Integrated Invasive Plant Management for the Northwest Oregon District

Environmental Assessment

(November 2018)

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

Northwest Oregon District
1717 Fabry Road, SE
Salem, OR 97306

BLM
NORTHWEST OREGON DISTRICT
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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 Regulations
EA	Environmental Assessment
EDRR	Early Detection Rapid Response
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FEIS	Final Environmental Impact Statement
FIFRA	Federal Insecticide Fungicide Rodenticide Act
FLPMA	Federal Land Policy and Management Act
FONSI	Finding of No Significant Impact
FWS	U.S. Fish and Wildlife Service
GIS	Geographic Information System
HUC	Hydrologic Unit Code
HQ	Hazard Quotient
IARC	International Agency for Research on Cancer
JMPR	Joint FAO / WHO Meeting on Pesticide Residues
LD_{50}	Lethal Dose to 50 percent of a population
LOAEL	Lowest Observed Adverse Effect Level
LOC	Level of Concern
MM	Mitigation Measure
NEPA	National Environmental Policy Act
NISIMS	National Invasive Species Information Management System
NMFS	National Marine Fisheries Service
NOAEL	No Observed Adverse Effect Level
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
ODA	Oregon Department of Agriculture
ODEQ	Oregon Department of Environmental Quality
ODFW	Oregon Department of Fish and Wildlife
ODOT	Oregon Department of Transportation
OWRD	Oregon Water Resources Department
Oregon FEIS	Vegetation Treatments Using Herbicides on BLM Lands in Oregon FEIS (2010)
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)
POEA	Polyoxyethyleneamine, a surfactant found in some glyphosate formulations
PUP	Pesticide Use Proposal
RfD	Reference Dose
RQ	Risk Quotient
SHPO	State Historic Preservation Office
TEA	With triclopyr, triethylamine salt
TEP	Federally listed as threatened or endangered, or proposed for such listing
TI	Toxicity Index
TMDL	Total Maximum Daily Load
WHO	World Health Organization

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Chapter 1 - Purpose and Need

The Northwest Oregon District of the Bureau of Land Management (BLM) manages 714,395 acres in 14 counties – including all BLM-administered lands in Benton, Clackamas, Clatsop, Columbia, Lincoln, Linn, Marion, Multnomah, Polk, Tillamook, Washington, and Yamhill Counties, the majority of BLM-administered lands in Lane County, and a small portion of Douglas County (see Map 1-1; maps are located at the end of this printed document or in a separate downloadable file, available on the BLM ePlanning website). In addition, the Northwest Oregon District collaborates with other landowners on efforts to control invasive plants across multiple ownerships.

> **Invasive plants** are non-native aggressive plants with either the potential to cause significant damage to native ecosystems, cause significant economic losses, or both.
>
> **Noxious weeds** are a subset of invasive plants that are 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 District is proposing to update its existing integrated invasive plant management programs on almost all[1] of these lands. Until 2016, the BLM managed the Northwest Oregon District as two districts – the Salem District, which included the Tillamook, Marys Peak, and Cascades Field Offices, and the Eugene District, which included the Siuslaw and Upper Willamette Field Offices, as well as the West Eugene Wetlands. Available invasive plant treatment methods have varied by field office, and include manual (e.g., hand-pulling, digging, grubbing, solarization), mechanical (e.g., mowing, tilling or disking, string trimmers, propane torch), seeding and planting, prescribed fire, biological control agents (generally insects), targeted grazing, and herbicides (primarily glyphosate[2]). The *Resource Management Plan for Northwestern and Coastal Oregon* (UDSI 2016d) and the *Resource Management Plan for the West Eugene Wetlands* (USDI 2015b) direct the District to prevent, detect, and rapidly control new invasive plant infestations, as well as to use a variety of direct control methods to manage existing infestations. Table 1-1 shows the treatment options available in each field office and the *National Environmental Policy Act* (NEPA) document under which those treatments were analyzed.

***Table 1-1**. Existing NEPA Analyses Authorizing Invasive Plant Treatments*

NEPA Analysis	Year	Field Office / Project Area	Invasive Plant Treatments Currently Allowed[A]	This EA and Associated Decision will:
Sandy Wild and Scenic River and State Scenic Waterway Environmental Assessment and Management Plan (USDI 1993)	1993 Decision	Sandy Wild and Scenic River Corridor (in the Cascades Field Office)	Prohibits the use of pesticides[B] in riparian zones (areas) on federally-managed lands[C]	Modify
Westside Salem Integrated Non-Native Plant Management Plan Environmental Assessment (EA)(USDI 2008d)	2008 Decision	Tillamook and Marys Peak Field Offices[D]	Invasive plants: manual, mechanical, prescribed fire, grazing, competitive plantings, biological control agents Noxious weeds only: glyphosate	Replace

[1] This EA does not address invasive plant management at the Horning Seed Orchard (Cascades Field Office) and Tyrrell Seed Orchard (Siuslaw Field Office). Invasive plant management on these seed orchards is addressed in separate seed orchard integrated pest management NEPA analyses.

[2] The herbicide active ingredient (e.g., glyphosate) is the part of an herbicide formulation or product (e.g., RoundUp) that 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 current product names that can be used on BLM-managed lands can be found in Appendix E.

NEPA Analysis	Year	Field Office / Project Area	Invasive Plant Treatments Currently Allowed[A]	This EA and Associated Decision will:
Cascades Resource Area[E] Invasive Non-Native Plant Management EA (USDI 2009)	2009-2018	Cascades Field Office[D, E]	Invasive plants: manual, mechanical, prescribed fire, grazing, competitive plantings, biological control agents Noxious weeds only: glyphosate, 2,4-D, picloram, dicamba	Replace
Marys Peak Resource Area[E] Noxious Weed Control Utilizing Glyphosate EA (USDI 2010c)	2010 Decision	Marys Peak Field Office[D, E]	Noxious weeds only: manual, mechanical, prescribed fire, grazing, competitive plantings, biological control agents, glyphosate	Replace
Proposed Resource Management Plan and Final Environmental Impact Statement for the Bureau of Land Management West Eugene Wetlands[F] Resource Management Plan (USDI 2015a)	2015 Decision[G]	West Eugene Wetlands (in Siuslaw Field Office)	Invasive plants[H]: prescribed fire, seeding, manual, mechanical, grazing, glyphosate, triclopyr, clopyralid, and research and demonstration plots of aminopyralid and fluazifop-P-butyl	Tier
Categorical Exclusion for Invasive Plant Control: Siuslaw Field Office and Upper Willamette Field Office, Fiscal Years 2018-2019 (USDI 2018)	2018 Decision	Siuslaw and Upper Willamette Field Offices	Invasive plants: manual and mechanical methods and seeding	Replace

A. Terrestrial invasive plants. Aquatic invasive plants are not addressed in any existing NEPA analysis.
B. 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.
C. Outside of riparian zone, under the No Action Alternative, treatments in the Sandy Wild and Scenic River Corridor would follow the direction in *Cascades Resource Area Invasive Non-Native Plant Management EA and Decision Record* (USDI 2009).
D. Includes the management of invasive plants within Field Office boundaries in cooperation and conjunction with other landowners.
E. BLM Field Offices were formerly referred to as Resource Areas.
F. The West Eugene Wetlands includes 1,340 acres of BLM-administered lands in the Siuslaw Field Office that are primarily managed to contribute to the recovery of species listed under the Endangered Species Act.
G. The *West Eugene Wetlands Resource Management Plan* does not authorize specific projects. On-the-ground actions taken in conformance with this Resource Management Plan require additional decision-making.
H. Non-native invasive plants. The *West Eugene Wetlands Resource Management Plan* and its associated EIS also describes the use of these treatment methods on native invasive plants.

The District proposes to update and expand this program by:

- Allowing additional non-native invasive plants that are not listed as noxious weeds to be treated with herbicides when necessary;
- Making additional herbicides available for use; and,
- Making all non-native invasive plant treatment options available district-wide.

The proposed action for this project is to provide for an invasive plant management program that allows the use of treatment methods district-wide, and to provide for efficient management of invasive plants through the use of management tools that are selective, provide effective control, and have few adverse environmental effects. Accordingly, the BLM is evaluating the use of additional herbicides that are effective at lower rates, control more species of invasive plants, decrease the potential for herbicide resistance, and can be used to make associated non-herbicide methods 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 lands (USDI 2008a). This EA is programmatic in nature, and as such does not authorize specific projects. Subsequent on-the-ground actions require additional decision-making.

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); and,
- the 2016 Final Programmatic Environmental Impact Statement (2016 PEIS) and Record of Decision for *Vegetation Treatments Using Aminopyralid, Fluroxypyr, and Rimsulfuron* (USDI 2016a, b).

Since 1984, the BLM has been under a court injunction, which has limited the use of herbicides on BLM-administered lands in Oregon. The 1984 U.S. District court injunction, amended in 1987, limited the BLM to using only four herbicides and restricted their use to noxious weeds only (USDI 2010a:3). The Court amended this injunction in 2011 (following completion of the 2010 Oregon FEIS and Record of Decision) permitting the BLM to use additional herbicides and to target additional plant species once site-specific NEPA analysis has been completed[3]. These analyses must be tiered to the Oregon FEIS, the 2007 PEIS, or subsequent analysis at the National or State level[4].

The action alternatives in this EA examine the environmental effects of BLM's proposal to expand and update its integrated weed management program at a site-specific scale within the District. This EA and its associated decision would replace the *Westside Salem Integrated Non-native Plant Management Plan Final Decision and Rationale* (USDI 2008d), *Cascades Area Resource Area Invasive Non-native Plant Management Decision Record* (USDI 2009), the *Marys Peak Resource Area Noxious Weed Control Utilizing Glyphosate Final Decision and Rationale* (USDI 2010d), and the *Categorical Exclusion: Siuslaw Field Office and Upper Willamette Field Office Invasive Plant Control* (USDI 2018). This EA will tier to the non-native invasive plant management described in the *Proposed Resource Management Plan and Final Environmental Impact Statement for the Bureau of Land Management West Eugene Wetlands Resource Management Plan* (USDI 2015a)[5]. In addition, the action alternatives in this EA would modify the *Sandy Wild and Scenic River and State Scenic Waterway Environmental Assessment and Management Plan* (USDI 1993) to allow the use of herbicides in riparian zones on federally-managed lands.

This 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 (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 analyses that the EA tiers to, as well as reports that the EA references. The last section of this chapter, *Conformance and Consistency with Land Use Plans and Other Decisions*, presents other direction that guides the analysis or decision.

The Need

Invasive plants have deleterious impacts on the structure, composition, and function of ecosystems. Adverse effects of invasive plants can include resource loss or degradation of ecosystem function, including displacement of

[3] The 2011 amended injunction also 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] The *Proposed Resource Management Plan and Final Environmental Impact Statement for the Bureau of Land Management West Eugene Wetlands Resource Management Plan* tiers to the 2010 Oregon FEIS and analyzes herbicide use on noxious weeds, non-native invasive plants, and native invasive plants.

native vegetation; reduction in habitat and forage for wildlife and livestock; loss of federally listed and other Special Status[6] species' habitat; increased soil erosion; reduced water quality; reduced soil productivity; and reduced wilderness and recreation values (USDI 2010a:7). For example, native short-statured grasses have largely been displaced by non-native, aggressively growing grasses across the prairies and savannas of western Oregon and in aquatic ecosystems, western pond turtles are not likely to inhabit ponds that are heavily infested with parrot feather or other aquatic invasive plants that form contiguous mats of vegetation.

Invasive plants infestations are also responsible for economic losses; a 2014 Oregon Department of Agriculture (ODA) report estimates that 25 of the most problematic noxious weeds listed in Oregon[7] cost the State an estimated 83.5 million dollars per year (ODA 2014). While much of this loss is to agricultural areas, invasive plants on BLM-administered lands may spread to adjacent non-BLM-administered lands, increasing control costs for affected landowners and degrading land values.

In addition, there are invasive plants on neighboring (non-BLM-administered) lands that may spread to BLM-administered lands at any time. The BLM participates in cooperative invasive plant control efforts with other private and government entities such as the ODA, Cooperative Weed Management Associations, the Nature Conservancy, Western Invasives Network, watershed councils, and others. However, the BLM's current inability to use herbicides commonly used by cooperators on adjacent lands results in less effective control, coordination challenges, or both.

Species of terrestrial and aquatic invasive plants on the District have been mapped on over 17,000 acres in over 49,000 separate known locations[8], with individual locations ranging from a few plants to a 366-acre site of Scotch broom *(Cytisus scoparius*). In addition, there are thousands of acres of unmapped invasive plants known on the District; for example, tansy ragwort (*Senecio jacobaea*), is estimated to occupy over 2,000 acres (see the *Existing Invasive Plant Sites* section in Appendix B). Despite the efforts of the existing invasive plant program, these species are continuing to spread at an estimated rate of 12 percent per year (see the *Spread from Existing Plant Sites* section in Appendix B) (USDI 2010a:133).

For some noxious weed species such as Japanese, Bohemian, and giant knotweeds *(Polygonum* spp.), neither non-herbicide methods nor the herbicides currently available on the District result in adequate control[9]. The existing program, which (with the exception of the West Eugene Wetlands) only allows herbicides treatments of noxious weeds, also does not have an adequate method for selectively[10] controlling other invasive plants that are not listed as noxious weeds such as English holly (*Ilex aquifolium*) and periwinkle species (*Vinca* spp.). In addition, outside of the West Eugene Wetlands, the Siuslaw and Upper Willamette Field Offices do not currently have the approval to use herbicides and rely on mechanical and manual methods to treat invasive plants.

Herbicides that are more selective than the currently approved options are available to treat invasive plants. These herbicides generally can be used in lower quantities and pose less environmental and human health safety risk[11] than the herbicides the BLM is currently authorized to use (USDI 2010a:80 and others). Furthermore, if these

[6] Federally listed threatened, endangered, proposed, or candidate species, and species managed as Bureau Sensitive species by the BLM.
[7] The latest ODA noxious weed list includes a total of 132 noxious weed species (ODA 2017).
[8] Summarized in Appendix A.
[9] As described further in Appendix C, *Treatment Key, Invasive Plant Sites, and the Annual Treatment Plan*, lack of adequate control means that control methods are unavailable or unfeasible and treatments would not be attempted even in high priority circumstances.
[10] 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.
[11] 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.

additional herbicides were approved, it is estimated that the efficacy of BLM's invasive plant treatment would improve from an estimated 30 to 60 percent under the No Action Alternative to 80 percent[12] under the action alternatives (USDI 2010a:136).

The Resource Management Plans for the District direct the District to prevent, detect, and rapidly control new invasive plant infestations, as well as to use a variety of direct control methods to manage existing infestations (USDI 2016d:80, 2015a:29-30). 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 invasive plant management program to:

- Provide a range of direct control methods that allow individual treatments in varying conditions to have more effective control of invasive plants, in accordance with the Records of Decision for the *Northwest Area Noxious Weed Control Program Final Environmental Impact Statement* (USDI 1987b) and the *Vegetation Treatments Using Herbicides on Bureau of Land Management Lands in Oregon Environmental Impact Statement* (USDI 2010b), so resource and economic losses from invasive plants are reduced.

In addition, this EA is consistent in scope with the Oregon FEIS (to which this EA tiers), which includes a purpose to:

- Prevent treatments from having unacceptable adverse effects to applicators and the public, to desirable flora and fauna, and to soil, air, and water.

Issues

In the context of an environmental analysis, an issue is defined as a point of disagreement, debate, or dispute with a proposed action based on some anticipated environmental effect. For the purposes of BLM's NEPA analyses, an issue:

- has a cause and effect relationship with the proposed action or alternatives;
- is within the scope of the analysis;
- has not been decided by law, regulation, or previous decision; and
- is amenable to scientific analysis rather than conjecture (USDI 2008c).

Issues Analyzed in Detail

The issues identified during internal (BLM) and external (public) scoping were used to guide the effects analysis in Chapter 3. Issues are analyzed in detail when:

a) the issue is related to how the alternatives respond to the purpose and need; or,
b) analysis is necessary to determine the significance of impacts.

[12] Treatments are not 100 percent effective at controlling all treated populations. Under any alternative, some level of retreatment may be necessary to achieve complete control. Treatments would be monitored, and a portion of the acres might require retreatment. The amount of retreatment necessary depends upon the extent to which the first treatment controls the target weed. More information about treatment effectiveness can be found in Issue 1 (see Chapter 3).

The following issues are analyzed in detail in Chapter 3:

- *Issue 1:* How does treatment efficacy under the alternatives affect the spread of invasive plants?
- *Issue 2:* What are the effects to Special Status aquatic species from aquatic invasive plant treatments?
- *Issue 3:* How would the alternatives affect the cost of invasive plant control?

Issues Not Analyzed in Detail

Several issues identified during internal and external scoping were considered but not analyzed in detail in this EA. Issue are not analyzed in detail when:

- the issue does not respond to the purpose and need;
- there is no potential for significant effects[13] related to the issue; or,
- the issue has already been appropriately analyzed in documents to which this EA tiers.

Further information about the following issues is included in Appendix G, *Issues Not Analyzed in Detail*.

- *Issue 4 (Native Vegetation):* What are the effects of invasive plant treatments on desirable plant communities and Special Status plants?
- *Issue 5 (Fungi):* How would invasive plant treatments affect fungi?
- *Issue 6 (Wildlife):* How would integrated invasive plant management affect wildlife of conservation concern?
- *Issue 7 (Birds):* How would treatments affect birds that may use potential treatment areas, especially during the nesting season?
- *Issue 8 (Pollinators):* How would herbicide treatments affect pollinators, especially Special Status pollinator species?
- *Issue 9 (Turtles):* How would the treatment of aquatic invasive plants affect the western pond turtle and painted turtle?
- *Issue 10 (Fish and Aquatic Organisms):* What are the effects of terrestrial herbicide treatments along streams to fish and aquatic organisms?
- *Issue 11 (Human Health):* What are the effects to human health from incidentally coming into contact with herbicides used on BLM-administered lands?
- *Issue 12 (Human Health):* What are the hazards to workers treating invasive plants?
- *Issue 13 (Human Health):* What are effects to human health of mixing two or more herbicides? What are the effects from adjuvants and other ingredients mixed with herbicides? What are the effects from the degradates when herbicides break down?
- *Issue 14 (Human Health):* What are effects to human health of using glyphosate, which a California court recently found to be cancer-causing, the International Agency for Research on Cancer (IARC) has declared a cancer hazard, and has been found in breakfast cereal?
- *Issue 15 (Human Health):* What are the effects to human health from invasive plants (allergies, rashes, etc.)?
- *Issue 16 (Soil):* How do herbicides detrimentally affect soils?
- *Issue 17 (Water):* How do herbicides treating terrestrial weeds affect water quality, including ground and surface water used for domestic and municipal supply?
- *Issue 18 (Water):* How do herbicide treatments of aquatic invasive plants affect water quality?
- *Issue 19 (Air):* How would the alternatives affect air quality?
- *Issue 20 (Air):* How would the alternatives affect climate change, including greenhouse gas emissions and carbon storage?

[13] Effects described in this EA are predicated on application of Protection Measures (see Appendix D).

- *Issue 21 (Traditional and Cultural Uses):* How would the treatment of invasive plants affect plant resources used by Native Americans given that these plants (or their locations) may not be known by the BLM?
- *Issue 22 (Environmental Justice):* How would the use of herbicides affect minorities and low-income populations?
- *Issue 23 (Socioeconomics):* What are the impacts to local timber production, forest products, agriculture, and recreation economies from the management of invasive plants in the Northwest Oregon District?
- *Issue 24 (Socioeconomics):* What is the potential for herbicide contamination of yards, gardens, organic farms, vineyards, and bee hives on private lands?
- *Issue 25 (Recreation):* How will invasive plant management affect the management and use of recreation sites?
- *Issue 26 (Recreation):* What are the effects of herbicides on dogs, horses, and other pets that accompany recreationists?
- *Issue 27 (Wilderness / Wilderness Study Areas):* How will invasive plant management affect Wilderness or Wilderness Study Areas on the District?
- *Issue 28 (Visual):* Would the use of invasive plant treatments affect the visual quality of the landscape?

Decision to Be Made

The decision of which alternative to select or whether to modify an alternative 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 Northwest Oregon District. The decision-maker will make the decision based on the analysis of the issues and how well the alternatives respond to the purpose and need. 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 by BLM personnel, contractors, grant holders, lessees, or cooperators, on all lands within the Northwest Oregon District (the "District") except the Horning and Tyrrell Seed Orchards, including BLM-administered lands and other land ownerships where the BLM partners on invasive plant control. This EA is programmatic in nature, and as such, a Decision would not authorize specific projects. Subsequent on-the-ground actions, including implementation of BLM's 2019 Annual Treatment Plan, would require additional decision-making. The BLM is in the process of preparing biological assessments for consultation with the U.S. Fish and Wildlife Service and National Marine Fisheries Service.

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 analysis. 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 originally conducted in July 2011, with letters sent to interested publics, and 50 scoping responses were received. The majority of these commenters expressed concern with the use of herbicides. Due to the lag in time since initiation of scoping and changes to the proposed action, scoping was reopened from

January 5, 2018, through February 8, 2018. Letters were sent to approximately 680 individuals, agencies, and organizations and posted on the BLM's ePlanning website. Fourteen comment letters were received in 2018, roughly split between those supportive of the judicious use of herbicides to control invasive plants, those who encouraged a cautionary or conservative approach to herbicide use, and those opposed to any alternative that includes herbicides. Two commenters were under the misunderstanding that aerial spraying of herbicides was part of the proposal. Those who expressed concerns almost exclusively focused on the use of herbicides, suggesting reducing or eliminating all use, and instead relying on manual and mechanical methods of control or changing land management practices. Requests were made to address the effects of herbicides on human health and unintended effects of herbicide drift or overspray on neighboring private land uses, soil, water, air, and wildlife. Some cited personal experience with the effects of herbicides used for agriculture or timber production and said that the cost of invasive plant control was greater than the resulting benefits. Similar issues were raised during the 2011 scoping, with additional suggestions to use a decision-making process with clearly defined metrics to prioritize the treatment method with the least risk. Many commenters had suggestions for specific treatment methods, such as targeted grazing and manual or mechanical treatments with volunteer labor.

Public Comment Period

This EA will be made available for a 30-day public comment period (November 2018) on BLM's ePlanning site and interested members of the public will be 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 Confederated Tribes of the Grand Ronde Community of Oregon, the Confederated Tribes of the Warm Springs, the Confederated Tribes of Siletz Indians of Oregon, and the Confederated Tribes of Coos, Lower Umpqua, and Siuslaw. The letters described the proposed EA, announced that scoping would begin, and encouraged the Tribes to enter into government-to-government consultation. Following a delay in the preparation of this EA, the same Tribes were contacted with letters in January 2018. 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. Staff-to-staff coordination with both the Confederated Tribes of Siletz Indians and the Confederated Tribes of the Grand Ronde Community of Oregon identified points for future involvement and continued coordination to address areas and plants of concern prior to implementation of the Annual Treatment Plans.

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). As part of the Annual Treatment Plan review (see Chapter 2), a cultural resource specialist would review each treatment application

(project) to determine whether fieldwork is required to identify cultural resources, and if additional protection measures would be needed.

Endangered Species Act

The District has 17 federally listed species that are known or have potential to occur (see Table 1-2)[14].

***Table 1-2**. Listed Species Documented or Suspected on the Northwest Oregon District*

Taxon	Common Name	Scientific Name	Population	Status	Documented or Suspected
Plant	Willamette Valley daisy	*Erigeron decumbens* var. *decumbens*		Endangered	Documented
Plant	Bradshaw's lomatium	*Lomatium bradshawii*		Endangered	Documented
Plant	Kincaid's lupine	*Lupinus oreganus*		Threatened	Documented
Plant	Nelson's checkermallow	*Sidalcea nelsoniana*		Threatened	Documented
Plant	golden paintbrush	*Castilleja levisecta*		Threatened	Suspected
Plant	water howellia	*Howellia aquatilis*		Threatened	Suspected
Anadromous Fish	Coho salmon	*Oncorhynchus kisutch*	Oregon Coast, Lower Columbia River	Threatened	Documented
Anadromous Fish	steelhead	*Oncorhynchus mykiss*	Upper Willamette River, Lower Columbia River	Threatened	Documented
Anadromous Fish	Chinook salmon	*Oncorhynchus tshawytscha*	Upper Willamette River, Lower Columbia River	Threatened	Documented
Anadromous Fish	Pacific eulachon	*Thaleichthys pacificus*	Southern	Threatened	Suspected
Resident Fish	bull trout	*Salvelinus confluentus*	All	Threatened	Documented
Insect	Fender's blue butterfly	*Plebejus icarioides fenderi*		Endangered	Documented
Insect	Taylor's checkerspot butterfly	*Euphydryas editha taylori*		Endangered	Suspected
Insect	Oregon silverspot butterfly	*Speyeria zerene hippolyta*		Threatened	Suspected
Bird	streaked horned lark	*Eremophila alpestris strigata*		Threatened	Documented
Bird	northern spotted owl	*Strix occidentalis caurina*		Threatened	Documented
Bird	marbled murrelet	*Brachyramphus marmoratus*		Threatened	Documented

Formal and informal consultation that covers herbicides and other invasive plant treatments on the District has occurred with the U.S. Fish and Wildlife Service (FWS) and National Marine Fisheries Service (NMFS) on numerous occasions (see Table 1-3). The BLM submits annual reports to the Services in compliance with these consultations at both the State- and District-level.

***Table 1-3**. 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) *Vegetation Treatments on BLM Lands in 17 Western States Programmatic Environmental Report* (USDI 2007d) *Vegetation Treatments on BLM Lands in 17 Western States Biological Assessment* (USDI 2007c)	BLM - 17 Western States	2007	FWS Letter of Concurrence (Reference: FWS/AES/DCHRS/027171) NMFS Biological Opinion (Tracking Number: FPR-2004-1502)

[14] More information about the effects to these species can be found in Chapter 3 or Appendix G, including Issue 3 (federally listed plants), Issues 2 and 10 (federally listed fish), Issue 7 (federally listed birds), and Issue 9 (federally listed butterflies).

Program / Biological Assessment	Agency / Area	Year	Consultation
Vegetation Treatments Using Herbicides on BLM Lands in Oregon (USDI 2010a) *Vegetation Treatments on BLM Lands in 17 Western States Biological Assessment* (USDI 2007c)	BLM - Oregon	2010	FWS Letter of Concurrence (TAILS Number: 13420-2010-I-0173) NMFS Biological Opinion (Number: 2009 / 05539)
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 Tracking Number: NWP-2013-9664) (FWS Reference: 01EOFW00-2013-F-0090)
Biological Assessment for the Resource Management Plan for the West Eugene Wetlands in Lane County, Oregon on the US BLM – Eugene District (USDI 2014a)	BLM - West Eugene Wetlands	2014	Biological Opinion (FWS) (Reference: 01EOFW00-2014-F-0139)
Biological Assessment (USDI 2016c) *for Vegetation Treatments Using Aminopyralid, Fluroxypyr, and Rimsulfuron PEIS* (USDI 2016a)	BLM - 17 Western States	2015 / 2016	FWS Letter of Concurrence (Reference: FWS/AES/DER/BCH/061446) NMFS Biological Opinion (Tracking Number: PCTS FPR-2015-9121)

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

In addition, the BLM is in the process of preparing Biological Assessments. The BLM will consult with the National Marine Fisheries Service to address:

- The use of fluazifop-P-butyl at distances up to 300 feet from listed anadromous fish habitat (Alternatives 2 and 3)
- Treatments of aquatic invasive plant infestations in waterbodies that contain federally threatened or endangered anadromous fish species or provide critical habitat (Alternative 3)

The BLM will consult with the U.S. Fish and Wildlife Service to address:

- The use of fluazifop-P-butyl, rimsulfuron, fluroxypyr, and hexazinone in listed species habitat (Alternatives 2 and 3)
- Treatments of terrestrial invasive plant infestations in Taylor's checkerspot butterfly, Fender's blue butterfly, and streaked horned lark critical habitat (Alternatives 2 and 3)
- Treatments of terrestrial invasive plant infestations in federally threatened or endangered plant habitats (Alternatives 2 and 3)

The BLM will adopt any additional protection measures that result from consultation with either agency.

Tiering and Reference

Tiering refers to the coverage of general matters in broader environmental impact statements with subsequent narrower statements or other 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[15]. 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 environmental impact statements (EISs), all completed at the State or National level. This EA tiers to the 2007 *PEIS for Vegetation Treatments Using Herbicides on BLM Lands in 17 Western States* (USDI 2007a) for the use of chlorsulfuron (west of the Cascades). In addition, this EA tiers to the 2016 *PEIS for Vegetation Treatments Using Aminopyralid, Fluroxypyr, and Rimsulfuron* (USDI 2016a), for the

[15] The BLM NEPA Handbook (USDI 2008c) states that an EA may be prepared for an action with significant effects if that EA is tiered to a broader environmental impact statement, which fully analyzed those significant effects.

use of those three herbicides. For the remaining herbicides analyzed in this EA, this EA tiers to the 2010 *Final Environmental Impact Statement for Vegetation Treatments Using Herbicides on BLM Lands in Oregon* (Oregon FEIS, USDI 2010a). The 2010 Record of Decision for the Oregon FEIS (USDI 2010b) requires, with few specific exceptions[16], the preparation of new site-specific analyses before herbicides other than 2,4-D, dicamba, glyphosate, or picloram can be used and these analyses must be tiered to the Oregon FEIS (USDI 2010b:9). This EA provides the site-specific analysis for the District. The alternatives (including the No Action Alternative) must adhere to restrictions described in the three EISs (USDI 2010b:30) including:

- Mitigation Measures[17] from the 2007 PEIS Record of Decision, 2010 Oregon FEIS Record of Decision, and 2016 PEIS Record of Decision.
- Standard Operating Procedures from the 2007 PEIS.
- Conservation Measures for Special Status species from the 2007 and 2016 PEISs' Biological Assessments.
- Typical and maximum herbicide application rates analyzed in the 2007 PEIS, 2010 Oregon FEIS, and 2016 PEIS.

Mitigation Measures, Standard Operating Procedures, and Conservation Measures adopted with the Records of Decisions for these three EISs (USDI 2007b, 2010b, and 2016b) are included in Appendix D of this EA. Actions in this EA are designed to be consistent with the actions authorized in the Records of Decisions for these three EISs (USDI 2007b, 2010b, and 2016b).

For its analysis of non-herbicide treatments, this EA tiers to the *Northwest Area Noxious Weed Control Program Final EIS and Supplement* (USDI 1985, 1987a) and is consistent with the actions authorized in its Record of Decision (USDI 1987b). 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).

In addition, Issue 1 in Chapter 3 and Issues 4, 7, 8, and 21 in Appendix G tier to the analyses in the *Proposed Resource Management Plan and Final Environmental Impact Statement for Resource Management Plans for Western Oregon* (USDI 2016e) or the *Proposed Resource Management Plan and Final Environmental Impact Statement for the Bureau of Land Management West Eugene Wetlands Resource Management Plan* (USDI 2015a).

Conformance and Consistency with Land Use Plans and Other Decisions

The BLM's integrated invasive plant 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

[16] 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) and an EA for Sudden Oak Death on the Coos Bay District (USDI 2010b:30).

[17] Mitigation Measures are practices or limitations adopted to mitigate potential adverse effects identified in the 2007 and 2016 PEISs and Oregon FEIS analyses.

on federally-managed 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.

Resource Management Plans on the Northwest Oregon 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 District are covered by two Resource Management Plans: the *Northwestern and Coastal Oregon Resource Management Plan and Record of Decision* (USDI 2016d) and the *West Eugene Wetlands Resource Management Plan and Record of Decision* (USDI 2015b).

The *Resource Management Plan for Northwestern and Coastal Oregon* (UDSI 2016d:80) directs the District to:

- Implement measures to prevent, detect, and rapidly control new invasive plant infestations.
- Use manual, mechanical, herbicides, and biological treatments to manage invasive plant infestations.

The *Resource Management Plan for the West Eugene Wetlands* (USDI 2015b:24-25) directs the agency to:

- In the Prairie Restoration Area, apply herbicides for vegetation control where prescribed burning, manual, mechanical, and other non-chemical vegetation treatments do not provide sufficient vegetation control for restoration and maintenance of high quality habitat for prairie-related species. Herbicides may be used for control of noxious weeds and invasive non-native plants. Follow Protection Measures for herbicide applications (see Appendix D).
- In the Natural Maintenance Area, apply herbicides for vegetation control where prescribed burning, manual, mechanical, and other non-chemical vegetation treatments do not provide sufficient vegetation control for maintenance and enhancement of existing plant and animal habitats. Herbicides may be used for control of noxious weeds and invasive non-native plants to achieve habitat goals identified as part of recovery or delisting or for conservation management of Special Status species. Follow Protection Measures for herbicide application (see Appendix D).

Northwestern and Coastal Oregon Resource Management Plan

The Northwestern and Coastal Oregon Resource Management Plan provides management direction and objectives for the management of all resources on BLM-administered lands in the Northwest Oregon District, Coos Bay District, and the Swiftwater Field Office of the Roseburg District. The actions proposed in this EA are in conformance with the management direction of this Resource Management Plan. Management objectives and direction related to invasive plant management are included in the *Invasive Species* (USDI 2016d:80) section of the Resource Management Plan. Additional management objectives and direction applicable to the program can be found in the *Land Use Allocations – Congressionally Reserved Lands and National Conservation Lands* (USDI 2016d:55-56), *District-Designated Reserve – Areas of Critical Environmental Concern* (USDI 2016d:57), *District-Designated Reserve – Lands Managed for their Wilderness Characteristics* (USDI 2016d:58), *Riparian Reserves* (USDI 2016d:68), *Hydrology* (USDI 2016d:79), *Rare Plants and Fungi* (USDI 2016d:86), *Soil Resources* (USDI 2016d:89-90), *Visual Resources Management* (USDI 2016d:93-94), and *Wildlife* (USDI 2016d:95) sections.

West Eugene Wetlands Resource Management Plan

The West Eugene Wetlands includes 1,340 acres of BLM-administered lands in the Siuslaw Field Office that are primarily managed to contribute to the recovery of species listed under the Endangered Species Act. The actions proposed in this EA are in conformance with the management direction of this Resource Management Plan. This EA tiers to the *Proposed Resource Management Plan and Final Environmental Impact Statement for the Bureau of*

Land Management West Eugene Wetlands Resource Management Plan (USDI 2015a) and the action alternatives make additional herbicides available for use for non-native invasive plants in the West Eugene Wetlands (see Chapter 3 and Appendix G). This EA and associated decision will not change, amend, replace, or otherwise modify the management of native invasive plants described in the Resource Management Plan and associated EIS. The BLM-administered lands within the West Eugene Wetlands planning area are assigned to the following two land use allocations - Prairie Restoration Areas or Natural Maintenance Areas. Herbicide use in these areas is directed for management of noxious weeds, native invasive plants, and non-native invasive plants, allowing for habitat restoration, maintenance, and enhancement. Herbicide use on invasive native plants is directed to achieve habitat goals identified as part of recovery or delisting or for conservation management of Special Status species as identified in the species Recovery Plan. The 2015 Resource Management Plan EIS tiers to the 2010 Oregon FEIS for its use of herbicides. Management objectives and direction related to invasive plant management are included in the *Prairie Restoration Area* (USDI 2015b:24), *Natural Maintenance Area* (USDI 2015b:24-25), and *Plants* (USDI 2015b:24) sections of the Resource Management Plan.

Other BLM Management Plans

While there are additional management plans on the District, the invasive plant management EAs and Categorical Exclusion shown in Table 1-1, the above-described Resource Management Plans, and *the Sandy Wild and Scenic River and State Scenic Waterway Management Plan* are the only plans that specifically address or constrain the invasive plant management program on the District.

Sandy Wild and Scenic River and State Scenic Waterway Management Plan

The Sandy Wild and Scenic River and State Scenic Waterway Management Plan (USDI 1993) is a framework for cooperative management of the 12.5 mile section of the Sandy River from Dodge Park to Dabney State Park. This section of the river includes 3.8 miles that are classified as a Scenic River and 8.7 miles that are classified as a Recreational River. The BLM and the Oregon State Parks and Recreation Department worked together to develop this plan. The plan prohibits the use of pesticides[18] in riparian zones on federally-managed lands. (No specific invasive plant direction is described in the plan.) The action alternatives in this EA propose modifying this management plan to authorize the use of herbicides on federally-managed lands in riparian zones, allowing for effective treatment of invasive riparian plants (such as knotweed species). (The action alternatives do not propose to change the restriction against pesticides that are not herbicides in these riparian zones; other pesticide use would still be prohibited.)

[18] 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.

Chapter 2 - The Alternatives

This chapter describes three alternatives in detail; the No Action Alternative, Alternative 2 (Terrestrial Invasive Plant Management), and Alternative 3 (Terrestrial and Aquatic Invasive Plant Management). These are the alternatives addressed in the effects analysis in Chapter 3. This section also describes the other alternatives that the District considered but did not carry forward for detailed study. The alternatives address the dynamic nature of invasive plants, including increasing numbers of invasive plant species and changing conditions of infestations. Due to the rapid growth and abundance of invasive plants, the size of the land base involved, and the nature of multiple uses that take place on it, invasive plant control will remain an ongoing need. The District's intent is to manage invasive plants in order to minimize adverse ecological and economic effects. Table 2-2, *Comparison of the Alternatives, Treatment Methods* shows a comparison of the treatment methods used under each alternative.

The 2010 Oregon FEIS, to which this document tiers, considered three action alternatives, as well as a reference analysis which described the effects of not using herbicides on BLM-administered lands. The action alternatives in this EA are most similar to Alternative 3 in the Oregon FEIS. The 2007 PEIS, to which this EA and the Oregon FEIS tiers, 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.

None of the alternatives in this EA address invasive plant management on the Horning Seed Orchard (Cascades Field Office) or Tyrrell Seed Orchard (Siuslaw Field Office); invasive plant management in these areas is addressed in separate integrated pest management analyses for these seed orchards.

Further information about the specific invasive plants on the District and the locations of these plants can be found in Appendix A, *Invasive Plants on the District* and Appendix C, *Treatment Key, Invasive Plant Sites, and the Annual Treatment Plan*. Further information about specific treatment methods can be found in Appendix B, *Integrated Invasive Plant Management* and Appendix C, *Treatment Key, Invasive Plant Sites, and the Annual Treatment Plan.* As described in Appendix B, monitoring, including implementation and effectiveness monitoring, is required under all alternatives. Effectiveness monitoring would inform adaptive management, including if and how follow-up treatments would occur.

The No Action Alternative (Alternative 1)

Under the No Action Alternative, the District would continue to implement the terrestrial invasive plant treatments allowed in different field offices or areas, consistent with the *Westside Salem Integrated Non-Native Plant Management Plan EA and Decision Record* (USDI 2008d), *Cascades Resource Area Invasive Non-Native Plant Management EA and Decision Record* (USDI 2009) [19], *Marys Peak Resource Area Noxious Weed Control Utilizing Glyphosate EA and Decision Record* (USDI 2010c)*, Proposed Resource Management Plan and Final Environmental Impact Statement for the Bureau of Land Management West Eugene Wetlands Resource Management Plan* (USDI 2015a) *and Record of Decision* (USDI 2015b)[20], and the *Siuslaw Field Office and Upper Willamette Field Office Invasive Plant Control Categorical Exclusion* (completed every one to two years), Resource Management Plans, and other District direction. In the Sandy Wild and Scenic River corridor, the management plan would prohibit the use

[19] The *Cascades Resource Area Invasive Non-Native Plant Management Environmental Assessment* analyzes the existing program for Cascades Field Office. Though the EA specifies that the analysis "will be effective from February 25, 2009 – December 31, 2018," (USDI 2009:5) it is assumed that the program would continue to be implemented after December 31, 2018 for the purposes of analysis. Invasive plant management is a high priority for the region and for the BLM; it would be unrealistic to assume that the Field Office would no longer have any invasive plant control program at all.

[20] The West Eugene Wetlands Resource Management Plan does not authorize specific projects. On-the-ground actions taken in conformance with this Resource Management Plan require additional decision-making.

of herbicides in riparian zones on federally-managed lands. (Treatments in this corridor would otherwise follow the direction in *Cascades Resource Area Invasive Non-Native Plant Management EA and Decision Record* (USDI 2009).)

Available treatment methods for the Cascades, Marys Peak, and Tillamook Field Offices include manual and mechanical methods, targeted grazing, biological control agents, prescribed fire, and competitive seeding and planting to treat invasive plants. The herbicides available for noxious weed management efforts would be 2,4-D, dicamba, glyphosate, and picloram in the Cascades Field Office, and glyphosate in the Marys Peak and Tillamook Field Offices. The Siuslaw and Upper Willamette Field Offices would be limited to manual and mechanical methods and seeding[21]. The BLM would continue to treat invasive plants in the West Eugene Wetlands with a variety of methods, including prescribed fire, seeding, manual and mechanical methods, solarization, targeted grazing, and herbicides including glyphosate, triclopyr, and clopyralid, and research and demonstration[22] plots of aminopyralid and fluazifop-P-butyl (a maximum of 15 acres unless herbicide Risk Assessments and additional NEPA analyses are completed). Table 2-2, *Comparison of the Alternatives, Treatment Methods,* indicates what treatment methods are available, area by area.

As described in the existing invasive plant NEPA analyses for the Cascades, Marys Peak, and Tillamook Field Offices, the BLM supports and implements cooperative invasive plant treatments proposed by non-BLM groups on federally and non-federally-managed lands within the field office boundaries. In these three field offices, invasive plant treatments currently occur on approximately 20 acres annually. For example, subject to available funding, the BLM would continue to provide funds to reduce invasive plant infestations, like manual control of policeman's helmet in areas identified as priority sites with partners in Clackamas County and especially in the Sandy Wild and Scenic River corridor off of federally-managed lands.

Appendix C, *Treatment Key, Invasive Plant Sites, and the Annual Treatment Plan* shows how the District would continue to treat specific invasive plant species under this Alternative. Similar species are lumped into species groups (e.g., the biennial thistles species group would have different treatment options than the perennial grasses species group). Treatment options would also vary based on considerations such as soil type, infestation size, neighboring vegetation, and weather conditions. In addition to treatments shown on the *Treatment Key*, the District would use competitive seeding and planting on an average of 110 acres / year to prevent the introduction and spread of invasive plant infestations (average 42 sites / year). The District typically prescribes seeding for soil disturbance areas associated with timber sale harvests, culvert replacements and other project sites where the soil has been exposed. Competitive restoration planting sites typically number more than a dozen per year across the district.

Under the No Action Alternative, the District would continue to treat approximately 1,000 to 6,000 gross acres (on average 3,000 gross acres) annually. Approximately 85 percent of those treatments would be with non-herbicide methods and 15 percent would be with herbicides. Of the non-herbicide treatments, the majority would be manual (42 percent) and mechanical (50 percent), and prescribed fire would account for 7 percent of treatments. Of the herbicide treatments, about 98 percent would be with glyphosate. Broadcast treatments with a low boom attached to a vehicle would occur occasionally (two times a year) in the West Eugene Wetlands, but all other treatments would be spot treatments (applied by backpack sprayer or other ground-based method; see Appendix B for more information about ground-based herbicide treatment methods). The *Annual Treatment Summary* table (Table 2-1) shows the last seven years of treatments.

[21] In addition, approximately one acre / year is treated with propane torches as part of the Upper Willamette Field Office's Oak Basin restoration project and analyzed in that NEPA analysis (USDI 2011).
[22] As described in Appendix B, *Integrated Invasive Plant Management*, 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.

