum dilatatum*	dallisgrass	Poaceae (grass)	Monocot	Perennial	M2
x	x		*Phalaris arundinacea*[2]	reed canarygrass	Poaceae (grass)	Monocot	Perennial	M2
	x		*Phleum pratense*	timothy	Poaceae (grass)	Monocot	Perennial	M2
	x		*Poa bulbosa*	bulbous bluegrass	Poaceae (grass)	Monocot	Perennial	M2
	x		*Poa compressa, P. pratensis, P. trivialis*	perennial bluegrasses	Poaceae (grass)	Monocot	Perennial	M2
		x	*Saccharum ravennae*	ravennagrass	Poaceae (grass)	Monocot	Perennial	M2
	x		*Schedonorus arundinaceus, S. pratensis*	tall fescue, meadow fescue	Poaceae (grass)	Monocot	Perennial	M2
	x		*Sorghum halepense*	Johnsongrass	Poaceae (grass)	Monocot	Perennial	M2
	x		*Thinopyrum intermedium, T. ponticum*	wheatgrasses	Poaceae (grass)	Monocot	Perennial	M2

Table D-3. Estimated Total Treatment Acres (gross), Categories 1 and 2, Over the Life of the Plan, Including Tank Mixes and Application Rates

Treatment Methods	Lbs. / Acre[1]	Acres Where Method Used[2]		
		No Action	Proposed Action	Alternative 3
Herbicides				
2,4-D	**1.00 to 2.00**	9,009.36	848.82	848.82
2,4-D (aquatic application)	**1.00 to 2.00**	-	-	0.00
2,4-D (aquatic application)	0.50 to 0.95	-	-	0.00
Aminopyralid	0.05 to **0.11**	**-**	**10,610.25**	**10,610.25**
Aminopyralid + Metsulfuron methyl	**0.08** to **0.11** + **0.12** to **0.15**	**-**	**424.41**	**424.41**
Chlorsulfuron + 2,4-D amine	**0.06** + 0.95	-	**212.00**	**212.00**
Clopyralid	0.23 to **0.49**	-	**848.82**	**848.82**
Clopyralid + 2,4-D amine	**0.375** + 0.95	-	**212.00**	**212.00**
Clopyralid + 2,4-D amine	**0.47** + **1.19**	-	**212.00**	**212.00**
Dicamba + 2,4-D amine	**0.5** + 0.95	**212.00**	**212.00**	**212.00**
Dicamba + 2,4-D amine	**1** + 0.95	**212.00**	**212.00**	**212.00**
Dicamba + Diflufenzopyr	0.18 to **0.35**	-	848.82	848.82
Fluazifop-P-butyl		-	45.00	45.00
Fluridone (aquatic application)	**0.15 to 1.20**	-	-	0.00
Fluroxypyr	0.13 to **0.26**	-	**424.41**	**424.41**
Glyphosate	0.50	-	212.00	212.00
Glyphosate	**3.00**	-	**212.00**	**212.00**
Glyphosate	**2.00** to **7.00**	10,344.08	2,122.05	2,122.05
Glyphosate	**2.00** to **7.00**	**212.00**	**212.00**	**212.00**
Glyphosate (aquatic application)	**2.00** to **7.00**	-	-	0.00
Glyphosate + 2,4-D amine	0.50 + 0.70	212.00	212.00	212.00
Imazapic	**0.06** to **0.12**	-	**4,244.10**	**4,244.10**
Imazapic	**0.12** to **0.19**	**-**	**2,122.05**	**2,122.05**
Imazapic + Glyphosate	**0.06** to **0.09** + 0.13 to 0.19	-	**848.82**	**848.82**
Imazapic + Glyphosate	**0.12** to **0.19** + 0.25 to 0.38	**-**	**848.82**	**848.82**
Imazapyr	0.25 to **0.50**	-	**212.00**	**212.00**
Imazapyr	0.38 to **0.75**	-	**212.00**	**212.00**
Imazapyr	**0.45** to **1.25**	-	212.00	212.00
Imazapyr	**0.45** to **1.25**	-	**212.00**	**212.00**
Imazapyr (aquatic application)	**0.50** to **1.00**	-	**-**	**0.00**
Imazapyr (aquatic application)	**1.00** to **1.25**	**-**	**-**	**0.00**
Imazapyr (aquatic application)	**0.45** to **1.25**	-	-	0.32
Metsulfuron methyl + 2,4-D amine	**0.038** + 0.95	**-**	**424.41**	**424.41**
Picloram	0.25 to **0.50**	**212.00**	**-**	**-**
Picloram	**0.50** to **1.00**	**212.00**	**-**	**-**
Pseudomonas fluorescens		-	45.00	45.00
Rimsulfuron	0.03 to **0.06**	**-**	**2,122.05**	**2,122.05**
Sulfometuron methyl	0.04 to 0.07	-	212.00	212.00
Triclopyr	**1.00** to **8.00**	-	2,122.05	2,122.05
Triclopyr	**1.00** to **4.00**	-	**212.00**	**212.00**
Triclopyr (aquatic application)	**1.00** to **8.00**	-	-	0.00
Triclopyr (aquatic application)	**2.50** to **5.30**	-	**-**	**8.00**
Triclopyr (aquatic application)	**1.00** to **8.00**	-	-	3.20
Non-Herbicide Methods				
Biological control agents		424.00	424.41	424.41
Manual control		13,347.20	10,185.84	10,185.84
Manual control (aquatic application)		-	-	24.00
Mechanical control		212.00	212.00	212.00
Mechanical control (aquatic application)		-	-	1.60
Prescribed fire		212.00	-	-