***Table 2-1**. Northwest Oregon District Annual Treatment Summary (2011-2017)*

Treatment Method	2011 acres	2012 acres	2013 acres	2014 acres	2015 acres	2016 acres	2017 acres
Herbicide (total)	*214*	*647*	*1,023*	*593*	*342*	*97*	*49*
2,4-D	3	5	5	-	-	-	-
Dicamba	-	22	10	-	4	-	-
Fluazifop-P-butyl	-	-	-	-	-	-	<1
Glyphosate	211	620	1,008	593	338	97	48
Picloram	-	-	-	-	-	-	-
Manual	1,125	241	2,414	1,616	1,191	1,228	1,041
Mechanical	1,668	1,870	614	1,296	425	2,214	2,561
Targeted Grazing	90	123	-	-	-	-	-
Prescribed Fire	172	233	311	261	177	237	37
Biocontrol Agents	-	-	1	1	-	-	-
Total Acres Treated	1,229	1,011	3,439	2,210	1,735	3,296	3,321
Inventory[1]	6,178	14,014	6,989	8,803	10,315	12,516	10,520

1. Further information about invasive plant inventories can be found in Appendix A, *Invasive Plants on the District*.

Some invasive plants would not be treated under this alternative, as the appropriate treatment method may not be available in the area. For example, reed canarygrass and teasel could only be treated in the West Eugene Wetlands; they are not listed as noxious weeds and non-herbicide methods are not effective.

The District would manually treat emergent aquatic plants that have a large portion of the plant or leaves out of the water if the infestation consisted of one to three stems. The District would not treat larger emergent aquatic infestations or submerged and floating aquatic invasive plants.

In the Marys Peak, Tillamook, and Cascades Field Offices, the No Action Alternative in this EA is similar to the No Action Alternative (Alternative 2) in the Oregon FEIS, where the BLM estimated overall treatment efficacy at 60 percent if a limited suite of herbicides were available for use. In the Upper Willamette and Siuslaw Field Offices, the No Action Alternative in this EA is most similar to the reference analysis in the Oregon FEIS, where overall treatment efficacy was estimated at 30 percent when herbicides were not used. The site-specific analysis of this can be found in Issue 1.

All treatments are constrained by the Standard Operating Procedures and other measures listed in Appendix D and by the herbicide application rates listed in Table B-2 (in Appendix B).

Alternative 2 (Terrestrial Invasive Plant Management)

Alternative 2 would replace the management described in the *Westside Salem Integrated Non-native Plant Management Plan Final Decision and Rationale* (USDI 2008d), the *Cascades Resource Area Invasive Non-native Plant Management Decision Record* (USDI 2009), the *Marys Peak Resource Area Noxious Weed Control Utilizing Glyphosate Final Decision and Rationale* (USDI 2010c), and the *Categorical Exclusion: Siuslaw Field Office and Upper Willamette Field Office Invasive Plant Control* (USDI 2018). In addition, it would modify the *Sandy Wild and Scenic River and State Scenic Waterway Environmental Assessment and Management Plan* (USDI 1993).

Alternative 2 would allow the District to treat all terrestrial invasive plants (not just noxious weeds) with herbicides, and expand the program to include the use of additional herbicides. The non-herbicide direct control methods available under the No Action Alternative would remain the same under Alternative 2. Herbicides

available for use under Alternative 2 would include 2,4-D, aminopyralid[23], chlorsulfuron, clopyralid, dicamba, dicamba + diflufenzopyr, fluroxypyr, glyphosate, hexazinone, imazapic, imazapyr, metsulfuron methyl, picloram, rimsulfuron, sulfometuron methyl, and triclopyr. In addition, research and demonstration plots of fluazifop-P-butyl and sethoxydim could be used on a maximum of 15 acres per field office[24]. The same treatment methods would be available to all field offices uniformly. In addition, these treatment methods would also be available as BLM supports and implements cooperative terrestrial invasive plant treatments, including those proposed by non-BLM groups on BLM-administered lands and non-federally-managed lands. This alternative would allow the District to participate in and facilitate the implementation of partnership-based invasive plant management projects on non-federally-managed lands. The District would incorporate these projects in Annual Treatment Plans.

Under this alternative, herbicide use within riparian areas would be allowed (with applicable protection measures) throughout the District, including on BLM-administered lands within the Sandy Wild and Scenic River Corridor.

Appendix C, *Treatment Key, Invasive Plant Sites, and the Annual Treatment Plan*, shows how the District would treat specific invasive plant species under this alternative. Similar species are lumped into species groups (e.g., the biennial thistles species group would have different treatment options than the perennial grasses species group). Treatment options would also vary based on considerations such as soil type, infestation size, neighboring vegetation, and weather conditions. In addition to treatments shown on the *Treatment Key*, the District would continue to use competitive seeding and planting and prescribed fire. Competitive seeding and planting would occur on an average of 110 acres / year to prevent the introduction and spread of invasive plant infestations (average 42 sites / year); typical sites being smaller than an acre. Prescribed fire would occur on an average of 400 acres of invasive plants annually. These prescribed fires could be broadcast fires (across monocultures or areas where all species are invasive) or machine or hand piled and burned (generally woody species).

Under this alternative, the District would continue to treat approximately 1,000 to 6,000 gross acres (on average 3,000 gross acres) annually. As shown in Appendix C, approximately 25 percent of those treatments would be with herbicide and 75 percent would be with non-herbicide treatments. Of the non-herbicide treatments, the majority would be manual (50 percent) and mechanical (45 percent). About 26 percent of the herbicide treatments would be with aminopyralid, 19 percent with glyphosate, 10 percent with imazapyr, and 23 percent with triclopyr. Other herbicides would be used 5 percent of the time or less. Herbicide treatments would be spot treatments applied by backpack sprayer or other ground-based method 95 percent of the time and broadcast treatments 5 percent of the time. See Appendix B for more information about ground-based herbicide treatment methods and the *Treatment Key* in Appendix C for information about how specific infestations would be treated.

As under the No Action Alternative, the District would manually treat emergent aquatic plants that have a large portion of the plant or leaves out of the water if the infestation consisted of one to three stems. The District would not treat larger emergent aquatic infestations or submerged and floating aquatic invasive plants.

As with the No Action Alternative, all treatments are constrained by the Standard Operating Procedures and other measures listed in Appendix D and by the herbicide application rates listed on Table B-2. In addition, Appendix D lists Project Design Features to reduce the effects of Alternative 2.

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

[23] 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. A Risk Assessment for aminopyralid was completed in 2015 (AECOM 2015, 2014c), and the herbicide was analyzed at the national level in the 2016 PEIS. This EA provides the additional NEPA analysis that would allow the use of aminopyralid on more than 15 acres in the West Eugene Wetlands.
[24] As further described in Appendix B, this is 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.

level of retreatment would still take place, the additional herbicides would substantially improve the chances invasive plants would be controlled with fewer retreatments (USDI 2010a:135-136). Treatments described under this alternative are effective on almost all[25] 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.

Alternative 3 (Terrestrial and Aquatic Invasive Plant Management)

Alternative 3 would replace the management described in the *Westside Salem Integrated Non-native Plant Management Plan Final Decision and Rationale* (USDI 2008d), the *Cascades Resource Area Invasive Non-native Plant Management Decision Record* (USDI 2009), the *Marys Peak Resource Area Noxious Weed Control Utilizing Glyphosate Final Decision and Rationale* (USDI 2010c), and the *Categorical Exclusion: Siuslaw Field Office and Upper Willamette Field Office Invasive Plant Control* (USDI 2018). In addition, it would modify the *Sandy Wild and Scenic River and State Scenic Waterway Environmental Assessment and Management Plan* (USDI 1993).

Alternative 3 includes all of the terrestrial and emergent aquatic invasive plant treatments described under Alternative 2, and adds the treatment of submerged and floating aquatic invasive plants as well as emergent aquatic invasive plant infestations that are larger than one to three stems. The District would implement integrated invasive plant management for aquatic infestations; treatments of these aquatic invasive plant species would occur using manual and mechanical methods and aquatic formulations of 2,4-D, fluridone, glyphosate, imazapyr, and triclopyr. There is currently less than one acre of aquatic invasive species currently known on the District, all within the Siuslaw Field Office, including three infestations of parrot feather on Hult Pond and an emergent infestation of yellow flag iris on Kelly Creek (see Map A-2). These aquatic invasive plants would be a high priority for treatment as control programs are most effective if they can eradicate the infestation while it is still in the introduction phase before these invasive plant species become established on the District and spread (USDI 2010a:133, see the *Prioritizing Areas for Treatment* section in Appendix B). Hence, if Alternative 3 were selected, these aquatic plant species would likely be treated as soon as feasible. (See Tables C-3 and C-14 in Appendix C for further information about the exact treatment methods that the BLM would use on these species.) Map A-2, *Aquatic Invasive Species Documented in NISIMS* shows the locations of these infestations on the District.

These known aquatic invasive plant infestations occur in the upper reaches of the Willamette River, where there is a potential for them to spread rapidly. However, infestations can also occur in isolated closed aquatic systems, such as lakes and ponds. 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. Aquatic invasive plants in streams and rivers would only be treated with herbicides in areas where a portion of the plant is sticking out of the water or when water levels are at their lowest and the invasive plants that were previously submerged or floating are no longer in water. (Or stated another way, fluridone would be applied directly to water in closed aquatic systems to treat aquatic invasive plants, whereas aquatic formulations of 2,4-D, triclopyr, glyphosate, or imazapyr would be applied directly to the foliage of the emergent aquatic invasive plant.)

Appendix C shows treatment options by species group for these aquatic plants. These treatments would likely be done in coordination with ODA staff. Manual methods are often used in conjunction with herbicides; while 50 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

[25] Submerged and floating aquatic invasive plants are the exception.

bottom barriers / weed mats, and mechanical methods include diver assisted suction harvest or tractors[26]. Treatments may be done via boat; for example, aquatic weeds may be manually pulled out by someone in a kayak.

In the Sandy Wild and Scenic River corridor, BLM would use herbicides in riparian areas on BLM-administered lands to treat both terrestrial and aquatic invasive plants when appropriate. Currently there are no known aquatic invasive plants in the Sandy River corridor, but this alternative would allow treatment if they are discovered.

These treatment methods would also be available as BLM supports and implements cooperative terrestrial and aquatic invasive plant treatments, including those proposed by non-BLM groups on BLM-administered lands and non-federally-managed lands. This alternative would allow the District to participate in and facilitate the implementation of partnership-based terrestrial and aquatic invasive plant management projects on non-federally-managed lands. The District would incorporate these projects in Annual Treatment Plans.

As with the other alternatives, all treatments are constrained by the Standard Operating Procedures and other Protection Measures listed in Appendix D and by the herbicide application rates listed on Table B-2. Appendix D lists Project Design Features adopted for this analysis to reduce the effects of Alternative 3. Project Design Features and monitoring described for Alternative 2 also apply to Alternative 3.

As described under Alternative 2, 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 District would control invasive plant infestations 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. Chapter 3 provides the site-specific analysis.

Annual Treatment Plan (Alternatives 2 and 3)

Under the action alternatives, the District will determine potential treatments based in part on available tools and funding, and develop an Annual Treatment Plan prior to the beginning of control treatments. In addition, the District may develop specific area or project treatment plans in coordination with partners. Annual Treatment Plans would be subject to an interdisciplinary team[27] review, preparation of a Determination of NEPA Adequacy, and an additional decision to implement the Plan. This process ensures the proposal is within the scope of the program of work analyzed in this EA, and that 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. The acres treated described in this EA provide analytical assumptions for the issues analyzed in this EA and are not thresholds or targets for treatment. Reviewing actions through a Determination of NEPA Adequacy would allow the District to evaluate the implementation of this programmatic EA and evaluate whether treatments in the Annual Treatment Plan (individually and collectively) are within the scope of the program of work authorized. If there is relevant new information or changed circumstances, the District would revise Annual Treatment Plans to comply with the Decision Record for this EA or would complete the appropriate level of NEPA analysis and issue a new decision. The District would post Determinations of NEPA Adequacy and decisions for annual site-specific implementation on BLM's ePlanning website. Annual Treatment Plans help the District ensure that treatments conform to design

[26] Mechanical methods would not include aquatic weed harvesters.
[27] The interdisciplinary teams would include botanists, wildlife and fisheries biologists, archaeologists, and other natural resource specialists with expertise in potentially affected resources. Interdisciplinary team review of Annual Treatment Plans with broadcast treatments would include natural resource specialists with expertise in soil and hydrology.

standards and protection measures in the relevant NEPA documents[28], that site-specific conditions are considered and appropriately mitigated[29]; and that the District completes required Pesticide Use Proposals, Biological Control Agent Release Proposals, and other authorizations, obligations, and commitments[30] prior to implementation. Unexpected events such as increased or decreased funding, new invaders, wildfire, or weather conditions could alter implementation of the Annual Treatment Plan; however, through the Determination of NEPA Adequacy process described above the District would evaluate every planned control treatment, including BLM's 2019 Annual Treatment Plan. The District bases treatment methods on best current science and the experience of invasive plant control professionals. As new information becomes available about effective (or ineffective) treatment options for species or species groups, the District would make modifications to the *Treatment Key* as part of the Annual Treatment Plan.

Table C-30 in Appendix C summarizes this calendar year's invasive plant control activities planned for the District to present an example of how priorities and treatment methods would be implemented. However, this EA is programmatic, and as such does not authorize specific projects. Subsequent on-the-ground actions require additional decision-making before the treatments listed in the Annual Treatment Plan would be implemented.

Summary of Invasive Plant Treatments Under Each Alternative

Table 2-2, *Comparison of the Alternatives, Treatment Methods* provides a summary of the treatment options that would be available for use under each alternative.

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

Treatment	**No Action Alternative**					**Alternative 2**	**Alternative 3**
	Marys Peak and Tillamook Field Office	*Sandy Wild and Scenic River Corridor*	*Cascades Field Office*[2]	*Siuslaw and Upper Willamette Field Offices*[1,2]	*West Eugene Wetlands*	*District Wide*[2]	*District Wide*[2]
Direct Control Methods: Non-Herbicide Methods							
Manual	✓(T[3])	✓ (T)	✓ (T)	✓ (T)	✓ (T)	✓ (T)	✓ (A[3] and T)
Mechanical	✓ (T)	✓ (T)	✓ (T)	✓ (T)	✓ (T)	✓ (T)	✓ (A and T)
Competitive seeding and planting	✓ (T)	✓ (T)	✓ (T)	✓ (T)	✓ (T)	✓ (T)	✓ (T)
Biological control agents	✓ (T)	✓ (T)	✓ (T)		✓ (T)	✓ (T)	✓ (T)
Prescribed fire	✓ (T)	✓ (T)	✓ (T)		✓ (T)	✓ (T)	✓ (T)
Targeted grazing	✓ (T)	✓ (T)	✓ (T)		✓ (T)	✓ (T)	✓ (T)
Direct Control Methods: Herbicides							
2,4-D		✓[5] (limited T)	✓[4] (T)			✓ (T)	✓ (A and T)
Aminopyralid					✓[6] (T)	✓ (T)	✓ (T)
Chlorsulfuron						✓ (T)	✓ (T)
Clopyralid					✓ (T)	✓ (T)	✓ (T)
Dicamba		✓[5] (limited T)	✓[4] (T)			✓ (T)	✓ (T)
Diflufenzopyr + dicamba						✓ (T)	✓ (T)
Fluroxypyr						✓ (T)	✓ (T)
Fluridone							✓ (A)
Fluazifop-P-butyl					✓[6] (T)	✓[6] (T)	✓[6] (T)

[28] 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 D.
[29] For example, treatments where invasive plant control would remove plants contributing to bank stability or stream shading could be delayed or phased as necessary in order to prevent adverse effects to water quality.
[30] Such as required Special Status species, archaeological, and paleontological surveys, as well as SHPO consultation.

Treatment	**No Action Alternative**					**Alternative 2**	**Alternative 3**
	Marys Peak and Tillamook Field Office	*Sandy Wild and Scenic River Corridor*	*Cascades Field Office*[2]	*Siuslaw and Upper Willamette Field Offices*[1,2]	*West Eugene Wetlands*	*District Wide*[2]	*District Wide*[2]
Glyphosate	✓[4] (T)	✓[5] (limited T)	✓[4] (T)		✓ (T)	✓ (T)	✓ (A and T)
Hexazinone						✓ (T)	✓ (T)
Imazapic						✓ (T)	✓ (T)
Imazapyr						✓ (T)	✓ (A and T)
Metsulfuron methyl						✓ (T)	✓ (T)
Picloram		✓[5] (limited T)	✓[4](T)			✓ (T)	✓ (T)
Rimsulfuron						✓ (T)	✓ (T)
Sethoxydim						✓[6] (T)	✓[6] (T)
Sulfometuron methyl						✓ (T)	✓ (T)
Triclopyr					✓ (T)	✓ (T)	✓ (A and T)

1. Not including the West Eugene Wetlands.
2. Not including the Horning and Tyrrell Seed Orchards.
3. T = terrestrial invasive plant treatments; A = aquatic invasive plant treatments
4. Used on noxious weeds only.
5. Used on noxious weeds only and not used within riparian zones.
6. Used on research and demonstration plots only (maximum of 15 acres per herbicide per field office without additional NEPA analyses).

Alternatives Considered but Eliminated from Detailed Study

The BLM is required to include a discussion of all reasonable alternatives that achieve the purpose and need. Reasonable alternatives include alternatives which are technically and economically feasible, and which meet the purpose and need for the project. The BLM may eliminate from detailed analysis any alternatives that are not reasonable, including if the alternative:

- does not meet the purpose and need;
- is technically or economically infeasible;
- is inconsistent with the basic policy objectives for the management of the area;
- implementation is remote or speculative;
- is substantially similar to an alternative being analyzed in detail; or,
- would have substantially similar effects to an alternative being considered in detail.

The interdisciplinary team considered several other alternatives for analysis during the interdisciplinary process. The majority of these alternatives were submitted in the form of public comments during scoping. The reasons why these alternatives were eliminated from detailed analysis follows.

No Herbicides

This 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, similar to the current management of the Siuslaw and Upper Willamette Field Offices. Some public scoping comments suggested that instead of using herbicides, manual treatment of invasive plants could be accomplished with volunteers. This alternative was eliminated from detailed study because a no-herbicides reference analysis was included in the Oregon FEIS (USDI 2010a:27) and indicated the rate of spread for noxious weeds would increase over time and in turn, the adverse ecological and economic impacts of noxious weeds would increase. (This is also explained in Issue 1, which describes the spread of invasive plants on the District.) In the Northwest Oregon District, plants that cannot be effectively controlled without the use of herbicides include Canada thistle, parrots feather, water primrose, and knotweeds. A no-herbicides alternative would not meet the need for more effective invasive plant control and therefore is not a

reasonable alternative. In addition, this alternative is inconsistent with the basic policy objectives for the management of the area, as established in the District's Resource Management Plans.

Use Fewer Herbicides than Analyzed Under the Action Alternatives

An alternative was considered that would remove one or more herbicides from consideration in the action alternatives for various reasons including stated risks or apparent lack of need. All of the herbicides available in the action alternatives have specific species or conditions for which they are the most suitable control. This proposed alternative would not meet the purpose and need; having the range of herbicides available under Alternative 2 or 3 would allow applicators to select the most appropriate one for a wider range of invasive plant species, site conditions, timing, and management objectives, and help avoid the development of herbicide resistance in target invasive plant species (see Appendix B for more discussion of herbicide resistance). This would allow 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* (Appendix C) 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. The District would not use herbicides that are not appropriate for the invasive plants or the conditions on the District. Hence, this alternative was eliminated from detailed analysis, as it would have substantially similar effects to the action alternatives.

Use More Herbicides than Analyzed Under the Action Alternatives

This alternative was suggested during scoping. An alternative was considered that would include additional herbicides, including herbicides that are not approved for use on BLM-administered lands. Herbicides used on BLM-administered 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 associated 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, and tebuthiuron, and the results have been evaluated through the NEPA process (USDI 2010b). Research and demonstration has been approved on numerous herbicides, including two that the District analyzes under the action alternatives (fluazifop-P-butyl and sethoxydim). In general, having a larger range of herbicides available allows applicators to select the most appropriate one for a wider range of invasive plant species, site conditions, timing, and management objectives, and helps to avoid resistance of targeted species to specific herbicides. However, the herbicides available under the action alternatives 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. At this time, additional herbicides are not needed to aid the BLM with its invasive plant program. Since the District would not use herbicides that are not appropriate for the invasive plants or the conditions on the District, these herbicides would not be applied. Hence, this alternative was eliminated from detailed analysis, as it would have substantially similar effects to the action alternatives.

Use Vinegar, Salt, Soap, Sugar, Wood Chips, Essential Oils, Hot Water or Foam, or Other Household Products to control Invasive Plants

These products were suggested during scoping as options for invasive plant control instead of or in addition to herbicide use. There are several EPA-registered herbicide formulations that have vinegar as the active ingredient, but they are not registered with the State of Oregon and / or they are not included on BLM's list of herbicides approved for use on BLM wildlands. The limited number of registered target plants, lack of widespread use on non-BLM-administered lands, and relatively little experience with environmental effects precludes the BLM from investing in the risk assessment process for these herbicides. The process for proposing, analyzing, and adopting additional herbicides is outlined in Appendix 4 of the 2010 Oregon FEIS (USDI 2010a:477-482), and it is possible that a vinegar herbicide could be considered in the future.

A mixture of salt, vinegar, and dish soap was suggested as an invasive plant treatment method in a letter received during scoping, as it has the "power of RoundUp [glyphosate product]… will kill any and all vegetation and will sterilize the soil so that nothing will grow for a long time." If this mixture works as described, it does not meet the purpose of preventing unacceptable adverse effects. While there can be advantages to having non-selective herbicides (such as glyphosate) available in certain circumstances, in general, having more selective treatment methods has less risk to non-target vegetation. Sterilizing the soil (by using vinegar, an acid with a pH of 2.2) so that nothing will grow would not allow native plants to return; in addition to other adverse effects, soil quality is important for nutrient cycling and water holding capacity (Page-Dumroese et al. 2009).

Essential oils can function as herbicides, although they are not registered by the EPA for this use. They are also non-selective (Campiglia et al. 2007). Mint oil products are registered as insecticides with the EPA, which suggests that they may not be as safe for insects as the herbicides analyzed in this EA. In addition, the costs of essential oils far exceeds the costs of treatment methods available under the alternatives.

The addition of carbon (via sugar or wood chips) to soils has been used to control certain annual weeds. In test plots, Charles Sturt University (Australia) ecologists spread half a kilogram of refined white sugar to each square meter of soil every three months and found this inhibited weed growth of most annual weeds, giving the native plants the opportunity to become well-established (Beemster 2005). In addition to being both expensive and time-consuming, most of the invasive plants found on the district are not annuals; these carbon additions would favor the more problematic perennial weeds on the District.

Hot foam treatments have been experimented with on some BLM districts in western Oregon in the past two decades, but have not been found to be effective for widespread use. While hot foam prevents seed set, it does not kill the seed bank. Hot foam and hot water would have more adverse environmental effects to non-target flora and fauna than the proposed treatment methods; hot water and foam are less selective, more time consuming, and have higher equipment costs than other available control methods.

Some household products were not considered because Oregon State Law prohibits the use of any material to control, kill, limit, or repel plants or animals unless it is registered with the State as a pesticide and such use is consistent with the label. Certain household materials are registered pesticides. For example, Clorox Ultra is registered for killing the oospores of the root disease *Phythophthora lateralis* (Port-Orford-cedar root disease), and borax is registered for use on tree stumps to prevent the root disease *Fomes annosus*. Pesticide registration and rigorous analysis is required; being a food or household product is not necessarily evidence it would not have unacceptable adverse environmental effects. For example, salt and acetic acid (vinegar) have an LD_{50} of 3,000 to 3,500, respectively[31]. While this is lower in toxicity than 2,4-D and triclopyr, it is similar in toxicity to glyphosate,

[31] Lethal dose to 50 percent of a population. Calculated on rats, as milligrams of substance per kilogram of body mass.

picloram, and dicamba, and higher toxicity than the other herbicides analyzed in this EA (USDI 2010a:92, OSU 2015). This alternative was eliminated from detailed analysis as it is technically and economically infeasible, it is inconsistent with the basic policy objectives for the management of the area, and it would 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 2007e), 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 action alternatives include adding use of more selective herbicides that are 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 and it is inconsistent with the basic policy objectives for the management of the area. In addition, similar to the *No Herbicides* alternative eliminated from detailed study, prioritizing the use of non-herbicide methods would have substantially similar effects to the action alternatives described in detail in this EA in which mechanical and manual methods are prioritized and herbicides are used discriminately. Hence, this alternative was eliminated from detailed analysis.

Limit Herbicide Treatments to Early Detection Rapid Response

An alternative was considered using the herbicides included in the action alternatives, but strictly limiting their use to early detection rapid response-type treatments 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 and it is inconsistent with the basic policy objectives for the management of the area. Control of established infestations essential to preventing or reducing ecologic and economic degradation, and controlling many of these sites cannot be achieved without using herbicides. Using herbicides to prevent invasive plant spread to uninfested areas is cost-effective and consistent with current laws, administrative direction, and the District's Resource Management Plans.

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 because it does not respond to the purpose and need. However, as described in Issue 1, 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-administered 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 inconsistent with the basic policy objectives for the management of the area, as established in the *Northwestern and Coastal Oregon Resource Management Plan and Record of Decision* (USDI 2016d) and the *West Eugene Wetlands Resource Management Plan and Record of Decision* (USDI 2015b). 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 *Northwestern and Coastal Oregon Resource Management Plan* and was considered in the decision to select the current Resource Management Plan (USDI 2016d:93).

Chapter 3 - Affected Environment and Environmental Consequences

This chapter focuses on resource issues analyzed in detail that were identified during scoping, and presents the consequences of Alternative 2 and Alternative 3 compared to continuing current management (the No Action Alternative). Issues are analyzed in detail when:

a) the issue is related to how the alternatives respond to the purpose and need; or,
b) analysis is necessary to determine the significance of impacts.

Appendix G contains Issues 4 through 28, which the District did not analyze in detail. Many of the issues included in Appendix G have already been adequately analyzed in documents to which this EA tiers.

Determination of Effects in this Environmental Analysis

The individual issues analyzed in detail in this chapter and those not analyzed in detail in Appendix G take into consideration the following factors:

- **Treatment Key** (see Tables C-1 through C-27, and C-28, *Summary of Treatment Options*): This shows invasive plant locations and sizes, treatment options under each alternative, considerations for when treatment methods would be used, and percent of acres by field office or area where a treatment method would be used.

- **Risk Assessments**: Issues that discuss native vegetation, fish and aquatic organisms, wildlife, and human health rely on herbicide Risk Assessments to aid in analyzing and describing adverse effects. Risk Assessments quantitatively evaluate the probability (i.e., risk) that herbicide use in wildland settings might pose harm to an organism. The analysis describes the potential for the given resource to experience the Risk Assessment-modeled exposure scenarios (See Appendix F, *Herbicide Risk Assessment Summaries).* The likelihood of actual exposures comparable to those described in the Risk Assessments is reduced by application of Protection Measures (see Appendix D), as well as by the nature of the application and the location and actions of the receptor.[32]

- **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 ARBO II (NMFS 2013, USDI 2013a) further protect federally listed species. The BLM will consult with the U.S. Fish and Wildlife Service and National Marine Fisheries Service on actions described in this EA and consultations are expected to result in additional Project Design Criteria to protect federally listed species. BLM will adopt all additional Project Design Criteria that result from consultation with either agency. In addition, Project Design Features have been adopted as part of this analysis' action alternatives.

[32] 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.

- **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.

Issue 1: How does treatment efficacy under the alternatives affect the spread of invasive plants?

Analytical Assumptions and Methods

The BLM considered the following factors in the analysis of this issue:

- Acres and infestations of invasive plants currently on the district;
- The rate of spread of those invasive plant infestations;
- Acres and infestations of invasive plants that would be treated;
- Adequacy of treatment methods on a species or infestation (i.e., is a treatment method available that can adequately treat a particular invasive plant species?); and
- Overall effectiveness of the program.

Acres and Infestations of Invasive Plants Currently on the District

As further described in the *Affected Environment* section, on the Northwest Oregon District, there are currently 81 species of invasive plants on 49,491 sites of invasive plants mapped on 17,430 gross acres (see Table 3-1). Appendix C displays these species, sites, and acreages, organized by 27 species groups and 5 field offices. Many of these sites overlap with other invasive plant sites. For example, a site of reed canarygrass may exist in the same area as a site of shining geranium and a site of creeping velvetgrass. This 17,430 figure accounts for this overlap. Not accounting for overlap, the summation of the acreage of each of these 49,491 sites is 52,088 acres.

In addition (as described in Appendix A), there are species and infestations that have not been mapped. Many of these species are widespread throughout the District and precise acreage is unknown. Field office invasive plant management staff have estimated approximately how many acres of each species are in need of treatment, but it is unknown if they will become a priority for treatment (see the *Prioritizing Areas for Treatment* section of Appendix B). However, these infestations would be mapped before treatments occur. For the purposes of the analysis of this issue, the BLM will calculate program-wide efficacy based on mapped acres.

Spread of Invasive Plant Infestations

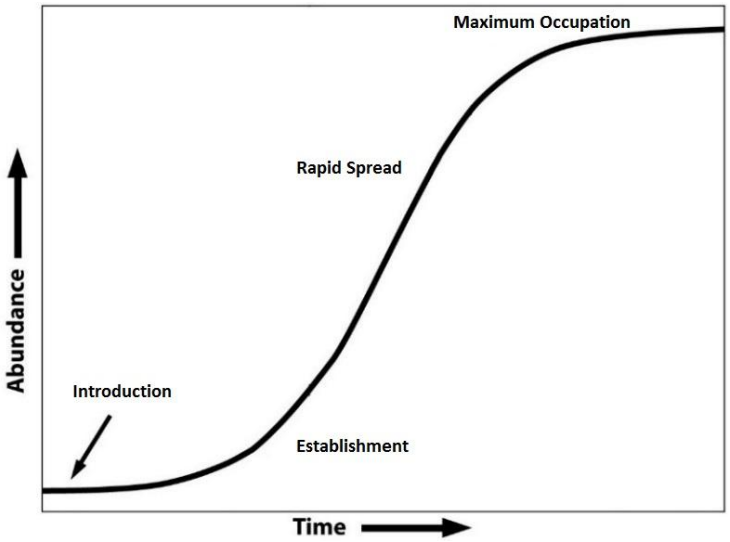
As described in Appendix B, *Spread from Existing Invasive Plant Sites*, timber harvest, road construction, and recreation can all contribute to invasive plant spread as well as actions such as management of special forest products, rights-of-way agreements, road maintenance, and fuels reduction treatments (USDI 2016e:419-438). Maps A-3 to A-7 show some of the routes of invasive plant spread.

As described in the Oregon FEIS, the BLM assumes that the rate of spread from each of these existing infestations is 12 percent annually (see Table 3-1). This rate of spread was estimated based on BLM and U.S. Forest Service data which showed that invasive plants generally spread at an estimated 10 to 15 percent annually (USDI 2010a:594-603). The projections in the Oregon FEIS were based on noxious weed data and may not hold true for other invasive plants (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.

It should be noted that within any particular plant community or infestation, the rate of spread would fluctuate over time (see Figure 3-1). As described in the Oregon FEIS, the invasive plant invasion process occurs in three

phases: introduction, establishment, and spread. Once an introduction occurs, a delay or lag phase often takes place while an invasive plant becomes established. This phase is followed by a period of rapid growth that continues until the invasive plant species reaches the bounds of its new range (USDI 2010a:132).

Figure 3-1. *Relationship between Area Occupied by Invasive Plant Species and Time*



Invasive plant control programs are the most effective in the earliest phases (before establishment and rapid spread). Eighty-five percent of mapped invasive plant infestations are smaller than one acre (Table A-1, *Summary of Invasive Plants Documented in NISIMS by Infestation Size*). These sites are a higher priority for treatment, in part because they are closer to the introduction phase of the invasion curve, where if effective treatments are available, control of the infestation and eradication is more likely. Two percent of sites are larger than 5 acres, but account for 39 percent of mapped acres (Table A-1). As described in the *Prioritizing Areas for Treatment* section in Appendix B, these larger sites would be treated to prevent spread (containment), but not for eradication.

Acres and Infestations of Invasive Plants Treated

The District would not treat all invasive plants or all infestations. As described in Chapter 2, the District treats between 1,000 and 6,000 acres a year, with an annual average of 3,000 acres (see Table 3-1). This would not change between alternatives. These acres would be selected based on type of species, location, potential for spread, and efficacy of available treatments. Further information can be found in Appendix B, in the *Prioritizing Areas for Treatment* section.

Under all alternatives, when invasive plant treatments occur, all invasive plant species within the project area that can be treated are treated; the removal of only one species at a site where several species are intermingled would lead to the other invasive plants at the site revegetating the area. Hence, the District's approximately 3,000 acres of annual treatments occur within the existing 17,430 acres of invasive plant infestations, which takes into account that species overlap (i.e., treating 3,000 acres treats 17 percent of the District's currently mapped invasive plant infestations).

Adequacy of Treatment Methods

Treatments would be done according to the *Treatment Key* (see Appendix C), which lays out treatment options and considerations by species groups and by alternative. As shown in the *Treatment Key*, many species group tables include a row for "no adequate control." This indicates the percent of acres under each alternative targeted for treatment that the District would not treat because adequate control methods are unavailable or unfeasible (e.g., infestations are too large or too established to be treated). Treatments would not be attempted even in high priority circumstances. Table 3-1 presents acres that cannot be treated, organized by alternative. (As described in the *Acres and Infestations of Invasive Plants Currently on the District* section above, invasive plant infestations often overlap. An infestation of one species that can be adequately controlled with available treatment methods may treated in the same area as a species that does not have an effective control method (and hence, would not be treated). For purposes of this analysis, Table 3-1 provides a weighted acreage by species or location.)

Effectiveness of the Program

As described in the Oregon FEIS, invasive plant control treatments are not 100 percent effective at controlling all treated populations; some level of retreatment is necessary to eradicate or prevent the spread of invasive plants (USDI 2010a:135-139). Plants continue to exist in an area after treatments because of the seed bank or propagules left behind or because some weeds are inadvertently missed during spot treatments.

The Oregon FEIS described that noxious weed treatments in a program where herbicides were not used had been found to be 30 percent effective (USDI 2010a:136); that is, 30 percent of the treated part of the infestation would not need follow-up treatments. The Oregon FEIS based this estimate (in part) off of data collected from the former Eugene District where herbicides are not used[33]. Hence, the District estimates noxious weed treatments in the Siuslaw and Upper Willamette Field Offices (the former Eugene District), as well as noxious weed treatments in the riparian zones in the Sandy Wild and Scenic River corridor, to be 30 percent effective. In addition, the District has treated invasive plants not listed as noxious weeds for more than a decade and determined the retreatment rate for those species is similar. Hence, under the No Action Alternative, the District estimates treatment efficacy to also be 30 percent for invasive plants not listed as noxious weeds. With 30 percent effectiveness and a 12 percent spread rate, if an area were treated annually, after 21 years the density of that area would be less than 1 percent of what it was when treatments started.

The Oregon FEIS estimated that program effectiveness would be 60 percent in a program where a limited suite of herbicides were available. The Oregon FEIS based this estimate off of data collected from districts where only 2,4-D, dicamba, picloram, and glyphosate were used (USDI 2010a:136). Hence, treatment efficacy is estimated to be 60 percent for noxious weeds in the Cascades, Marys Peak, and Tillamook Field Offices under the No Action Alternative. With 60 percent effectiveness and a 12 percent spread rate, if an area were treated annually, after seven years the density of that area would be less than 1 percent of what it was when treatments started.

The Oregon FEIS estimated that program effectiveness would be 80 percent in a program where the suite of treatment methods and available herbicides would be sufficiently broad for treatments to meet the program's invasive plant management objectives (USDI 2010a:136). Hence, treatment efficacy is estimated to be 80 percent for most terrestrial plants under the action alternatives. With 80 percent effectiveness and a 12 percent spread rate, if an area were treated annually, after five years the density of that area would be less than 1 percent of what it was when treatments started. However, perennial grasses would continue to have limited effective treatment methods available, so effectiveness for these species is estimated at 60 percent.

As shown in Table 2-2, the West Eugene Wetlands program includes more herbicides and treatment methods than the other field offices and locations on the District; however, treatment efficacy would still be lower than what would be achieved with a broader suite of treatment methods. The District estimates treatment efficacy to be 70 percent for the West Eugene Wetlands for invasive plants under the No Action Alternative. With 70 percent effectiveness and a 12 percent spread rate, if an area were treated annually, after six years the density of that area would be less than 1 percent of what it was when treatments started.

Except for the possibility of early detection and rapid response manual treatments on up to three stems of emergent aquatic infestations, the District would not attempt to control aquatic invasive plant infestations under the No Action Alternative and Alternative 2. The District estimates aquatic treatment efficacy to be 80 percent under Alternative 3.

These projections of effectiveness should not be considered absolute, but rather reasonable approximations of the relative differences among the alternatives. Table 3-1 illustrates these varying levels of treatment effectiveness across the District under the alternatives.

[33] The Oregon FEIS also used data from National Forests in Oregon where herbicides had not been used (USDI 2010a:136).

***Table 3-1**. Summary of Factors that Affect the Spread of Invasive Plants*

Species or Locations with Varying Treatment Effectiveness		Treatment Effectiveness	Total Infested Area (Acres[1])	Acres[1] with No Adequate Treatment Method	Annual Spread Rate	Acres[1] Treated Annually
No Action Alternative						
West Eugene Wetlands		70%	595	198	12%	3,000
Marys Peak, Tillamook, and Cascades Field Offices[2]	Noxious Weeds	60%	4,608	1,750		
	Other Invasive Plants	30%	100			
Sandy Wild and Scenic River Riparian Areas		30%	15			
Upper Willamette and Siuslaw Field Offices[3]		30%	12,111	5,461		
Aquatic invasive plants		(NA[4])	1	1		
District-wide		*Varies*	*17,430*	*7,409*		
Alternative 2						
Invasive grasses		60%	1,508	128	12%	3,000
Aquatic invasive plants		(NA)	1	1		
All other invasive plants		80%	15,921	0		
District-wide		*Varies*	*17,430*	*129*		
Alternative 3						
Invasive grasses		60%	1,508	128	12%	3,000
Aquatic invasive plants		80%	1	0		
All other invasive plants		80%	15,922	0		
District-wide		*Varies*	*17,430*	*128*		

1. As described in *Acres and Infestations of Invasive Plants*, *Adequacy of Treatment Methods*, and *Acres and Infestations of Invasive Plants Treated* sections above, invasive plants species on these individual acres may overlap with other invasive plant species.
2. Not including the Sandy Wild and Scenic River Riparian Areas.
3. Not including West Eugene Wetlands.
4. Not applicable; treatments do not occur.

The analysis area includes locations where invasive plants species are found on BLM-administered lands on the District as well as areas where these species are found on non-federal land in partnership project areas. The temporal scale of the analysis is 15 years. This is a long enough timeframe to show a comparison between the alternatives; however, variables in new introductions of invasive plants over time are too uncertain to allow for a useful analysis beyond this.

Affected Environment

As further described in Appendices A, *Invasive Plants on the District*, and C, *Treatment Key, Invasive Plant Sites, and the Annual Treatment Plan*, the District identified 120 invasive plant species known or suspected to occur on the District. Of those, 53 species are not listed as noxious weeds. The District has mapped 81 invasive plant species on over 49,000 sites, totaling more than 17,000 infested acres (Table A-3, *Invasive Plants Mapped in NISIMS by Infestation Size,* Maps A-1, *Terrestrial Invasive Species Documented in NISIMS*, and Map A-2, *Aquatic Invasive Species Documented in NISIMS*). In addition, there are species and infestations that are known to occur on the District but are not mapped. These species are generally widespread and / or dispersed throughout the District. While the locations are not mapped, it is possible to characterize the areas and habitat where they may occur. While the precise acreage occupied by these species on the District is unknown, the unmapped acres column in the tables in Appendix C indicates how many additional acres invasive plant management staff estimate to be in need of treatment. Most infestations on the Northwest Oregon District occur on roadsides within forests, at recreation sites, in meadows, and in forest openings where invasive plants have more access to sunlight and less competition from native woody plants. Two aquatic invasive species are mapped on the District. Appendix C describes in additional detail the District's invasive plant species and infestations.

Environmental Consequences

This analysis shows how the alternatives would affect spread of the current infestations. It does not account for unknown infestations on neighboring lands that would spread on to BLM-administered lands. Likewise, infestations on BLM-administered lands would spread on to non-BLM-administered lands, where they may or may not be treated. Exact data are unknown; as described in the *Proposed Resource Management Plan / Final Environmental Impact Statement for Resource Management Plans for Western Oregon*, the distribution of invasive plant species across all lands is available on the iMapInvasives website. However, as described in the *Proposed Resource Management Plan and Final Environmental Impact Statement for Resource Management Plans for Western Oregon*, to which this EA tiers, the data are limited because there is no requirement for county, private, or corporate landowners to report invasive plant information (USDI 2016e:245). The alternatives could cumulatively contribute to spread on these other lands or may cumulatively aid in the reduction of spread.

As described in the Oregon FEIS, under all alternatives, treatment efficacy would be beneficially affected by restoration projects and right of way maintenance when these projects incidentally control invasive plants (USDI 2010a:154). The Oregon FEIS estimates that 25 percent of right-of-way maintenance incidentally treats undetected noxious weeds (USDI 2010a:137).

No Action Alternative

Under the No Action Alternative, the District would treat approximately 3,000 acres per year. Invasive plants would continue to spread at their current rate, estimated at 12 percent per year. Given a 12 percent rate of spread and annual treatment of 3,000 acres per year at a 30, 60, or 70 percent effective treatment rate depending on the species and location, as well as 7,409 acres that have no adequate treatment method, the 17,430 acres of mapped infestations is estimated to spread to 51,968 acres over the next 15 years. The effective annual increase in infested acres in year 15 would be 198 percent, meaning that despite a combination of prevention efforts and control treatments, spread would rapidly outpace rate of control. This varies by field office: in the Cascades, Marys Peak, and Tillamook Field Offices, infestations would increase 108 percent (from 4,608 acres to 9,578 acres) over 15 years and infestations in the Upper Willamette and Siuslaw Field Offices would grow 238 percent (from 12,227 acres to 41,305 acres).

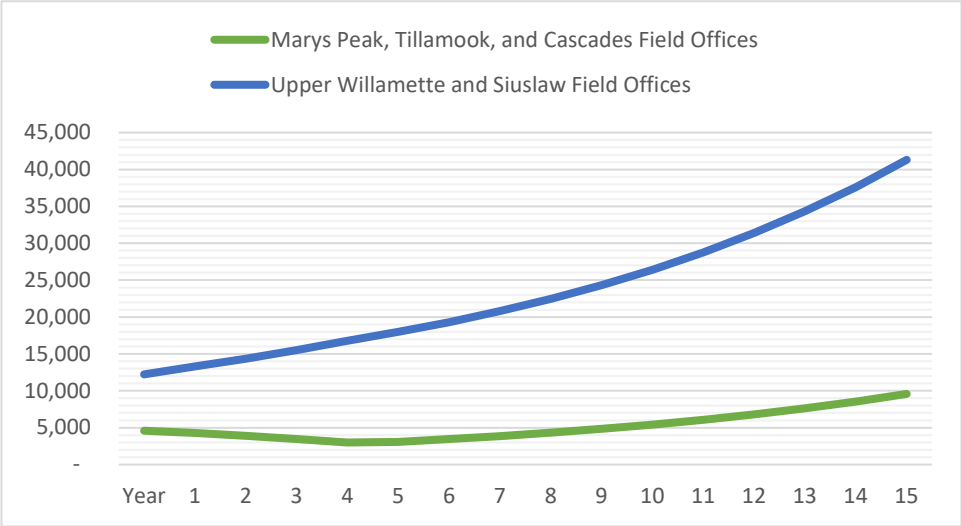
This spread is influenced both by program's treatment effectiveness but also by the quantity of acres without adequate treatment methods. As shown in Appendix C, all of the 27 species groups have inadequate treatments for some portion of the District. As shown in Figure 3-2, in Cascades, Marys Peak, and Tillamook Field Offices where overall program effectiveness is 60 percent for noxious weeds, this means that existing mapped infestations would reduce from the current infestation size of 4,608 acres to 2,993 acres in the next four years. However, acres that could not be treated would continue to grow 12 percent a year, and hence grow from 2,993 to 9,578 acres over the next 11 years.

Table 3-2 shows the existing acres (mapped and estimated) that cannot be controlled as well as the projected spread of those acres after 15 years. Many species groups do not have adequate treatment methods for infestations in some areas, but those species also do not have any acreage in many areas. For example, there are no treatment methods available to treat aquatic species under this alternative, but there are no known infestations in the Upper Willamette Field Office. Hence, after 15 years, there would be no spread from known infestations in this field office. Biological control agents may also affect spread; as described in the *Biological Control Agents* section of Appendix B, biocontrols are effective when there are enough invasive plants for the agent to feed on.

The BLM works in conjunction with other landowners off of BLM-administered lands on approximately 20 acres annually. Effects on these acres would be as described on BLM-administered lands, as projects are limited to the same restrictions and treatment methods available to the BLM. Due to the limited treatment methods available

under this alternative, some partners have stopped collaborating with the BLM on projects off of BLM-administered lands so they can use more effective methods of treatment.

***Figure 3-2**. Acres of Invasive Plants, 15 year Projection (No Action Alternative)*



Other neighboring infestations cannot be quantified; it is unknown how many acres exist, whether treatments are being done, and if they are, how effective they are. Given that the BLM administers 7 percent of the land within the District boundary and that land is dispersed across the northwest quarter of the state, it is likely that tens of thousands of acres of invasive plants may spread onto BLM-administered land in the next 15 years. Likewise, invasive plants on BLM-administered lands will spread off of BLM-administered lands. The inability to effectively control species on BLM-administered land results 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-administered 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- administered lands would reduce treatment efficacy at the landscape scale. In addition, potential partners have been reluctant to engage in cooperative control due to BLM's herbicide use restrictions and resulting confusion and complication of switching treatments at ownership boundaries.

As appropriate, the impact of invasive plant spread described under this alternative to other resources is discussed in Issue sections related to those resources (see Issues 2 and 3 and Appendix G).

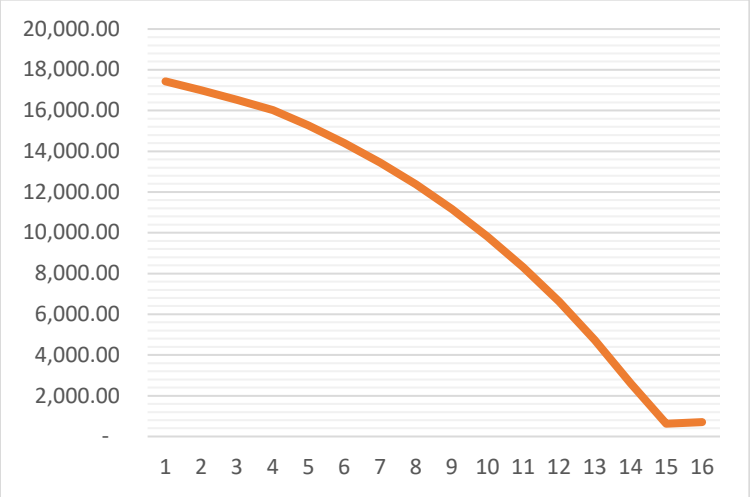
Table 3-2. *Acres With No Adequate Control Methods, by Species Group, No Action Alternative*[1]

Area / Species Groups	Upper Willamette Field Office		Siuslaw Field Office		West Eugene Wetlands		Tillamook Field Office		Marys Peak Field Office		Cascades Field Office	
	Current	*Infestation in 15 Years*[2]	*Current*	*Infestation in 15 Years*[2]	*Current*	*Infestation in 15 Years*[2]	*Current*	*Infestation in 15 Years*[2]	*Current*	*Infestation in 15 Years*[2]	*Current*	*Infestation in 15 Years*[2]
Annual Grasses	0[3]	0	-[3]	-	0	1	-	-	-	-	2	9
Annual Peas	9	49	98	538	NA[4]	NA	-	-	0	1	-	-
Aquatic Species	-	-	0	2	-	-	-	-	-	-	-	-
Biennial Thistles	596	3,261[5]	15	83	265	1,450[5]	547	2,996[5]	614	3,362[5]	39	213
Borage	-	-	1	4	-	-	-	-	-	-	0	0
Buckwheat	2	9	1,264	6,920	NA	NA	2	9	5	28	19	103
Buttercups	-	-	0	0	NA	NA	0	0	0	2	10	55
Canada Thistle	1,194	6,534[5]	-	-	NA	NA	709	3,883[5]	798	4,367[5]	87	477
Carnations	-	-	-	-	-	-	-	-	-	-	-	-
Carrot	-	-	1	4	-	-	-	-	-	-	0	1
Geranium	210	1,147	135	741	12	67	111	608	90	490	45	248
Hawkweeds	-	-	-	-	NA	NA	-	-	-	-	0	0
Knapweeds	22	120	250	1,368[5]	NA	NA	13	72	22	123	37	200
Lilies, Iris, Sedges, Rushes	-	-	0	1	-	-	-	-	-	-	-	-
Loosestrifes	-	-	0	2	-	-	-	-	-	-	-	-
Miscellaneous Herbaceous - Annual	-	-	0	2	NA	NA	-	-	-	-	0	2
Miscellaneous Herbaceous - Perennial	4	21	8	44	NA	NA	0	1	0	1	3	18
Mustards	-	-	0	0	NA	NA	6	34	0	0	0	0
Perennial Grasses	609	3,332	246	1,346	445	2,436	52	284	309	1,689	247	1,350
Perennial Mints	0	2	0	3	NA	NA	-	-	-	-	2	8
Perennial Peas	16	85	8	45	NA	NA	108	591	2	10	3	14
Snapdragons	713	3,901	1,495	8,182	-	-	1	8	2	9	18	99
Spurges	-	-	-	-	-	-	-	-	-	-	0	1
St. Johnswort	2,006	10,977[5]	1,950	10,676[5]	NA	NA	186	1,020[5]	209	1,146[5]	20	109
Sunflower	604	3,305[5]	709	3,882[5]	NA	NA	99	544	112	616	35	194
Teasel	-	-	-	-	NA	NA	-	-	-	-	-	-
Woody	4,307	23,574	3,433	18,789	NA	NA	900	4,927	483	2,645	427	2,339

1. White cells = < 1 acre, yellow cells = 1 to 100 acres, and pink cells > 100 acres. Colors do not indicate any sort of threshold. These acres do not add up to the 7,409 acres shown in Table 3-1. Table 3-1 accounts for species with overlapping acreage; however, many species with overlapping acres are in separate species groups. In addition, this table shows mapped acres as well as additional estimated acres in each species group in need of treatment.
2. While current infestations are on BLM-administered lands, infestations may spread beyond the geographic area in which they currently occur.
3. 0 acres in an area indicates that the acreage rounds to 0 (acreage is less than 0.5). A dash indicates that the species is not present in an area.
4. NA = adequate control methods available for this species group in this area.
5. In these species groups and geographic areas, 15-year infestation acres are expected to be overestimates. Biocontrol control agents are effective on at least 90 percent of the invasive plants in these species groups in these areas (see Table B-1, *Widespread Biological Control Agents in the Northwest Oregon District* and as described in Appendix B, *Biological Control Agents*, biocontrols are only effective when there are enough invasive plants for the agent to feed on.)

Alternative 2

***Figure 3-3**. Acres of Invasive Plants, 15 year Projection (Alternative 2)*



Under Alternative 2, the District would treat approximately 3,000 acres per year. Invasive plants would continue to spread at their current rate, estimated at 12 percent per year. Given a 12 percent rate of spread and annual treatment of 3,000 acres per year at a 60 or 80 percent effective treatment rate, the existing 17,430 acres of mapped terrestrial infestations is estimated to be reduced to 705 acres over the next 15 years, a 96 percent reduction. Similar to the No Action Alternative and as shown in Figure 3-3, existing mapped infestations would reduce from the current infestation size of 17,430 acres to 627 acres in the next 14 years. However, acres that could not be treated because adequate treatment methods are not available would continue to grow 12 percent a year, and hence grow from 627 to 705 acres over the next year.

***Table 3-3.** Acres With No Adequate Control Methods, by Species Group, Alternative 2*[1]

Species Groups	*Current*	*15 Years*
Aquatic Species	0.32	1.75
Lilies, Iris, Sedges, Rushes Group	0.19	1.04
Perennial Grasses	128.30	702.23
All other Species Groups	NA[1]	NA[1]
1. Adequate control methods available for these species groups		

Table 3-3 shows the existing acres (mapped and estimated) that cannot be controlled as well as the projected spread of those acres after 15 years.

This spread does not account for the unknown infestations on neighboring lands that would spread onto BLM-administered lands. However, given the more effective treatment methods available, as well as the existing prioritization of small invasive plant sites, these new infestations would be eradicated while they are in the introduction or establishment phase. While it is not possible to quantify this influence on the rate of spread, it can be assumed that this would result in a reduction in the spread rate (USDI 2010a:137-138). As described in the Oregon FEIS (USDI 2010a:133), implementing control efforts in this phase can prevent future infestations on tens to hundreds of times more acres (Radtke and Davis 2000)[34]. The Oregon FEIS describes that the resource value benefits from being able to treat weeds as aggressively as adjacent landowners cannot be quantified (USDI 2010a:327), and that BLM would be perceived as a more equal partner in invasive plant control efforts (USDI 2010a:325). Partnership projects are more likely to occur under the action alternatives and the BLM would have the ability to be strategic in targeting new invaders and other infestations early in the invasion curve (see Figure 3-1).

Alternative 3

In addition to terrestrial treatments, the District would treat aquatic infestations under Alternative 3. There is currently less than one acre of these infestations. The infestations would be high priority for treatment and it is expected that these treatments would eliminate these known infestations within three years (see Table 3-4). However, the District has not been able to treat aquatic infestations and hence has not been inventorying them. It is expected that there are additional unmapped acres throughout the District. In addition, (similar to terrestrial species), various vectors (such as recreation activities) have the ability to add new invaders into aquatic systems at

[34] An updated version of this 2000 report is cited in this EA as ODA (2014). See Issue 23.

any time. To support the proper function of aquatic systems , BLM needs the ability to go beyond early detection, rapid response to actively treat and effectively control aquatic invasive species.

***Table 3-4**. Projected Infestation Size Over 15 Years, Aquatic Infestations, Alternative 3*

Invasive Aquatic Weeds		
Original infestation size / Year 0		0.51
Spread rate		12%
Percent effectiveness		80%
Acres treated annually		0.51
Acres effectively treated annually		0.41
Acres of invasive plant infestation based on original infestation	Year 1	0.10
	Year 2	0.02
	Year 3	0.00

Partnership projects are more likely to occur under the action alternatives and the BLM would be able to be strategic in targeting new aquatic invaders and other infestations early in the invasion curve (see Figure 3-1). For example, Alternative 3 would allow the BLM to coordinate with other land managers to control aquatic species not yet known on BLM-administered lands, but known to occur on adjacent lands such as Eurasian watermilfoil, water primrose, and floating water primrose. The BLM would start actively participating with the Willamette Aquatic Invasive Network. This group has been active in water primrose survey, mapping, and treatments along the Willamette, Luckiamute, and Long Tom Rivers, all of which flow through BLM-administered lands.

Spread of terrestrial invasive plants under Alternative 3 would be as described under Alternative 2.

Issue 2: What are the effects to Special Status aquatic species from aquatic invasive plant treatments?

Analytical Methods

The analysis area includes any area on the Northwest Oregon District which could potentially receive treatments to control aquatic invasive plants, which is any water source found on the District. Therefore, the aquatic analysis area includes all of the large rivers, streams, springs, ponds, pump chances, heliponds, and reservoirs on BLM-administered lands on the Northwest Oregon District. The District primarily includes lands in the Willamette basin and its tributaries along with drainages along the coast range flowing directly into the Pacific Ocean.

Analysis of effects to aquatic organisms from herbicide treatments is based on the Risk Assessments conducted for the individual herbicides (see Appendix F and Table 3-6 later in this Issue), and on proposed application rates and treatment acres as described in Chapter 2 of this EA. 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.

The analysis of effects on western pond turtle and painted turtle is discussed in Issue 9 in Appendix G.

Affected Environment

Habitat conditions across the District's 714,395 acres vary greatly and range from relatively intact, functioning ecosystems to degraded systems. Stream habitats are greatly influenced by adjacent riparian stand conditions that contribute large and small functional wood, gravel substrate from adjacent hillslopes, and include shade providing trees and vegetation to maintain cool stream temperatures required by salmonids. While the lowland valley of the Willamette River has been largely converted to agricultural, industrial, and urban uses, much of the upland and headwater reaches on BLM-administered lands are forested and habitat conditions in those streams are within the range of natural variability seen across any regional landscape. Habitat modification through historical stream cleaning, riparian harvest, and road construction are all factors in the reduction of spawning and rearing habitat for salmonids in the basin.

The distribution of anadromous stocks of salmon and steelhead in the Willamette River basin has been altered by multiple-use dams on both the Willamette and McKenzie River. There are 13 dams within the Willamette Project area that are operated in cooperation between the U.S. Army Corps of Engineers (which operates and maintains the dams and revetments), the Bonneville Power Administration (which markets the hydropower generated at the dams), and the U.S. Bureau of Reclamation (which sells a portion of the water) (NMFS 2008). Willamette Project dams block access to a substantial portion of the historical habitat and adversely impacts habitat downstream of the dams. The dams contribute to habitat loss, altered water temperatures, and altered flows that impact channel structure and floodplain connectivity (NMFS 2008).

Similarly for the Coastal Recovery Unit of the bull trout, fish passage is listed as one the primary threats to the species. Reintroductions of bull trout in the Willamette and McKenzie Rivers above Hills Creek Dam have proved successful in establishing self-sustaining populations (USDI 2015c:A-24).

There are 25,540 miles of fish-bearing streams within the boundary of the Northwest Oregon District and 1,980 miles (7.8 percent) are on BLM-administered lands. There are eight federally threatened species and numerous other Bureau Sensitive aquatic fauna species throughout the District (Table 3-5). Steelhead trout, coho salmon, and Chinook salmon are highly prized game fish that are fished year round in the Willamette River and tributaries. Resident rainbow and cutthroat trout are present in many smaller tributaries and are also popular sport fish.

The Northwest Oregon District lacks comprehensive surveys for Bureau Sensitive invertebrate species. However, their distributions are similarly affected by stream and off-channel habitat conditions as salmonids. Invertebrates are affected by a variety of water quality indicators, including sediment, temperature, and dissolved oxygen. For example, where streams have multiple road crossings or are highly segmented by the road network, contribution of fine sediment has reduced availability of clean gravel substrate for riffle-associated species. Where aquatic invasive species have encroached on native species, food webs and habitat availability for aquatic invertebrates are altered (Kuehne et al. 2016).

Table 3-5. *Aquatic Federally-Listed and Special Status Species within the Northwest Oregon District.*

Common Name *(Distinct Population Segment)*	***Species***	***Listing status***	***Taxon***
Coho salmon (Oregon Coast)	*Oncorhynchus kisutch*	Federal threatened	Anadromous Fish
Coho salmon (Lower Columbia River)	*Oncorhynchus kisutch*	Federal threatened	Anadromous Fish
Steelhead (Upper Willamette River)	*Oncorhynchus mykiss*	Federal threatened	Anadromous Fish
Steelhead (Lower Columbia River)	*Oncorhynchus mykiss*	Federal threatened	Anadromous Fish
Steelhead (Oregon Coast)	*Oncorhynchus mykiss*	Bureau Sensitive	Anadromous Fish
Chinook salmon (Upper Willamette River)	*Oncorhynchus tshawytscha*	Federal threatened	Anadromous Fish
Chinook salmon (Lower Columbia River)	*Oncorhynchus tshawytscha*	Federal threatened	Anadromous Fish
Bull trout	*Salvelinus confluentus*	Federal threatened	Resident Fish
Pacific eulachon (Southern)	*Thaleichthys pacificus*	Federal threatened	Anadromous Fish
Pacific lamprey	*Entosphenus tridentatus*	Bureau Sensitive	Anadromous Fish

Common Name *(Distinct Population Segment)*	***Species***	***Listing status***	***Taxon***
Coastal cutthroat trout (Southwest Washington / Columbia River)	*Oncorhynchus clarkii clarkii*	Bureau Sensitive	Anadromous Fish
Chum salmon (Pacific Coast)	*Oncorhynchus keta*	Bureau Sensitive	Anadromous Fish
Puget oregonian	*Cryptomastix devia*	Bureau Sensitive	Class Gastropoda
Olympia pebblesnail	*Fluminicola virens*	Bureau Sensitive	Class Gastropoda
Columbia sideband	*Monadenia fidelis columbiana*	Bureau Sensitive	Class Gastropoda
Pacific walker	*Pomatiopsis californica*	Bureau Sensitive	Class Gastropoda
Crowned tightcoil	*Pristiloma pilsbryi*	Bureau Sensitive	Class Gastropoda
Shiny tightcoil	*Pristiloma wascoense*	Bureau Sensitive	Class Gastropoda
Crater Lake tightcoil	*Pristiloma crateris*	Bureau Sensitive	Class Gastropoda
Western ridged mussel	*Gonidea angulata*	Bureau Sensitive	Class Bivalvia
Haddock's rhyacophilan caddisfly	*Rhyacophila haddocki*	Bureau Sensitive	Order Tricoptera
Scott's apatanian caddisfly	*Allomyia scotti*	Bureau Sensitive	Order Tricoptera

Treatments Planned Related to the Issue

No Action Alternative and Alternative 2

Manual methods would be used to control emergent aquatic plants if the infestation consists of one to three stems. Larger emergent aquatic infestations and submerged and floating aquatic vegetation would not be treated.

Alternative 3

Herbicide treatments with aquatic formulations could be implemented directly in aquatic habitat. Alternative 3 includes the use of fluridone in closed aquatic habitats that are disconnected and do not flow into streams during the treatment window. In addition, aquatic formulations of 2,4-D, glyphosate, imazapyr, and triclopyr would be used in areas where a portion of the plant is sticking out of the water or when water levels are at their lowest and the invasive plants that were previously submerged or floating are no longer in water. Manual treatment methods used on aquatic invasive plants include hand-pulling, rakes, shovels, or bottom barriers / weed mats and mechanical methods include diver assisted suction harvest or tractors. Manual methods would be used to treat aquatic plants 50 percent of the time and triclopyr would be used 35 percent of the time. Imazapyr (4 percent), glyphosate (10 percent), and mechanical methods (1 percent) would also be used in limited situations. The use of fluridone and 2,4-D is proposed in very limited situations (less than 1 percent of the time). Treatments may be done via boat; for example, aquatic weeds may be manually pulled out by someone in a kayak. As shown on Map A-2, there are currently 0.32 acres of parrot feather (an aquatic invasive plant) located in Hult Pond (see Table C-3) and 0.19 acres of yellow flag iris on Kelly Creek (see Table C-14).

Protection Measures

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

There are numerous required Protection Measures that have been developed to protect water resources, riparian and aquatic habitat, and aquatic organisms, and are listed in full in Appendix D. Some of the ones most relevant to this issue 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[35].
- 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 Alternative 3

The following Project Design Features would further reduce effects on fish and other aquatic organisms under Alternative 3:
- In waterbodies that contain federally threatened or endangered fish species or provide critical habitat, follow all Project Design Criteria developed in coordination with NMFS.
- Delay treating side channels and connected backwaters until they are disconnected from the mainstem river or during the period of lowest flow.
- When using aquatic 2,4-D, glyphosate, imazapyr, or triclopyr in closed aquatic systems, implement a phased treatment (treating less than 50 percent of the surface area of the pond at a time) to reduce the likelihood of all of the aquatic plants dying at the same time, which would result in a rapid depletion of dissolved oxygen.

Environmental Consequences

Direct and Indirect Effects

No Action and Alternative 2

Known aquatic invasive plant sites would not be treated with herbicides under these alternatives. Existing infestations would continue to spread at an estimated 12 percent annually; the 0.51 acres of aquatic invasive plants currently known on the District would be expected to increase to 1.41 acres in 10 years and 4.39 acres in 20 years. Unmapped infestations will continue to expand until detected and mapped, which will further add to the overall acreage across the District at a similar rate to existing known sites. Manual methods would be used to control emergent aquatic plants if the infestation consists of one to three stems. No infestations of this size are currently known to exist but if they were found, no effects to fish or other aquatic organisms are anticipated to result from this activity.

Alternative 3

Potential effects to water quality from aquatic herbicide use are discussed in the Issue 18 (see Appendix G); this discussion focuses on potential effects to aquatic organisms themselves.

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. This would result in temporary localized displacement or a reduction in population size. However, many individuals would escape or

[35] Also called broadcast application.

remain in undisturbed areas, and populations would quickly rebound. Therefore, effects to aquatic macroinvertebrate species diversity or populations would be negligible.

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 parrot feather 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 negligible effects to macroinvertebrate species diversity or populations.

Mechanical methods, including diver assisted suction harvest (DASH) or tractors, would be used where removal of large portions of the root mass of the invasive is needed to treat the infestation. There would be a localized short-term (several hours) disturbance to the area around the infestation, which would result in an increase in turbidity and disturbance to the bed of the channel or water body and surrounding vegetation (USDI 2010a:231). Over several hours, the sediment would resettle in close proximity to its source. Treating the sites while seasonally disconnected or during the period of lowest flow would reduce the amount of disturbance. Local populations of fish and aquatic organisms would disperse from the site but are then expected to return to the site to forage on recently uncovered macroinvertebrates. Areas proposed for treatment - slower water and off channel habitats or disconnected aquatic habitat - are less likely to have native fish species and therefore they are unlikely to be affected.

Effects to fish and other aquatic organisms from herbicides is based on the Risk Assessment information (summarized below in Table 3-6).

Table 3-6*. Forest Service-Evaluated Herbicide Risk Categories for Aquatic Organisms (Aquatic Formulations)*

Receptor		**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
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

Receptor		2,4-D Amine		Fluridone		Glyphosate		Imazapyr		Triclopyr	
		Typ[1]	Max[1]	Typ	Max	Typ	Max	Typ	Max	Typ	Max
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 (see Table B-2, *Herbicide Information*, for typical and max applications rates. Application rates by species group can be found in the *Treatment Key* in Appendix C)
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 chemical to individual organisms, and the likelihood organisms would be exposed to the chemical. Because aquatic herbicides would be applied directly to water or to plants floating on water, 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 with direct spray to fish and other aquatic fauna. 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 C-3) 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 no risk to aquatic fauna from glyphosate, unless a spill of concentrated chemical occurred directly in water, which would result in localized impacts to aquatic organisms. Standard Operating Procedures such as mixing and loading in areas where spill would not contaminate waterbodies would minimize or eliminate the risk of such a spill. Given the small area to be treated in any given year, and lack of direct risk to fish and other aquatic organisms, any potential future use of glyphosate as currently allowed would not directly effect fish or aquatic insects.

The Risk Assessment for the aquatic formulation of triclopyr shows no risk to any aquatic organisms under all scenarios, except for the accidental acute exposure scenario calculated for maximum rates of application (10 lbs. / acre; see Table B-2, *Herbicide Information* for typical and maximum application rates for each herbicide), which has low risk to susceptible fish and invertebrates (see Table 3-6). As shown in Appendix C, proposed application rates of triclopyr range from 0.6 to 2 lbs. / acre; therefore, there would be no risk to any aquatic fauna from use of this herbicide as proposed in this EA. For imazapyr, there is 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 closed aquatic habitats that are disconnected and do not flow into streams and only on an extremely limited basis (less than 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. 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 Special Status fish, there is no potential that use of it, as described in this EA, would result in any direct or indirect effect to Special Status fish.

Currently there is 0.32 acre of parrot feather at three sites in Hult Pond (Table C-1) and 0.19 acre of yellow flag iris, on Kelly Creek (see Table C-14). Given the limited number of known sites, the potential future herbicide treatments in aquatic habitat would be uncommon and less than two to three acres per year. Treatments would occur during periods of low flow or in seasonally disconnected or ponded habitats during a period of the year when this type of habitat would not be suitable for Special Status fish due to warm temperatures and low dissolved oxygen. 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 Special Status fish would result from any potential future herbicide treatments directly in aquatic habitats.

Aquatic invasive plants can spread to infest an entire water body. While there are no currently known infestations on the District that meet this description, this analysis assumes that this will occur. In an area where invasive plants cover more than half the surface area of a waterbody, should all invasive plants in a closed aquatic environment (i.e., no flow in or out) die and decay at once, there would be potential for oxygen depletion, which could be lethal to gilled aquatic organisms. However, this would not affect Special Status fish since they would be very unlikely to be found in such locations during the summer months when treatments would occur. Special Status 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. However, a required Project Design Features calls for phased treatments when treating aquatic weed populations. This would adequately limit the amount of decaying vegetation that could deplete oxygen levels for aquatic organisms.

These invertebrate 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 temporary loss of vegetation would change the nature of the aquatic habitat. However, this would not have any meaningful effect on native fauna since the amount of area treated any given year would be less than 1/100th of one percent of all available aquatic habitat across the District. Furthermore, these areas are not representative of natural habitat occupied by native salmonids. In Hult Pond, for example, the species present are primarily non-native game fish, bass, and bluegill. 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.

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 at the District-level in the short-term to populations of both native and nonnative plant species. Overall, treatments of currently small infestations of aquatic invasive plants would benefit fish and aquatic organisms by controlling existing invasive plant species and preventing future spread that has the potential to degrade large areas of habitat.

Selection and implementation of Alternative 3 would essentially mimic a localized drought event by temporarily increasing the amount of habitat disturbance, on less than three 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.

Summary of Effects

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

Alternative	Direct Effects	Indirect Effects
No Action Alternative and Alternative 2	There would be no application of herbicide directly to aquatic habitats, so no direct effects would occur to aquatic species or their habitats. If manual methods were used on one to three stems of an emergent weed, no effects are expected to fish or other aquatic organisms.	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 would impact less than 3 acres of aquatic habitat annually. No direct effects to aquatic fauna are anticipated to result. No effects to aquatic fauna are anticipated to result from non-herbicide treatments.	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 and Alternative 2, there would be no direct or indirect effects from invasive plant treatments to any aquatic organisms or aquatic habitat, and thus no cumulative effects are expected. 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 or habitat for aquatic organisms.

Under all alternatives, other 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 and ditch lines, instream mining, grazing, and other anthropomorphic disturbances has buried coarse gravel 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 of stream reaches to varying degrees across the District. These types of disturbances have led to reductions in numbers and diversity of macroinvertebrate populations in some areas. These disturbances are chronic in nature and can persist for very long time periods (decades). Natural disturbance mechanisms such as floods, landslides, and droughts also episodically affect fish and macroinvertebrates, and can potentially result in local extirpations (e.g., 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 weeks to several months in most cases)(Benoit et al. 1998, Mackay 1992).

In addition to effects described under Alternative 3, reasonably foreseeable future actions that would affect fish and aquatic organisms include routine fish passage and habitat restoration projects implemented as directed under the Northwestern and Coastal Oregon Resource Management Plan. These projects include the tipping, falling, and placing of whole trees and logs along with boulders to create spawning, resting, and rearing habitat for both anadromous and resident fish. These projects result in short-term, localized sediment pulses occurring during summer when juveniles are rearing in freshwater streams. Fish generally avoid sediment and associated turbidity by moving downstream or into side channels. Additional stress can result from disturbance, but effects are still expected to be negligible. Any accumulated fine sediment is routed through the system during the first higher fall flows.

The BLM is in the preparation and planning stages of an environmental analysis addressing the safety of the dam at Hult Pond. This analysis may result in modifications to the dam site that would improve fish passage but would result in sediment routing downstream reducing the quality of spawning habitat in Lake Creek. Over a period of several years, any accumulated sediment would be routed through the system and gravel substrate would return to pre-project levels. If the dam is removed, it is likely that gravel stored in the pond substrate would also be carried downstream adding to the amount of spawning habitat downstream.

Issue 3: How would the alternatives affect the cost of invasive plant control?

Analytical Methods

As previously described in the analysis for the Oregon FEIS (USDI 2010a:338-343), costs are arguably not a potential effect on the human environment and are not required by NEPA. However, an analysis of how implementation costs change between the alternatives informs decision making. BLM policy specifies that management actions having a high likelihood of improving resource conditions for relatively small expenditures of time and money should receive relatively higher priority (USDI 2005:34).

Table 3-8. *Direct Costs of Invasive Plant Treatments, by Gross Acre*[1]

Activity	Density	Cost
Herbicide Spot Spray	Low	$58.00
Manual Pull & Pile	Low	$65.00
Manual Pull & Scatter	Low	$65.00
Herbicide Spot Spray	Medium	$86.00
Herbicide Wicking/Wiping Application	Low	$88.00
Manual Pull & Bag	Low	$95.00
Manual Pull & Scatter	Medium	$145.00
Herbicide Wicking/Wiping Application	Medium	$150.00
Manual Pull & Pile	Medium	$165.00
Herbicide Spot Spray	High	$194.00
Manual Pull & Bag	Medium	$200.00
Herbicide Wicking/Wiping Application	High	$270.00
Manual Pull & Pile	High	$270.00
Manual Pull & Scatter	High	$270.00
Manual Pull & Bag	High	$380.00

1. Costs based on recent District contracts for invasive plant control projects.

The costs presented in this section are in 2018 dollars. Costs listed here include equipment, materials (including herbicides[36]), wages, and contract costs; they do not include program planning (e.g., NEPA or the creation of Annual Treatment Plans). As shown in Table 3-8, the direct cost of treating an acre of invasive plants varies by method and by density of infestation.

Density levels are defined as follows:

- *Low* concentrations consist of a few scattered plants, patches, clumps, or concentrations, generally less than 20 percent ground coverage within each treatment site.
- *Medium* concentrations consist of many plants, patches, clumps, or concentrations of specified species that have approximately 21 to 59 percent ground coverage within each treatment site.
- *High* concentrations consist of large, dense, heavy, concentrations of the specified species that have 60 to 100 percent ground coverage within each treatment site with only a few or occasional open areas.

Manual treatments range from $65 / acre (low density, pull and scatter invasive plants) to $380 (high density pull and bag invasive plants). Herbicide treatments are slightly less; herbicide spot spray of low-density plants is $58 / acre and herbicide wicking / wiping application of high-density plants is $270. Treatments of low-density infestations varies from $58 to $95 an acre, with the $95 / acre figure including manually pulling plants and then

[36] The cost of the herbicide product may vary; however, with the exception of fluridone, the difference in costs are accounted for in Table 3-8. As shown in the *Treatment Key* (see Appendix C), fluridone would be used less than one percent of the time when aquatic species are treated, and there are only 0.32 acres of invasive plant infestation in the aquatic species group.

bagging them. Treatments of a high-density acre would range from $194 (herbicide spot spray) to $380 (manually pull and bag invasive plants).

The BLM plans to treat approximately 3,000 acres annually and for analysis purposes, the BLM assumes that the average gross acre infested with invasive plants has 25 percent coverage: a medium density acre. As described in Issue 1, invasive plant control treatments are not 100 percent effective at controlling invasive plant infestations on the first try. Under all alternatives, some level of retreatment would be necessary to achieve complete control. The amount of retreatment necessary is a function of how effective the prior treatment is. It is most appropriate to look at cost per effectively treated acres, because the overarching objective is to control invasive plants and prevent their spread.

Indirect costs are not analyzed in detail. As described in the Oregon FEIS, it is difficult to assess the monetary value for many of the resource values obtained from public lands (USDI 2010a:338). However, Issue 23 in this EA describes the negative effects in qualitative terms. A recent study estimated an annual loss of $83.5 million to the State's economy from 25 noxious weed species (ODA 2014). The indirect costs of the treatment of invasive plants would include program planning (e.g., the creation of Annual Treatment Plans, training, or management of the program), but it is not expected that additional costs would result from the selection of either action alternative. Public scoping comments raised the concern that herbicide use could lead to increased indirect costs related to medical bills, but this analysis did not indicate risk to human health from the use of herbicides (see Issues 11-14).

Treatments Planned Related to the Issue

Under the No Action Alternative, approximately 15 percent of invasive plant treatments would be with herbicides and 85 percent would be with manual methods. Under the action alternatives, 25 percent of the treatments would be spot treatments with herbicides and 75 percent would be with manual methods. Herbicide treatments would be spot treatments 95 percent of the time.

Environmental Consequences

Costs shown in Table 3-8 reflect that contractors do the majority of the treatments on the District. Some treatments are done by volunteers or in coordination with other agencies and these costs are negligible, unknown, or would be borne by other agencies. Table 3-9 shows the average direct cost of invasive plant treatments.

Table 3-9. *Average Direct Cost of Treatments (Annual)*

Acres Treated	Cost / Acre[1]	No Action Alternative		Alternatives 2 and 3	
		Acres	***Total Cost***	***Acres***	***Total Cost***
Manually (contractor)	$170	2,450	$416,500	2,150	$365,500
Manually (other)	$0	100	$0	100	$0
With herbicides	$86	450	$38,700	750	$64,500
Total	$152 (No Action) $143 (Alts. 2 and 3)	3,000	$455,200	3,000	$430,000

1. Assuming medium density and an average manual treatment cost.

As shown in Table 3-10 costs per effectively treated acre are 37 percent less under the action alternatives when compared to the No Action Alternative. Similarly, the Oregon FEIS found that costs on west side districts (including Northwest Oregon) under Alternative 3 (similar to the action alternatives in this EA) would be reduced by 31 percent, when compared to the No Action Alternative (USDI 2010a:78,340).

Table 3-10. *Costs of Effectively Treated Acre, by Alternative*

	No Action Alternative	Alternatives 2 and 3
Cost per acre	$152	$143
Cost per year	$455,200	$430,000
Acres treated annually	3,000	3,000
Effectiveness of treatments	30%-70%[1]	60%-80%[1]
Acres effectively treated	1,510	2,252
Cost per effectively treated acre	$301	$191

1. Varies by geographic area and/or species. See Issue 1 for more detail.

No Action Alternative

The cost of implementing treatments under the No Action Alternative would be $455,200 a year, or $152 an acre. Treatments are estimated to be 30 to 70 percent effective, so treatment cost per effectively treated acre is $301 (see Table 3-10).

Alternatives 2 and 3

The cost of implementing treatments under the No Action Alternative would be $430,000 a year, or $143 an acre. Treatments are estimated to be 60 to 80 percent effective, so treatment cost per effectively treated acre is $191 (see Table 3-10).

Cumulative Effects

Management of invasive plants affects the costs of managing BLM-administered lands. Increased operating costs due to invasive plant management may result in direct or indirect transfer of costs to land management programs or users of BLM-administered lands. Invasive plant management may compete with other important land management needs, resulting in cost tradeoffs. However, invasive plant treatments would result in improvements in the condition of BLM resources and would lead to increases in commodity and non-commodity values, improving the goods, services, and uses provided by BLM-administered lands. Treatments would increase the quantity and quality of wildlife forage, reduce fire hazard, and reduce other negative effects from invasive plant spread. Improved recreation opportunities and reductions in risk of wildfires would benefit the economies of local communities, which are dependent on recreational opportunities and other natural resource-based businesses.

Consultation and Coordination

The EA has been made available for a 30-day comment period.

List of Preparers

Core Team

Northwest Oregon	
Team Lead and District Botanist and Invasive Plant Coordinator	Claire Hibler
Field Office Botanist and Invasive Plant Coordinator	Heidi Christensen
Planning and Environmental Coordinator	Panchita Paulete
Management Representative and Tillamook Assistant Field Manager	Rachel Showalter
GIS Specialist	Jay Ruegger
Oregon State Office	
Project Manager and Oregon State Office Invasive Plant Coordinator	Erin McConnell
Planner	Leslie Frewing
Planner	Richard Hardt
GIS Specialist	Maria Fiorella
Denton and Denton Environmental (Contractor)	Christi Denton
Denton and Denton Environmental (Contractor)	Carolyn Sharp

Other Specialists (all Northwest Oregon District unless otherwise specified)

Wildlife Biologist	John DeLuca
Fuels Management	Jessica Gallimore
Ecologist (Plant Conservation Program)	Patricia Johnston
Recreation	Traci Meredith
Hydrologist	Jonas Parker
Cartographer	Gabriel Rousseau (Oregon State Office)
Fish Biologist	Cory Sipher
Soil Scientist	Marissa Theve
Archaeologist	Heather Ulrich

Reviewers

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Review Opportunity

The EA and Finding of No Significant Impact (FONSI) were made available for a 30-day review period (November 2018) on BLM's ePlanning website. 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

Absorption: The process by which one substance, such as a solid or liquid, takes up another substance, such as a liquid or gas, through minute pores or spaces between its molecules. See also *Adsorption*.

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 EA, the ALS-inhibitors include four sulfonylureas (chlorsulfuron, metsulfuron methyl, rimsulfuron, 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 (e.g., glyphosate is the active ingredient in the product RoundUp).

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 or effectiveness of the active ingredient or to make the active ingredient easier to handle or apply.

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, rock quarries, bulk 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. See also *Absorption*.

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.

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. See also *Resident fish*.

Anaerobic: Life or processes, such as the breakdown of organic contaminants by microorganisms, which take place without oxygen. Anaerobic, or saturated soils, are general found in areas with a high water table.

Aquatic: Growing, living in, frequenting, or taking place in water; used to indicate habitat, vegetation, or wildlife in water.

Area of Critical Environmental Concern (ACEC): Lands where special management attention is needed to protect and prevent irreparable damage to important historic, cultural, or scenic values, fish and wildlife resources, or other natural systems or processes or to protect life and provide safety from natural hazards.

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: 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 control: The use of non-native agents including invertebrate parasites and predators (usually insects, mites, and nematodes), and plant pathogens to reduce populations of invasive plants. Also called biocontrol or biological control agent.

Boom (herbicide spray): A tubular device that conducts an herbicide mixture from a tank to a series of spray nozzles designed to deliver equal amounts across a bar. Usually mounted to a truck, or behind a tractor or all-terrain vehicle oriented perpendicular to the direction of travel.

Broadcast treatment or application: An application of an herbicide that uniformly covers an entire area.

Buffer: A space or distance left between the application and a non-target area.

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: As defined by the U.S. Department of Agriculture (USDA) soil texture classification system, soil particles smaller than 0.002 mm in diameter. Fine textured sediment, with particles smaller than silt (USDA 2017).

Conservation Measures: Measures adopted with the *2007 Vegetation Treatments using Herbicides on BLM Lands in 17 Western States Biological Assessment* and the *2016 Vegetation Treatments using Aminopyralid, Fluroxypyr, and Rimsulfuron* to prevent or reduce herbicide effects to federally listed species. A Mitigation Measure adopted with the 2007 and 2016 PEISs 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.

Critical habitat: 1) Specific areas within a species' habitat that are critically important to its life functions; 2) an area designated by the U.S. 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 effect 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: 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: A law passed in 1973 to conserve species of wildlife and plants determined by the Director of the U.S. 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, the *Endangered Species Act* requires all Federal agencies to conserve these species and consult with the U.S. Fish and Wildlife Service or National Marine Fisheries Service on Federal actions that may affect these species or their designated critical habitat.

Endocrine: Relating to several glands that secrete hormones or products directly into the bloodstream.

Environmental assessment (EA): A public document that serves to document an examination of the potential environmental effects of a proposed project, and from that, documents whether to prepare an environmental impact statement or a finding of no significant impact.

Eradication: Removal or elimination of a population

Erosion: The wearing away of the land surface by running water, wind, ice, or other geological agents.

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. 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*.

Forage: Vegetation eaten by animals, especially grazing and browsing animals.

Forb: Broad-leaved herbaceous plant.

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.

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 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 invasive plants to survive and reproduce, producing a population, over time, in which the majority of the plants of the weed species have the resistant characteristics.

Hydrologic: The properties, distribution, and effects of water on the earth's surface, in the soil and underlying rocks, and in the atmosphere.

Hydrolysis: The chemical breakdown of a compound due to reaction with water.

Inert ingredients: 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 plant species – either plants or plant pathogens. Infested areas are not necessarily 100 percent infested.

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: Non-native aggressive plants with the potential to cause significant damage to native ecosystems, cause significant economic losses, or both. *This EA and the 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.

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 percent 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 same as the rate on the label of the formulated product, but in certain cases, the maximum application rate is lower.

Mechanical control: The use of any mechanized approach to control or eliminate invasive plants (e.g., 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; or, 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 D.

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 biologically significant differences in the frequency or severity of any adverse 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 State, county, or federally listed as injurious to public health, agriculture, recreation, wildlife, or any public or private property.

Particulate matter (PM): A complex mixture consisting of varying combinations of dry solid fragments, solid cores with liquid coatings, and small droplets of liquid. These tiny particles vary greatly in shape, size, and chemical composition, and can be made up of many different materials such as metals, soot, soil, and dust.

Pathogen: Any disease-producing agent, especially a virus, bacterium, or other microorganism.

Perennial: A plant with a life cycle lasting more than two years; a stream that flows year round.

Persistence: The length of time a compound, once introduced into the environment, stays there.

Pesticide: Any substance used for controlling, preventing, destroying, repelling, or mitigating any pest. Includes fungicides, herbicides, fumigants, insecticides, nematicides, rodenticides, desiccants, defoliants, plant growth regulators, and so forth. Any material used in this manner is a pesticide and must be registered as such, even if it has other non-pesticide uses.

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.

Photolysis: The chemical breakdown of a compound due to reaction with light.

Point of Diversion (water): The geographic area from which water is diverted using infrastructure (works) and put to beneficial use. Examples of works include groundwater wells, water storage dams, diversion dams, dugouts, and pump sites along a surface water source.

Post-emergent (herbicide): Herbicide used to kill invasive plants after they have germinated and are growing.

Pre-emergent (herbicide): Herbicide applied to the soil to keep seeds from germinating.

Prescribed fire: A wildland fire that burns under specified conditions and in a 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 included in this analysis to prevent adverse effects from invasive plant treatments under the action alternatives.

Propagule: A part of a plant, e.g., a bud, spore, or root fragment, capable of producing a new plant.

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.

Protection Measures: Includes Standard Operating Procedures (from BLM manuals and handbooks), Mitigation Measures (adopted with the Records of Decision from the 2010 Oregon FEIS and 2007 and 2016 PEISs), Project Design Features (included in this EA), and Conservation Measures and Project Design Criteria (from listed species consultation) identified to protect resources from adverse effects from invasive plant treatments. See Appendix D, *Protection Measures*.

Rangeland: Land on which the native vegetation is predominantly grasses, grass-like plants, forbs, or shrubs; not forests.

Receptor: A biological entity such as a human, fish, plant, or invertebrate; used in the context of herbicide Risk Assessments and the organisms that are used to assess the potential affects of the herbicide.

Resident fish: Fish that spend their entire life in freshwater (e.g., bull trout) on or near a specific location.

Residue: Herbicide or its metabolites remaining in or on soil, water, plants, animals, or other 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. These herbicides are not available to the general public.

Resource Management Plan: Land use plans developed by BLM under the FLPMA; provides long-term (up to 20 years) direction for the management of a particular area of land.

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: 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 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 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.

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: As defined by the USDA soil texture classification system, individual rock or mineral fragments that range in diameter from 0.05 to 2 mm in diameter (USDA 2017).

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.

Sediment: 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: An herbicide 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.

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: As defined by the USDA soil texture classification system, individual mineral particles that range in diameter from between 0.002 and 0.05 mm in diameter (USDA 2017).

Site-specific: At the site, area, or project level.

Socioeconomic: Pertaining to, or signifying the combination or interaction of social and economic factors.

Sorption: The attachment of one particle to another; a general term, which includes adsorption and absorption.

Special Status species: Federally listed threatened, endangered, proposed, or candidate species, and species managed as Sensitive species by the BLM.

Spot treatment: An application of an herbicide to a small selected area such as an individual plant, as opposed to a broadcast application.

Standard Operating Procedures: 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 D. Since they originate from Manual and other direction, they may appear in resource management and other plans under other titles.

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 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.

Toxicity: A characteristic of a substance that makes it injurious.

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 or areas.

Transmissivity: See **Groundwater Transmissivity**.