Treatment Methods	**Lbs. / Acre[1]**	**Acres Where Method Used[2]**		
		No Action	**Proposed Action**	**Alternative 3**
Propane torch		-	212.00	212.00
Targeted grazing - cattle		-	212.00	212.00
Targeted grazing - goats		-	212.00	212.00

1. Lbs. / acre in bold are at the typical application rate or above. Red indicates lbs. / acre at the maximum application rate. Rates are rounded to two digits; e.g., the max rate of imazapic is 0.1875 lbs. / acre is shown as 0.19 in this table. In rows where the intended rate of application is described as "percent solution," the lbs. / acre would generally be the typical rate.
2. A dash indicates that the treatment method would not be used under that alternative. 0.00 indicates that the treatment would be used under the alternative, but on acres that round to 0.00 (e.g., 0.003 acres).

Table D-4. Estimated Total Treatment Acres, Categories 1 and 2 (Not Including Tank Mixes or Application Rates)

Treatment Methods	**Acres Where Method Used[1]**		
	No Action	**Proposed Action**	**Alternative 3[2]**
2,4-D	9,645	2,545	2,545 + <1
Aminopyralid	-	11,035	
Chlorsulfuron	-	212	
Clopyralid	-	1,273	
Dicamba	424	424	
Dicamba + Diflufenzopyr	-	849	
Fluazifop-p-butyl	-	45	
Fluridone	-	-	<1
Fluroxypyr	-	424	
Glyphosate	10,768	4,668	4,668 + <1
Imazapic	-	8,064	
Imazapyr	-	848	848 + <1
Metsulfuron methyl	-	424	
Picloram	424	NA	
Pseudomonas fluorescens	-	45	
Rimsulfuron	-	2,122	
Sulfometuron methyl	-	212	
Triclopyr	-	2,334	2,334 + 11
Biological control agents	212	424	
Manual control	13,347	10,186	10,186 + 24
Mechanical control	334	212	212 + 2
Propane torch	-	212	
Targeted grazing - cattle	-	212	
Targeted grazing - goats	-	212	

1. A dash indicates that the treatment method would not be used under that alternative.
2. Where two numbers are in the Alternative 3 column, the first number is the acres of terrestrial treatments and the second is the acres of aquatic treatments. Where only one number is included, it indicates terrestrial treatments.