Treaty rights: Tribal rights or interests reserved in treaties, by Native American Tribes for the use and benefit of their members. The uses include such activities as described in the respective treaty document. Only Congress may abolish or modify treaties or treaty rights.

Tribe: Term used to designate any Native American band, nation, or other organized group or community.

Typical rate or **typical application rate:** One of two application rates considered in many Risk Assessments (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.

Uncertainty factor: A multiplier used in Risk Assessments to compensate for unknown risks due to limitations in the research.

Volatilization: The conversion of a solid or liquid into a gas or vapor; evaporation of herbicide before they are bound to a plant or ground.

Watershed: The region draining into a river, stream, or body of water. When used in this EA, it refers to a 5th-field hydrologic unit.

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.

References

Cited As	Reference
AECOM 2014a	AECOM. 2014. Fluroxypyr Ecological Risk Assessment Final Report. Prepared for USDI BLM. Manchester, New Hampshire
AECOM 2014b	AECOM. 2014. Rimsulfuron Ecological Risk Assessment Final Report. Prepared for USDI BLM. Manchester, New Hampshire
AECOM 2014c	AECOM. 2014. Final Human Health Risk Assessment Final Report. (Fluroxypyr, Rimsulfuron, Aminopyralid) Prepared for USDI BLM. Manchester, New Hampshire
AECOM 2015	AECOM. 2015. Aminopyralid Ecological Risk Assessment Final Report. Prepared for USDI BLM. Manchester, New Hampshire
Anderson 1992	Anderson, N.H. 1992. Influence of disturbance on insect communities in Pacific Northwest streams. Hydrobiologia 248:79-92. A.D. Berrie (ed.), Invertebrate Communities of Rivers: Structure and Function. https://andrewsforest.oregonstate.edu/sites/default/files/lter/pubs/pdf/pub1411.pdf
ASI 2006	American Sheep Industry. 2006. Targeted Grazing: A Natural Approach to Vegetation Management and Landscape Enhancement. Karen Launchbaugh (ed.). American Sheep Industry Assoc. http://www.fs.fed.us/rm/pubs/rmrs_gtr292/2006_launchbaugh_k002.pdf
Beemster 2005	Beemster, Margrit. 2005. A sweet end to weeds. Study funded by the NSW Environmental Trust. https://www.csu.edu.au/__data/assets/pdf_file/0003/721641/sweetendtoweeds.pdf
Bell et al. 2012	Bell, J.L., M.R. Manucheri, H. Malone., and I.C. Burke. 2012. Absorption and translocation of aminopyralid and clopyralid in rush skeletonweed. Proceedings – Western Society of Weed Science 65.
Benoit et al. 1998	Benoit, Hughes, J. R Post, E. A. Parkinson, and N. Tom Johnston. 1998. Colonization by lentic macroinvertebrates: evaluating colonization processes using artificial substrates and appraising applicability of the technique. Canadian Journal of Fisheries and Aquatic Sciences. 55:2425-2435. http://www.nrcresearchpress.com/doi/pdf/10.1139/f98-125
Berg 2004	Berg, N. 2004. Assessment of herbicide best management practices: Status of our knowledge of BMP effectiveness. Pacific Southwest Research Station. USDA Forest Service. Albany, CA.
Bergman et al. 2012	Bergman, A., JJ Heindel, S Jobling, KA Kidd and RT Zoeller, eds. 2012. State of the Science of Endocrine Disrupting Chemicals Summary for Decision Makers. Geneva, Switzerland. http://apps.who.int/iris/bitstream/10665/78102/1/WHO_HSE_PHE_IHE_2013.1_eng.pdf?ua=1
Campiglia et al. 2007	Campiglia E, Mancinelli R, Cavalieri A, Caporal F. 2007. Use of essential oils of cinnamon, lavender and peppermint for weed control. Italian Journal of Agronomy. https://doi.org/10.4081/ija.2007.171
Chang and Delzell 2016	Chang, E.T. and E.D. Delzell. 2016. Systematic review and meta-analysis of glyphosate exposure and risk of lymphohematopoietic cancers. Journal of Environmental Science and Health. 51(6):402-434. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4866614/
Community Attributes Inc. 2017	Community Attributes Inc. 2017. Economic Impact of invasive Species: Direct Costs Estimates and Economic Impacts for Washington State. Report prepared for State of Washington. http://www.invasivespecies.wa.gov/council_projects/economic_impact/Invasive%20Species%20Economic%20Impacts%20Report%20Jan2017.pdf
Dent and Robben 2000	Dent, Liz and Joshua Robben. 2000. Aerial Pesticide Application Monitoring Final Report, Oregon Department of Forestry, Forest Practices Monitoring Program, Technical Report 7.
DiTomaso and Kyser 2006	DiTomaso, J.M. and G.B. Kyser. 2006. Evaluation of Imazapyr and Aminopyralid for Invasive Plant Management. Proceedings of the California Weed Science Society 58:107-109.
DiTomaso et al. 2013	DiTomaso, J.M., G.B. Kyser et al. 2013. Weed Control in Natural Areas in the Western United States. Weed Research and Information Center, University of California.
Donnegan et al. 2008	Donnegan, J, Campbell S., Azuma D, tech eds. 2008. Oregon's forest resources, 2001-2005: Five-year Forest Inventory and Analysis Report. Gen. Tech. Rep. PNW-GTR-765. Portland, OR: U.S. Forest Service, Pacific Northwest Research Station. 186 p. https://www.fs.usda.gov/treesearch/pubs/31453
Dow Agrosciences 2015	Dow Agrosciences. 2015. Integrating Herbicides in Prairie and Grassland Management: A Practical and Technical Guide, 1st edition. https://update-techline.squarespace.com/s/2015prairieguide_Garlon3A_web.pdf
EFSA 2017	European Food Safety Authority. July 6th, 2017. Letter to Dr. Portier. Subject: your letter: Review of the carcinogenicity of Glyphosate by ECHA, EFSA, and BrF. https://echa.europa.eu/documents/10162/23294236/portier_echa_efsa_response.pdf/9e199eca-af2f-96bb-9e61-d6bae2588f4b

Cited As	Reference
Enloe et al. 2007	Enloe, S.F., R.G. Lym, R. Wilson, P. Westra, S. Nissen, G. Beck, M. Moechnig, V. Peterson, R.A. Masters, and M. Halstvedt. 2007. Canada thistle (*Cirsium arvense*) control with aminopyralid in range, pasture, and non-crop areas. Weed Technology. 21:890-894.
Enloe et al. 2008	Enloe, S.F., G.B. Kyser, S.A. Dewey, V. Peterson, and J.M. DiTomaso. 2008. Russian knapweed (*Acroptilon repens*) control with low Rates of Aminopyralid on Range and Pasture. Invasive Plant Science and Management 1(4):385-389.
ENSR 2005a	ENSR. 2005. Vegetation Treatments Programmatic EIS – Chlorsulfuron Ecological Risk Assessment Final Report. Prepared for the U.S. Department of the Interior Bureau of Land Management, Nevada State Office, Reno, Nevada. Westford, Massachusetts.
ENSR 2005b	ENSR. 2005. Vegetation Treatments Programmatic EIS – Diflufenzopyr Ecological Risk Assessment Final Report. Prepared for the U.S. Department of the Interior Bureau of Land Management, Nevada State Office, Reno, Nevada. Westford, Massachusetts.
ENSR 2005c	ENSR. 2005. Vegetation Treatments Programmatic EIS – Fluridone Ecological Risk Assessment Final Report. Prepared for the U.S. Department of the Interior Bureau of Land Management, Nevada State Office, Reno, Nevada. Westford, Massachusetts.
ENSR 2005d	ENSR. 2005. Vegetation Treatments Programmatic EIS – Imazapic Ecological Risk Assessment Final Report. Prepared for the U.S. Department of the Interior Bureau of Land Management, Nevada State Office, Reno, Nevada. Westford, Massachusetts.
ENSR 2005e	ENSR. 2005. Vegetation Treatments Programmatic EIS – Overdrive® Ecological Risk Assessment Final Report. Prepared for the U.S. Department of the Interior Bureau of Land Management, Nevada State Office, Reno, Nevada. Westford, Massachusetts.
ENSR 2005f	ENSR. 2005. Vegetation Treatments Programmatic EIS – Sulfometuron Methyl Ecological Risk Assessment Final Report. Prepared for the U.S. Department of the Interior Bureau of Land Management, Nevada State Office, Reno, Nevada. Westford, Massachusetts.
ENSR 2005g	ENSR. 2005. Vegetation Treatments Programmatic EIS – Human Health Risk Assessment Final Report. Prepared for the U.S. Department of the Interior Bureau of Land Management, Nevada State Office, Reno, Nevada. Westford, Massachusetts.
Gray and Bahm 2015	Gray, E.C. and M.A. Bahm. 2015. Habitat monitoring at Greenhill, Oxbow West, and Fir Butte. Institute for Applied Ecology, Corvallis, Oregon; USDI Bureau of Land Management, Eugene District; and US Fish and Wildlife Service, Portland, Oregon. vi + 21 pp. https://appliedeco.org/wp-content/uploads/WEW-Habitat-sampling-2015-report.pdf
IARC 2015	International Agency for Research on Cancer. 2016. IARC Monographs Volume 112: evaluation of five organophosphate insecticides and herbicides. March 2015. Lyon, France. http://www.iarc.fr/en/media-centre/iarcnews/pdf/MonographVolume112.pdf
Iowa State University 2006	Iowa State University. 2006. Aminopyralid – New Herbicide for Pastures, Roadsides, Etc. http://www.weeds.iastate.edu/mgmt/2006/aminopyralid.shtml.
JMPR 2016	Joint Food and Agriculture Organization of the United Nations/World Health Organization Meeting on Pesticide Residues Summary Report. May 9-13, 2016. Geneva, Switzerland. http://www.who.int/foodsafety/jmprsummary2016.pdf?ua=1
Kelland 2017	Kelland, Kate. June 14, 2017. Cancer agency left in the dark over glyphosate evidence. Reuters. http://www.reuters.com/investigates/special-report/glyphosate-cancer-data/
Kerle et al. 2007	Kerle, E. A., J. J. Jenkins, P. A. Vogue. 2007. Understanding pesticide persistence and mobility for groundwater and surface water protection. EM 8561-E.
Kuehne et al. 2016	Kuehne, Lauren M,. J. D. Olden, and E. S. Rubenson. 2016. Multi-trophic impacts of an invasive aquatic plant. Freshwater Biology 61:1846-1861.
Levin and Greenfield 2018	S. Levin and P. Greenfield. "Monsanto ordered to pay $289m as jury rules weedkiller caused man's cancer." The Guardian. August 11, 2018. https://monsanto.com/news-stories/statements/environmental-working-group-ewg-spreading-misleading-information-time-glyphosate/
Mackay 1992	Mackay, R. 1992. Colonization by lotic macroinvertebrates: A review of processes and patterns. Canadian Journal of Fisheries and Aquatic Sciences. 49:617-628.
Meehan 1991	Meehan, William R. ed. 1991. Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitats. USDA American Fisheries Society Special Publication 19. Bethesda, MD.
Monsanto 2018	Monsanto. 2018. Statement. August 15, 2018. Accessed September 21, 2018. https://monsanto.com/news-stories/statements/environmental-working-group-ewg-spreading-misleading-information-time-glyphosate/

Cited As	Reference
NMFS 2008	National Marine Fisheries Service. 2008. Willamette Project Biological Opinion - Continued Operation of 13 Dams & Maintenance of 43 Miles of Revetments in the Willamette Basin, OR. https://pcts.nmfs.noaa.gov/pcts-web/dispatcher/trackable/NWR-2000-2117
NMFS 2013	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.
ODA 2009	Oregon Department of Agriculture. 2009. Annual Report: Pesticide Use Reporting System for 2008. Salem, OR.
ODA 2014	Oregon Department of Agriculture. 2014. Economic Impact From Selected Noxious Weeds in Oregon. Salem, OR. https://www.oregon.gov/ODA/shared/Documents/Publications/Weeds/ORNoxiousWeedEconomicImpact.pdf
ODA 2017	Oregon Department of Agriculture. 2017. Noxious Weed Policy and Classification System 2017. http://www.oregon.gov/ODA/shared/Documents/Publications/Weeds/NoxiousWeedPolicyClassification.pdf
ODF 2016	Oregon Department of Forestry. 2016. Oregon Smoke Management Annual Report. Salem, OR. http://www.oregon.gov/ODF/Board/Documents/SMAC/2016AnnualReport.pdf
Oregon SHPO and USDI 2015	Oregon State Historic Preservation Office and USDI Bureau of Land Management. 2015. State Protocol between the Oregon BLM and the Oregon 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.
OSU 2015	The Ohio State University, College of Food, Agricultural, and Environmental Service: OSU Extension. Stan Smith. Vinegar: Is it a Safer Herbicide? https://fairfield.osu.edu/news/vinegar-it-%E2%80%9Csafer%E2%80%9D-herbicide
OWRD 2013	Oregon Water Resources Department (OWRD). 2013. Water Rights in Oregon: An introduction to Oregon's water laws. https://www.oregon.gov/OWRD/WRDPublications1/aquabook.pdf
Page-Dumroese et al. 2009	Page-Dumroese, Deborah S., Ann M. Abbott, and Thomas M. Rice. Forest soil disturbance monitoring protocol. Volume II: Supplementary Methods, Statistics, and Data Collection. United States Department of Agriculture, Forest Service, 2009. https://www.fs.fed.us/rm/pubs_series/wo/wo_gtr082b.pdf
Plum 2017	Plum, K. June 27 2017. California to list herbicide as cancer-causing; Monsanto vows fight. Reuters. http://www.reuters.com/article/us-usa-glyphosate-california-idUSKBN19H2K1
Radtke and Davis 2000	Radtke, H.D. and S.W. Davis. 2000. Economic Analysis of Containment Programs, Damages and Production Losses from Noxious Weeds in Oregon. Oregon Department of Agriculture, Plant Division, Noxious Weed Control Program.
Rosenberg et al. 2016	Rosenberg, KV, J. A. Kennedy, R. Dettmers, R. P. Ford, D. Reynolds, J.D. Alexander, C. J. Beardmore, P. J. Blancher, R. E. Bogart, G. S. Butcher, A. F. Camfield, A. Couturier, D. W. Demarest, W. E. Easton, J.J. Giocomo, R.H. Keller, A. E. Mini, A. O. Panjabi, D. N. Pashley, T. D. Rich, J. M. Ruth, H. Stabins, J. Stanton, T. Will. 2016. Partners in Flight Landbird Conservation Plan: 2016 Revision for Canada and Continental United States. Partners in Flight Science Committee. 119 pp.
SERA 2001	Syracuse Environmental Research Associates, Inc. (SERA). 2001. Sethoxydim [Poast] – Human Health and Ecological Risk Assessment Final Report. Prepared for the U.S. Department of Agriculture Forest Service, Forest Health Protection.
SERA 2003	Syracuse Environmental Research Associates, Inc. (SERA). 2003. Glyphosate – Human Health and Ecological Risk Assessment Final Report. SERA TR 02-43-09-04a. Prepared for the U.S. Department of Agriculture Forest Service, Arlington, Virginia. Fayetteville, New York.
SERA 2004a	Syracuse Environmental Research Associates, Inc. (SERA). 2004. Chlorsulfuron – Human Health and Ecological Risk Assessment Final Report. SERA TR 04-43-18-01c. Prepared for the U.S. Department of Agriculture Forest Service, Arlington, Virginia. Fayetteville, New York.
SERA 2004b	Syracuse Environmental Research Associates, Inc. (SERA). 2004. Clopyralid (Transline) – Human Health and Ecological Risk Assessment Final Report. SERA TR 04 43-17- 03c. Prepared for the U.S. Department of Agriculture Forest Service, Arlington, Virginia. Fayetteville, New York.

Cited As	Reference
SERA 2004c	Syracuse Environmental Research Associates, Inc. (SERA). 2004. Imazapic Plateau and Plateau Dg – Human Health and Ecological Risk Assessment Final Report. SERA TR 04-43- 17-04b. Prepared for the U.S. Department of Agriculture Forest Service, Arlington, Virginia. Fayetteville, New York.
SERA 2004d	Syracuse Environmental Research Associates, Inc. (SERA). 2004. Metsulfuron Methyl – Human Health and Ecological Risk Assessment Final Report. SERA TR 04-43-17- 01c. Prepared for the U.S. Department of Agriculture Forest Service, Arlington, Virginia. Fayetteville, New York
SERA 2004e	Syracuse Environmental Research Associates, Inc. (SERA). 2004. Sulfometuron Methyl – Human Health and Ecological Risk Assessment Final Report. SERA TR 03-43-17- 02c. Prepared for the U.S. Department of Agriculture Forest Service, Arlington, Virginia. Fayetteville, New York
SERA 2004f	Syracuse Environmental Research Associates, Inc. (SERA). 2004. Dicamba - Human Health and Ecological Risk Assessment Final Report. SERA TR 04-43-17-06d. Prepared for the U.S. Department of Agriculture Forest Service, Arlington, Virginia. Fayetteville, New York
SERA 2006	Syracuse Environmental Research Associates, Inc. (SERA). 2006 2,4 Dichlorophenoxyacetic Acid Formulations – Human Health and Ecological Risk Assessment Final Report. Prepared for the U.S. Department of Agriculture Forest Service. Arlington, Virginia. Fayetteville, New York.
SERA 2008	Syracuse Environmental Research Associates, Inc. (SERA). 2008. Fluridone Human Health and Ecological Risk Assessment. Final Report. Prepared for USDA Forest Service and National Park Service. Syracuse, New York.
SERA 2011a	Syracuse Environmental Research Associates, Inc. (SERA). 2011. Glyphosate – Human Health and Ecological Risk Assessment Final Report. SERA TR 052-22-03b. Prepared for the U.S. Department of Agriculture Forest Service, Atlanta, Georgia.
SERA 2011b	Syracuse Environmental Research Associates, Inc. (SERA). 2011. Imazapyr– Human Health and Ecological Risk Assessment Final Report. SERA TR 052-29-03b. Prepared for the U.S. Department of Agriculture Forest Service, Atlanta, Georgia.
SERA 2011c	Syracuse Environmental Research Associates, Inc. (SERA). 2011. Picloram– Human Health and Ecological Risk Assessment Final Report. SERA TR 052-27-03b. Prepared for the U.S. Department of Agriculture Forest Service, Atlanta, Georgia.
SERA 2011d	Syracuse Environmental Research Associates, Inc. (SERA). 2011. Triclopyr. Human Health and Ecological Risk Assessment Final Report. SERA TR 052-25-03b. Prepared for the U.S. Department of Agriculture Forest Service, Atlanta, Georgia.
SERA 2014	Syracuse Environmental Research Associates, Inc. (SERA). 2014. Fluazifop-P-butyl. Human Health and Ecological Risk Assessment Final Report. SERA TR 052-25-03b. Prepared for the U.S. Department of Agriculture Forest Service, Atlanta, Georgia.
Temkin 2018	Temkin, A. 2018. Breakfast with a dose of Roundup? Retreived from: https://www.ewg.org/childrenshealth/glyphosateincereal/#.W6UzL-hKiUm
Tu et al. 2001	Tu, M., C. Hurd, and J.M. Randall. 2001. Weed Control Methods Handbook: Tools & Techniques for Natural Areas. The Nature Conservancy. http://www.invasive.org/gist/handbook.html. June 2001.
University of Idaho 2011	University of Idaho. 2011. Herbicide-Resistant Weeds and Their Management, PNW 437, a Pacific Northwest Extension publication (University of Idaho, revised 2011). Joan Campbell, University of Idaho; Carol Mallory-Smith and Andy Hulting, Oregon State University; Donn Thill, University of Idaho. http://www.cals.uidaho.edu/edComm/pdf/pnw/pnw0437.pdf
USDA 2005	USDA Forest Service. 2005. Pacific Northwest Region Invasive Plant Program Environmental Impact Statement.
USDA 2017	USDA Soil Science Division Staff. 2017. Soil Survey Manual. C. Ditzler, K. Scheffe, and H. C. Monger (eds.). USDA Handbook 18. Government Printing Office, Washington D.C. https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/ref/?cid=nrcs142p2_054262
USDA and USDI 2015	USDA Forest Service and USDI Bureau of Land Management. 2015. Interagency Special Status / Sensitive Species Program (ISSSSP) Agency Policy and Lists
USDA et al. 2013	USDA Forest Service. Pacific Northwest Region, USDI-Bureau of Land Management, Oregon State Office, and USDI-Bureau of Indian Affairs. 2013. 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. January 28.
USDI 1985	USDI Bureau of Land Management. 1985. Northwest Area Noxious Weed Control Program Final EIS. BLM Oregon State Office. Portland, OR.

Cited As	Reference
USDI 1986	USDI Bureau of Land Management. 1986. Visual Resources Contrast Rating Manual Handbook H-8431-1. Washington, DC.
USDI 1987a	USDI Bureau of Land Management. 1987. Northwest Area Noxious Weed Control Program Supplemental EIS. BLM Oregon State Office. Portland, OR.
USDI 1987b	USDI Bureau of Land Management. 1987. Supplemental Record of Decision Northwest Area Noxious Weed Control Program. Washington, D. C.
USDI 1992a	USDI Bureau of Land Management. 1992. Handbook 9011. Chemical Pest Control Handbook.
USDI 1992b	USDI Bureau of Land Management. 1992. Manual 9015. Integrated Weed Management. Release 9-321.
USDI 1993	USDI Bureau of Land Management. 1993. Sandy Wild and Scenic River and State Scenic Waterway Management Plan
USDI 2005	USDI Bureau of Land Management. 2005. Handbook 1601-1. Land Use Planning Handbook. Release 1-1693.
USDI 2007a	USDI Bureau of Land Management. 2007. Vegetation Treatments using Herbicides on Bureau of Land Management Lands in 17 Western States Programmatic Environmental Impact Statement. https://eplanning.blm.gov/epl-front-office/eplanning/planAndProjectSite.do?methodName=dispatchToPatternPage&currentPageId=103592
USDI 2007b	USDI Bureau of Land Management. 2007. Vegetation Treatments using Herbicides on Bureau of Land Management Lands in 17 Western States Record of Decision. https://eplanning.blm.gov/epl-front-office/eplanning/planAndProjectSite.do?methodName=dispatchToPatternPage&currentPageId=103592
USDI 2007c	USDI Bureau of Land Management. 2007. Vegetation Treatments on Bureau of Land Management Lands in 17 Western States. Biological Assessment BLM, Nevada State Office, Reno, NV.
USDI 2007d	USDI Bureau of Land Management. 2007. Vegetation Treatments on Bureau of Land Management Lands in 17 Western States. Final Programmatic Environmental Report. BLM, Nevada State Office, Reno, NV. https://eplanning.blm.gov/epl-front-office/eplanning/planAndProjectSite.do?methodName=dispatchToPatternPage&currentPageId=103592
USDI 2007e	USDI 2007. Department of the Interior Departmental Manual. Part 517. Pesticides.
USDI 2008a	USDI Bureau of Land Management. 2008. BLM Handbook H1740-2 Integrated Vegetation Management. Washington D.C. https://www.blm.gov/sites/blm.gov/files/uploads/Media_Library_BLM_Policy_Handbook_H-1740-2.pdf
USDI 2008b	USDI Bureau of Land Management. 2008. BLM Manual 6840, Special Status Species Management. IM 2009-039.
USDI 2008c	USDI Bureau of Land Management. 2008. BLM Handbook H-1790-2 National Environmental Policy Act Handbook. Washington D.C. https://www.ntc.blm.gov/krc/uploads/366/NEPAHandbook_H-1790_508.pdf
USDI 2008d	USDI Bureau of Land Management. 2008. Westside Salem Integrated Non-Native Plant Management Plan Environmental Assessment
USDI 2008e	USDI Fish and Wildlife Service. 2008. Birds of Conservation Concern 2008. United States Department of Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Arlington, Virginia. 85 pp.
USDI 2009	USDI Bureau of Land Management. 2009. Cascades Resource Area Invasive Non-Native Plant Management EA.
USDI 2010a	USDI Bureau of Land Management. 2010. Vegetation Treatments Using Herbicides on BLM Lands in Oregon Final Environmental Impact Statement. https://eplanning.blm.gov/epl-front-office/eplanning/planAndProjectSite.do?methodName=renderDefaultPlanOrProjectSite&projectId=70730&dctmId=0b0003e880df5615
USDI 2010b	USDI Bureau of Land Management. 2010. Vegetation Treatments Using Herbicides on BLM Lands in Oregon Record of Decision. https://eplanning.blm.gov/epl-front-office/eplanning/planAndProjectSite.do?methodName=renderDefaultPlanOrProjectSite&projectId=70730&dctmId=0b0003e880df5615
USDI 2010c	USDI Bureau of Land Management. 2015. Marys Peak Resource Area Noxious Weed Control Utilizing Glyphosate EA

Cited As	Reference
USDI 2010d	USDI Bureau of Land Management. 2015. Marys Peak Resource Area Noxious Weed Control Utilizing Glyphosate Final Decision and Rationale.
USDI 2010e	USDI Fish and Wildlife Service. 2010. Recovery Plan for the Prairie Species of Western Oregon and Southwestern Oregon. Portland, OR. https://www.fws.gov/oregonfwo/Species/PrairieSpecies/Documents/PrairieSpeciesFinalRecoveryPlan.pdf
USDI 2011	USDI Bureau of Land Management. 2011. Oak Basin Restoration/RAC Project Upper Willamette Resource Area BLM Eugene District Environmental Assessment DOI-BLM-OR-E060-2011-0005-EA.
USDI 2013a	USDI Fish and Wildlife Service. 2013. Endangered Species Act - Section 7 Consultation Programmatic Biological Opinion for Aquatic Restoration Activities in the States of Oregon, Washington and portions of California, Idaho and Nevada (ARBO II).
USDI 2013b	USDI Fish and Wildlife Service. 2013. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for Taylor's Checkerspot Butterfly and Streak Horned Lark; Final Rule. Federal Register 78(192):61506-61589.
USDI 2014a	USDI Bureau of Land Management. 2014. Biological Assessment for the Resource Management Plan for the West Eugene Wetlands in Lane County, Oregon on the US BLM – Eugene District.
USDI 2014b	USDI Fish and Wildlife Service. 2014c. Biological Opinion For The Resource Management Plan For The West Eugene Wetlands In Lane County, Oregon. FWS Reference Number OlEOFW00-2014-F-0139.
USDI 2015a	USDI Bureau of Land Management. 2015. Proposed Resource Management Plan and Final Environmental Impact Statement for the Bureau of Land Management West Eugene WetlandsF Resource Management Plan. Eugene District.
USDI 2015b	USDI Bureau of Land Management. 2015. Record of Decision and Resource Management Plan West Eugene Wetlands. Eugene District.
USDI 2015c	USDI Fish and Wildlife Service. 2015. Coastal Recovery Unit Implementation Plan for Bull trout (*Salvelinus confluentus*). Lacey, WA. https://www.fws.gov/pacific/bulltrout/pdf/Final_Coastal_RUIP_092915.pdf
USDI 2016a	USDI Bureau of Land Management. 2016. Final Programmatic Environmental Impact Statement for Vegetation Treatments Using Aminopyralid, Fluroxypyr, and Rimsulfuron. Washington Office
USDI 2016b	USDI Bureau of Land Management. 2016. Record of Decision for Vegetation Treatments Using Aminopyralid, Fluroxypyr, and Rimsulfuron. Washington Office
USDI 2016c	USDI Bureau of Land Management. 2016. Biological Assessment for Vegetation Treatments Using Aminopyralid, Fluroxypyr, and Rimsulfuron. Washington Office
USDI 2016d	USDI Bureau of Land Management. 2016. Northwestern and Coastal Oregon Resource Management Plan and Record of Decision
USDI 2016e	USDI Bureau of Land Management. 2016. Proposed Resource Management Plan / Final Environmental Impact Statement for Resource Management Plans for Western Oregon.
USDI 2017	USDI 2017. Department of the Interior Departmental Manual. Part 524. Invasive Species Management.
USDI 2018	USDI Bureau of Land Management. 2018. Categorical Exclusion for Invasive Plant Control: Siuslaw Field Office and Upper Willamette Field Office
USEPA 2001	Environmental Protection Agency. 2001. Office of Pesticide Programs. General Principles for Performing Aggregate Exposure and Risk Assessments.
USEPA 2004	US Environmental Protection Agency 2004. Human Health Risk Assessment for 2,4-D.
USEPA 2007	US Environmental Protection Agency. 2007. Inert (other) Pesticide Ingredients in Pesticide Products - Categorized List of Inert (other) Pesticide Ingredients (outdated). http://www.epa.gov/opprd001/inerts/oldlists.html
Vencill et al. 2002	Vencill, W.K. (ed). 2002. Herbicide Handbook, 8th ed. Weed Science Society of America, Lawrence, KS. 155-157.
Washington Department of Ecology 2002	Washington Department of Ecology. 2002. Eurasian Watermilfoil Infested Lake Control Strategies. Eradication - Whole Lake Furidone Treatment (Aquatic Herbicide).
Woodward et al. 1997	Woodrow J.E., Seiber J.N., and Baker L.W. 1997. Correlation techniques for estimating pesticide volatilization flux and downwind concentrations. Environ. Sci. Technol. 31(2), 523–529.

Appendices

Figures

Tables

Maps

Appendix A: Invasive Plants on the District

This appendix summarizes information about infestations of invasive plants on the District, including known or estimated invasive plant sites, to help clarify invasive plant treatments described in Appendices B and C and the analysis in Chapter 3 and Appendix G. 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 colonization by invasive plants is influenced by many factors, including community structure, disturbance, proximity to infested areas, and the biological traits of the invading species.

Existing Invasive Plant Sites

This section describes infestations known to occur on the District, some of which the BLM has digitally mapped in GIS, and others the BLM estimated or documented on paper maps. Invasive plant inventories on the District focus on locations where invasive plants are most likely to occur and spread from, such as waterways, road corridors, and areas with recent or frequent disturbance. The BLM also conducts project clearance or risk assessment surveys[1] in advance of planned projects, such as forest management projects, so the BLM can take measures to prevent the introduction and spread of invasive plants into and from project areas. The District maps and documents invasive plant infestations found through inventories, project risk assessment surveys, and incidental observations made during the course of conducting other land management work. Most of the known invasive plant sites documented on the District have been found by BLM staff and contractors completing inventories and project risk assessment surveys. The BLM is required to monitor new project areas with moderate likelihood of noxious weed introduction[2] for the first three years after completion and areas with high likelihood for five years (USDI 1992b).

The District uploads inventory data to the BLM's National Invasive Species Information Management System (NISIMS), the GIS that 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 appear to have been controlled are retained in NISIMS to guide future site monitoring. The BLM has historically had data sharing agreements with the Oregon Department of Agriculture to make District noxious weed distribution information available to the public on their WeedMapper website. The BLM also shares data with the IMapInvasives website. In addition, the BLM is in the process of making NISIMS data about invasive plant sites and treatment history accessible to the public.

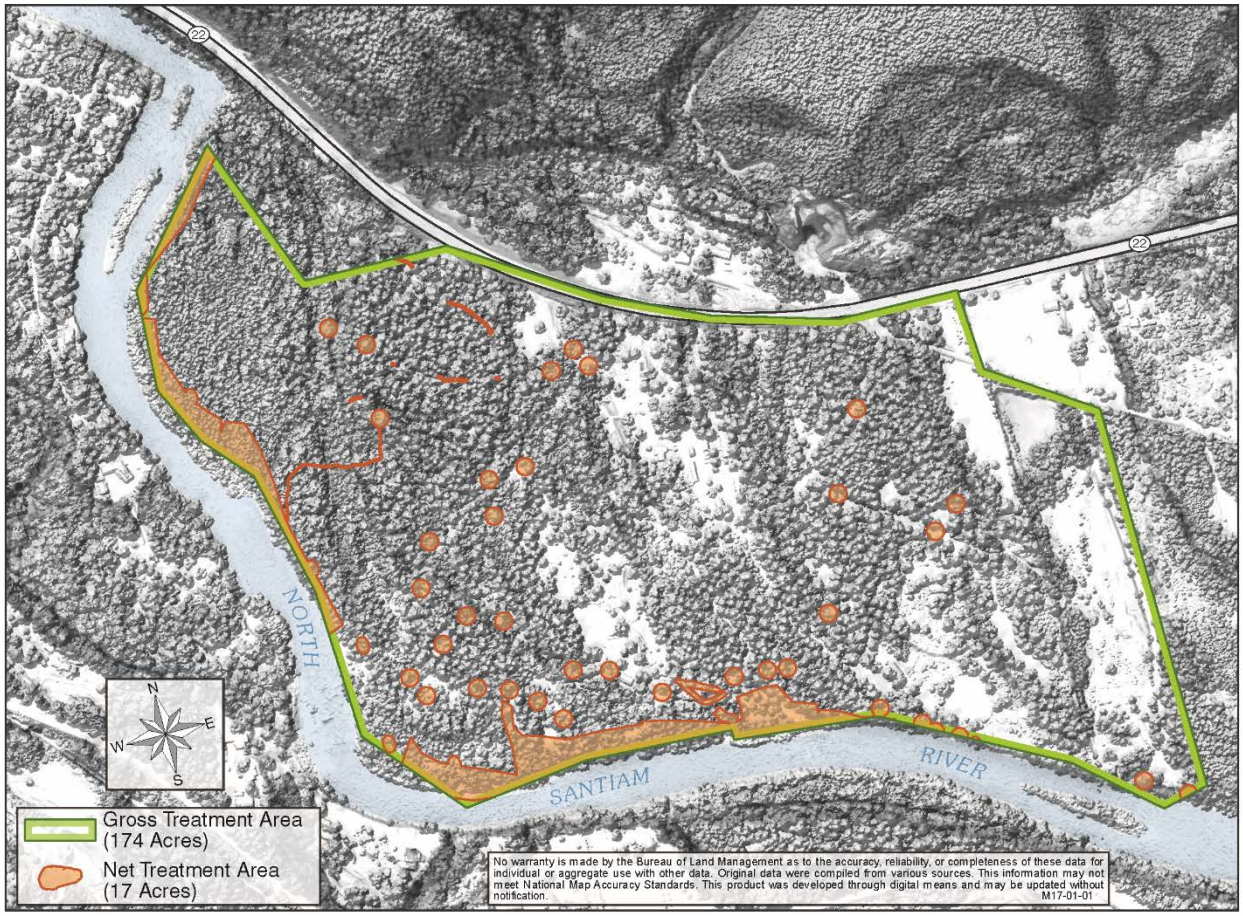
The most prevalent species mapped on the District in NISIMS are Scotch broom, slender false brome, St. Johnswort, tansy ragwort, thistles, and blackberry (Himalayan and cutleaf)[3]. NISIMS includes 81 different invasive

[1] Surveys are conducted to determine if an invasive plant is present or absent in a project area. If presence is confirmed, inventories are completed to catalog the abundance and distribution of the invasive plants present.
[2] Generally, any type of project resulting in ground disturbance, such as slash / pile / burn units, timber harvest areas, road / bridge construction, and trail construction. Current handbook direction requires this assessment only for noxious weeds (*Integrated Weed Management Manual 9015*; USDI 1992b). Handbook direction is in the process of being updated to include all invasive plant species in order to comply with Executive Order 13112 (February 1999, amended December 2016).
[3] St. Johnswort, tansy ragwort, and thistle infestations tend to be less dense than other widespread species; these species may occur on more gross acres but have fewer net acres than other pervasive invasive plants.

plant species occupying 17,430 acres on 49,491 sites[4] on the District. In addition, there are 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. Field office invasive plant management staff estimated these unmapped areas based on their professional judgement and field experience. While the locations are not mapped, it is possible to characterize the areas and habitat where they may occur. Some of these species are widespread, and while the precise acreage occupied by these species on the District is unknown, the unmapped acres column in the tables in Appendix C indicates how many additional acres invasive plant management staff estimate to be in need of treatment. Map A-1, *Invasive Plants Documented in NISIMS* shows the locations of mapped invasive plants. Map A-2, *Submerged and Floating Aquatic Invasive Plants,* shows the locations of mapped aquatic invasive plants.

As shown in Figure A-1, the gross infested area is the area of land defined by drawing a line around the general perimeter of the infestation, and does not reflect the percent cover of the plants. This area may contain large areas of land that are not occupied by an invasive plant species. Net acres are the actual infestation within the area. In some areas, a large area may have a sparse infestation and net acres would be calculated by multiplying the gross acres by the percent cover of the infestation. The net acres of many infestations on the District is not known; hence, acres described in this analysis are gross acres.

Figure A-1. *Gross and Net Treatment Acres*



[4] Many of these sites overlap with sites of other invasive plants species. For example, a blackberry infestation may exist on the same acreage as a thistle infestation.

Table A-1. *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	17,173	*22%*	1,142	*2%*
0.1 to < 0.5	37,065	*48%*	10,177	*16%*
0.5 to < 1	10,772	*14%*	7,742	*12%*
1 to < 5	10,066	*13%*	19,019	*31%*
5 to < 20	1,445	*2%*	13,036	*21%*
20 to <100	285	*<1%*	9,400	*15%*
>100	7	*<1%*	1,426	*2%*

Tables A-1 and A-3 indicate the size of invasive plant infestations mapped in NISIMS within the Northwest Oregon District boundary. Eighty-five percent of mapped sites are smaller than one gross acre each (see Table A-1 and Table A-3, *Invasive Plants Mapped in NISIMS by Infestation Size*); however, a relatively small number of large sites account for a majority of infested acres (about 39 percent of the mapped acres are on sites that are larger than 5 gross acres).

Spread from Existing Invasive Plant Sites

As described in the Oregon FEIS, 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. As described in the *Proposed Resource Management Plan/Final Environmental Impact Statement for the Resource Management Plans for Western Oregon*, timber harvest, road construction, and public motorized vehicle use can all contribute to invasive plant spread as well as actions such as management of special forest products, rights-of-way agreements, road maintenance, and fuels reduction treatments (USDI 2016e:419-438). 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 concentration areas, mining areas, and recreation sites. Wildlife (including birds) can introduce invasive plant seeds from their coats and feces (USDI 2010a:132). Proximity to urban areas and the checkerboard ownership pattern increases opportunities for invasive plant movement onto the District (See Map A-7, *Routes of Invasive Plant Spread: Landcover and Population Centers)*.

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 are being spread along roads by vehicles annually. (See Map A-4, *Routes of Invasive Plant Spread: Ground Transportation Network* and Map A-6, *Transmission Lines and Water Developments*.)

Water developments such as heliponds, reservoirs, and water tanks and troughs may also spread invasive plants throughout the District. For example, aquatic invasive plants in heliponds (areas where surface water is available for firefighting operations) have the potential to be spread into newly disturbed burned areas. (Map A-6, *Transmission Lines and Water Developments*.)

Streams are also major pathways for the movement of invasive plants. The Willamette, Sandy, Nestucca, Siletz, and their tributaries transport invasive plant propagules downstream. These areas attract birds, wildlife, and humans who spread invasive plants along these corridors. (See Map A-3, *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 are easily transported from one site to other areas on the District and beyond. (See Map A-3, *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 invasive plant spread. Equipment and work crews can also spread invasive plants 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 A-5, *Routes of Invasive Plant Spread: Material Sites and Mineral Resources*.)

Potential 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. BLM staff, partners, and contractors check common routes of spread (e.g., roads and waterways) regularly. Species of concern not yet documented on the District but documented on adjacent lands include garlic mustard, false indigo bush, Eurasian watermilfoil, water primrose, floating water primrose, and tree-of-heaven. For example, garlic mustard is present around Colton, Estacada, and Welches on public and private lands close to BLM, but has yet to be detected on BLM-administered 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. The District assigns all new invaders 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 in Appendix B).

Table A-2. *Invasive Plants on the Northwest Oregon District*

Common Name	Scientific Name	Species Group (Treatment Key Table)	Known on District?	Noxious Weed?
Red top, creeping bentgrass	*Agrostis stolonifera*	Perennial Grasses (Table C-19)	Existing	
Tree of heaven	*Ailanthus altissima*	Woody Species (Table C-27)	Potential new invader	✓
Garlic mustard	*Alliaria petiolata*	Mustards (Table C-18)	Potential new invader	✓
Meadow foxtail	*Alopecurus pratensis*	Perennial Grasses (Table C-19)	Existing	
European beachgrass	*Ammophila arenaria*	Perennial Grasses (Table C-19)	Existing	
False indigo bush	*Amorpha fruticosa*	Perennial Peas (Table C-21)	Potential new invader	✓
Common bugloss	*Anchusa officinalis*	Borage (Table C-5)	Potential new invader	✓
Sweet vernal grass	*Anthoxanthum odoratum*	Perennial Grasses (Table C-19)	Existing	
Common burdock	*Arctium minus*	Biennial Thistles (Table C-4)	Existing	
Tall oatgrass	*Arrhenatherum elatius*	Perennial Grasses (Table C-19)	Existing	
Italian arum	*Arum italicum*	Lilies, Iris, Sedges, Rushes (Table C-14)	Potential new invader	
Wild oat	*Avena fatua*	Annual Grasses (Table C-1)	Existing	✓
Slender false brome	*Brachypodium sylvaticum*	Perennial Grasses (Table C-19)	Existing	✓
Soft brome	*Bromus hordeaceus*	Annual Grasses (Table C-1)	Existing	✓
Butterfly bush	*Buddleja davidii*	Woody Species (Table C-27)	Existing	✓
Flowering rush	*Butomus umbellatus*	Aquatic Species (Table C-3)	Potential new invader	✓
Italian thistle	*Carduus pycnocephalus*	Biennial Thistles (Table C-4)	Potential new invader	✓
Distaff thistle	*Carthamus lanatus*	Biennial Thistles (Table C-4)	Potential new invader	✓
Meadow knapweed	*Centaurea ×moncktonii*	Knapweeds (Table C-13)	Existing	✓
Diffuse knapweed	*Centaurea diffusa*	Knapweeds (Table C-13)	Existing	✓
Malta thistle	*Centaurea melitensis*	Knapweeds (Table C-13)	Potential new invader	
Yellow starthistle	*Centaurea solstitialis*	Knapweeds (Table C-13)	Existing	✓
Spotted knapweed	*Centaurea stoebe L. ssp. micranthos*	Knapweeds (Table C-13)	Existing	✓
Canada thistle	*Cirsium arvense*	Canada Thistle (Table C-8)	Existing	✓
Bull thistle	*Cirsium vulgare*	Biennial Thistles (Table C-4)	Existing	✓
Old man's beard	*Clematis vitalba*	Woody Species (Table C-27)	Potential new invader	✓
Poison hemlock	*Conium maculatum*	Carrot Family (Table C-10)	Existing	✓

Common Name	Scientific Name	Species Group (Treatment Key Table)	Known on District?	Noxious Weed?
Field bindweed	*Convolvulus arvensis*	Miscellaneous Herbaceous - Perennial (Table C-17)	Existing	✓
Jubata grass	*Cortaderia jubata*	Perennial Grasses (Table C-19)	Potential new invader	✓
Cotoneaster spp.	*Cotoneaster*	Woody Species (Table C-27)	Existing	
Hawthorn	*Crataegus*	Woody Species (Table C-27)	Existing	
Oneseed hawthorn	*Crataegus monogyna*	Woody Species (Table C-27)	Existing	
Gypsyflower/ houndstounge	*Cynoglossum officinale*	Borage (Table C-5)	Existing	✓
Scotch broom	*Cytisus scoparius*	Woody Species (Table C-27)	Existing	✓
Striated broom	*Cytisus striatus*	Woody Species (Table C-27)	Existing	✓
Orchardgrass	*Dactylis glomerata*	Perennial Grasses (Table C-19)	Existing	
Spurge laurel	*Daphne laureola*	Woody Species (Table C-27)	Existing	✓
Purple foxglove	*Digitalis purpurea*	Snapdragons (Table C-22)	Existing	
Fuller's teasel	*Dipsacus fullonum*	Teasel (Table C-26)	Existing	
Patterson's curse	*Echium plantagineum*	Borage (Table C-5)	Potential new invader	✓
Weeping lovegrass	*Eragrostis curvula*	Perennial Grasses (Table C-19)	Potential new invader	
Leafy spurge	*Euphorbia esula*	Spurges (Table C-23)	Existing	✓
Oblong spurge	*Euphorbia oblongata*	Spurges (Table C-23)	Potential new invader	✓
Common fennel	*Foeniculum vulgare*	Carrot Family (Table C-10)	Potential new invader	
French broom	*Genista monspessulana*	Woody Species (Table C-27)	Existing	✓
Shining geranium	*Geranium lucidum*	Geranium (Table C-11)	Existing	✓
Herb Robert	*Geranium robertianum*	Geranium (Table C-11)	Existing	✓
Waxy mannagrass	*Glyceria declinata*	Perennial Grasses (Table C-19)	Potential new invader	
English ivy	*Hedera helix*	Woody Species (Table C-27)	Existing	✓
Giant hogweed	*Heracleum mantegazzianum*	Carrot Family (Table C-10)	Existing	✓
Orange hawkweed	*Hieracium aurantiacum*	Hawkweeds (Table C-12)	Existing	
Yellow hawkweed	*Hieracium floribundum*	Hawkweeds (Table C-12)	Potential new invader	
Common velvet grass	*Holcus lanatus*	Perennial Grasses (Table C-19)	Existing	
Creeping velvet grass	*Holcus mollis*	Perennial Grasses (Table C-19)	Existing	
Hydrilla	*Hydrilla verticillata*	Aquatic Species (Table C-3)	Existing	✓
St. Johnswort	*Hypericum perforatum*	St (Table C-24)	Existing	✓
English holly	*Ilex aquifolium*	Woody Species (Table C-27)	Existing	
Policeman's helmet	*Impatiens glandulifera*	Miscellaneous Herbaceous - Annual (Table C-16)	Existing	✓
Yellow flag iris / paleyellow iris	*Iris pseudacorus*	Lilies, Iris, Sedges, Rushes (Table C-14)	Existing	✓
Dyers woad	*Isatis tinctoria*	Mustards (Table C-18)	Potential new invader	✓
Yellow archangel	*Lamiastrum galeobdolon*	Perennial Mints (Table C-20)	Existing	
Perennial pea	*Lathyrus latifolius*	Perennial Peas (Table C-21)	Existing	✓
Flat pea	*Lathyrus sylvestris*	Perennial Peas (Table C-21)	Existing	✓
Purpleanther field pepperweed	*Lepidium heterophyllum*	Mustards (Table C-18)	Existing	
Oxeye daisy	*Leucanthemum vulgare*	Sunflower Family (Table C-25)	Existing	
Butter and eggs	*Linaria vulgaris*	Snapdragons (Table C-22)	Existing	✓
Birdsfoot trefoil	*Lotus corniculatus*	Perennial Peas (Table C-21)	Existing	
Water primrose	*Ludwigia hexapetala*	Aquatic Species (Table C-3)	Potential new invader	✓
Floating water primrose	*Ludwigia peploides*	Aquatic Species (Table C-3)	Potential new invader	✓
Money plant	*Lunaria annua*	Mustards (Table C-18)	Potential new invader	
Creeping jenny	*Lysimachia nummularia*	Loosestrifes (Table C-15)	Existing	
Garden loosestrife	*Lysimachia vulgaris*	Loosestrifes (Table C-15)	Potential new invader	✓
Purple loosestrife	*Lythrum salicaria*	Loosestrifes (Table C-15)	Potential new invader	✓
Sweetclover	*Melilotus offincinalis*	Annual Peas (Table C-2)	Existing	

Common Name	Scientific Name	Species Group (Treatment Key Table)	Known on District?	Noxious Weed?
Pennyroyal	*Mentha pulegium*	Perennial Mints (Table C-20)	Existing	
Parrot feather	*Myriophyllum aquaticum*	Aquatic Species (Table C-3)	Existing	✓
Eurasian watermilfoil	*Myriophyllum spicatum*	Aquatic Species (Table C-3)	Potential new invader	✓
Daffodil	*Narcissus*	Lilies, Iris, Sedges, Rushes (Table C-14)	Existing	
Fragrant water lily	*Nymphaea odorata*	Aquatic Species (Table C-3)	Potential new invader	
Yellow floating heart	*Nymphoides peltata*	Aquatic Species (Table C-3)	Potential new invader	✓
Scotch cottonthistle	*Onopordum acanthium*	Biennial Thistles (Table C-4)	Existing	✓
Bulbous canarygrass	*Phalaris aquatica*	Perennial Grasses (Table C-19)	Existing	
Reed canarygrass	*Phalaris arundinacea*	Perennial Grasses (Table C-19)	Existing	✓
Timothy	*Phleum pratense*	Perennial Grasses (Table C-19)	Existing	
Bristly oxtongue	*PIcris echioides*	Sunflower Family (Table C-25)	Potential new invader	
Japanese knotweed	*Polygonum cuspidatum*	Buckwheat Family (Table C-6)	Existing	✓
Cultivated knotweed	*Polygonum polystachyum*	Buckwheat Family (Table C-6)	Existing	✓
Giant knotweed	*Polygonum sachanlinense*	Buckwheat Family (Table C-6)	Existing	✓
Bohemian knotweed	*Polygonum X bohemicum*	Buckwheat Family (Table C-6)	Existing	
Sulfur cinquefoil	*Potentilla recta*	Miscellaneous Herbaceous - Perennial (Table C-17)	Potential new invader	✓
Sweet cherry	*Prunus avium*	Woody Species (Table C-27)	Existing	
Cherry laurel	*Prunus laurocerasus*	Woody Species (Table C-27)	Potential new invader	
Kudzu	*Pueraria lobata*	Perennial Peas (Table C-21)	Potential new invader	✓
Common pear	*Pyrus communis*	Woody Species (Table C-27)	Existing	
Lesser celandine	*Ranunculus ficaria*	Buttercups (Table C-7)	Potential new invader	✓
Creeping buttercup	*Ranunculus repens*	Buttercups (Table C-7)	Existing	
Cultivated radish	*Raphanus sativus*	Mustards (Table C-18)	Existing	
Creeping yellowcress	*Rorippa sylvestris*	Mustards (Table C-18)	Existing	✓
Non-native invasive roses	*Rosa*	Woody Species (Table C-27)	Existing	
Multiflora rose	*Rosa multiflora*	Woody Species (Table C-27)	Existing	
Cutleaf blackberry	*Rubus laciniatus*	Woody Species (Table C-27)	Existing	
Himalayan blackberry	*Rubus armeniacus*	Woody Species (Table C-27)	Existing	✓
European blackberry	*Rubus vestitus*	Woody Species (Table C-27)	Existing	
Curly dock	*Rumex crispus*	Buckwheat Family (Table C-6)	Existing	
Tall fescue	*Schedonorus arundinaceus*	Perennial Grasses (Table C-19)	Existing	
Stinking willie, tansy ragwort	*Senecio jacobaea*	Sunflower Family (Table C-25)	Existing	✓
Bladder campion	*Silene vulgaris*	Carnations (Table C-9)	Existing	
Milk thistle	*Silybum marianum*	Biennial Thistles (Table C-4)	Existing	✓
Bittersweet / Climbing nightshade	*Solanum dulcamara*	Miscellaneous Herbaceous - Perennial (Table C-17)	Existing	
Spanish broom	*Spartium junceum*	Woody Species (Table C-27)	Existing	✓
Medusahead	*Taeniatherum caput-medusae*	Annual Grasses (Table C-1)	Existing	✓
Puncturevine	*Tribulus terrestris*	Miscellaneous Herbaceous - Annual (Table C-16)	Existing	✓
Coltsfoot	*Tussilago farfara*	Sunflower Family (Table C-25)	Existing	✓
Common gorse	*Ulex europaeus*	Woody Species (Table C-27)	Existing	✓
North Africa grass	*Ventenata dubia*	Annual Grasses (Table C-1)	Existing	
Brazilian verbena	*Verbena bonariensis*	Miscellaneous Herbaceous - Perennial (Table C-17)	Existing	
Bigleaf periwinkle	*Vinca major*	Miscellaneous Herbaceous - Perennial (Table C-17)	Existing	
Common periwinkle	*Vinca minor*	Miscellaneous Herbaceous - Perennial (Table C-17)	Existing	

Table A-3. *Invasive Plants Mapped in NISIMS by Infestation Size*

Common Name	Scientific Name	Sites >100 acres		Sites 20 to 100 acres		Sites 5 to 20 acres		Sites 1 to 5 acres		Sites 0.5 to 1 acre		Sites 0.1 and <0.5 acres		Sites <0.1 acre	
		Number of Sites	Total Acres	Number of Sites	Total Acres	Number of Sites	Total Acres	Number of Sites	Number of Sites	Total Acres	Number of Sites	Total Acres	Number of Sites	Total Acres	Number of Sites
Bigleaf periwinkle	*Vinca major*					1	9.15					3	0.30	1	0.07
Birdsfoot trefoil	*Lotus corniculatus*											3	0.60	2	0.03
Bittersweet / Climbing nightshade	*Solanum dulcamara*									6	3.58	14	4.67	1	0.07
Bohemian knotweed	*Polygonum X bohemicum*													2	0.13
Bulbous canarygrass	*Phalaris aquatica*									2	1.24	1	0.13	11	0.24
Bull thistle	*Cirsium vulgare*			36	1,085.51	87	831.81	881	1,574.23	863	627.31	2,289	717.06	1,606	108.54
Butter and eggs	*Linaria vulgaris*											2	0.27	4	0.31
Butterfly bush	*Buddleja davidii*											2	0.20	2	0.12
Canada thistle	*Cirsium arvense*			31	950.98	53	493.12	455	741.03	788	569.64	2,487	821.04	1,269	86.83
Common burdock	*Arctium minus*					2	25.43	4	4.67	5	3.48	16	5.44		
Common gorse	*Ulex europaeus*													2	0.04
Common pear	*Pyrus communis*			2	43.28	2	17.78	2	2.83						
Common periwinkle	*Vinca minor*							1	2.50	3	1.62	12	1.97	12	1.19
Common velvet grass	*Holcus lanatus*			6	234.48	14	120.90	8	14.92	2	1.24	13	3.02	22	0.59
Cotoneaster spp.	*Cotoneaster*													1	0.02
Creeping buttercup	*Ranunculus repens*											9	1.23	3	0.05
Creeping jenny	*Lysimachia nummularia*											1	0.39	2	0.07
Creeping velvet grass	*Holcus mollis*									1	0.58	9	1.20	34	3.29
Creeping yellowcress	*Rorippa sylvestris*							2	4.03	2	1.77	85	9.52	4	0.15
Cultivated knotweed	*Polygonum polystachyum*							1	1.07	1	0.50	2	0.20		
Cultivated radish	*Raphanus sativus*													1	0.10
Curly dock	*Rumex crispus*							1	1.60	3	1.94	7	1.37	10	0.51
Cutleaf blackberry	*Rubus laciniatus*			4	138.94	21	199.59	575	922.26	891	638.82	3,248	928.70	1,689	106.22
Daffodil	*Narcissus*													1	0.01
Diffuse knapweed	*Centaurea diffusa*							1	1.04	2	1.50	1	0.14	1	0.10
English holly	*Ilex aquifolium*					1	5.58	4	12.42			47	9.84	33	2.59
English ivy	*Hedera helix*					3	22.71	13	22.49	9	5.66	52	13.45	51	2.79
European beachgrass	*Ammophila arenaria*					2	35.66	1	2.01	1	0.59	1	0.47	5	0.32
European blackberry	*Rubus vestitus*			1	38.34	2	14.61	14	36.16	22	15.75	37	10.66	144	10.30
Field bindweed	*Convolvulus arvensis*									1	0.99	32	11.59	3	0.11
Flat pea	*Lathyrus sylvestris*							1	2.86			5	0.97		
French broom	*Genista monspessulana*					2	11.77					4	1.03	1	0.04
Fuller's teasel	*Dipsacus fullonum*					1	5.41	2	3.19	8	5.41	21	3.91	126	4.11
Giant hogweed	*Heracleum mantegazzianum*											1	0.18		
Giant knotweed	*Polygonum sachanlinense*							3	6.46			10	2.76	3	0.16
Gypsyflower / Houndstongue	*Cynoglossum officinale*													1	0.10
Hawthorn	*Crataegus*			2	43.28	6	47.27	7	17.49					29	0.43

Common Name	Scientific Name	Sites >100 acres		Sites 20 to 100 acres		Sites 5 to 20 acres		Sites 1 to 5 acres		Sites 0.5 to 1 acre		Sites 0.1 and <0.5 acres		Sites <0.1 acre	
		Number of Sites	Total Acres	Number of Sites	Total Acres	Number of Sites	Total Acres	Number of Sites	Number of Sites	Total Acres	Number of Sites	Total Acres	Number of Sites	Total Acres	Number of Sites
Herb Robert	*Geranium robertianum*	1	107.39	4	172.76	16	143.22	129	290.32	104	70.30	865	137.05	483	28.58
Himalayan blackberry	*Rubus armeniacus*	2	339.71	41	1,478.13	250	2,301.51	1,373	2,707.19	1,449	1,031.84	6,914	1,643.46	2,680	186.56
Japanese knotweed	*Polygonum cuspidatum*			1	23.57	1	7.55	2	3.02	10	7.24	62	14.49	45	2.62
Leafy spurge	*Euphorbia esula*							1	1.38						
Meadow foxtail	*Alopecurus pratensis*			1	22.37	2	20.68	3	12.37			3	0.43	11	0.24
Meadow knapweed	*Centaurea ×moncktonii*			4	90.60	73	576.21	328	708.03	289	212.80	571	150.53	292	19.19
Medusahead	*Taeniatherum caput-medusae*							1	4.39					1	0.10
Multiflora rose	*Rosa multiflora*							3	6.10	3	1.73	9	2.09	36	0.77
Non-native invasive roses	*Rosa*					1	10.28	1	1.84	1	0.52	3	0.39	9	0.25
Oneseed hawthorn	*Crataegus monogyna*					1	12.49							13	0.14
Orange hawkweed	*Hieracium aurantiacum*													3	0.21
Orchardgrass	*Dactylis glomerata*											1	0.47	15	0.26
Oxeye daisy	*Leucanthemum vulgare*							7	14.98	1	0.57	12	2.29	69	2.13
Parrot feather	*Myriophyllum aquaticum*													4	0.24
Perennial pea	*Lathyrus latifolius*			7	357.35	3	46.23	9	17.82	23	16.08	205	46.29	26	1.76
Poison hemlock	*Conium maculatum*											4	1.15	21	0.64
Policeman's helmet	*Impatiens glandulifera*											17	3.92		
Purple foxglove	*Digitalis purpurea*					20	135.44	611	1,038.10	720	521.90	1,769	628.88	7	0.48
Purpleanther field pepperweed	*Lepidium heterophyllum*													4	0.03
Red top / Creeping bentgrass	*Agrostis stolonifera*			2	76.69	2	16.66	7	23.51	4	3.19	5	1.48	17	0.59
Reed canarygrass	*Phalaris arundinacea*			1	21.24	3	20.45	22	43.64	43	30.79	238	79.09	351	16.08
Scotch broom	*Cytisus scoparius*	3	790.28	53	1,749.69	543	4,894.95	2,617	5,306.50	2,319	1,668.87	7,082	1,858.70	3,347	243.62
Scotch cottonthistle	*Onopordum acanthium*											2	0.53	1	0.10
Shining geranium	*Geranium lucidum*							15	23.35	27	19.11	478	72.77	269	8.07
Slender false brome	*Brachypodium sylvaticum*	1	188.36	8	359.31	90	773.97	549	1,130.55	483	337.00	3,227	645.20	1,867	131.01
Soft brome	*Bromus hordeaceus*											5	1.49	17	0.50
Spanish broom	*Spartium junceum*									1	0.68	1	0.38		
Spotted knapweed	*Centaurea stoebe L.* ssp. *micranthos*					4	39.41	8	14.25	19	12.30	124	37.40	56	4.05
St. Johnswort	*Hypericum perforatum*			38	1,153.30	121	1,088.57	1,246	2,271.98	1,315	951.15	3,555	1,177.74	45	2.82
Stinking willie / Tansy ragwort	*Senecio jacobaea*			37	1,143.34	98	920.58	1,045	1,820.70	1,217	877.05	2,998	947.58	2,343	158.28
Striated broom	*Cytisus striatus*											2	0.21	1	0.04
Sweet cherry	*Prunus avium*											1	0.24		
Sweet vernal grass	*Anthoxanthum odoratum*			5	186.71	15	138.35	14	33.09	5	3.14	11	2.57	11	0.36
Sweetclover	*Melilotus offincinalis*							75	108.47	115	83.37	444	159.64	5	0.44
Tall fescue	*Schedonorus arundinaceus*					4	37.58	21	55.97	8	6.05	11	2.98	24	0.86
Tall oatgrass	*Arrhenatherum elatius*					1	10.81	3	8.38	6	4.21	9	1.90	13	0.55
Timothy	*Phleum pratense*													2	0.10

Common Name	Scientific Name	Sites >100 acres		Sites 20 to 100 acres		Sites 5 to 20 acres		Sites 1 to 5 acres		Sites 0.5 to 1 acre		Sites 0.1 and <0.5 acres		Sites <0.1 acre	
		Number of Sites	Total Acres	Number of Sites	Total Acres	Number of Sites	Total Acres	Number of Sites	Number of Sites	Total Acres	Number of Sites	Total Acres	Number of Sites	Total Acres	Number of Sites
Wild oat	*Avena fatua*													6	0.08
Yellow archangel	*Lamiastrum galeobdolon*			1	29.98							7	1.61	3	0.25
Yellow flag iris / paleyellow iris	*Iris pseudacorus*											2	0.29		
Yellow starthistle	*Centaurea solstitialis*											1	0.25		

Appendix B: Integrated Invasive Plant Management

This appendix explains how various methods are used together programmatically to control invasive plants. Actions taken for prevention, education, and coordination are described as context and do not vary between alternatives. This appendix also describes direct control methods, which may vary between alternatives. Direct control methods include manual and mechanical treatment methods, competitive planting and seeding, solarization, prescribed fire, biological treatment methods (insects and targeted grazing), and herbicide application.

As noted in Chapter 1, the action alternatives would update the direct control methods that are available to the existing invasive plant management program, making all treatment options available to the entire district and increasing the number of herbicides available for use. In addition, Alternatives 2 and 3 would allow herbicide treatments on invasive plants that are not listed as noxious weeds District-wide. (Currently, the District uses herbicides in the West Eugene Wetlands to control invasive plants, including noxious weeds. The Cascades, Marys Peak, and Tillamook Field Offices can treat only plants that are listed by the State as noxious. Outside of the West Eugene Wetlands and Tyrrell Seed Orchard[5], the Siuslaw and Upper Willamette Field Offices do not use herbicides.) Other elements of the program would remain the same across all alternatives. These unchanging elements of the program, including prevention, education, awareness, coordination, cooperation, planning, and monitoring are described below. This is followed by information on direct control methods, which varies by alternative.

Prevention, Education, and Awareness

Prevention, education, and awareness are the highest priority for the management of invasive plants. The District has incorporated weed prevention into regular field work and project management practices. Examples of prevention practices include cleaning vehicles and equipment before moving onto or from BLM-administered 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 prevention activities include the continuing education of employees, contractors, and the public.

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). The District practice, however, is to include all invasive plant species in these project risk assessments. 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).

The BLM requires weed-free forage for pack stock, weed-free seed for revegetation projects, and weed-free straw for erosion control, and specifies in contracts that materials brought on to the District are to be weed-free. The District uses competitive seeding and planting as both a preventative and a control measure. Further information can be found in the *Direct Control Methods* section later in this appendix.

The District actively contributes and participates with other organizations to provide workshops and trainings for a wide variety of publics and organizations (see next section).

[5] This EA does not address invasive plant management at the Horning Seed Orchard (Cascades Field Office) and Tyrell Seed Orchard (Siuslaw Field Office).

Coordination and Cooperation

Due to the size of the population centers and the amount of human development within the District, there are dozens of organizations working cooperatively to combat the spread of invasive plants. These organizations include other Federal entities like the U.S. Forest Service and the U.S. Army Corps of Engineers; state entities such as the Oregon Department of Agriculture (ODA) and the Oregon Department of Transportation (ODOT); as well as local cities, counties, Tribes, watershed councils, non-governmental organizations, and private landowners. District staff work in cooperation with the Western Invasives Network, its associated Cooperative Weed Management Areas, and Soil and Water Conservation Districts. The District is also involved with the Northwest Oregon Restoration Partnership and the Clackamas River Invasive Species Partnership.

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 Oregon Parks and Recreation Department, ODA, ODOT, and the Oregon Department of Forestry, as well as watershed councils and other non-governmental organizations through interagency and cooperative agreements in which grant monies and BLM contributions help fund youth crews, volunteer "Let's Pull Together" events, and other 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. The *Integrated Vegetation Management Manual* (USDI 2008a:59) describes an adaptive management approach based on clearly identified outcomes (see *Prioritizing Areas for Treatments*, below), monitoring to determine if management actions are meeting outcomes (see *Monitoring*, below), and if not, facilitating management changes that will best ensure that outcomes are met or re-evaluated (see Appendix C, Tables C-1 to C-27, *Treatment Key*).

In general, the District's strategy is to manage invasive plants while minimizing adverse effects to ecological function and economic values. This strategy requires District staff to set action thresholds and to evaluate sites to determine when the BLM has reached or exceeded those thresholds. Action thresholds are the levels of ecological or economic damage that invasive plant infestations cause before needing treatments, 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., giant hogweed) the threshold may be a single plant, regardless of the site, while for other species (e.g., St. Johnswort) the threshold would rarely be reached except at extremely sensitive sites.

Prioritizing Areas for Treatment

The District recommends management action for invasive plant infestations that exceed action thresholds. The District prioritizes treatment sites because the number of invasive plant infestations requiring management action exceeds the District's annual treatment capacity. 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.

Early Detection Rapid Response (EDRR) is used whenever possible to prevent establishment and increase chances of eradication. Infestations targeted for EDRR include:

- Species included on District, cooperative weed management area, and state EDRR lists.
- Observations of non-native species spreading quickly (even if they are not already included on an EDRR list).
- Small outlier infestations of established invasive plant species.

The following factors help the District set treatment priorities:

- Whether the species or infestation is EDRR, new invader, or an established species.
- The proximity of the infestation to ground disturbing project planned and sensitive resources (rare species, special management areas)
- The proximity of the infestation to administrative sites and areas likely to serve as sources of spread (e.g., recreation sites, gravel stockpiles, roads, major rights-of-way).
- Whether the infestation is part of a partnered project (allowing for an opportunity to combine resources).
- Whether the species or infestation is currently or potentially could cause high ecological or economic impacts.

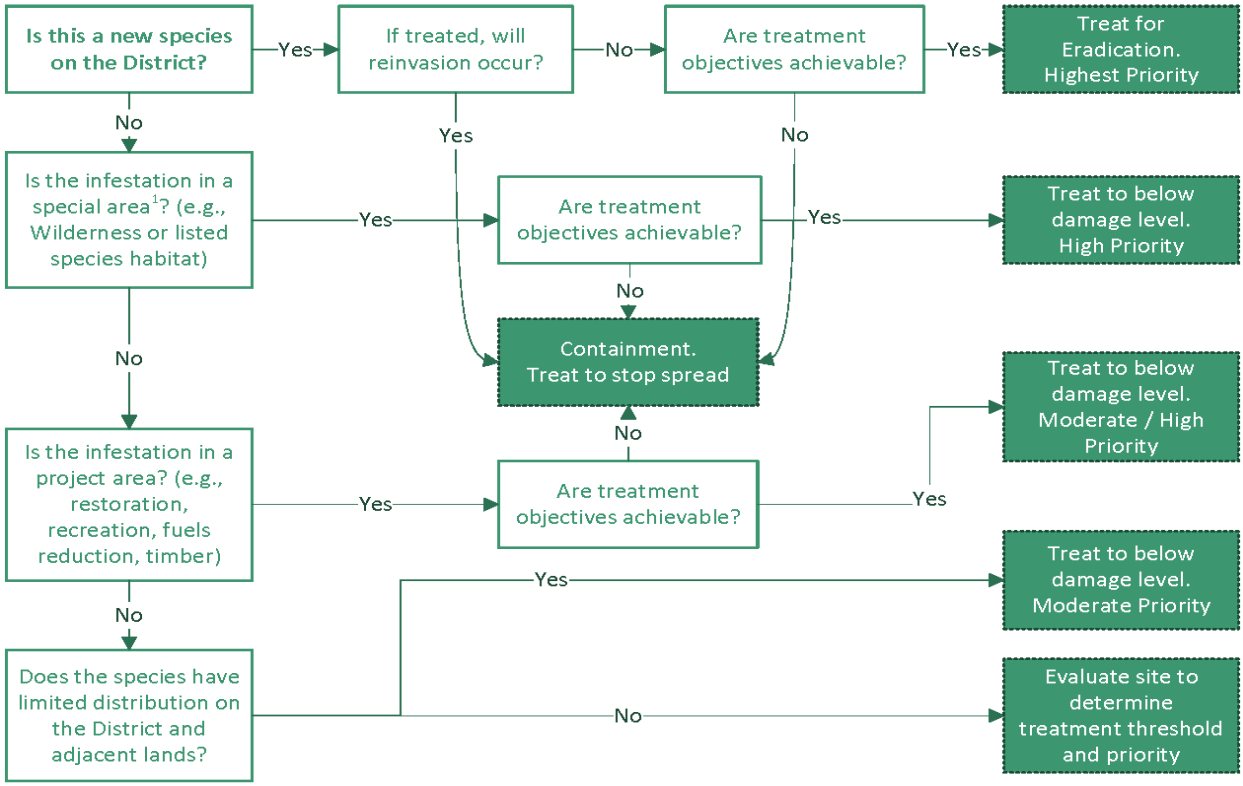
It is a higher priority to retreat an infestation than to start treatment on a new infestation.

Treatment objectives for priority infestations are generally as follows:

- EDRR – treat for eradication.
- New Invaders – treat for eradication if possible; otherwise, containment to decrease infestation size and prevent spread
- Established species – treat to contain infestations, decrease infestation size and density, and prevent the infestation from spreading.

Figure B-1 shows a generalized process for prioritizing invasive plant treatments across the District.

Figure B-1. *Prioritizing Areas for Treatment*



1. These areas include Table Rock Wilderness Area, Little Sink Instant Study Area, Special Recreation Management Ares and Extensive Recreation Management Areas, ACECs, Special Status species habitat, and lands managed for their wilderness characteristics.

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, habitat quality monitoring at the West Eugene Wetlands for federally listed species has shown that invasive plant species are in all monitored sites (Gray and Bahm 2015). Directly related to the invasive plant program, BLM staff monitor many timber sales for invasive plant infestations for three to five years following harvest. Implementation and effectiveness monitoring are also required (*Integrated Vegetation Management Handbook*, USDI 2008a:71). The methods in these handbooks and manuals are followed and adjusted as necessary for different sites and objectives. Data from monitoring identifying the location of invasive plants are recorded in NISIMS.

Implementation Monitoring

BLM policy and the EPA require monitoring where the BLM uses herbicide (USDI 1992a). The District develops and the State Office approves Pesticide Use Proposals (PUPs) prior to application; PUPs 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 applicators fill out Pesticide Application Records 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 the BLM and the pesticide applicators met all planning and application requirements. The District also documents non-herbicide treatment activities.

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 D), and contract specifications. To ensure proper implementation, District project inspectors review contractor operations, treatment sites, and treatment records.

As required by existing Standard Operating Procedures, District staff would monitor targeted grazing activities 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. The Oregon Department of Agriculture's Noxious Weed Control Program conducts the monitoring of traditional biological control agent populations in coordination with the BLM.

In addition, the *West Eugene Wetlands Resource Management Plan* requires monitoring. This monitoring focuses specifically on monitoring the Resource Management Plan itself. For example, monitoring would assess whether implemented projects followed standard operating procedures for herbicide application (USDI 2015a: Appendix B).

Effectiveness Monitoring

Monitoring integrated 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. The District recommends follow-up treatments when an integrated invasive plant management 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. BLM records infestation and treatment data in BLM's corporate geospatial databases (e.g., NISIMS).

The following example is provided to illustrate how adaptive management and effectiveness monitoring would be implemented within the context of invasive plant treatments. Integrated invasive plant management includes a process to determine when and where to take action. The *Integrated Vegetation Management Manual* (USDI

2008a:59) describes an adaptive management approach based on clearly identified outcomes, monitoring to determine if management actions are being met, and if not, changing management approaches to those that will better ensure that outcomes are met.

The *Planning* section (above) explains that the District manages invasive plants to minimize adverse effects to ecological function. Setting treatment priorities is primarily driven by the resources that would be adversely affected by the invasive plants (such as habitats for Special Status species). For example, Canada thistle (and several other invasive plant species) occurs in an ACEC within proximity of a Special Status plant, the Umpqua swertia. The *Treatment Key* for Canada thistle (Table C-8) shows potential treatment options for this infestation. Mowing Canada thistle is effective when it is repeated every 3 to 4 weeks over several growing seasons (DiTomaso et al. 2013), but can adversely affect desirable intermingled species. Under the action alternatives, aminopyralid and clopyralid would both be selective treatment methods for Canada thistle intermingled with the Umpqua swertia (Dow AgroSciences 2015). In the first year, clopyralid could be used on Canada thistle, applied at the rosette stage. As described above, sites are revisited following treatments to assess how the infestation and associated plant community have changed over time. This would be done several months after treatments; clopyralid begins to kill target plants within two weeks after contact but can take several weeks for complete control. Staff conducting the monitoring would evaluate factors such as the size and density of the Canada thistle infestation; the amount of colonization by nearby St. Johnswort; the amount of damage or mortality in neighboring native species as well as their growth, vigor, and population density; and the need for follow-up treatments. If the Umpqua swertia were unharmed by this treatment and were able to colonize the site (instead of the St. Johnswort) and the population of Canada thistle was reduced, but not eliminated, another follow-up treatment would occur the following spring. However, spring rain accelerates seed growth, and in the spring, the Canada thistle seedbank may have begun to produce additional plants. In this case, BLM would use aminopyralid to control Canada thistle seedlings during the second year, as it has longer soil residual than clopyralid. If instead the original treatment eliminates the Canada thistle but St. Johnswort appear in the following spring, the St Johnswort *Treatment Key* (Table C-24) would direct BLM to use aminopyralid or glyphosate during the second year.

Direct Control Methods

Direct control methods vary by alternative. Selection of a treatment method considers what would be effective for each species and what is appropriate for the lands infested (including what nearby resources may be affected). For many species, BLM controls small infestations with manual or other non-herbicide treatments. Other species may require herbicides to obtain adequate 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 2007e).

Manual Treatment Methods

Manual treatment methods (such as pulling, digging, chopping, girdling, cutting/lopping, weed wrenches, and grubbing) can provide adequate control for some invasive plant species, particularly if the infestation is relatively small. These techniques can be extremely target specific and the BLM often uses them to minimize damage to adjacent desirable plants. However, manual control methods 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 impractical. The BLM uses manual techniques on small infestations and / or where a large pool of labor is available. The BLM frequently uses manual treatments 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).

Land managers use manual treatment methods, including hand pulling, rakes, shovels, and bottom barriers / weed mats to control infestations of submerged and floating aquatic invasive plants. Weed mats placed on the bottom of an aquatic body and held in place with a heavy object (see Figure B-2) for up to a few years can eradicate some infestations. (This method would not be used in areas where invasive plants are intermingled with desirable vegetation.) Bottom barriers have been used successfully by Rogue River-Siskiyou National Forest to control yellow floatingheart at Squaw Lakes.

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

© Big Foot Media / The Nature Conservancy

Solarization involves putting a barrier like a plastic sheet, shade cloth, or tarp over an area for up to six months to trap heat from solar radiation in order to kill extant vegetation and the associated seed bank. Areas where invasive plants are not intermingled with native vegetation create the best conditions for using solarization. Solarization is generally used on annual invasive plants because perennials often have deeply buried underground vegetative structures such as roots and rhizomes that may resprout. The best solarization will occur on areas where there is little or no slope or where the slope has a south or southwest exposure. Solarization prepares sites for seeding and planting desirable vegetation.

Mechanical Treatment Methods

Mechanical treatment methods include tilling or disking, string trimmers, chainsaws, propane torches, and mowers. Some of these methods (e.g., chainsaws and string trimmer) can be more target-specific than other methods. Land managers commonly use string trimmer and mowing methods 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 invasive plants in the annual grasses, snapdragons, geranium, and perennial peas species groups (see Appendix C) growing in parking lots, cobble bars, and other sparsely vegetated sites. Propane torches are used to heat plants to boil the water in invasive plant cells, not to consume plants with fire.

For aquatic invasive plants, tractors or diver assisted suction harvest (DASH) can be used to remove large quantities of invasive plants more quickly than manual methods alone. A diver physically removes (hand-pulls) the

targeted plant, being careful to remove the entire root system and to minimize fragmentation. A pump is located on the surface (on a boat or the bank of the waterbody), with a four-inch suction hose that the diver uses to transport the hand-pulled plant and any root fragments to the surface for collection and disposal. Water and sediment is allowed to flow through back into the lake or pond. The objective is not to remove the sediment but to remove only the target plants to retain visibility in the water for the diver. Tractors can also be used to remove the entire root system of aquatic infestations. Aquatic weed harvesters would not be used to mow and remove aquatic vegetation.

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 seeds and plants often occurs in conjunction with other treatments but can also occur independently as a measure to prevent invasive plant establishment. The District most commonly seeds 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. The District plants native species to complement seeding at sites to generate immediate vegetation cover 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. Planting prescriptions can include a combination of plant functional groups including perennial grasses, annual forbs, and perennial forbs. Most of the seeding prescribed on the District calls for grass species. Prescriptions including annual and perennial forbs are usually associated with restoration projects. Shrubs and trees are included in some prescriptions.

Prescribed Fire

Prescribed fires are used for invasive plant control, and can be most effective in spring or in fall when conducted just before flower or seed set, or at the young seedling or sapling stage. It may also be used in conjunction with other methods as a pre-treatment to an herbicide application, such as when the target invasive plants have gone to seed and there is a need to remove the seed source or to remove thatch (the mat of un-decomposed plant material) in invasive annual grass stands. Like other treatments, timing is critical and is dependent on characteristics of the invasive plant, presence of desirable plants, soil moisture, and environmental conditions. These prescribed fires could be broadcast fires (across monocultures or areas where all species are invasive) or machine or hand piled and burned (generally woody species). Treatment areas are calculated by infestation sizes; for example, if two acres of woody invasive plant species were collected into a 20 square foot pile, this would count as a two-acre treatment.

Propane torches are described above, in the *Mechanical Treatment Methods* section.

Biological Treatment Methods

Biological treatment methods involve the intentional use of domestic animals (such as goats or sheep) or biological control agents (such as insects, bacteria, or fungi) that weaken or destroy vegetation (USDI 2007d). 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 (Biocontrols)

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 of the agents 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 persist at background levels in the environment until the tansy ragwort population spreads and provides a food source for the biocontrol populations to grow again. The primary factors for when and where to release additional biocontrols are infestation size and availability of effective agents for the specific site.

Biological control agents (primarily insects) have been used on noxious weeds throughout northwest Oregon. All available biocontrol agents that are appropriate for the species present on the District have been released; there are no additional releases that are recommended at this time. Table B-1 shows in which counties biocontrols are widespread. The Oregon Department Agriculture is currently evaluating several prospective new biological control agents for Japanese knotweed and garlic mustard.

Table B-1. *Widespread Biological Control Agents on the Northwest Oregon District*

Invasive plant (host)	Biocontrol	County											
		Benton	Clackamas	Clatsop	Columbia	Lane	Lincoln	Linn	Marion	Multnomah	Polk	Tillamook	Yamhill
Broom species[1]	*Bruchidius villosus* (beetle)	✓	✓			✓	✓	✓	✓	✓	✓		✓
	Exapion fuscirostre (weevil)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Leucoptera spartifoliella (twig miner)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Gorse	*Exapion ulicis* (weevil)		✓	✓		✓							
	Tetranychus lintearius (spider mite)		✓	✓		✓							
Knapweed species[1]	*Bangasternus fausti* (weevil)									✓			
	Chaetorellia acroloph (peacock fly)					✓							
	Larinus spp. (weevil)	✓				✓		✓	✓	✓	✓		✓
	Metzneria paucipunctella (moth)		✓			✓							
	Sphenoptera jugoslavica (root borer)		✓							✓			
	Terellia virens (fly)					✓							

Invasive plant (host)	Biocontrol	County											
		Benton	Clackamas	Clatsop	Columbia	Lane	Lincoln	Linn	Marion	Multnomah	Polk	Tillamook	Yamhill
	Urophora quadrifasciata (fly)	✓	✓			✓		✓	✓	✓	✓	✓	✓
Purple loosestrife	*Galerucella* spp. (beetle)		✓	✓	✓		✓		✓	✓	✓	✓	✓
	Nanophyes marmoratus (weevil)								✓	✓	✓		✓
Rush skeletonweed	*Eriophyes chondrillae* (gall mite)									✓			
	Puccinia chondrillina (rust fungus)									✓			
St. Johnswort	*Aplocera plagiata* (inchworm)					✓		✓	✓	✓	✓		✓
	Chrysolina spp. (beetle)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Tansy ragwort	*Botanophila seneciella* (fly)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Longitarsus jacobaeae (flea beetle)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Tyria jacobaeae (cinnabar moth)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Thistle species[1]	*Cheilosia corydon* (fly)					✓							
	Rhinocyllus conicus (weevil)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Thistles and knapweed species[1]	*Urophora* spp. (fly)	✓	✓			✓		✓	✓	✓			
Toadflax species[1]	*Brachypterolus pulicarius* (beetle)								✓				
	Gymnetron antirrhini (weevil)								✓				

1. May include one or more species in this group.

Targeted Grazing

Targeted grazing[6] 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 and sheep eat broadleaf plants. 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-administered lands must be approved by the BLM National Office, and must, by policy, be subject to detailed ecological and human health risk assessments (see Appendix F, *Herbicide Risk Assessment Summaries*) 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[7]. Approval to use an herbicide for research

[6] Also referred to as directed livestock grazing or prescribed grazing.
[7] 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.

and demonstration is provided by the BLM National Office after an initial evaluation of *Federal Insecticide, Fungicide and Rodenticide Act* registration materials and associated risk assessments (USDI 2010a:478)[8]. Herbicides analyzed in this EA are shown in Table B-2, *Herbicide Information*, and Table B-3, *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;[9]
- 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 gorse 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).

BLM only applies herbicides 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). Applicators complete a Pesticide Application Record within 24 hours of the application to document 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.

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 E, *Herbicides Formulations and Adjuvants*. For applications with a potential to enter streams or other waterbodies, herbicides are limited to aquatic formulations. Applicators use aquatic-approved adjuvants[10] for applications with a potential to affect federally listed and Bureau Sensitive fish.

Herbicides are primarily applied to plant foliage, but some herbicides may be applied to the soil (see Table B-2 for information about point of application by herbicide). These treatments are usually done only in small areas (see Table A-1 for a summary of invasive plant infestation sizes). Herbicide applications can be done with a backpack sprayer (see Figure B-3). Sprayers are generally non-motorized and are pressurized by a diaphragm or piston-style pump. Spot treatments using hand-held sprayers are attached to vehicle-mounted trucks, utility vehicles (UTVs), boats, or on horseback. In spot treatments, the hand-held sprayer can target specific plants, so that effects to non-target species can be kept to a minimum. Broadcast treatments would also occur under the action alternatives, although this would happen rarely (less than five percent of the time). The District would usually do these treatments with a handheld sprayer. Broadcast treatments using a boom would most often occur in the West Eugene Wetlands or in special plant communities (such as a meadow or grassland). Broadcast treatments would be done with selective herbicides that would not harm non-target plants or these treatments would happen on larger monocultures of invasive plants (larger than 300 square feet). All broadcast treatments (with a handheld sprayer or a boom) would be specifically noted on the Annual Treatment Plan. Interdisciplinary team review of Annual Treatment Plans with broadcast treatments would include natural resource specialists with expertise in soil and hydrology. The District has not and would not use aerial applications to control non-native invasive plants.

Other ground-based herbicide application methods that the District could use include:

- basal bark treatments (where herbicides are applied to the bark of woody plants with a backpack sprayer or handheld spray bottle);

[8] 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.
[9] For example, Canada thistle root fragments readily resprout and some plants can be injurious to workers attempting to manually remove them.
[10] These "approved adjuvants" shown in Appendix E are indicated in the ARBO II column of Table E-3. These adjuvants were analyzed in the U.S. Fish and Wildlife Service and National Marine Fisheries Service ARBO II (USDI 2013a, NMFS 2013).

- frill or "hack and squirt" (where herbicides are applied to a continuous downward cut around a woody plant that extends into the sapwood);
- wipers (where herbicides are wiped directly onto the plant or to cut stems and stumps); or
- injecting herbicides into the inner bark.

Figure B-3. *Ground-Based Herbicide Applications with Backpack Sprayer*

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[11].

[11] See Chapter 2 and Issue 1 in Chapter 3 of this EA for information treatment efficiency under each alternative.

***Table B-2**. 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[4] (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*	*Alternative 2*	*Alternative 3*
2, 4-D: Many, including Amine 4, HardBall, Unison, Saber, and Aqua-Kleen *Broadleaf plants*	**broadleaf** Post *Foliar*	*Annual and Perennial Species*											
		✓	✓	✓		✓	✓	✓	1	(1.9 or 2[9])	✓	✓	✓
		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 *Starthistle, St. Johnswort, thistles, knapweeds*	**broadleaf** Post *Foliar*	✓	✓	✓		✓	✓	✓	0.078	0.11		✓	✓
Chlorsulfuron: Telar XP *Perennial mustards, purple foxglove, houndstongue*	**broadleaf** Pre and early post *Foliar*	✓		✓		✓	✓	✓	0.047	0.141		✓	✓
Clopyralid: Transline, Stinger, Spur *Knapweed, hawkweed, biennial thistles, starthistles*	**broadleaf** Post *Foliar*	✓	✓	✓		✓	✓	✓	0.35	0.5		✓	✓
Dicamba: Vanquish, Banvel, Diablo, Vision, Clarity *Perennial mustards, biennial thistles, field bindweed*	**broadleaf, woody plants** Pre and post *Foliar*	✓		✓		✓	✓	✓	0.3	2[7]	✓	✓	✓
Diflufenzopyr + Dicamba: Overdrive, Distinct *Field bindweed, oxeye daisy, St. Johnswort* Dicamba Diflufenzopyr	**broadleaf** Post *Foliar*	✓				✓	✓	✓	0.2625 0.1875 0.075	0.35 0.25 0.1		✓	✓
Fluridone: Avast!, Sonar AS *Aquatic plants*	**submerged plants** Post *Aquatic*				✓				0.15	(1.3)			✓

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[4] (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*	*Alternative 2*	*Alternative 3*
Fluroxypyr: Comet Selective, Vista XRT *Mustards, spurge, blackberry*	**broadleaf** Post *Foliar*	✓	✓	✓		✓	✓	✓	0.26	0.5		✓	✓
Glyphosate: Many, including Rodeo, Mirage, Roundup Original, Mad Dog Plus, and Honcho *Grasses, trees and shrubs, yellow flag iris*	**non-selective** Post *Foliar*	✓	✓	✓	✓[3]	✓	✓	✓	2	3 or 7[5, 6]	✓	✓	✓
Hexazinone: Velpar DF *Grasses*	**grasses, broadleaf, woody plants** **Pre and post** **Foliar**	✓	✓			✓	✓	✓	2	4[6]		✓	✓
Imazapic: Plateau, Panoramic 2SL *Annual grasses*	**some broadleaf and grasses** Pre and post *Soil*	✓	✓	✓		✓	✓	✓	0.0313	0.1875		✓	✓
Imazapyr: Arsenal, Stalker, Habitat, Polaris *Trees and shrubs, yellow flag iris*	**non-selective** Pre and post *Foliar*	✓	✓	✓	✓	✓	✓	✓	0.45	1.50[7]		✓	✓
Metsulfuron methyl: Escort XP, Patriot, PureStand *Perennial mustards, St. Johnswort, biennial thistles*	**broadleaf** Pre and post *Foliar*	✓	✓	✓		✓	✓	✓	0.03	0.15[7]		✓	✓
Picloram: Triumph 22K, OutPost 22K, Tordon 22K *Leafy spurge, field bindweed, knapweed, St. Johnswort, starthistles, biennial thistles*	**broadleaf, woody plants** Pre and post *Foliar*	✓	✓			✓	✓	✓	0.35	1	✓	✓	✓
Rimsulfuron: Matrix SG *Annual grasses*	**annual grasses** Pre and post *Soil*	✓	✓	✓		✓	✓	✓	0.0469	0.0625		✓	✓
Sulfometuron methyl: Oust XP, Spyder *Annual grasses*	**non-selective** Pre and post *Foliar*		✓	✓		✓	✓	✓	0.14	0.38		✓	✓
Triclopyr: Garlon 3A, Renovate 3, Element 4, Vastlan *Purple loosestrife, blackberry, trees and shrubs*	**broadleaf, woody plants** Post *Foliar*	✓	✓	✓	✓[3]	✓	✓	✓	1	(10)		✓	✓

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[4] (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*	*Alternative 2*	*Alternative 3*
Proposed For Research and Demonstration													
Fluazifop-P-butyl[9]: Fusilade DX *Perennial grasses*	**grasses** Post *Foliar*	✓	✓			✓	✓		Single app. 0.1 to 0.375. Maximum annual application 1.125[8]			✓	✓
Sethoxydim: Poast, Torpedo, Ultima, Vantage, Conclude, and Rezult *Perennial grasses*	**grasses** Post *Foliar*					✓	✓	✓	0.3[10]	0.375[10]		✓	✓

1. See Table E-2, *Herbicide Formulations Approved for use on BLM-Administered Lands*, in Appendix E 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-administered 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 Appendix C, *Treatment Key, Invasive Plant Sites, and the Annual Treatment Plan*
5. Three lbs. / acre acid equivalent for the No Action Alternative and 7 lbs. / acre under the action alternatives. The existing NEPA analyses on the District 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 (SERA 2011a) analyzes a maximum rate of 7 lbs. / acre. Maximum rates on formulated product labels listed in Table E-2 (Appendix E) range from 7 lbs. / acre to 14 lbs. / acre.
6. PEIS Mitigation Measures include "where practical, limit glyphosate and hexazinone 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. Information from SERA (2014). BLM maximum and typical rates have yet to be calculated.
9. 1.9 lbs. / acre for the No Action Alternative and 2 lbs. / acre under the action alternatives.
10. As described in the sethoxydim Risk Assessment (SERA 2001). BLM maximum and typical rates have yet to be calculated.

***Table B-3**. Herbicide Characteristics*

Herbicides analyzed for Research and Demonstration	
Fluazifop-P-butyl Sethoxydim	Fluazifop-P-butyl and sethoxydim are effective on annual and perennial grasses, but do not affect broadleaf plants.
Herbicides approved for use on BLM-administered 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 in areas 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 Northwest 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 (sunflower) and Fabaceae (pea) families and is also effective on certain species in the Apiaceae (carrot), and Polygonaceae (knotweed) families. It is effective at controlling knapweed and various thistles (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 mustards, houndstongue, 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 teasel, shining geranium, or herb Robert. 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.
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. Aminopyralid would replace glyphosate for many terrestrial broadleaf species. The BLM does not use glyphosate formulated with polyoxyethyleneamine (POEA).

Imazapic	Imazapic is a broad-spectrum herbicide for broadleaf and grass species, but is particularly effective on invasive annual grasses such as soft brome 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, hawthorn, and tree-of-heaven. It is also used to treat perennial grasses and loosestrife. Imazapyr may be used for the control of aquatic invasive plants like parrot feather, flowering rush, hydrilla, 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 the mustard family, as well as thistles. It can be used in combination with aminopyralid to treat species in the carnation, carrot, mustards, knapweed species groups (such as bladder campion, poison hemlock, garlic mustard and yellow starthistle).
Picloram	Picloram is effective on knapweeds, hawkweed, 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. Picloram is a restricted used herbicide.
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 has a one-year grazing restriction. It would not be applied near water.
Sulfometuron methyl	Like imazapic, sulfometuron methyl is effective on 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 blackberry, brooms, gorse, and other trees and shrubs. It may also be used on select broadleaf species such as annual peas and buttercups. The aquatic formulations are also the most effective herbicide for treatment of purple loosestrife and other aquatic species. 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.

Resistance and Rotation

Herbicide resistance[12] 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[13].

The use of additional herbicides would help prevent herbicide resistance by adding chemicals that control the plants through different modes and sites of action. More effective rotation of herbicides (see Table B-4), when coupled with integrated invasive plant management, would help prevent the development of herbicide resistance.

[12] 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.

[13] Site of action is defined as the specific process in plants that the herbicide disrupts to interfere with plant growth and development. Mode of action is defined as all herbicide interactions with the plant, from application to final effect. The mode of action involves absorption into the plant, translocation or movement in the plant, metabolism of the herbicide, and the physiological plant response.

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 B-4**. Guide for Herbicide Rotation*[1]

Herbicide Group	Herbicide Chemical Family	Herbicide Common Name	Resistant Plants	States with Resistant Plants
ACCase Inhibitors	Cyclohexanediones	Sethoxydim	Italian ryegrass	Idaho, Oregon
	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
Photosystem II inhibitors	As-triazines	Hexazinone	shepherd's purse Italian ryegrass	Oregon
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), which did not include fluridone. However, plants have been shown to develop resistance to repeated fluridone use (ENSR 2005c).

Appendix C: Treatment Key, Invasive Plant Sites, and the Annual Treatment Plan

Tables C-1 through C-27 contain information about invasive plant infestations and their potential treatments under each alternative (the *Treatment Key*). The District arranged species of invasive plants that would be treated in the same manner into groups. Information about which plants species are in which group and the locations of those groups are included in the first part of each table and treatment methods are included in the second part. Groups include existing invasive plant sites (species known on the District), as well as species not yet found on the District that may spread to the District in the future. Noxious weeds are listed in bold. (Note that invasive plants that are not listed as noxious weeds cannot be treated with herbicides under the No Action Alternative.) Acres are gross acres (see Figure A-1 in Appendix A) and acres are rounded to two digits; acres that are shown as 0.00 are smaller than 0.005 acres.

The *Treatment Key* portion of each table shows treatment options under each alternative, as well as considerations for when treatment methods may be used. Most treatments are suggested by *Weed Control in Natural Areas in the Western United States* (DiTomaso et al. 2013). For each species group, the preferred treatment method is listed first, with second and third choices (and so on) listed subsequently. Factors that could lead to the preferred (and subsequent) methods not being appropriate are listed in the *Treatment Considerations* column, and includes information such as plant life cycle, soil types, plant resistance to herbicides, infestation size, herbicide selectivity to neighboring desirable vegetation, weather conditions, and protection measures or label restrictions that limit areas an herbicide could be used in. The *Treatment Considerations* column includes common treatment considerations and is not an exhaustive list. Application rates are shown as lbs./acre and are averages. Actual formulations may vary slightly, depending on mixes of herbicides or adjuvants, timing, and other factors that could increase effectiveness on individual plants. Lbs./acre are calculated from rates per acre on the label, and can vary based on formulation. Typical and maximum application rates are listed on Table B-2, *Herbicide Information.* 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 some cases, application rate is listed as (minimal), which indicates that the rate would be 1/10th or less of the typical application rate.

As described under the alternatives in Chapter 2, competitive planting and seeding may also occur to revegetate areas in conjunction with other treatment methods. In addition, prescribed fire may also occur in any group.

Within each species group, area or field office, and by alternative, the *Percent of Acres where Treatment Would be Used* column adds up to 100 percent and shows how often a treatment method would be used when a species infestation is targeted for treatment. For example, under the No Action Alternative in the Tillamook and Marys Peak Field Offices, annual grasses would be controlled manually 50 percent of the time, mechanically 5 percent of the time, with glyphosate 10 percent of the time, propane torch less than 1 percent of the time, and 35 percent of the time, there would be no adequate control method. These estimates are generally based on treatment of known sites. These percentages are based on acres treated, not on number of sites treated. For example, if 20 one-acre sites had invasive plants that were manually pulled, and one 20-acre site is sprayed with imazapyr, manual and imazapyr would both be 50 percent each. Under the No Action Alternative, areas (e.g., field offices) are grouped if similar treatments occur in both areas. For example, Tillamook and Marys Peak Field Offices are both covered by the *Westside Salem Integrated Non-Native Plant Management Plan EA* (USDI 2008d) and would use the same treatment methods on the same species.

It should be noted that the District would not necessarily treat all invasive plants or the infestations listed in these tables. The District would treat approximately 2,000 to 6,000 gross acres (on average 3,000 gross acres) annually and these acres would be selected based on type of species, location, and potential for spread. Further information can be found in Appendix B, in the *Prioritizing Areas for Treatment* section. Many of the species groups include a row for "no adequate control" after the listed treatment methods. This indicates the percent of acres targeted for treatment that the District cannot control because adequate control methods are unavailable or unfeasible and treatments would not be attempted even in high priority circumstances.

A summary of treatment methods and species groups can be found in Table C-28, *Summary of Treatment Options Available under One or More Alternatives, by Species Group*. This year's proposed invasive plant treatments can be found in Table C-29, *Annual Treatment Plan.*

Table C-1. *Annual Grasses: Locations and Treatment Key*

Annual Grasses Group: Locations (Species and Sites)																				
Common Name ***Scientific Name***	**Upper Willamette Field Office**			**Siuslaw Field Office**			**Tillamook Field Office**			**Marys Peak Field Office**			**Cascades Field Office**			**Northwest Oregon District**				**Common Habitat**
	NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		Widespread?	
		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		
Medusahead ***Taeniatherum caput-medusae***													6	4.50		6	4.50		No	Limited distribution. In clay soils and open disturbed areas.
North Africa grass *Ventenata dubia*			0.10															0.10	No	Roadsides, open areas, grasslands, plantations
Soft brome *Bromus hordeaceus*				22	1.98											22	1.98		No	Forest, woodland, roadside, riparian
Wild oat *Avena fatua*				6	0.08											6	0.08		No	Meadows, fields
Totals			**0.10**	**28**	**2.06**								**6**	**4.50**		**34**	**6.56**	**0.10**		

Annual Grasses Group: Treatment Key (Methods and Considerations)								
Treatment Method	**Application Rate (lbs./acre)**	**Percent of Acres where Treatment Would be Used**						**Treatment Considerations**
		No Action Alternative					**Action Alternatives**	
		Upper Willamette Field Office	**Siuslaw Field Office**		**Marys Peak / Tillamook Field Offices**	**Cascades Field Office**		
				West Eugene Wetlands				
Manual control	NA	50%	50%	50%	50%	50%	5%	Small sites can be controlled through hand-pulling.
Mechanical control	NA	5%	5%	5%	5%	5%	5%	Mowing at the bolt to early flowering stage may help to suppress plants. However, mowing after seed set will disperse seeds.
Imazapic	**0.06** to **0.12**	NA	NA	NA	NA	NA	45%	Apply at the pre-emergent stage in the fall, when desirable grasses and forbs are dormant.
Rimsulfuron	0.03 to **0.06**	NA	NA	NA	NA	NA	35%	Apply pre-emergence to early post-emergence when target plants are young and actively growing. Perennial grasses are tolerant to fall applications.
Glyphosate	**<3.00**	NA	NA	10%	10%	10%	1%	Apply at the seedling stage. Since it is non-selective, minimize exposure to non-target plants.
Fluazifop-P-butyl	**0.38**	NA	NA	1%	NA	NA	1%	Research and Demonstration herbicide. See Special Local Needs Label (FIFRA Sec 24, OR-120016). Apply to actively growing grasses. Repeat applications may be needed.
Sulfometuron methyl	0.05 to 0.09	NA	NA	NA	NA	NA	1%	Apply pre-emergence or early when plants are germinating and actively growing. May be used in seasonally wet areas when water is not present.
Hexazinone	0.75	NA	NA	NA	NA	NA	1%	Apply pre-emergence or early post emergence. Use primarily on road rights-of-way.

Annual Grasses Group: Treatment Key (Methods and Considerations)								
Treatment Method	**Application Rate (lbs./acre)**	**Percent of Acres where Treatment Would be Used**						**Treatment Considerations**
		No Action Alternative					**Action Alternatives**	
		Upper Willamette Field Office	**Siuslaw Field Office**	**West Eugene Wetlands**	**Marys Peak / Tillamook Field Offices**	**Cascades Field Office**		
Sethoxydim	**0.30**	NA	NA	NA	NA	NA	1%	Research and Demonstration herbicide.
Targeted grazing (cattle)	NA	NA	NA	NA	0%	0%	1%	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 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.
Propane torch	NA	NA	NA	1%	<1%	<1%	4%	Most effective on small plants. Use only on infestations on non-flammable substrate (e.g., sand, gravel, concrete).
No adequate control methods	NA	45%	45%	13%	35%	35%	0%	

Table C-2. *Annual Peas: Locations and Treatment Key*

Annual Peas Group: Locations (Species and Sites)																			
Common Name ***Scientific Name***	**Upper Willamette Field Office**			**Siuslaw Field Office**			**Tillamook Field Office**			**Marys Peak Field Office**			**Cascades Field Office**			**Northwest Oregon District**				**Common Habitat**
	NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		Widespread?	
		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		
Sweetclover *Melilotus offincinalis*	71	36.14		375	318.60	74.31						1.00				446	354.74	75.31	In areas[1]	Meadows, prairies, open woodlands, waste areas

1. Marys Peak Field Office

Annual Peas Group: Treatment Key (Methods and Considerations)								
Treatment Method	**Application Rate (lbs./acre)**	**Percent of Acres where Treatment Would be Used**						**Treatment Considerations**
		No Action Alternative					**Action Alternatives**	
		Upper Willamette Field Office	**Siuslaw Field Office**	**West Eugene Wetlands**	**Marys Peak / Tillamook Field Offices**	**Cascades Field Office**		
Manual control	NA	75%	75%	25%	75%	75%	25%	Hand-pulling can be used on small infestations or isolated plants, as long as below-ground tissue is also removed (to prevent re-sprouting).
Aminopyralid	0.05 to **0.11**	NA	NA	35%	NA	NA	35%	Apply in spring before flowering.
Clopyralid	0.09 to 0.19	NA	NA	15%	NA	NA	15%	Apply in spring before flowering.
Triclopyr	**2.00**	NA	NA	15%	NA	NA	15%	Apply in spring when plants are rapidly growing.

Annual Peas Group: Treatment Key (Methods and Considerations)								
Treatment Method	**Application Rate (lbs./acre)**	**Percent of Acres where Treatment Would be Used**						**Treatment Considerations**
		No Action Alternative					**Action Alternatives**	
		Upper Willamette Field Office	**Siuslaw Field Office**	**West Eugene Wetlands**	**Marys Peak / Tillamook Field Offices**	**Cascades Field Office**		
Glyphosate	**<3.00**	NA	NA	10%	NA	NA	5%	Apply in spring before flowering.
2,4-D	**1.00**	NA	NA	NA	NA	NA	5%	Apply in spring to actively growing plants, particularly at bud to flower.
Picloram	**0.50** to **0.95**	NA	NA	NA	NA	<1%	<1%	Appropriate from rosette to flowering stage, where there are seed banks and where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse effects to desirable vegetation can be minimized. Evaluate soil, slope, and proximity to water when considering this herbicide. Works best when plants are growing rapidly in spring before full bloom or in late summer to early fall.
Mechanical control	NA	<1%	<1%	<1%	<1%	<1%	<1%	Target plants are suppressed with mowing or weed whackers before seed set, non-selectively removes growth of desirable species. May require multiple treatments/year for effective weed control.
Targeted grazing (goats or sheep)	NA	NA	NA	<1%	<1%	<1%	<1%	Targeted grazing can reduce the biomass of invasive plants. Fencing or herding required.
No adequate control methods	NA	25%	25%	0%	25%	25%	0%	

Table C-3. *Aquatic Species: Locations and Treatment Key*

Aquatic Species Group: Locations (Species and Sites)																						
Common Name ***Scientific Name***	**Upper Willamette Field Office**			**Siuslaw Field Office**			**Tillamook Field Office**			**Marys Peak Field Office**			**Cascades Field Office**			**Northwest Oregon District**				**Common Habitat**
	NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		Widespread?	
		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		
Eurasian watermilfoil ***Myriophyllum spicatum***	Currently unknown on District																				Aquatic
Flowering rush ***Butomus umbellatus***	Currently unknown on District																				Aquatic
Fragrant water lily *Nymphaea odorata*	Currently unknown on District																				Aquatic
Hydrilla ***Hydrilla verticillata***	Currently unknown on District																				Aquatic
Parrot feather ***Myriophyllum aquaticum***				3	0.32											3	0.32		No		Aquatic, river

Aquatic Species Group: Locations (Species and Sites)																					
Common Name ***Scientific Name***	**Upper Willamette Field Office**			**Siuslaw Field Office**			**Tillamook Field Office**			**Marys Peak Field Office**			**Cascades Field Office**			**Northwest Oregon District**				**Common Habitat**
	NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		Widespread?	
		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		
Water primrose ***Ludwigia hexapetala***	Currently unknown on District																			Aquatic in shallow slow-moving water along rivers, ditches, ponds
Floating water primrose ***Ludwigia peploides***	Currently unknown on District																			Aquatic in shallow slow-moving water along rivers, ditches, ponds
Yellow floating heart ***Nymphoides peltata***	Currently unknown on District																			Aquatic

Aquatic Species Group: Treatment Key (Methods and Considerations)								
Treatment Method	**Application Rate (lbs./acre)**	**Percent of Acres where Treatment Would be Used**						**Treatment Considerations**
		No Action Alternative and Alternative 2					**Alternative 3**	
		Upper Willamette Field Office	**Siuslaw Field Office**	**West Eugene Wetlands**	**Marys Peak / Tillamook Field Offices**	**Cascades Field Office**		
Manual control	NA	NA	NA	NA	NA	NA	50%	Weed mats, held in place with a heavy object, can be used to eradicate infestations. Hand pulling can be effective on small infestations.
Glyphosate	(Minimal)	NA	NA	NA	NA	NA	10%	Non-selective. Likely to be used on smaller infestations where exposure to non-target plants can be minimized.
Triclopyr	(Minimal)	NA	NA	NA	NA	NA	35%	Emergent shoots of parrot feather are difficult to "wet" due to dense waxy cuticle and a surfactant should be used. Broadleaf selective (more selective than 2,4-D).
Imazapyr	(Minimal)	NA	NA	NA	NA	NA	4%	Slow acting systemic. Non-selective.
Mechanical control	NA	NA	NA	NA	NA	NA	1%	Diver assisted suction harvest or tractor. Tractor can be effective but difficult to get entire plant.
Fluridone	(Minimal)	NA	NA	NA	NA	NA	<1%	Use various formulations (variable release-rates) or repeated applications for five to seven weeks. Would only be applied in ponds, lakes, and other non-flowing water bodies. Non selective.
2,4-D	(Minimal)	NA	NA	NA	NA	0%	<1%	Emergent shoots of parrot feather are difficult to "wet" due to dense waxy cuticle and a surfactant should be used. Broadleaf selective; use infestations where exposure to non-target plants can be minimized.
No adequate control methods	NA	100%	100%	100%	100%	100%	0%	

Table C-4. *Biennial Thistles: Locations and Treatment Key*

Biennial Thistles Group: Locations (Species and Sites)

Common Name *Scientific Name*	Upper Willamette Field Office			Siuslaw Field Office			Tillamook Field Office			Marys Peak Field Office			Cascades Field Office			Northwest Oregon District				Common Habitat
	NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		Widespread?	
		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		
Bull thistle ***Cirsium vulgare***	1,442	1,191.40		1,390	1,425.62	341.05			1,824.70	594	2,047.54		1,574	194.14		5,000	4,858.70	2,165.75	Yes	Roadside, open forest, clearings
Common burdock *Arctium minus*				21	24.15	6.16										21	24.15	6.16	Yes	Open forests, roadside, riparian areas
Distaff thistle ***Carthamus lanatus***	Currently unknown on District																			Roadsides, disturbed openings
Italian thistle ***Carduus pycnocephalus***	Currently unknown on District																			Urban, grassland
Milk thistle ***Silybum marianum***	Widespread on District																			Roadsides, grasslands, disturbed openings
Scotch cottonthistle ***Onopordum acanthium***													4	0.60		4	0.60		Yes	Roadside, rangeland, prairies, riparian
Totals	**1,442**	**1,191.40**		**1,411**	**1,449.77**	**347.21**			**1,824.70**	**594**	**2,047.54**		**1,578**	**194.74**		**5,025**	**4,883.45**	**2,171.91**		

Biennial Thistles Group: Treatment Key (Methods and Considerations)

Treatment Method	Application Rate (lbs./acre)	Percent of Acres where Treatment Would be Used						Treatment Considerations
		No Action Alternative					Action Alternatives	
		Upper Willamette Field Office	Siuslaw Field Office	West Eugene Wetlands	Marys Peak / Tillamook Field Offices	Cascades Field Office		
Manual control	NA	45%	45%	25%	40%	40%	5%	Grubbing and pulling can be effective in controlling existing plant, but will not be effective on seed bank. Would only be used on small infestations.
Mechanical control	NA	5%	5%	15%	10%	10%	15%	Thistles can be controlled with mowing or weed whackers, but can adversely affect desirable intermingled species.
Aminopyralid	**0.08** to **0.11**	NA	NA	45%	NA	NA	48%	Preferred treatment method. Longer soil residual than clopyralid. 90 percent control if applied at the bud stage.
Clopyralid + 2,4-D	**0.38** + 0.95	NA	NA	NA	NA	NA	10%	Treatment for young plants (actively growing thru flowering).
Metsulfuron methyl	**0.04**	NA	NA	NA	NA	NA	10%	Good choice at the rosette to bud stage. It is harder on some wet-meadow grass species than chlorsulfuron.
Glyphosate	1.00	NA	NA	5%	20%	20%	5%	Non-selective. Apply postemergence to plants in the rosette state in spring or before freeze-up in the fall.
Picloram + 2,4-D	0.25 + 0.95	NA	NA	NA	NA	<1%	<1%	Appropriate from rosette to flowering, where there is an established seed bank at site, where soils are not sandy or gravelly, where treatments are within labeled

Biennial Thistles Group: Treatment Key (Methods and Considerations)								
Treatment Method	**Application Rate (lbs./acre)**	**Percent of Acres where Treatment Would be Used**						**Treatment Considerations**
		No Action Alternative					**Action Alternatives**	
		Upper Willamette Field Office	**Siuslaw Field Office**	**West Eugene Wetlands**	**Marys Peak / Tillamook Field Offices**	**Cascades Field Office**		
								distances from water or wells, and where adverse effects to desirable vegetation can be minimized.
Dicamba + 2,4-D	**0.50** + 0.95	NA	NA	NA	NA	10%	3%	Appropriate if treatment occurs at spring and fall rosette stage.
Chlorsulfuron + Clopyralid + 2,4-D	**0.05** + **0.38** + 0.95	NA	NA	NA	NA	NA	1%	Appropriate when there is an established seed bank at site. Treat from rosette to flowering. This treatment is particularly useful when Canada thistle occurs in the infestation mix. Combination to consider using when burn-down to prevent seed formation / set is needed or where resistance to sulfonylureas is a concern. It adds a second mode or site of action.
Chlorsulfuron + 2,4-D	**0.05** + 0.95	NA	NA	NA	NA	NA	1%	Combination to consider using when burn-down to prevent seed formation / set is needed or where resistance to sulfonylureas is a concern. It adds a second mode or site of action.
Chlorsulfuron	**0.05**	NA	NA	NA	NA	NA	1%	Treatment at the rosette to bud stage. This treatment is particularly useful when Canada thistle occurs in the infestation mix.
Clopyralid	**0.38**	NA	NA	<1%	NA	NA	<1%	Post emergence in spring up to bud stage. Can also apply to fall re-growth. Results are best if applied to rapidly growing weeds. More selective than picloram.
Picloram + 2,4-D + Dicamba	0.25 + 0.95 **+ 0.50**	NA	NA	NA	NA	0%	<1%	Appropriate from rosette to flowering stage, where there are seed banks and where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse effects to desirable vegetation can be minimized. Apply where residual control is desired.
Chlorsulfuron + Picloram	**0.05** + **0.5**	NA	NA	NA	NA	NA	<1%	Use when there is an established seed bank at site, treat from rosette to flowering, where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse effects to desirable vegetation can be minimized.
Targeted grazing (goats)	NA	NA	NA	NA	0%	0%	1%	Goats will eat young plants.
No adequate control methods	NA	50%	50%	15%	30%	20%	0%	Large infestations may be infeasible to treat using manual/mechanical methods.
Within the Northwest Oregon District boundary, the ODA releases and tracks biological control agents on bull and milk thistle infestations. See Table B-1, *Widespread Biological Control Agents on the Northwest Oregon District*, for further information.								

Table C-5. *Borage: Locations and Treatment Key*

Borage Group: Locations (Species and Sites)																					
Common Name ***Scientific Name***	**Upper Willamette Field Office**			**Siuslaw Field Office**			**Tillamook Field Office**			**Marys Peak Field Office**			**Cascades Field Office**			**Northwest Oregon District**				**Common Habitat**
	NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		Widespread?	
		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		
Common bugloss ***Anchusa officinalis***	Currently unknown on District																			Fields, roadsides, riparian, waste areas
Gypsyflower/houndstounge ***Cynoglossum officinale***													1	0.10		1	0.10		No	Roadsides, pastures, meadows, open forest
Patterson's curse ***Echium plantagineum***	Currently unknown on District																			Open areas, pastures

Borage Group: Treatment Key (Methods and Considerations)								
Treatment Method	**Application Rate (lbs./acre)**	**Percent of Acres where Treatment Would be Used**						**Treatment Considerations**
		No Action Alternative					**Action Alternatives**	
		Upper Willamette Field Office	**Siuslaw Field Office**		**Marys Peak / Tillamook Field Offices**	**Cascades Field Office**		
				West Eugene Wetlands				
Manual control	NA	50%	50%	50%	50%	50%	50%	Hand pulling is feasible for scattered plants or for areas where other control methods are not feasible. Manual control would be limited to small infestations.
Glyphosate	**<3.00**	NA	NA	25%	25%	30%	15%	Preferred herbicide near water.
Chlorsulfuron + 2,4-D	**0.06** + 0.95	NA	NA	NA	NA	NA	15%	Combination to consider using when burn-down to prevent seed formation / set is needed or where resistance to sulfonylureas is a concern. This combination adds a second mode or site of action.
Metsulfuron methyl + 2,4-D	**0.04** + 0.95	NA	NA	NA	NA	NA	10%	Combination to consider using when burn-down to prevent seed formation / set is needed or where resistance to sulfonylureas is a concern. This combination adds a second mode or site of action. Less expensive than chlorsulfuron but is harder on some wet meadow grass species.
Metsulfuron methyl	**0.04** to **0.08**	NA	NA	NA	NA	NA	8%	Can be used safely around grasses. Early post emergence, apply early spring to be most effective.
Dicamba + 2,4-D	**0.50** + 0.95	NA	NA	NA	NA	<1%	1%	Appropriate from the seedling to flowering stage. Option to prevent resistance to sulfonylureas.
Picloram + 2,4-D	**0.50** + 0.95	NA	NA	NA	NA	<1%	1%	Appropriate from rosette to flowering stage, where there are seed banks and where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse effects to desirables can be minimized.
No adequate control methods	NA	50%	50%	25%	25%	20%	0%	

Table C-6. *Buckwheat Family: Locations and Treatment Key*

Buckwheat Family Group: Locations (Species and Sites)																				
Common Name ***Scientific Name***	**Upper Willamette Field Office**			**Siuslaw Field Office**			**Tillamook Field Office**			**Marys Peak Field Office**			**Cascades Field Office**			**Northwest Oregon District**				**Common Habitat**
	NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		Widespread?	
		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		
Bohemian knotweed *Polygonum X bohemicum*				2	0.13											2	0.13		No	Riparian, waste areas, forest edges
Cultivated knotweed *Polygonum polystachyum*							2	1.60					2	0.20		4	1.80		No	Riparian, waste areas, forest edges
Curly dock *Rumex crispus*				21	5.42	0.02										21	5.42	0.02	No	Widespread in open disturbed areas
Giant knotweed *Polygonum sachanlinense*				1	0.42					8	5.21	8	2	2.48		11	8.11		No	Riparian, waste areas, forest edges
Japanese knotweed *Polygonum cuspidatum*	10	1.66		86	11.05	1,313.81	1	0.10	0.10	2	0.54	2	20	34.95		119	48.30	1,313.91	No	Riparian, waste areas, forest edges
Totals	**10**	**1.66**		**110**	**17.03**	**1,313.83**	**3**	**1.70**	**0.10**	**10**	**5.76**		**24**	**37.62**		**157**	**63.76**	**1,313.93**		

Buckwheat Family Group: Treatment Key (Methods and Considerations)								
Treatment Method	**Application Rate (lbs./acre)**	**Percent of Acres where Treatment Would be Used**						**Treatment Considerations**
		No Action Alternative					**Action Alternatives**	
		Upper Willamette Field Office	**Siuslaw Field Office**	**West Eugene Wetlands**	**Marys Peak / Tillamook Field Offices**	**Cascades Field Office**		
Manual control	NA	5%	5%	<1%	<1%	<1%	<1%	Recommended when rhizomes can be completely removed. Should only be used for very small upland infestations (less than 50 stems).
Imazapyr	**0.75** to **1.00**	NA	NA	NA	NA	NA	50%	Most effective treatment method. Repeat applications necessary.
Aminopyralid	**0.11**	NA	NA	40%	NA	NA	30%	Apply in mid-summer to autumn, when plants are fully leafed. Optimum results when plants are 3-5 ft. tall. Repeat applications necessary.
Glyphosate	**<3.00**	NA	NA	30%	10%	50%	15%	Apply mid-summer to fall, when plants are fully leafed. Injection treatments are also effective. Repeat applications necessary.
Triclopyr	0.50 to **2.00**	NA	NA	30%	NA	NA	3%	Apply midsummer to actively growing plants.
Triclopyr + 2,4-D	**1.50** + 0.95	NA	NA	NA	NA	NA	2%	Apply midsummer to actively growing plants.
No adequate control methods	NA	95%	95%	0%	90%	50%	0%	

Table C-7. *Buttercups: Locations and Treatment Key*

Buttercups Group: Locations (Species and Sites)																				
Common Name ***Scientific Name***	**Upper Willamette Field Office**			**Siuslaw Field Office**			**Tillamook Field Office**			**Marys Peak Field Office**			**Cascades Field Office**			**Northwest Oregon District**				**Common Habitat**
	NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		Widespread?	
		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		
Creeping buttercup *Ranunculus repens*				1	0.02				1.20	10	1.30	5.00	1	0.00	100.00	12	1.32	106.20	In areas[1]	Roadside, fields, pastures, forest edges, riparian
Lesser celandine ***Ranunculus ficaria***	Currently unknown on District																			Woodland, urban, wetland, riparian

1. In Siuslaw, Tillamook, and Cascades Field Offices

Buttercups Group: Treatment Key (Methods and Considerations)								
Treatment Method	**Application Rate (lbs./acre)**	**Percent of Acres where Treatment Would be Used**						**Treatment Considerations**
		No Action Alternative					**Action Alternatives**	
		Upper Willamette Field Office	**Siuslaw Field Office**	**West Eugene Wetlands**	**Marys Peak / Tillamook Field Offices**	**Cascades Field Office**		
Manual methods	NA	60%	60%	2%	20%	20%	5%	Roots must be removed from site, will regenerate from stem fragments and runners.
Aminopyralid	0.05 to **0.11**	NA	NA	NA	NA	NA	25%	Apply to actively growing plants.
Glyphosate	**<3.00**	NA	NA	40%	75%	60%	10%	Effective when applied in summer/fall before leaf dieback.
Metsulfuron methyl	0.01 to **0.08**	NA	NA	NA	NA	NA	20%	Apply early when plants are small and actively growing.
Chlorsulfuron	**0.05**	NA	NA	NA	NA	NA	10%	Treat marshes, swamps and bogs after water has receded as well as seasonally dry flood deltas.
Dicamba + 2,4-D	**0.50** to **1.00** + 0.95	NA	NA	NA	NA	5%	5%	Apply early spring before flowers appear.
Triclopyr	**2.00**	NA	NA	56%	NA	NA	15%	Apply when actively growing to full bloom.
Triclopyr + 2 4-D	**2.00** + 0.95	NA	NA	NA	NA	NA	5%	Apply when actively growing to full bloom.
2,4-D	0.95	NA	NA	NA	NA	5%	5%	Apply in spring to rosettes.
Picloram	**0.50** to **0.95**	NA	NA	NA	NA	<1%	<1%	Appropriate from rosette to flowering stage, where there are seed banks and where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse effects to desirables can be minimized. Evaluate soil, slope, and proximity to water when considering this herbicide.
Targeted grazing (sheep)	NA	NA	NA	NA	NA	<1%	<1%	Sheep will feed on seedlings and young vines at ground level. (Some buttercup species can be toxic.)
Mechanical control	NA	2%	2%	2%	<1%	<1%	0%	Tillage must be conducted before roots become well established.

Buttercups Group: Treatment Key (Methods and Considerations)								
Treatment Method	**Application Rate (lbs./acre)**	**Percent of Acres where Treatment Would be Used**						**Treatment Considerations**
		No Action Alternative					**Action Alternatives**	
		Upper Willamette Field Office	**Siuslaw Field Office**		**Marys Peak / Tillamook Field Offices**	**Cascades Field Office**		
				West Eugene Wetlands				
No adequate control methods	NA	38%	38%	0%	5%	10%	0%	

Table C-8. *Canada Thistle: Locations and Treatment Key*

Canada Thistle Group: Locations (Species and Sites)																				
Common Name ***Scientific Name***	**Upper Willamette Field Office**			**Siuslaw Field Office**			**Tillamook Field Office**			**Marys Peak Field Office**			**Cascades Field Office**			**Northwest Oregon District**				**Common Habitat**
	NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		Widespread?	
		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		
Canada thistle ***Cirsium arvense***	1,236	1,256.51		792	634.10	142.54			1,418.80	422	1,595.51		1,314	174.12		3,764	3,660.25	1,561.34	Yes	Grasslands, open forest, roadside, pastures, clearings

Canada Thistle Group: Treatment Key (Methods and Considerations)								
Treatment Method	**Application Rate (lbs./acre)**	**Percent of Acres where Treatment Would be Used**						**Treatment Considerations**
		No Action Alternative					**Action Alternatives**	
		Upper Willamette Field Office	**Siuslaw Field Office**		**Marys Peak / Tillamook Field Offices**	**Cascades Field Office**		
				West Eugene Wetlands				
Clopyralid	**0.50**	NA	NA	30%	NA	NA	35%	One of the preferred herbicide treatments, post-frost.
Aminopyralid	**0.08** to **0.11**	NA	NA	30%	NA	NA	30%	One of the most effective herbicides. Apply post-emergence, bud stage to senescence. Applications can be made into winter if conditions permit.
Glyphosate	(Minimal)	NA	NA	25%	35%	35%	24%	Would be used where herbicide treatments could get into the water.
Chlorsulfuron	**0.06**	NA	NA	NA	NA	NA	5%	Can be used for Canada thistle at any stage.
Clopyralid + 2,4-D	**0.50** + 0.95	NA	NA	NA	NA	NA	1%	Treatment for young plants (actively growing thru flowering). Adding 2,4-D is helpful if treatment occurs at the bud to flowering stage.
Picloram + 2,4-D	0.25 + 0.95	NA	NA	NA	NA	<1%	<1%	Appropriate at sites where there is a known seed bank, where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse effects to desirable vegetation can be minimized. Adding 2,4-D is helpful if treatment occurs at the bud to flowering stage.
Picloram	0.25	NA	NA	NA	NA	NA	<1%	Appropriate from rosette to flowering stage, where there are seed banks and where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse effects to desirable vegetation can be minimized.

Canada Thistle Group: Treatment Key (Methods and Considerations)								
Treatment Method	**Application Rate (lbs./acre)**	**Percent of Acres where Treatment Would be Used**						**Treatment Considerations**
		No Action Alternative					**Action Alternatives**	
		Upper Willamette Field Office	**Siuslaw Field Office**	**West Eugene Wetlands**	**Marys Peak / Tillamook Field Offices**	**Cascades Field Office**		
Mechanical control	NA	0%	0%	10%	10%	10%	5%	Mowing can be used to reduce the nutrient storage in the roots and suppress flower formation. However, for mowing to be effective it must be repeated at least every 3-4 weeks for several seasons. Or should be combined with other control practices.
Manual	NA	5%	5%	5%	5%	5%	<1%	Pulling is an inadequate control method; cutting and bagging heads can reduce seed set.
No adequate control methods	NA	95%	95%	0%	50%	50%	0%	
Within the Northwest Oregon District boundary, the ODA releases and tracks biological control agents on Canada thistle infestations. See Table B-1, *Widespread Biological Control Agents on the Northwest Oregon District*, for further information.								

Table C-9. *Carnations: Locations and Treatment Key*

Carnations Group: Locations (Species and Sites)																				
Common Name ***Scientific Name***	**Upper Willamette Field Office**			**Siuslaw Field Office**			**Tillamook Field Office**			**Marys Peak Field Office**			**Cascades Field Office**			**Northwest Oregon District**				**Common Habitat**
	NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		Widespread?	
		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		
Bladder campion *Silene vulgaris*	Currently unknown on District																			Open areas and meadows

Carnations Group: Treatment Key (Methods and Considerations)								
Treatment Method	**Application Rate (lbs./acre)**	**Percent of Acres where Treatment Would be Used**						**Treatment Considerations**
		No Action Alternative					**Action Alternatives**	
		Upper Willamette Field Office	**Siuslaw Field Office**	**West Eugene Wetlands**	**Marys Peak / Tillamook Field Offices**	**Cascades Field Office**		
Manual control	NA	50%	50%	50%	50%	50%	50%	Hand pull scattered plants or for areas where other control methods are not feasible. Limited to small infestations.
Mechanical control	NA	5%	5%	5%	5%	5%	5%	Repeated mowing of small patches is laborious but effective.
Dicamba + 2,4-D	**0.50** + 0.95	NA	NA	NA	NA	NA	5%	Apply in spring from rosettes to bolting, on plants with green basal leaves.
Glyphosate	**<3.00**	NA	NA	32%	NA	NA	32%	Apply in spring to actively growing plants from germination to bolting, with green basal leaves.

Carnations Group: Treatment Key (Methods and Considerations)								
Treatment Method	**Application Rate (lbs./acre)**	**Percent of Acres where Treatment Would be Used**						**Treatment Considerations**
		No Action Alternative					**Action Alternatives**	
		Upper Willamette Field Office	**Siuslaw Field Office**	**West Eugene Wetlands**	**Marys Peak / Tillamook Field Offices**	**Cascades Field Office**		
Aminopyralid + Metsulfuron methyl	**0.08** to **0.11** + **0.12** to **0.15**	NA	NA	NA	NA	NA	3%	Apply pre-emergence in fall or when target plants are in the seedling to rosette stage.
2,4-D	0.95	NA	NA	NA	NA	NA	5%	Apply to spring rosettes or to bolting plants with green basal leaves.
No adequate control methods	NA	45%	45%	13%	45%	45%	0%	

Table C-10. *Carrot Family: Locations and Treatment Key*

Carrot Family Group: Locations (Species and Sites)																				
Common Name ***Scientific Name***	**Upper Willamette Field Office**			**Siuslaw Field Office**			**Tillamook Field Office**			**Marys Peak Field Office**			**Cascades Field Office**			**Northwest Oregon District**				**Common Habitat**
	NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		Widespread?	
		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		
Common fennel *Foeniculum vulgare*	Currently unknown on District																			Roadsides, ditches, open disturbed sites
Giant hogweed ***Heracleum mantegazzianum***				1	0.18	0.08							5	0.60		6	0.78	0.08	No	Riparian, clearings, meadows, roadsides
Poison hemlock ***Conium maculatum***				20	1.23											25	1.83		No	Roadside, meadow, riparian, flood plains, ditches
Totals				**21**	**1.42**	**0.08**							**5**	**0.60**		**26**	**2.02**	**0.08**		

Carrot Family Group: Treatment Key (Methods and Considerations)							
Treatment Method	**Application Rate (lbs./acre)**	**Percent of Acres where Treatment Would be Used**					**Treatment Considerations**
		No Action Alternative				**Action Alternatives**	
		Upper Willamette Field Office	**Siuslaw Field Office**	**West Eugene Wetlands**	**Marys Peak / Tillamook Field Offices**	**Cascades Field Office**	
Manual control	NA	5%	5%	5%	5%	5%	5%	Good for single plants or small infestations, try to get as much of the taproot as possible to prevent regrowth.
Mechanical control	NA	45%	45%	30%	45%	45%	5%	Target plants are suppressed with mowing or weed whackers before seed set, nonselectively removes growth of desirable species. May require multiple treatments per year for effective weed control.

Carrot Family Group: Treatment Key (Methods and Considerations)								
Treatment Method	**Application Rate (lbs./acre)**	**Percent of Acres where Treatment Would be Used**						**Treatment Considerations**
		No Action Alternative					**Action Alternatives**	
		Upper Willamette Field Office	**Siuslaw Field Office**	**West Eugene Wetlands**	**Marys Peak / Tillamook Field Offices**	**Cascades Field Office**		
Aminopyralid + Metsulfuron methyl	**0.08** to **0.11** + **0.12** to **0.15**	NA	NA	NA	NA	NA	30%	Pre-emergence in fall, or post-emergence in the seedling to rosette stage.
Metsulfuron methyl + Dicamba + 2,4-D	0.02 + **0.50** + **1.00**	NA	NA	NA	NA	NA	25%	Appropriate for use in rights-of-way.
Imazapyr	**0.50**	NA	NA	NA	NA	NA	15%	Non-selective. Apply pre-emergence or in the rosette stage. Can be used near water.
Chlorsulfuron + 2,4-D	**0.05** + 0.95	NA	NA	NA	NA	NA	10%	Treat marshes, swamps and bogs after water has receded as well as seasonally dry flood deltas. (Do not make application to natural or man-made bodies of water such as lakes, reservoirs, ponds, streams and canals.)
Metsulfuron methyl	**0.07**	NA	NA	NA	NA	NA	5%	Treat marshes, swamps and bogs after water has receded as well as seasonally dry flood deltas. (Do not make application to natural or man-made bodies of water such as lakes, reservoirs, ponds, streams and canals.)
Glyphosate	1.00 to **2.00**	NA	NA	5%	5%	5%	5%	Use where herbicide treatments could contact water. For glyphosate, apply to rosettes before they bolt.
No adequate control methods	NA	50%	50%	60%	45%	45%	0%	

Table C-11. *Geranium: Locations and Treatment Key*

Geranium Group: Locations (Species and Sites)																				
Common Name ***Scientific Name***	**Upper Willamette Field Office**			**Siuslaw Field Office**			**Tillamook Field Office**			**Marys Peak Field Office**			**Cascades Field Office**			**Northwest Oregon District**				**Common Habitat**
	NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		Widespread?	
		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		
Herb Robert ***Geranium robertianum***	169	224.59		241	139.51	10.93	113	28.07	159.00	520	172.91	20.00	537	95.87		1,580	660.94	189.93	Yes	Roadside, forest
Shining geranium ***Geranium lucidum***	17	8.24		43	16.35	2.14	546	80.67	10.00	60	11.00	20.00	53	5.08	50.00	719	121.34	82.14	Yes	Roadside, forest
Totals	**186**	**232.83**		**284**	**155.86**	**13.07**	**659**	**108.74**	**169.00**	**580**	**183.91**	**40.00**	**590**	**100.95**	**50.00**	**2,299**	**782.28**	**272.07**		

Geranium Group: Treatment Key (Methods and Considerations)								
Treatment Method	**Application Rate (lbs./acre)**	**Percent of Acres where Treatment Would be Used**						**Treatment Considerations**
		No Action Alternative					**Action Alternatives**	
		Upper Willamette Field Office	**Siuslaw Field Office**	**West Eugene Wetlands**	**Marys Peak / Tillamook Field Offices**	**Cascades Field Office**		
Manual control	NA	5%	5%	5%	5%	5%	5%	Pull, dig, or till before flowers and seeds.
Mechanical control	NA	5%	5%	5%	5%	5%	5%	Target plants are suppressed with mowing or weed whackers before seed set, non-selectively removes growth of desirable species. May require multiple treatments per year for effective weed control.
Propane torch	NA	NA	NA	1%	0%	0%	1%	Most effective on small plants. Use only on infestations on non-flammable substrate (e.g., sand, gravel, concrete).
Metsulfuron methyl	0.01 to 0.02	NA	NA	NA	NA	NA	20%	Apply in spring before flowering on rapidly growing plants.
Aminopyralid	0.05 to **0.11**	NA	NA	20%	NA	NA	20%	Apply in spring on rosette to flowering stages or in fall to seedlings or rosettes.
Imazapyr	0.38 to **0.75**	NA	NA	NA	NA	NA	20%	Apply pre- or post-emergence to control visible plants and seeds.
Dicamba + Diflufenzopyr	0.18 to **0.35**	NA	NA	NA	NA	NA	15%	Apply in spring to actively growing weeds. Use higher rates on perennials or large plants.
Dicamba + 2,4-D	**0.75** + 0.25	NA	NA	NA	NA	5%	5%	Apply in spring before flowering on rapidly growing plants.
2,4-D	0.95	NA	NA	NA	NA	5%	5%	Apply from seedling to flowering, to actively growing plants.
Glyphosate	**<3.00**	NA	NA	3%	50%	50%	3%	Apply to rapidly growing plants. Use higher rates on larger plants.
Triclopyr + 2 4-D	**1.00** + **1.00**	NA	NA	NA	NA	NA	1%	Provides excellent control (>95%) according to *Weed Control in Natural Areas in the Western United States* (DiTomaso et al. 2013).
Imazapic	**0.03**	NA	NA	NA	NA	NA	<1%	Provides good control (80-95%) according to *Weed Control in Natural Areas in the Western United States* (DiTomaso et al. 2013).
Sulfometuron methyl	**0.14**	NA	NA	NA	NA	NA	<1%	Apply during the rainy season when weeds are rapidly growing, has mixed selectivity and desired grasses may be stunted.
Fluroxypyr	**0.49**	NA	NA	NA	NA	NA	<1%	Apply in spring on rapidly growing plants.
No adequate control methods	NA	90%	90%	66%	40%	30%	0%	

Table C-12. *Hawkweeds: Locations and Treatment Key*

Hawkweeds Group: Locations (Species and Sites)

Common Name ***Scientific Name***	**Upper Willamette Field Office**			**Siuslaw Field Office**			**Tillamook Field Office**			**Marys Peak Field Office**			**Cascades Field Office**			**Northwest Oregon District**				**Common Habitat**
	NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		Widespread?	
		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		
Orange hawkweed ***Hieracium aurantiacum***													3	0.21		3	0.21		No	Roadside, open forest, pasture, rangeland
Yellow hawkweed ***Hieracium floribundum***	Currently unknown on District																			Roadside, grasslands, forest

Hawkweeds Group: Treatment Key (Methods and Considerations)

Treatment Method	**Application Rate (lbs./acre)**	**Percent of Acres where Treatment Would be Used**						**Treatment Considerations**
		No Action Alternative					**Action Alternatives**	
		Upper Willamette Field Office	**Siuslaw Field Office**	**West Eugene Wetlands**	**Marys Peak / Tillamook Field Offices**	**Cascades Field Office**		
Manual control	NA	5%	5%	2%	5%	5%	5%	Hand pulling effective for small infestations.
Clopyralid	0.25 to **0.5**	NA	NA	45%	NA	NA	45%	For meadow hawkweed, apply up to bloom stage. For orange hawkweed, apply in the spring before bolting. Preferred on orange hawkweed.
Triclopyr + Clopyralid	0.40 to 0.60 + 0.14 to 0.19	NA	NA	30%	NA	NA	30%	Preferred for meadow hawkweed; apply rosette to early bolt. Triclopyr not necessary unless seed set is imminent.
Aminopyralid	**0.08**	NA	NA	23%	NA	NA	20%	Apply from seedling to full bloom in spring.
Dicamba + 2,4-D	**0.5** + 0.95	NA	NA	NA	NA	<1%	<1%	Appropriate from the seedling to flowering stage.
Picloram	0.25 to **0.5**	NA	NA	NA	NA	<1%	<1%	Appropriate from rosette to flowering stage, where there are seed banks and where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse effects to desirable vegetation can be minimized.
Glyphosate	**2.00**	NA	NA	<1%	80%	80%	<1%	Non-selective.
No adequate control methods	NA	95%	95%	0%	15%	15%	0%	

Table C-13. *Knapweeds: Locations and Treatment Key*

Knapweeds Group: Locations (Species and Sites)																				
Common Name ***Scientific Name***	**Upper Willamette Field Office**			**Siuslaw Field Office**			**Tillamook Field Office**			**Marys Peak Field Office**			**Cascades Field Office**			**Northwest Oregon District**				**Common Habitat**
	NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		Widespread?	
		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		
Diffuse knapweed ***Centaurea diffusa***	2	1.10											3	1.70		5	2.80		No	Roadsides, waste areas
Malta thistle *Centaurea melitensis*	Currently unknown on District																			Disturbed soils, grassy areas
Meadow knapweed ***Centaurea ×moncktonii***	22	13.02		288	395.27	71.23	6	1.37	25.10	55	31.05		229	52.42		600	493.13	96.33	In areas[1]	Widespread on western portion of the district: roadsides, fields, meadows, forest openings, waste areas
Spotted knapweed ***Centaurea stoebe L.* ssp. *micranthos***	53	29.71		45	28.73	4.57			2.60	33	18.94		45	26.95		176	104.33	7.17	In areas[2]	Roadside, pasture, open forests, prairies, waste areas
Yellow starthistle ***Centaurea solstitialis***													3	0.20		3	0.20		No	Grasslands, rangelands, roadside
Totals	**77**	**43.83**		**333**	**424.00**	**75.8**	**6**	**1.37**	**27.7**	**88**	**49.99**		**280**	**81.27**		**784**	**600.46**	**103.5**		

1. In Siuslaw, Tillamook, and Marys Peak Field Offices.
2. In Tillamook and Marys Peak Field Offices.

Knapweeds Group: Treatment Key (Methods and Considerations)								
Treatment Method	**Application Rate (lbs./acre)**	**Percent of Acres where Treatment Would be Used**						**Treatment Considerations**
		No Action Alternative					**Action Alternatives**	
		Upper Willamette Field Office	**Siuslaw Field Office**	**West Eugene Wetlands**	**Marys Peak / Tillamook Field Offices**	**Cascades Field Office**		
Manual control	NA	50%	50%	5%	50%	25%	17%	Hand pulling is feasible for scattered plants or for areas where other control methods are not feasible. Manual control would be limited to small infestations and would be needed up to 3 times a year. Sometimes an inadequate control method in hard compacted soils (roadsides).
Aminopyralid	0.05 to **0.11**	NA	NA	45%	NA	NA	48%	One of the most effective herbicides for knapweeds. Apply post-emergence, bud stage to senescence. Applications can be made into winter if conditions permit.
Aminopyralid + Metsulfuron methyl	**0.08** to **0.11** + **0.12** to **0.15**	NA	NA	NA	NA	NA	15%	Apply to plants in spring.
Clopyralid	**0.38**	NA	NA	10%	NA	NA	10%	Apply at the rosette to bolting stage.

Knapweeds Group: Treatment Key (Methods and Considerations)								
Treatment Method	**Application Rate (lbs./acre)**	**Percent of Acres where Treatment Would be Used**						**Treatment Considerations**
		No Action Alternative					**Action Alternatives**	
		Upper Willamette Field Office	**Siuslaw Field Office**	**West Eugene Wetlands**	**Marys Peak / Tillamook Field Offices**	**Cascades Field Office**		
Clopyralid + 2,4-D	**0.38** + 0.95	NA	NA	NA	NA	NA	5%	Treat invasive plants from rosette to flowering. It also offers residual control for late season applications to kill fall rosettes and to inhibit seedling growth the following year.
Dicamba + 2,4-D	**0.50** + 0.95	NA	NA	NA	NA	<1%	<1%	Apply post-emergence from rosette to beginning of bolting, or autumn rosette. Optimal at early flowering stage.
Picloram + 2,4-D	**0.50** + 0.95	NA	NA	NA	NA	<1%	<1%	Appropriate from rosette to flowering stage, where there are seed banks and where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse effects to desirable vegetation can be minimized.
Glyphosate	(minimal)	NA	NA	40%	5%	30%	5%	Appropriate where adverse effects to desirable vegetation can be minimized. Use where treatments could get into the water.
No adequate control methods	NA	50%	50%	0%	45%	45%	0%	Manual/mechanical not effective on older plants.
Within the Northwest Oregon District boundary, the ODA releases and tracks biological control agents on diffuse, meadow, and spotted knapweed and yellow starthistle infestations. See Table B-1, *Widespread Biological Control Agents on the Northwest Oregon District, for further information*.								

Table C-14. *Lilies, Iris, Sedges, Rushes: Locations and Treatment Key*

Lilies, Iris, Sedges, Rushes: Locations (Species and Sites)																				
Common Name ***Scientific Name***	**Upper Willamette Field Office**			**Siuslaw Field Office**			**Tillamook Field Office**			**Marys Peak Field Office**			**Cascades Field Office**			**Northwest Oregon District**				**Common Habitat**
	NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		Widespread?	
		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		
Daffodil *Narcissus*				1	0.00											1	0.00		No	Roadsides, wet meadows, old homesites
Italian arum *Arum Italicum*	Currently unknown on District																			Urban areas, forests, roadsides, shady areas
Yellow flag iris / paleyellow iris ***Iris pseudacorus***				1	0.19											1	0.19		No	Aquatic, wet shores of rivers, ditches, and in marshes
Totals				**2**	**0.19**											**2**	**0.19**			

Lilies, Iris, Sedges, Rushes: Treatment Key (Methods and Considerations)								
Treatment Method	**Application Rate (lbs./acre)**	**Percent of Acres where Treatment Would be Used**						**Treatment Considerations**
		No Action Alternative (and Alternative 2[1])					**(Alternative 2[1] and) Alternative 3**	
		Upper Willamette Field Office	**Siuslaw Field Office**	**West Eugene Wetlands**	**Marys Peak / Tillamook Field Offices**	**Cascades Field Office**		
Manual control	NA	20%	20%	20%	19%	18%	15%	Hand pulling can be effective on single plants.
Imazapyr	**0.75** to **1.00**	NA	NA	NA	NA	NA	50%	Apply post-emergence to plants at pre-bloom stage or to late season plants in autumn.
Glyphosate	**<3.00**	NA	NA	79%	40%	40%	25%	Apply post-emergence to foliage when plants are growing rapidly, but before flowering in late spring or early summer. Can also apply in fall.
2,4-D	**1.00**	NA	NA	NA	NA	1%	5%	Post-emergence to early bloom. Use aquatic formulations near water.
Mechanical control	NA	1%	1%	1%	1%	1%	5%	Tractor can be effective but difficult to get entire rhizome.
Hexazinone	0.75	NA	NA	NA	NA	NA	<1%	Apply pre-emergence or early post emergence. Primarily for road right-of-ways. Not registered for aquatic use; would not be used on yellow flag iris.
No adequate control methods	NA	100%	100%	100%	100%	100%	0%	
1. Yellow flag iris, an aquatic species, would only be treated under Alternative 3. If sites of non-aquatic species in this species group where treated, they could be treated under the No Action Alternative and Alternative 2.								

Table C-15. *Loosestrifes: Locations and Treatment Key*

Loosestrifes Group: Locations (Species and Sites)																				
Common Name ***Scientific Name***	**Upper Willamette Field Office**			**Siuslaw Field Office**			**Tillamook Field Office**			**Marys Peak Field Office**			**Cascades Field Office**			**Northwest Oregon District**				**Common Habitat**
	NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		Widespread?	
		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		
Creeping jenny *Lysimachia nummularia*				2	0.41											2	0.41		No	Riparian, meadows, marshes, forests
Garden loosestrife ***Lysimachia vulgaris***	Currently unknown on District																			Riparian along lakeshores, rivers, open wetland habitats
Purple loosestrife ***Lythrum salicaria***	Currently unknown on District																			Riparian areas, ditches, wetlands, pond and lake margins

Loosestrifes Group: Treatment Key (Methods and Considerations)								
Treatment Method	**Application Rate (lbs./acre)**	**Percent of Acres where Treatment Would be Used**						**Treatment Considerations**
		No Action Alternative					**Action Alternatives**	
		Upper Willamette Field Office	**Siuslaw Field Office**	**West Eugene Wetlands**	**Marys Peak / Tillamook Field Offices**	**Cascades Field Office**		
Manual control	NA	25%	25%	25%	25%	25%	25%	Hand pulling or digging can be effective on single plants.
Triclopyr	1.00	NA	NA	40%	NA	NA	40%	Preferred treatment. Use aquatic formulations. It can be used at all stages but primarily at the flowering stage.
Glyphosate	**<3.00**	NA	NA	20%	60%	60%	15%	Can be applied at all stages but primarily at the flowering stage. This is a non-selective product and care should be taken to avoid treating desirable vegetation.
Imazapyr	**0.75** to **1.00**	NA	NA	NA	NA	NA	15%	Apply after mid-bloom until killing frost.
Metsulfuron methyl	**0.04** to **0.08**	NA	NA	NA	NA	NA	5%	Most effective at flower-bud and flowering stage but can be applied earlier.
No adequate control methods	NA	75%	75%	15%	15%	15%	0%	
Within the Northwest Oregon District boundary, the ODA releases and tracks biological control agents on purple loosestrife infestations. See Table B-1, *Widespread Biological Control Agents on the Northwest Oregon District*, for further information.								

Table C-16. *Miscellaneous Herbaceous - Annual: Locations and Treatment Key*

Miscellaneous Herbaceous - Annual: Locations (Species and Sites)																				
Common Name ***Scientific Name***	**Upper Willamette Field Office**			**Siuslaw Field Office**			**Tillamook Field Office**			**Marys Peak Field Office**			**Cascades Field Office**			**Northwest Oregon District**				**Common Habitat**
	NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		Widespread?	
		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		
Policeman's helmet ***Impatiens glandulifera***				2	0.50								11	2.51		13	3.01		No	Riparian, woodland, wetland
Puncturevine ***Tribulus terrestris***	Currently unknown on District																			Disturbed sites, roadsides, open disturbed areas, sandy soils

Miscellaneous Herbaceous - Annual: Treatment Key (Methods and Considerations)								
Treatment Method	**Application Rate (lbs./acre)**	**Percent of Acres where Treatment Would be Used**						**Treatment Considerations**
		No Action Alternative					**Action Alternatives**	
		Upper Willamette Field Office	**Siuslaw Field Office**	**West Eugene Wetlands**	**Marys Peak / Tillamook Field Offices**	**Cascades Field Office**		
Manual control	NA	20%	20%	10%	10%	10%	10%	Hand pulling can be effective on single plants or small infestations.
Mechanical control	NA	10%	10%	10%	10%	10%	10%	Target plants are suppressed with mowing or weed whackers before seed set, non-selectively removes growth of desirable species. May require multiple treatments/year for effective weed control.
Imazapyr	**0.75**	NA	NA	NA	NA	NA	20%	Non-selective and long soil residual activity. Use where adverse effects to desirable vegetation can be minimized.
Glyphosate	**<3.00**	NA	NA	35%	50%	50%	20%	Apply in spring to actively growing plants from germination to bolting, with green basal leaves.
Triclopyr	**1.00**	NA	NA	35%	NA	NA	10%	Apply at flowering. Can be used at all stages.
Glyphosate + 2,4-D	0.50 + 0.70	NA	NA	NA	NA	10%	8%	Apply in late spring, prior to seed set.
Dicamba + Diflufenzopyr	0.18 to **0.35**	NA	NA	NA	NA	NA	8%	Apply in spring to actively growing weeds. Use higher rates on perennials or large plants.
Dicamba + 2,4-D	**0.50** + 0.95	NA	NA	NA	NA	NA	7%	Apply to actively growing plants.
Aminopyralid	0.05 to **0.11**	NA	NA	10%	NA	NA	4%	Apply to actively growing plants.
Metsulfuron methyl	**0.12** to **0.15**	NA	NA	NA	NA	NA	3%	Apply early when plants are small and rapidly growing.
2,4-D	**1.00**	NA	NA	NA	NA	5%	<1%	Apply in spring to rosettes.
Picloram	**0.50** to **0.95**	NA	NA	NA	NA	<1%	<1%	Appropriate from rosette to flowering stage, where there are seed banks and where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse effects to desirable vegetation can be minimized.
Picloram + 2,4-D	**0.50** + 0.95	NA	NA	NA	NA	<1%	<1%	Appropriate from rosette to flowering stage, where there are seed banks and where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse effects to desirable vegetation can be minimized. Evaluate soil, slope, and proximity to water when considering this herbicide.
Targeted grazing (sheep)	NA	NA	NA	<1%	<1%	<1%	<1%	Sheep selectively choose broadleaved plants over grass. Fencing or herding required.
Propane torch	NA	<1%	<1%	<1%	<1%	<1%	<1%	Most effective on small plants. Use only on infestations on non-flammable substrate (e.g., sand, gravel, concrete).
No adequate control methods	NA	70%	70%	0%	30%	15%	0%	
Within the Northwest Oregon District boundary, the ODA releases and tracks biological control agents on puncturevine infestations. See Table B-1, *Widespread Biological Control Agents on the Northwest Oregon District*, for further information.								

Table C-17. *Miscellaneous Herbaceous - Perennial: Locations and Treatment Key*

Miscellaneous Herbaceous - Perennial: Locations (Species and Sites)

Common Name *Scientific Name*	Upper Willamette Field Office			Siuslaw Field Office			Tillamook Field Office			Marys Peak Field Office			Cascades Field Office			Northwest Oregon District				Common Habitat
	NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		Widespread?	
		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		
Bigleaf periwinkle *Vinca major*				2	0.17		2	0.20					1	9.10		5	9.47		No	Forest, roadside, old home sites, residential areas
Bittersweet / Climbing nightshade *Solanum dulcamara*	4	1.00		11	5.00	1.76							10	2.70		25	8.70	1.76	In areas[1]	Roadsides, moist clearings, open forests
Brazilian verbena *Verbena bonariensis*	Currently unknown on District																			Wetlands, open areas
Common periwinkle *Vinca minor*				1	0.29	0.29							29	6.77		30	7.06	0.29	No	Forest, roadside
Field bindweed *Convolvulus arvensis*	17	6.20		17	5.36	1.92			0.90	1	1.00		1	0.10		36	12.66	2.82	No	Widespread along roadsides, residential and agricultural areas
Sulfur cinquefoil *Potentilla recta*	Currently unknown on District																			Roadsides, open areas, grasslands
Totals	**21**	**7.20**		**31**	**10.83**	**3.97**	**2**	**0.20**	**0.90**	**1**	**1.00**		**41**	**18.67**		**96**	**37.89**	**4.87**		

1. In Siuslaw Field Office.

Miscellaneous Herbaceous - Perennial: Treatment Key (Methods and Considerations)

Treatment Method	Application Rate (lbs./acre)	Percent of Acres where Treatment Would be Used						Treatment Considerations
		No Action Alternative					Action Alternatives	
		Upper Willamette Field Office	Siuslaw Field Office	West Eugene Wetlands	Marys Peak / Tillamook Field Offices	Cascades Field Office		
Manual control	NA	40%	40%	10%	10%	10%	10%	Hand pulling can be effective on single plants or small infestations.
Mechanical control	NA	5%	5%	5%	5%	5%	5%	Target plants are suppressed with mowing or weed whackers before seed set, non-selectively removes growth of desirable species. May require multiple treatments/year for effective weed control.
Imazapyr	**0.75** to **1.00**	NA	NA	NA	NA	NA	20%	Non-selective and long soil residual activity. Use where adverse effects to desirable vegetation can be minimized.
Glyphosate	**<3.00**	NA	NA	40%	60%	60%	20%	Apply in spring to actively growing plants from germination to bolting, with green basal leaves.
Triclopyr	**2.00**	NA	NA	20%	NA	NA	10%	Apply at flowering. Can be used at all stages.
Glyphosate + 2,4-D	0.50 + 0.70	NA	NA	NA	NA	5%	5%	Apply in late spring, prior to seed set.

Miscellaneous Herbaceous - Perennial: Treatment Key (Methods and Considerations)								
Treatment Method	**Application Rate (lbs./acre)**	**Percent of Acres where Treatment Would be Used**						**Treatment Considerations**
		No Action Alternative					**Action Alternatives**	
		Upper Willamette Field Office	**Siuslaw Field Office**	**West Eugene Wetlands**	**Marys Peak / Tillamook Field Offices**	**Cascades Field Office**		
Dicamba + Diflufenzopyr	0.18 to **0.35**	NA	NA	NA	NA	NA	10%	Apply in spring to actively growing weeds. Use higher rates on perennials or large plants.
Dicamba + 2,4-D	**0.50** to **1.00** + 0.95	NA	NA	NA	NA	NA	5%	Apply to actively growing plants.
Aminopyralid	0.05 to **0.11**	NA	NA	24%	NA	NA	10%	Apply to actively growing plants.
Metsulfuron methyl	0.01 to **0.08**	NA	NA	NA	NA	NA	3%	Apply early when plants are small and rapidly growing.
2,4-D	0.95	NA	NA	NA	NA	1%	1%	Apply in spring to rosettes.
Picloram	**0.50** to **0.95**	NA	NA	NA	NA	<1%	<1%	Appropriate from rosette to flowering stage, where there are seed banks and where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse effects to desirable vegetation can be minimized. Evaluate soil, slope, and proximity to water when considering this herbicide.
Picloram + 2,4-D	**0.50** + 0.95	NA	NA	NA	NA	<1%	<1%	Appropriate from rosette to flowering stage, where there are seed banks and where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse effects to desirable vegetation can be minimized. Evaluate soil, slope, and proximity to water when considering this herbicide.
Targeted grazing (sheep)	NA	NA	NA	<1%	<1%	<1%	<1%	Sheep selectively choose weeds over grass. Fencing or herding required.
Propane torch	NA	1%	1%	1%	1%	1%	1%	Most effective on small plants. Use only on infestations on non-flammable substrate (e.g., sand, gravel, concrete).
No adequate control methods	NA	54%	54%	0%	24%	18%	0%	
Within the Northwest Oregon District boundary, the ODA releases and tracks biological control agents on field bindweed infestations. See Table B-1, *Widespread Biological Control Agents on the Northwest Oregon District*, for further information.								

Table C-18. *Mustards: Locations and Treatment Key*

Mustards Group: Locations (Species and Sites)																				
Common Name ***Scientific Name***	**Upper Willamette Field Office**			**Siuslaw Field Office**			**Tillamook Field Office**			**Marys Peak Field Office**			**Cascades Field Office**			**Northwest Oregon District**				**Common Habitat**
	NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		Widespread?	
		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		
Creeping yellowcress ***Rorippa sylvestris***							92	15.40	0.10	1	0.10					93	15.50	0.10	No	Disturbed wetlands, ditches, wet meadows, poorly drained areas
Cultivated radish *Raphanus sativus*													1	0.10		1	0.10		No	Waste areas, fields
Dyers woad ***Isatis tinctoria***	Currently unknown on District																			River banks, roadsides, flood plains
Garlic mustard ***Alliaria petiolate***	Currently unknown on District																			Forest, woodland, urban, riparian
Money plant *Lunaria annua*	Currently unknown on District																			Widespread in forests, woodlands, near residential and urban areas
Purpleanther field pepperweed *Lepidium heterophyllum*				4	0.03											4	0.03		No	Riparian, floodplains, marshes, meadows, roadsides
Totals				4	0.03		92	15.40	0.10	1	0.10		1	0.10		**98**	**15.63**	**0.10**		

Mustards Group: Treatment Key (Methods and Considerations)								
Treatment Method	**Application Rate (lbs./acre)**	**Percent of Acres where Treatment Would be Used**						**Treatment Considerations**
		No Action Alternative					**Action Alternatives**	
		Upper Willamette Field Office	**Siuslaw Field Office**	**West Eugene Wetlands**	**Marys Peak / Tillamook Field Offices**	**Cascades Field Office**		
Manual control	NA	50%	50%	20%	20%	20%	20%	Can work on individuals or small populations. Remove as much of the root as possible.
Chlorsulfuron + 2,4-D	**0.06** + 0.95	NA	NA	NA	NA	NA	35%	Combination to consider using where resistance to sulfonylureas is a concern. It adds a second mode or site of action. Apply when weeds are germinating or actively growing.
Aminopyralid + Metsulfuron methyl	0.02 + 0.01	NA	NA	NA	NA	NA	15%	Optimum timing is when the plants are in the bloom stage.
Glyphosate	**3.00**	NA	NA	79%	40%	40%	25%	Non-selective.
Chlorsulfuron	**0.06**	NA	NA	NA	NA	NA	1%	Safe around grasses and most effective at flower bud or flowering stage.
Triclopyr	**1.00**	NA	NA	1%	NA	NA	1%	Apply postemergence in spring when plants are in rosette stage.
Imazapic	**0.06** to **0.09**	NA	NA	NA	NA	NA	1%	Apply postemergence fall or early spring.

Mustards Group: Treatment Key (Methods and Considerations)								
Treatment Method	**Application Rate (lbs./acre)**	**Percent of Acres where Treatment Would be Used**						**Treatment Considerations**
		No Action Alternative					**Action Alternatives**	
		Upper Willamette Field Office	**Siuslaw Field Office**		**Marys Peak / Tillamook Field Offices**	**Cascades Field Office**		
				West Eugene Wetlands				
Metsulfuron methyl + 2,4-D	**0.07** + 0.95	NA	NA	NA	NA	NA	1%	Combination to consider using where resistance to sulfonylureas is a concern. Aquatic 2,4-D would be used in riparian areas.
Mechanical control	NA	<1%	<1%	<1%	<1%	<1%	1%	Mowing multiple times can reduce root reserves and seed production.
No adequate control methods	NA	50%	50%	0%	40%	40%	0%	

Table C-19. *Perennial Grasses: Locations and Treatment Key*

Perennial Grasses Group: Locations (Species and Sites)																			
Common Name ***Scientific Name***	**Upper Willamette Field Office**		**Siuslaw Field Office**			**Tillamook Field Office**			**Marys Peak Field Office**			**Cascades Field Office**			**Northwest Oregon District**				**Common Habitat**
	NISIMS Sites	NISIMS Acres	NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		Widespread?	
				NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		
Bulbous canarygrass *Phalaris aquatica*			14	1.61											14	1.61			Roadsides, forests, grasslands
Common velvet grass *Holcus lanatus*			61	374.25	3.37										61	374.25	3.37	In areas[1]	Meadows, woodlands
Creeping velvet grass *Holcus mollis*								1.20	8	1.30		37	3.79		45	5.09	1.20		Meadows, woodlands
European beachgrass *Ammophila arenaria*			6	20.17											6	20.17			Dunes
Jubata grass ***Cortaderia jubata***	Currently unknown on District																		Limited distribution, ditch banks, coastal habitats, forests, roadsides
Meadow foxtail *Alopecurus pratensis*			20	56.09	0.09										20	56.09	0.09		Meadows, fields
Orchardgrass *Dactylis glomerata*			16	0.73											16	0.73		In areas[2]	Roadsides, meadows
Red top, creeping bentgrass *Agrostis stolonifera*			33	119.57	0.04										33	119.57	0.04		Riparian, wet meadows
Reed canarygrass *Phalaris arundinacea*	102	60.91	335	125.87	19.68			0.20	3	0.17	20.00	156	23.56	15.00	596	210.52	54.88	In areas[2]	Roadside, ditches, marshes, wet meadows

Perennial Grasses Group: Locations (Species and Sites)																			
Common Name ***Scientific Name***	**Upper Willamette Field Office**		**Siuslaw Field Office**			**Tillamook Field Office**			**Marys Peak Field Office**			**Cascades Field Office**			**Northwest Oregon District**				**Common Habitat**
	NISIMS Sites	NISIMS Acres	NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		Widespread?	
				NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		
Slender false brome ***Brachypodium sylvaticum***	1,054	1,154.83	465	417.44	54.22	63	75.02	10.00	1,009	482.75	10.00	1,163	289.92	20.00	3,754	2,419.96	94.22	Yes	Widespread; roadside, forest, woodland, riparian, shady areas
Sweet vernal grass *Anthoxanthum odoratum*			54	350.29	2.15										54	350.29	2.15	In areas[1]	Meadows, pastures
Tall fescue *Schedonorus arundinaceus*	1	1.70	57	92.74	1.55										58	94.44	1.55	In areas[1]	Damp grasslands, river banks, coastal habitats
Tall oatgrass *Arrhenatherum elatius*			27	22.70	0.35										27	22.70	0.35		Forest edges, meadows, fields
Timothy *Phleum pratense*			2	0.10											2	0.10			Meadows, pastures, woodlands
Waxy mannagrass *Glyceria declinata*	Currently unknown on District																		Ditches, swales, seasonally wet habitats, disturbed areas
Weeping lovegrass *Eragrostis curvula*	Currently unknown on District																		Roadsides, disturbed areas, residential areas
Totals	**1,157**	**1,217.44**	**1,090**	**1,581.57**	**81.45**	**63**	**75.02**	**11.40**	**1,020**	**484.22**	**30.00**	**1,356**	**317.27**	**35.00**	**4,686**	**3,675.53**	**157.85**		

1. In Siuslaw Field Office.
2. In Siuslaw, Marys Peak, and Cascades Field Offices.

Perennial Grasses Group: Treatment Key (Methods and Considerations)								
Treatment Method	**Application Rate (lbs./acre)**	**Percent of Acres where Treatment Would be Used**						**Treatment Considerations**
		No Action Alternative					**Action Alternatives**	
		Upper Willamette Field Office	**Siuslaw Field Office**		**Marys Peak / Tillamook Field Offices**	**Cascades Field Office**		
				West Eugene Wetlands				
Fluazifop-P-butyl	**0.38**	NA	NA	<1%	NA	NA	<1%	Research and Demonstration herbicide. Apply post-emergence. Spring is best to control seedlings, but established plants can be treated in mid-summer to fall.
Sethoxydim	< **0.38**	NA	NA	NA	NA	NA	<1%	Research and Demonstration herbicide. Apply post-emergence. Spring is best to control seedlings, but established plants can be treated in mid-summer to fall.
Manual control	NA	25%	50%	10%	10%	0%	25%	Remove entire plant. Effective for smaller populations of false brome.
Imazapyr	**0.75** to **1.50**	NA	NA	NA	NA	NA	10%	Apply early spring when reed canarygrass is sprouting.

Perennial Grasses Group: Treatment Key (Methods and Considerations)								
Treatment Method	**Application Rate (lbs./acre)**	**Percent of Acres where Treatment Would be Used**						**Treatment Considerations**
		No Action Alternative					**Action Alternatives**	
		Upper Willamette Field Office	**Siuslaw Field Office**	**West Eugene Wetlands**	**Marys Peak / Tillamook Field Offices**	**Cascades Field Office**		
Sulfometuron methyl	**0.14** to **0.38**	NA	NA	NA	NA	NA	5%	Appropriate for use on roadsides.
Imazapyr + Glyphosate	**0.75** to **1.50** + **3.00**	NA	NA	NA	NA	NA	25%	Apply in spring to young growth.
Glyphosate	**<3.00**	NA	NA	40%	20%	20%	10%	Non-selective. Good for pure stands. May require 2 to 3 years of retreatments.
Hexazinone	**2.00**	NA	NA	NA	NA	NA	5%	Pre or postemergence. Mobile in soil and has long soil residual activity. Should not be used in areas with shallow water table. Ideal for upland use.
Mechanical control	NA	25%	<1%	10%	10%	10%	10%	Mow to remove annual seed production, clean equipment prior to moving it elsewhere. Not effective treatment by itself.
No adequate control methods	NA	50%	50%	38%	60%	70%	10%	

Table C-20. *Perennial Mints: Locations and Treatment Key*

Perennial Mints Group: Locations (Species and Sites)																				
Common Name ***Scientific Name***	**Upper Willamette Field Office**			**Siuslaw Field Office**			**Tillamook Field Office**			**Marys Peak Field Office**			**Cascades Field Office**			**Northwest Oregon District**				**Common Habitat**
	NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		Widespread?	
		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		
Pennyroyal *Mentha pulegium*						0.10													No	Widespread, wetland, agricultural areas.
Yellow archangel ***Lamiastrum galeobdolon***	2	0.60		5	0.75	0.11							1	30.00		8	31.35	0.11	No	Roadside, forest edges, riparian
Totals	**2**	**0.60**		**5**	**0.75**	**0.21**							**1**	**30.00**		**8**	**31.35**	**0.11**		

Perennial Mints Group: Treatment Key (Methods and Considerations)								
Treatment Method	**Application Rate (lbs./acre)**	**Percent of Acres where Treatment Would be Used**						**Treatment Considerations**
		No Action Alternative					**Action Alternatives**	
		Upper Willamette Field Office	**Siuslaw Field Office**	**West Eugene Wetlands**	**Marys Peak / Tillamook Field Offices**	**Cascades Field Office**		
Manual control	NA	25%	50%	10%	5%	5%	10%	Infestations can be suppressed by manual removal of plants before flowering, including rhizomes and stolons. Belowground tissues should be severed approximately three inches below soil surface.
Triclopyr	**1.50** to **3.00**	NA	NA	45%	NA	NA	45%	Apply when plants are mature. Most effective when they have bolted but before seed production.
Glyphosate + Triclopyr	**2.00** + **2.00**	NA	NA	25%	NA	NA	25%	Apply when actively growing and not during drought stress.
Glyphosate	**<3.00**	NA	NA	18%	90%	90%	10%	Apply when plants are bolting but before seed production.
Metsulfuron methyl	**0.10**	NA	NA	NA	NA	NA	2%	Effective on dry sites.
Mechanical control	NA	0%	0%	2%	0%	0%	2%	Target plants are suppressed with mowing or weed whackers before seed set, non-selectively removes growth of desirable species. May require multiple treatments per year for effective weed control.
2,4-D	**1.00**	NA	NA	NA	NA	0%	5%	Apply after bolting and before seed production.
Propane torch	NA	NA	NA	0%	0%	0%	1%	Most effective on small plants. Use only on infestations on non-flammable substrate (e.g., sand, gravel, concrete).
No adequate control methods	NA	75%	50%	0%	5%	5%	0%	

Table C-21. *Perennial Peas: Locations and Treatment Key*

Perennial Peas Group: Locations (Species and Sites)																				
Common Name ***Scientific Name***	**Upper Willamette Field Office**			**Siuslaw Field Office**			**Tillamook Field Office**			**Marys Peak Field Office**			**Cascades Field Office**			**Northwest Oregon District**				**Common Habitat**
	NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		Widespread?	
		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		
Birdsfoot trefoil *Lotus corniculatus*				5	0.64	0.11										5	0.64	0.11	No	Roadsides, meadows, pastures, riparian
False indigo bush ***Amorpha fruticosa***	Currently unknown on District																			Riparian along lakeshores, rivers, open wetland habitats
Flat pea *Lathyrus sylvestris*									3.40	6	3.80					6	3.80	3.40	No	Forest edges, meadows
Kudzu	Currently unknown on District																			Forest, woodland, urban

Perennial Peas Group: Locations (Species and Sites)																				
Common Name ***Scientific Name***	**Upper Willamette Field Office**			**Siuslaw Field Office**			**Tillamook Field Office**			**Marys Peak Field Office**			**Cascades Field Office**			**Northwest Oregon District**				**Common Habitat**
	NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		Widespread?	
		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		
Pueraria lobata																				
Perennial pea ***Lathyrus latifolius***	50	31.10		32	12.10	3.76	117	428.21		19	3.28		35	10.40		253	485.09	3.76	In areas[1]	Roadside, forest edges
Totals	**50**	**31.10**		**37**	**12.74**	**3.87**	**117**	**428.21**	**3.40**	**25**	**7.08**		**35**	**10.40**		**264**	**489.53**	**7.27**		

1. In Siuslaw Field Office.

Perennial Peas Group: Treatment Key (Methods and Considerations)								
Treatment Method	**Application Rate (lbs./acre)**	**Percent of Acres where Treatment Would be Used**						**Treatment Considerations**
		No Action Alternative					**Action Alternatives**	
		Upper Willamette Field Office	**Siuslaw Field Office**	**West Eugene Wetlands**	**Marys Peak / Tillamook Field Offices**	**Cascades Field Office**		
Manual control	NA	50%	50%	30%	50%	50%	30%	Hand pulling can be used on small infestations or isolated plants, as long as belowground tissue is also removed (to prevent re-sprouting).
Aminopyralid	0.05 to **0.11**	NA	NA	30%	NA	NA	25%	Apply in spring before flowering.
Clopyralid	0.23 to **0.49**	NA	NA	10%	NA	NA	10%	Apply in spring before flowering.
Triclopyr	**2.00**	NA	NA	15%	NA	NA	15%	Apply in spring when plants are rapidly growing.
Glyphosate	**<3.00**	NA	NA	15%	25%	25%	10%	Apply in spring before flowering.
Imazapyr	**0.45**	NA	NA	NA	NA	NA	4%	Non-selective with long residual soil activity. Appropriate where adverse effects to desirable vegetation can be minimized.
2,4-D	0.95	NA	NA	NA	NA	0%	1%	Apply in spring to actively growing plants, particularly at bud to flower stage.
Picloram	**0.50** to **0.95**	NA	NA	NA	NA	0%	<1%	Appropriate from rosette to flowering stage, where there are seed banks and where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse effects to desirable vegetation can be minimized. Evaluate soil, slope, and proximity to water when considering this herbicide.
Chlorsulfuron	**0.05**	NA	NA	NA	NA	0%	1%	Safe around grasses and most effective at flower bud or flowering stage.
Metsulfuron methyl	**0.03**	NA	NA	NA	NA	NA	1%	Safe around grasses and most effective at flower bud or flowering stage.
Sulfometuron methyl	**0.14**	NA	NA	NA	NA	NA	1%	Non-selective and can be used in limited areas (roadsides).
Propane torch	NA	NA	NA	<1%	0%	0%	1%	Most effective on small plants. Use only on infestations on non-flammable substrate (e.g., sand, gravel, concrete).

Perennial Peas Group: Treatment Key (Methods and Considerations)								
Treatment Method	**Application Rate (lbs./acre)**	**Percent of Acres where Treatment Would be Used**						**Treatment Considerations**
		No Action Alternative					**Action Alternatives**	
		Upper Willamette Field Office	**Siuslaw Field Office**	**West Eugene Wetlands**	**Marys Peak / Tillamook Field Offices**	**Cascades Field Office**		
Targeted grazing (goats or sheep)	NA	NA	NA	NA	0%	0%	1%	Delay spring grazing until target plants are at least 8 inches tall.
Mechanical control	NA	<1%	<1%	<1%	<1%	<1%	<1%	Target plants are suppressed with mowing or weed whackers before seed set, non-selectively removes growth of desirable species. May require multiple treatments per year for effective weed control.
No adequate control methods	NA	50%	50%	0%	25%	25%	0%	

Table C-22. *Snapdragons: Locations and Treatment Key*

Snapdragons Group: Locations (Species and Sites)																				
Common Name ***Scientific Name***	**Upper Willamette Field Office**			**Siuslaw Field Office**			**Tillamook Field Office**			**Marys Peak Field Office**			**Cascades Field Office**			**Northwest Oregon District**				**Common Habitat**
	NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		Widespread?	
		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		
Butter and eggs ***Linaria vulgaris***	3	0.36											5	0.41		8	0.77		No	Meadows, roadsides, waste places
Purple foxglove *Digitalis purpurea*	844	848.00		987	1,453.30	326.30			15.80	13	17.74				200.00	1,844	2,319.04	542.10	In areas[1]	Roadside, open forests, clearings
Totals	**847**	**848.36**		**987**	**1,453.30**	**326.30**			**15.80**	**13**	**17.74**		**5**	**0.41**	**200.00**	**1,852**	**2,319.82**	**542.10**		

1. In Cascades, Siuslaw, and Tillamook Field offices.

Snapdragons Group: Treatment Key (Methods and Considerations)								
Treatment Method	**Application Rate (lbs./acre)**	**Percent of Acres where Treatment Would be Used**						**Treatment Considerations**
		No Action Alternative					**Action Alternatives**	
		Upper Willamette Field Office	**Siuslaw Field Office**	**West Eugene Wetlands**	**Marys Peak / Tillamook Field Offices**	**Cascades Field Office**		
Manual control	NA	15%	15%	15%	15%	15%	15%	Effective in spring on small infestations.
Metsulfuron methyl	**0.12** to **0.15**	NA	NA	NA	NA	NA	20%	Apply in spring or fall to plants in the rosette stage or to bolting plants less than 12 inches tall.
Chlorsulfuron + 2,4-D	**0.05** + 0.70	NA	NA	NA	NA	NA	20%	Apply in spring or fall to plants in the rosette stage or to bolting plants less than 12 inches tall.
Chlorsulfuron	**0.05**	NA	NA	NA	NA	NA	20%	Apply in fall for most consistent control.

Snapdragons Group: Treatment Key (Methods and Considerations)								
Treatment Method	**Application Rate (lbs./acre)**	**Percent of Acres where Treatment Would be Used**						**Treatment Considerations**
		No Action Alternative					**Action Alternatives**	
		Upper Willamette Field Office	**Siuslaw Field Office**	**West Eugene Wetlands**	**Marys Peak / Tillamook Field Offices**	**Cascades Field Office**		
Imazapyr	**0.75** to **1.50**	NA	NA	NA	NA	NA	10%	Apply in spring when plants are growing rapidly or apply in mid-fall to dormant infestation.
Picloram + 2,4-D	**0.50** + **1.50**	NA	NA	NA	NA	<1%	<1%	Appropriate from rosette to flowering stage, where there are seed banks and where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse effects to desirable vegetation can be minimized.
Glyphosate	**<3.00**	NA	NA	75%	75%	75%	13%	Apply in spring to rapidly growing plants.
Picloram	**0.50** to **0.95**	NA	NA	NA	NA	<1%	<1%	Appropriate from rosette to flowering stage, where there are seed banks and where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse effects to desirable vegetation can be minimized. Evaluate soil, slope, and proximity to water when considering this herbicide.
Propane torch	NA	<1%	<1%	<1%	<1%	<1%	1%	Most effective on small plants. Use only on infestations on non-flammable substrate (e.g., sand, gravel, concrete).
Mechanical control	NA	1%	1%	1%	1%	1%	1%	Target plants are suppressed with mowing or weed whackers before seed set, non-selectively removes growth of desirable species. May require multiple treatments per year for effective control.
No adequate control methods	NA	84%	84%	9%	9%	9%	0%	
Within the Northwest Oregon District boundary, the ODA releases and tracks biological control agents on butter and egg infestations. See Table B-1, *Widespread Biological Control Agents on the Northwest Oregon District*, for further information.								

Table C-23. *Spurges: Locations and Treatment Key*

Spurges Group: Locations (Species and Sites)																			
Common Name ***Scientific Name***	**Upper Willamette Field Office**			**Siuslaw Field Office**			**Tillamook Field Office**			**Marys Peak Field Office**			**Cascades Field Office**			**Northwest Oregon District**				**Common Habitat**
	NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		Widespread?	
		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		
Leafy spurge ***Euphorbia esula***													1	1.38		1	1.38			Roadsides, pastureland, waste areas
Oblong Spurge ***Euphorbia oblongata***	Currently unknown on District																			Riparian

Spurges Group: Treatment Key (Methods and Considerations)								
Treatment Method	**Application Rate (lbs./acre)**	**Percent of Acres where Treatment Would be Used**						**Treatment Considerations**
		No Action Alternative					**Action Alternatives**	
		Upper Willamette Field Office	**Siuslaw Field Office**	**West Eugene Wetlands**	**Marys Peak / Tillamook Field Offices**	**Cascades Field Office**		
Imazapyr	**0.75**	NA	NA	NA	NA	NA	40%	Non-selective with no residual soil activity. Appropriate where an extensive seed bank is present.
Glyphosate	(minimal)	NA	NA	60%	60%	60%	25%	Non-selective with no residual soil activity.
Mechanical control	NA	15%	15%	15%	15%	15%	15%	Mowing or weed whacking in conjunction with herbicide is effective control on infestations.
Dicamba + 2,4-D	**1.00** + 0.95	NA	NA	NA	NA	9%	9%	Apply in spring at flower emergence or to fall regrowth.
Imazapic	**0.13** to **0.19**	NA	NA	NA	NA	NA	5%	Apply after summer dry period when plants begin to grow (fall / winter).
Glyphosate + 2,4-D	0.50 + **1.50**	NA	NA	NA	NA	5%	5%	Apply as spring treatment before seed set. May take 3-5 years of repeated application.
Picloram + 2,4-D	**0.50** + 0.95	NA	NA	NA	NA	<1%	<1%	Appropriate from rosette to flowering stage, where there are seed banks and where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse effects to desirable vegetation can be minimized. Three to five consecutive years of treatment needed.
Picloram	**0.50** to **1.00**	NA	NA	NA	NA	<1%	<1%	Appropriate from rosette to flowering stage, where there are seed banks and where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse effects to desirable vegetation can be minimized.
Targeted grazing (goats)	NA	NA	NA	NA	1%	1%	1%	Targeted grazing by goats/ sheep in spring can control spurges. Toxic to cattle and horses.
No adequate control methods	NA	85%	85%	25%	24%	10%	0%	
Within the Northwest Oregon District boundary, the ODA releases and tracks biological control agents on leafy spurge infestations. See Table B-1, *Widespread Biological Control Agents on the Northwest Oregon District*, for further information.								

Table C-24. *St. Johnswort: Locations and Treatment Key*

St. Johnswort Group: Locations (Species and Sites)																			
Common Name ***Scientific Name***	**Upper Willamette Field Office**			**Siuslaw Field Office**			**Tillamook Field Office**			**Marys Peak Field Office**			**Cascades Field Office**			**Northwest Oregon District**				**Common Habitat**
	NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		Widespread?	
		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		
St. Johnswort ***Hypericum perforatum***	674	2,506.89		968	2,026.07	411.92			1,863.70	544	2,093.15				200.00	2,186	6,626.10	2,475.62	Yes	Roadside, fields, waste areas, disturbed openings

St. Johnswort Group: Treatment Key (Methods and Considerations)								
Treatment Method	**Application Rate (lbs./acre)**	**Percent of Acres where Treatment Would be Used**						**Treatment Considerations**
		No Action Alternative					**Action Alternatives**	
		Upper Willamette Field Office	**Siuslaw Field Office**	**West Eugene Wetlands**	**Marys Peak / Tillamook Field Offices**	**Cascades Field Office**		
Manual control	NA	20%	20%	20%	20%	20%	20%	Only for very small infestations. Not effective control.
Aminopyralid	**0.08** to **0.11**	NA	NA	50%	NA	NA	35%	Post-emergence to rapidly growing plants before bloom.
Glyphosate	**2.00**	NA	NA	30%	70%	70%	30%	Non-selective with no residual soil activity.
Metsulfuron methyl + 2,4-D	**0.06** + 0.95	NA	NA	NA	NA	NA	1%	Targets plants that are small or rapidly growing.
Dicamba + Diflufenzopyr	**0.35**	NA	NA	NA	NA	NA	14%	Primarily for use on roadsides.
Picloram + 2,4-D	**0.50** + 0.95	NA	NA	NA	NA	<1%	<1%	Appropriate from rosette to flowering stage, where there are seed banks and where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse effects to desirable vegetation can be minimized.
No adequate control methods	NA	80%	80%	0%	10%	10%	0%	
Within the Northwest Oregon District boundary, the ODA releases and tracks biological control agents on St. Johnswort infestations. See Table B-1, *Widespread Biological Control Agents on the Northwest Oregon District*, for further information.								

Table C-25. *Sunflower Family: Locations and Treatment Key*

Sunflower Family Group: Locations (Species and Sites)																				
Common Name ***Scientific Name***	**Upper Willamette Field Office**			**Siuslaw Field Office**			**Tillamook Field Office**			**Marys Peak Field Office**			**Cascades Field Office**			**Northwest Oregon District**				**Common Habitat**
	NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		Widespread?	
		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		
Bristly oxtongue *Picris echioides*	Currently unknown on District																			Roadsides, open areas, grasslands
Coltsfoot ***Tussilago farfara***	Currently unknown on District																			Riparian, forests, woodlands, riverbanks, shorelines, grasslands
Oxeye daisy *Leucanthemum vulgare*				89	19.97	0.19			5.00			50.00			200.00	89	19.97	255.19	In areas[1]	Roadside, pastures, open woodlands, meadows
Stinking willie, tansy ragwort ***Senecio jacobaea***	1,221	1,509.32		1,296	1,510.77	242.16			1,981.40	772	2,199.09		2,459	508.81		5,748	5,727.99	2,223.56	Yes	Widespread in roadsides, clearings

Sunflower Family Group: Locations (Species and Sites)																				
Common Name ***Scientific Name***	**Upper Willamette Field Office**			**Siuslaw Field Office**			**Tillamook Field Office**			**Marys Peak Field Office**			**Cascades Field Office**			**Northwest Oregon District**				**Common Habitat**
	NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		Widespread?	
		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		
Totals	**1,221**	**1,509.32**		**1,385**	**1,530.74**	**242.35**			**1,986.40**	**772**	**2,199.09**	**50.00**	**2,459**	**508.81**	**200.00**	**5,837**	**5,747.96**	**2,478.75**		

1. In Siuslaw and Cascades Field Offices

Sunflower Group: Treatment Key (Methods and Considerations)								
Treatment Method	**Application Rate (lbs./acre)**	**Percent of Acres where Treatment Would be Used**						**Treatment Considerations**
		No Action Alternative					**Action Alternatives**	
		Upper Willamette Field Office	**Siuslaw Field Office**		**Marys Peak / Tillamook Field Offices**	**Cascades Field Office**		
				West Eugene Wetlands				
Manual control	NA	30%	30%	10%	30%	30%	10%	Hand pulling and grubbing are effective on visible plants. These treatments stimulate the seed bank. Would only be used on small infestations and where retreatment is planned.
Mechanical control	NA	30%	30%	15%	40%	40%	15%	Target plants are suppressed with mowing or weed whackers before seed set, non-selectively removes growth of desirable species. May require multiple treatments per year for effective weed control.
Aminopyralid	0.05 to **0.11**	NA	NA	45%	NA	NA	45%	Apply in spring at bud stage. Preferred treatment when desirable plants in susceptible families are not present. Longer soil residual than clopyralid.
Clopyralid	0.23 to **0.49**	NA	NA	5%	NA	NA	5%	Apply at the rosette to bolting stage.
Dicamba + Diflufenzopyr	0.18 to **0.35**	NA	NA	NA	NA	NA	5%	Apply in spring to actively growing weeds. Use higher rates on perennials or large plants.
Metsulfuron methyl	0.02 to **0.04**	NA	NA	NA	NA	NA	5%	Use where resistance to sulfonylureas is a concern or to prevent seed formation or set. Primarily on roadsides.
Picloram + 2,4-D	0.25 + 0.95	NA	NA	NA	NA	<1%	<1%	Appropriate from rosette to flowering stage, where there are seed banks and where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse effects to desirable vegetation can be minimized. Evaluate soil, slope, and proximity to water when considering this herbicide.
Glyphosate	**<3.00**	NA	NA	25%	25%	25%	13%	Apply in spring to rapidly growing plants before flowering.
Targeted grazing (sheep and goats)	NA	NA	NA	NA	0%	0%	1%	Palatable, but does not control.
Propane torch	NA	NA	NA	<1%	0%	0%	1%	Most effective on small plants. Use only on infestations on non-flammable substrate (e.g., sand, gravel, concrete).
No adequate control methods	NA	40%	40%	0%	5%	5%	0%	

Sunflower Group: Treatment Key (Methods and Considerations)								
Treatment Method	**Application Rate (lbs./acre)**	**Percent of Acres where Treatment Would be Used**						**Treatment Considerations**
		No Action Alternative					**Action Alternatives**	
		Upper Willamette Field Office	**Siuslaw Field Office**	**West Eugene Wetlands**	**Marys Peak / Tillamook Field Offices**	**Cascades Field Office**		
Within the Northwest Oregon District boundary, the ODA releases and tracks biological control agents on stinking willie infestations. See Table B-1, *Widespread Biological Control Agents on the Northwest Oregon District*, for further information.								

Table C-26. *Teasel: Locations and Treatment Key*

Teasel Group: Locations (Species and Sites)																			
Common Name ***Scientific Name***	**Upper Willamette Field Office**			**Siuslaw Field Office**			**Tillamook Field Office**			**Marys Peak Field Office**			**Cascades Field Office**			**Northwest Oregon District**				**Common Habitat**
	NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		Widespread?	
		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		
Fuller's teasel *Dipsacus fullonum*				148	21.59	0.46										148	21.59	0.46	No	Meadows, clearings, roadsides

Teasel Group: Treatment Key (Methods and Considerations)								
Treatment Method	**Application Rate (lbs./acre)**	**Percent of Acres where Treatment Would be Used**						**Treatment Considerations**
		No Action Alternative					**Action Alternatives**	
		Upper Willamette Field Office	**Siuslaw Field Office**	**West Eugene Wetlands**	**Marys Peak / Tillamook Field Offices**	**Cascades Field Office**		
Manual control	NA	30%	30%	10%	30%	30%	10%	With small infestation, digging or hand pulling before flowering are effective controls.
Aminopyralid	**0.08** to **0.11**	NA	NA	40%	NA	NA	40%	Provides over 90 percent control when applied to rosettes. Long soil residual activity.
Glyphosate	**<3.00**	NA	NA	20%	NA	NA	20%	Apply to rapidly growing plants from rosette to early bolting stage.
Imazapic	**0.13** to **0.19**	NA	NA	20%	NA	NA	10%	Apply postemergence to rosettes.
Chlorsulfuron	**0.05**	NA	NA	NA	NA	NA	10%	Apply post-emergence from rosette to bolting stage.
Fluroxypyr	0.24	NA	NA	NA	NA	NA	2%	Post-emergence from rosette to beginning of bolting, or fall rosette stage. Safe for most grasses.
Metsulfuron methyl	0.02 to **0.04**	NA	NA	NA	NA	NA	2%	Apply post-emergence from rosette to bolting stage.
Clopyralid	0.23 to **0.49**	NA	NA	10%	NA	NA	2%	Treatments effective for young plants.
Dicamba + Diflufenzopyr	0.18 to **0.35**	NA	NA	NA	NA	NA	2%	Apply post emergence to rapidly growing plants.

Teasel Group: Treatment Key (Methods and Considerations)								
Treatment Method	**Application Rate (lbs./acre)**	**Percent of Acres where Treatment Would be Used**						**Treatment Considerations**
		No Action Alternative					**Action Alternatives**	
		Upper Willamette Field Office	**Siuslaw Field Office**	**West Eugene Wetlands**	**Marys Peak / Tillamook Field Offices**	**Cascades Field Office**		
Dicamba + 2,4-D	**0.50** + 0.95	NA	NA	NA	NA	NA	2%	Apply to rosettes until bolting stage.
No adequate control methods	NA	70%	70%	0%	70%	70%	0%	

Table C-27. *Woody Species: Locations and Treatment Key*

Woody Species Group: Locations (Species and Sites)																			
Common Name ***Scientific Name***	**Upper Willamette Field Office**		**Siuslaw Field Office**			**Tillamook Field Office**			**Marys Peak Field Office**			**Cascades Field Office**			**Northwest Oregon District**				**Common Habitat**
	NISIMS Sites	NISIMS Acres	NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		Widespread?	
				NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		
Butterfly bush ***Buddleja davidii***												4	0.32		4	0.32		No	Riparian, roadside
Cherry laurel *Prunus laurocerasus*	Currently unknown on District																		
Common gorse ***Ulex europaeus***			1	0.00											1	0.00		No	Forest, roadside, open disturbed sites
Common pear *Pyrus communis*			6	63.89	0.27										6	63.89	0.27	No	Roadside, fields, meadows, woodlands
Cotoneaster spp. *Cotoneaster*			1	0.02											1	0.02		No	Open areas
Cutleaf blackberry *Rubus laciniatus*	1,605	1,464.69	1,426	891.14	163.82		0.01	25.00	47	12.80	50.00	1,498	279.61	100.00	4,576	2,648.25	338.82	Yes	Open forest, roadside, wet areas
English holly *Ilex aquifolium*	1	0.04	27	9.11	0.10			5.00				34	9.26	25.00	62	18.41	30.10	In areas[1]	Forests
English Ivy ***Hedera helix***	21	11.74	36	8.11		3	1.20	6.00	13	6.50		29	15.96	25.00	102	43.51	31.00	No	Forest, riparian, roadside, near residential areas, old home sites

Woody Species Group: Locations (Species and Sites)																			
Common Name ***Scientific Name***	**Upper Willamette Field Office**		**Siuslaw Field Office**			**Tillamook Field Office**			**Marys Peak Field Office**			**Cascades Field Office**			**Northwest Oregon District**				**Common Habitat**
	NISIMS Sites	NISIMS Acres	NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		Widespread?	
				NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		
European blackberry *Rubus vestitus*	184	118.00	36	7.03	0.45										220	125.03	0.45	In areas[1]	Open forest, roadside
French broom ***Genista monspessulana***	4	6.80	1	0.04				0.10	1	0.10					6	6.94	0.10	No	Forest, woodland, meadows
Hawthorn *Crataegus*			44	108.47	1.42										44	108.47	1.42	No	Meadows, woodlands, open areas
Himalayan blackberry ***Rubus armeniacus***	1,925	3,475.25	1,824	2,126.80	201.01	721	424.92	570.80	1,521	612.77		2,762	837.31	100.00	8,753	7,477.05	871.81	Yes	Widespread in open forest, roadside, wet areas.
Multiflora rose Rosa multiflora			35	2.46	1.52										35	2.46	1.52	In areas[1]	Roadside, open areas
Non-native invasive roses *Rosa*			63	95.95	0.03										63	95.95	0.03	No	Open areas, prairies
Old man's beard ***Clematis vitalba***	Currently unknown on District																		Woodland, urban, riparian
Oneseed hawthorn *Crataegus monogyna*			14	12.62	0.43										14	12.62	0.43	No	Forest edges, meadows
Scotch Broom ***Cytisus scoparius***	1,226	3,536.14	1,405	3,717.31	511.08	1,012	767.15	450.00	591	475.78	50.00	3,604	1,456.23		7,838	9,952.61	1,011.08	Yes	Open forest, roadside, woodland, grassland, clearings
Spanish broom ***Spartium junceum***	2	1.10													2	1.10		No	Roadsides, open disturbed habitats

Woody Species Group: Locations (Species and Sites)																			
Common Name ***Scientific Name***	**Upper Willamette Field Office**		**Siuslaw Field Office**			**Tillamook Field Office**			**Marys Peak Field Office**			**Cascades Field Office**			**Northwest Oregon District**				**Common Habitat**
	NISIMS Sites	NISIMS Acres	NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		NISIMS Sites	Acres		Widespread?	
				NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		NISIMS	Unmapped		
Spurge laurel ***Daphne laureola***					0.10												0.10	No	Woodlands, shady areas, well drained soils
Striated broom ***Cytisus striatus***	2	0.16										1	0.10		3	0.26		No	Roadsides, forest openings, woodlands, meadows
Sweet cherry *Prunus avium*			1	0.24											1	0.24		No	Fields, hardwood forests
Tree of Heaven ***Ailanthus altissima***	Currently unknown on District																		Forest, woodland, urban, riparian, residential areas
Totals	**4,970**	**8,613.91**	**4,920**	**7,043.19**	**880.23**	**1,736**	**1,193.28**	**1,056.90**	**2,173**	**1,107.95**	**100.00**	**7,932**	**2,598.78**	**250.00**	**21,731**	**20,557.12**	**2,287.13**		

1. Marys Peak Field Office

Woody Species Group: Treatment Key (Methods and Considerations)								
Treatment Method	**Application Rate (lbs./acre)**	**Percent of Acres where Treatment Would be Used**						**Treatment Considerations**
		No Action Alternative					**Action Alternatives**	
		Upper Willamette Field Office	**Siuslaw Field Office**		**Marys Peak / Tillamook Field Offices**	**Cascades Field Office**		
				West Eugene Wetlands				
Manual control	NA	5%	10%	5%	10%	9%	5%	Grubbing can effectively control small infestations.
Mechanical control	NA	45%	45%	53%	25%	35%	10%	Cut shrubs off at ground level. Can be combined with herbicide treatments or multiple treatments over a period of years.
Triclopyr	**2.00**	NA	NA	25%	NA	NA	50%	Used primarily as a cut stump treatment or drill and fill the stem of large mature plants. Use formulations labeled for aquatic use if treatments near water. Or Apply as a foliar treatment mid-summer to early fall to smaller plants.
Glyphosate	**<3.00**	NA	NA	15%	24%	40%	15%	Apply as foliar or cut stump. Foliar treatments would be made in late summer. Aquatic formulations would be used near water.
Imazapyr	**1.00** to **1.50**	NA	NA	NA	NA	NA	16%	Apply late summer to early fall.
Triclopyr + 2 4-D	**2.00** + 0.95	NA	NA	NA	NA	NA	1%	Apply when plants are actively growing.

Woody Species Group: Treatment Key (Methods and Considerations)								
Treatment Method	**Application Rate (lbs./acre)**	**Percent of Acres where Treatment Would be Used**						**Treatment Considerations**
		No Action Alternative					**Action Alternatives**	
		Upper Willamette Field Office	**Siuslaw Field Office**	**West Eugene Wetlands**	**Marys Peak / Tillamook Field Offices**	**Cascades Field Office**		
Triclopyr + Aminopyralid	**1.00 + 0.11**	NA	NA	2%	NA	NA	2%	Apply before bud to early flowering.
Targeted grazing (goats)	NA	NA	NA	NA	1%	1%	1%	Effective at defoliating blackberries, but does not provide long-term control. Limited to areas without desirable plants or vehicle traffic.
Picloram		NA	NA	NA	NA	<1%	<1%	Appropriate from rosette to flowering stage, where there are seed banks and where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse effects to desirable vegetation can be minimized.
No adequate control methods	NA	50%	45%	0%	40%	15%	0%	
Within the Northwest Oregon District boundary, the ODA releases and tracks biological control agents on common gorse and Scotch and French broom infestations. See Table B-1, *Widespread Biological Control Agents on the Northwest Oregon District*, for further information.								

***Table C-28**. Summary of Species Group Information and Treatment Adequacy*

Species Groups	Annual grasses	Annual peas	Aquatic species	Biennial thistles	Borage	Buckwheat family	Buttercups	Canada thistle	Carnations	Carrot family	Geranium	Hawkweeds	Knapweeds	Lilies, Iris, Sedges, Rushes	Loosestrifes	Misc. herbaceous - annual	Misc. herbaceous - perennial	Mustards	Perennial Grasses	Perennial mints	Perennial peas	Snapdragons	Spurges	St. Johnswort	Sunflower family	Teasel	Woody species
Number of Species in Group	4	1	7	6	3	5	2	1	1	3	2	2	5	3	3	2	6	6	16	2	5	2	2	1	4	1	22
Number unknown on District			6	2	2		1		1	1		1	1	1	2	1	2	3	3		2		1		2		3
NISIMS sites	34	446	3	5,025	1	157	12	3,764	NA	26	2,299	3	784	2	2	13	96	98	4,686	8	264	1,852	1	2,186	5,837	148	21,731
NISIMS acres[1]	7	355	0	4,883	0	64	1	3,660	NA	2	782	0	600	0	0	3	38	16	3,676	31	490	2,320	1	6,626	5,748	22	20,557
Unmapped acres[1]	0	75		2,172		1,314	106	1,561	NA	0	272		104				5	0	158	0	7	542		2,476	2,479	0	2,287
Adequate Treatment Methods Available (Percent)[2]																											
No Action Alternative																											
Upper Willamette Field Office	55	75	0	50	50	5	62	5	55	50	10	5	50	0	25	30	46	50	50	25	50	16	15	20	60	30	50
Siuslaw Field Office	55	75	0	50	95	5	62	5	55	50	10	5	50	0	25	30	46	50	50	50	50	16	15	20	60	30	55
West Eugene Wetlands	87	100	0	85	75	100	100	100	87	40	34	100	100	0	85	100	100	100	62	100	100	91	75	100	100	100	100
Marys Peak / Tillamook Field Offices	65	75	0	70	75	10	95	50	55	55	60	85	55	0	85	70	76	60	40	95	75	91	76	90	95	30	60

Species Groups	Annual grasses	Annual peas	Aquatic species	Biennial thistles	Borage	Buckwheat family	Buttercups	Canada thistle	Carnations	Carrot family	Geranium	Hawkweeds	Knapweeds	Lilies, Iris, Sedges, Rushes	Loosestrifes	Misc. herbaceous - annual	Misc. herbaceous - perennial	Mustards	Perennial Grasses	Perennial mints	Perennial peas	Snapdragons	Spurges	St. Johnswort	Sunflower family	Teasel	Woody species
Cascades Field Office	65	75	0	80	80	50	90	50	55	55	70	85	55	0	85	85	82	60	30	95	75	91	90	90	95	30	85
Alternative 2	100	100	0	100	100	100	100	100	100	100	100	100	100	0	100	100	100	100	90	100	100	100	100	100	100	100	100
Alternative 3	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	90	100	100	100	100	100	100	100	100

1. Acres are rounded to the nearest digit
2. Red cells indicate that treatment methods are less than or equal to 50 percent adequate; yellow cells are greater than 50 percent and less than 100 percent adequate and green cells are 100 percent adequate.

***Table C-29**. Summary of Treatment Options Available under One or More Alternatives, by Species Group*

Species Group / Treatment Method[1]	Annual grasses	Annual peas	Aquatic species	Biennial thistles	Borage	Buckwheat family	Buttercups	Canada thistle	Carnations	Carrot family	Geranium	Hawkweeds	Knapweeds	Lilies, Iris, Sedges, Rushes	Loosestrifes	Misc. herbaceous - annual	Misc. herbaceous - perennial	Mustards	Perennial Grasses	Perennial mints	Perennial peas	Snapdragons	Spurges	St. Johnswort	Sunflower family	Teasel	Woody species
Herbicide Treatment Methods																											
2,4-D		✓	✓				✓		✓		✓			✓		✓	✓			✓	✓						
Aminopyralid		✓		✓		✓	✓	✓			✓	✓	✓			✓	✓				✓			✓	✓		
Aminopyralid + Metsulfuron methyl									✓	✓			✓					✓									
Chlorsulfuron				✓			✓	✓										✓			✓	✓				✓	
Chlorsulfuron + 2,4-D				✓	✓					✓								✓				✓					
Chlorsulfuron + Clopyralid + 2,4-D				✓																							
Chlorsulfuron + Picloram				✓																							
Clopyralid		✓		✓				✓				✓	✓								✓				✓	✓	
Clopyralid + 2,4-D				✓				✓					✓														
Dicamba + 2,4-D				✓	✓		✓		✓		✓	✓	✓			✓	✓						✓			✓	
Dicamba + Diflufenzopyr											✓					✓	✓							✓	✓	✓	
Fluazifop-P-butyl	✓																		✓								
Fluridone			✓																								
Fluroxypyr											✓															✓	

Species Group **Treatment Method**[1]	Annual grasses	Annual peas	Aquatic species	Biennial thistles	Borage	Buckwheat family	Buttercups	Canada thistle	Carnations	Carrot family	Geranium	Hawkweeds	Knapweeds	Lilies, Iris, Sedges, Rushes	Loosestrifes	Misc. herbaceous - annual	Misc. herbaceous - perennial	Mustards	Perennial Grasses	Perennial mints	Perennial peas	Snapdragons	Spurges	St. Johnswort	Sunflower family	Teasel	Woody species
Glyphosate	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Glyphosate + 2,4-D																✓	✓						✓				
Glyphosate + Triclopyr																				✓							
Hexazinone	✓													✓					✓								
Imazapic	✓										✓							✓					✓			✓	
Imazapyr	✓					✓				✓	✓			✓	✓	✓	✓		✓		✓	✓	✓				✓
Imazapyr + Glyphosate																			✓								
Metsulfuron methyl				✓	✓		✓			✓	✓				✓	✓	✓			✓	✓	✓			✓	✓	
Metsulfuron methyl + 2,4-D					✓													✓						✓			
Metsulfuron methyl + Dicamba + 2,4-D										✓																	
Picloram		✓					✓	✓				✓				✓	✓				✓	✓	✓				✓
Picloram + 2,4-D				✓	✓			✓					✓			✓	✓					✓	✓	✓	✓		
Picloram + 2,4-D + Dicamba				✓																							
Rimsulfuron	✓																										
Sethoxydim	✓																		✓								
Sulfometuron methyl	✓										✓								✓		✓						
Triclopyr		✓	✓			✓	✓								✓	✓	✓	✓		✓	✓						✓
Triclopyr + 2 4-D						✓	✓				✓																✓
Triclopyr + Aminopyralid																											✓
Triclopyr + Clopyralid												✓															
Non-Herbicide Treatment Methods																											
Manual control	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓
Mechanical control	✓	✓	✓	✓			✓	✓	✓	✓	✓			✓		✓	✓	✓	✓	✓	✓	✓	✓		✓		✓
Propane torch	✓										✓					✓	✓			✓	✓	✓			✓		
Targeted grazing (cattle)	✓																										
Targeted grazing (goats or sheep)		✓																			✓				✓		
Targeted grazing (goats)				✓																			✓				✓
Targeted grazing (sheep)							✓									✓	✓										

1. Seeding, planting, and prescribed fire may occur in any species group.

Table C-30. *Annual Treatment Plan*

Project Area	Target/Objective	Treatment Method	Treatment Acres
Cascades Field Office			
Beeline	Orange hawkweed	Herbicide	1
Crabtree	Knotweed	Herbicide	1
Harlan's Plantation	Scotch broom, blackberry	Mechanical (brush cutting)	12
Harlan's Plantation	Scotch broom, blackberry	Herbicide	12
Marmot Canal	Knapweed, blackberry	Herbicide	2
Marmot Dam	Meadow knapweed, blackberry, Scotch broom, perennial peavine, garlic mustard, teasel, poison hemlock	Herbicide	11
Mensinger Bench	Scotch broom, blackberry	Mechanical (brush cutting)	14
Middle Gorge	Knotweed	Herbicide	3
Middle Gorge Road	Blackberry, Scotch broom	Herbicide	3
Mill City Parcel	Yellow archangel, false brome, blackberry, ivy, vinca	Herbicide	3
Miller Quarry	Diffuse knapweed, Scotch broom	Herbicide	9
Molalla Corridor Sites	Blackberry, Scotch broom, knapweed	Herbicide	10
Mt Hood Quarry	False brome, Scotch broom	Herbicide	2
Pinecrest	Knapweed	Herbicide	1
Rogers Mtn	Ivy, blackberry	Herbicide	1
Sandy River Basin - Little Sandy 2	Inventory and treat EDRR species as needed	Would vary depending on species found	457[1] (limited BLM)
Sandy River Basin - Little Sandy Dam area	Inventory and treat EDRR species as needed	Manual	31
Sandy River Basin - Marmot Dam	EDRR and treat invasive plants species as needed	Manual	101
Sandy River Basin - Middle Gorge Area	Giant knotweed & EDRR	Herbicide	1,890[1] (limited BLM)
Sandy River Basin - Salmon River Lower BLM reach	Inventory and treat EDRR species as needed	Manual	786[1] (mostly BLM)
Sandy River Basin - Sandy BLM Channel to Wildcat Creek	English ivy, policemen's helmet and EDRR	Manual and herbicide	201[1] (limited BLM)
Sandy River Basin - Sandy Gorge	English ivy & EDRR	Herbicide	3,892[1] (691 BLM)
Sandy River Basin - Sandy-Salmon Confluence	Inventory and treat EDRR species as needed	Manual	195[1] (mostly BLM)
Sandy River Basin - Wildcat 2 and Wildcat 3	Inventory and treat EDRR species as needed	Would vary depending on species found	367[1] (mostly BLM)
Silverfalls	Knapweed, false brome, blackberry	Herbicide	1
Sunday Morning	Ivy	Herbicide	1
Marys Peak Field Office			
BLM Alsea maintenance yard	Blackberry	Herbicide	3
Eastline Pit	Scotch broom, blackberries, geranium, false brome	Herbicide	11

Project Area	Target/Objective	Treatment Method	Treatment Acres
Gunsite Pass Pit	Bull thistle, tansy ragwort, Canada thistle	Herbicide	12
Marys Peak Access Road & Hwy 34	Scotch broom, false brome, thin-leaved peavine, spotted and meadow knapweeds, shining geranium and herb Robert	Herbicide	40[1] (partially Forest Service)
Pedee Creek Pit	Scotch broom, geranium	Herbicide	4
Quail Hollow Quarry	Miscellaneous species for all pits including: false brome, knapweed, thistles and geranium	Herbicide	9
Rock Pit and associated gravel road	Scotch broom, false brome, thin-leaved peavine, spotted and meadow knapweeds, shining geranium and herb Robert	Herbicide	5
Vernon Pit	Miscellaneous species for all pits including: false brome, knapweed, thistles and geranium	Manual	8
Whitehouse Pit	Scotch broom, blackberries, geranium, false brome	Mechanical and herbicide	12
Winney Pit	Miscellaneous species for all pits including: false brome, knapweed, thistles and geranium	Manual	4
Winney Road access	Teasel, knotweed, blackberry	Herbicide and mechanical	4
Yaquina Head Outstanding Natural Area	Blackberry, teasel	Manual	3
Yaquina Head Outstanding Natural Area	Blackberry, teasel	Mechanical	4
Siuslaw Field Office			
Roadside infestations	Knotweeds	Herbicides	10
Roadside infestations	Geranium	Herbicides	15
Roadside infestations	Knapweeds	Manual and herbicides	120
Roadside infestations	Perennial grasses (false brome)	Manual and herbicides	118
Roadside infestations	Woody species (English ivy, Scotch broom, blackberries, English holly, vinca, cherry laurel)	Mechanical and herbicides	306
West Eugene Wetlands			
Balboa	Hawthorn/common pear/non-native rose	Herbicide (cut stump)	0.25
Balboa	Hawthorn/common pear/non-native rose	Herbicide	5
Balboa	Reed canarygrass	Herbicide	0.5
Balboa	Scotch broom	Manual	0.1
Balboa	Teasel	Manual	0.1
Beaver Run	Reed canarygrass	Herbicide	0.1
Fir Butte	Blackberry	Herbicide	3
Fir Butte	Tall oatgrass	Herbicide	2
Fir Butte	Meadow knapweed	Herbicide	0.25
Greenhill	Hawthorn/common pear/blackberry/non-native rose	Herbicide	2
Greenhill	Hawthorn/common pear/blackberry/non-native rose	Herbicide (cut stump)	0.25
Greenhill	Reed canarygrass	Herbicide	0.25
Hansen	Blackberry	Herbicide	2.5
Hansen	Meadow knapweed	Herbicide	0.1
Isabelle	Tall oatgrass	Herbicide	0.05
Isabelle	Scotch broom	Manual	2
Long Tom	Blackberry	Herbicide	1

Project Area	Target/Objective	Treatment Method	Treatment Acres
Long Tom	Non-native rose	Herbicide	5
Long Tom	Tall oatgrass	Herbicide	0.25
North Taylor	Blackberry	Herbicide	0.05
North Taylor	Shining geranium	Herbicide	0.25
Oak Hill	Scotch broom/blackberry	Herbicide	3
Oak Hill	Shining geranium	Propane torch	0.3
Oak Hill	Shining geranium	Propane torch	0.3
Oxbow West	Hawthorn/common pear	Herbicide (cut stump)	1
Oxbow West	Reed canarygrass	Herbicide	1
Oxbow West	Non-native rose/blackberry/hawthorn/common pear	Herbicide	0.5
Oxbow West	Scotch broom	Manual	0.1
Oxbow West	Teasel	Manual	0.1
Rosy	Blackberry/Scotch broom	Herbicide	1
Rosy	Reed canarygrass	Herbicide	0.25
Rosy	Scotch broom	Manual	0.1
Rosy	Teasel	Manual	0.1
Speedway	Hawthorn/common pear/blackberry	Herbicide (cut stump)	2
Speedway	Reed canarygrass	Herbicide	1
Speedway	Scotch broom	Manual	2
Speedway	Teasel	Manual	2
Stewart Pond	False brome	Herbicide	0.1
Turtle Swale	Hawthorn/common pear/blackberry	Herbicide	0.5
Turtle Swale	Reed canarygrass	Herbicide	0.1
Turtle Swale	Scotch broom	Manual	1
Turtle Swale	Teasel	Manual	0.5
Vinci	Hawthorn/common pear/blackberry	Herbicide (cut stump)	0.5
Vinci	Reed canarygrass	Herbicide	0.1
Vinci	Scotch broom	Manual	1
Willow Corner Annex	Hawthorn/common pear/blackberry	Herbicide	0.1
Willow Corner Annex	Hawthorn/common pear/blackberry	Herbicide (cut stump)	0.1
Willow Corner Annex	Reed canarygrass	Herbicide	0.1
Willow Corner Annex	Shining geranium	Herbicide	0.1
Willow Corner Annex	Shining geranium	Manual	0.1
Tillamook			
Dixie Mountain Potential focus areas	Woody - Scotch broom, English ivy	Manual	5
Little North Fork Wilson River	Knotweed	Herbicide	2
Nestucca roadsides	Woody species, geranium	Manual and herbicide	100

Project Area	Target/Objective	Treatment Method	Treatment Acres
Pacific City 80	Woody - Scotch broom	Mechanical	15
Quarries and mineral sites	Any invasive species	Manual and herbicide	15
Yamhill County roadsides	Perennial grass (false brome)	Herbicide	10
Upper Willamette			
Roadside infestations	Perennial grasses (false brome)	Manual and herbicide	70
Roadside infestations	Woody - Scotch broom/blackberry	Manual, mechanical and herbicide	141
Many sites across the field office	Geranium	Manual and herbicide	25
Many sites across the field office	Perennial mint (yellow archangel)	Manual and herbicide	1
Many sites across the field office	Knapweeds	Manual and herbicide	50
East Fork Dee Creek - McKenzie River	Knotweed	Herbicide	2

1. Partnership done across various landownerships by various partners.

Appendix D: Protection Measures

Standard Operating Procedures, Mitigation Measures, Conservation Measures, and Project Design Criteria presented in this appendix are a compilation of information originally presented in:

- 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 *Vegetation Treatments on BLM Lands in Oregon FEIS* (USDI 2010a) and *Record of Decision* (USDI 2010b);
- 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); and,
- the 2013 *U.S. Fish and Wildlife Service's Aquatic Restoration Biological Opinion II* (ARBO II, USDI 2013a)

In addition, the BLM is in the process of consultation with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service. Additional Project Design Criteria that are expected to be adopted through this consultation process.

Project Design Features

The following Project Design Features are adopted for this analysis to reduce effects of the action alternatives (unless otherwise noted, Project Design Features are applicable to both Alternatives 2 and 3):

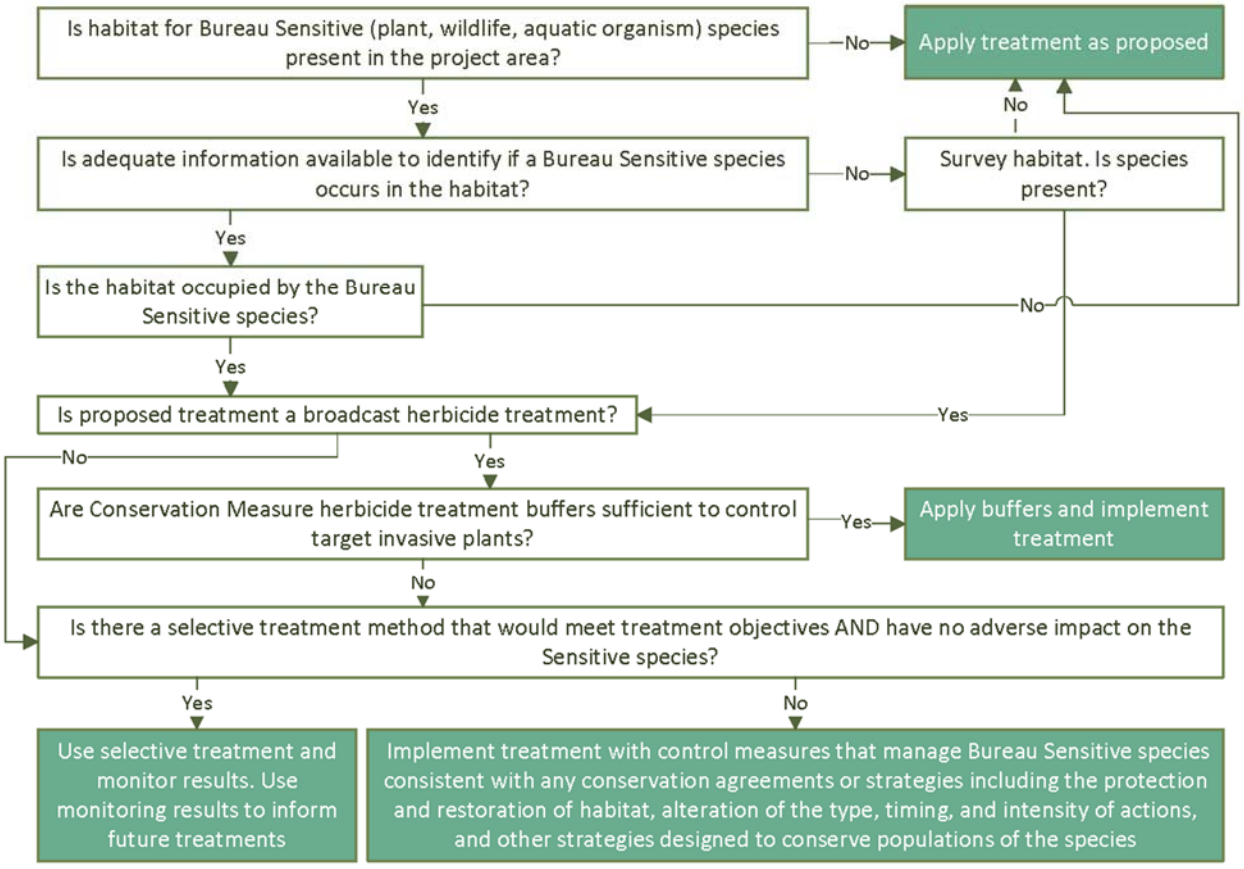
Special Status Species

Multiple issue sections (Issue 2 in Chapter 3 and Issues 4 to 10 in Appendix G) include effects to Special Status[14] species. 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 *Protection Measures for Federally Listed Species* later in this appendix). 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 Features*** included in the analysis of Alternative 2 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.

[14] Special Status species include 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)

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

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



- For treatments within the same watershed as a federally listed plant, animal, or resident fish or within 1,500 feet of listed anadromous fish habitat, follow all Project Design Criteria outlined in ARBO II[15].
- On BLM-administered lands in the West Eugene Wetlands, follow all Project Design Criteria outlined in the *Biological Opinion For The Resource Management Plan For The West Eugene Wetlands In Lane County, Oregon* (USDI 2014b).

Native Vegetation

- For federally threatened or endangered upland plant species, follow all Project Design Criteria adopted in consultation with U.S. Fish and Wildlife Service.

Additional Monitoring Under the Action Alternatives

- As described in Figure D-1, if a selective treatment method could have an effect on a Special Status plant, the BLM would monitor the response. Monitoring would happen yearly for a minimum of two years following the treatment, and would measure Special Status plant numbers, plant size, and whether plants are reproductive or not. If adverse effects occur (e.g., impacts or loss of a few individual Special Status

[15] Note that ARBO II does not address the use of rimsulfuron, fluazifop-P-butyl, fluroxypyr, or hexazinone and hence these herbicides cannot be used in these areas unless they are addressed through other consultation.

plants), the BLM would weigh the consequences of these effects against the potential long-term impacts of invasive plants that would be expected in the absence of treatments. It is expected that information gained from this monitoring will provide additional information to consider as part of Appendix C, *Treatment Key*; helping to refine future prescriptions for greater success.

Wildlife

- In federally listed, terrestrial wildlife species' habitat, follow all Project Design Criteria developed in coordination with U.S. Fish and Wildlife Service.
- Apply Conservation Measures applicable to butterflies and moths, as appropriate, for other Bureau Sensitive terrestrial invertebrates.

Alternative 3 Project Design Features

- Survey for western pond turtles and painted turtles before applying bottom barriers / weed mats or diver-assisted suction harvest/tractors in the habitat of these species[16] (e.g., ponds and streams/rivers with pools and/or coves). If either species is present, restrict these types of treatments to only occur between May 7 and July 15 or between August 15 and September 15.

Fish / Riparian

- Apply the aquatic no-herbicide application buffers specified in the Aquatic Restoration Biological Opinion II (NMFS 2013) from the National Marine Fisheries Service to all waterbodies with known or suitable habitat for Bureau Sensitive fish and other Bureau Sensitive aquatic species.
- Outside of BLM administered land at the West Eugene Wetlands, confine the use of fluazifop-P-butyl to flat, dry ground located greater than 300 feet from any surface water connected to a stream network to prevent herbicide mobilization.

Alternative 3 Project Design Features

- In waterbodies that contain federally threatened or endangered fish species or provide critical habitat, follow all Project Design Criteria developed in coordination with NMFS.
- Delay aquatic herbicide treatments in side channels and connected backwaters until they are disconnected from the mainstem river or during the period of lowest flow.
- When using aquatic 2,4-D, glyphosate, imazapyr, or triclopyr in closed aquatic systems, implement a phased treatment (treating less than 50 percent of the surface area of the pond at a time) to reduce the likelihood of all of the aquatic plants dying at the same time, which would result in a rapid depletion of dissolved oxygen.

Traditional and Cultural Uses (Native American Interests)

- At least one month prior to beginning treatments for the season, Annual Treatment Plans would be presented to potentially affected Tribes showing planned treatments and treatment areas. If these Tribes request coordination or consultation regarding proposed treatments, the BLM would seek to avoid conflict with tribal resource use by modifying the timing of treatments or posting signs to allow Tribal members to avoid treated areas. These proposed modifications would be determined in coordination with the Tribe and are not limited to those stated above. Additionally, modification to Annual Treatment Plans may be requested in order to avoid adverse affects to cultural features. Ultimately, a line officer will

[16] This can be identified during the interdisciplinary team review of the Annual Treatment Plan.

make an informed decision regarding the level of modification appropriate through tribal coordination or consultation.

Soil

- For slopes greater than 20 percent, use low ground- pressure equipment such as rubber-tired or rubber tracked equipment, use a slash [vegetation] mat under equipment, or limit heavy equipment to one pass.

Standard Operating Procedures and Mitigation Measures

In the following section, Standard Operating Procedures applicable to non-herbicide treatments are listed first under each resource, followed by the Standard Operating Procedures, Mitigation Measures, and Oregon FEIS Mitigation Measures applicable to herbicide applications.

Standard Operating Procedures have been identified to reduce adverse effects to environmental and human resources from vegetation treatment activities based on guidance in BLM manuals and handbooks, regulations, and standard BLM and industry practices. 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 "Provide alternative forage sites for livestock, if possible" would not need to be applied where livestock are not present. In addition, if the parent handbook or policy direction evolves, it is assumed that the new direction would continue to provide the appropriate environmental protections (USDI 2010b:33).

2007 PEIS Mitigation Measures (marked as MMs in the list below) were identified for all potential adverse effects identified for herbicide applications in the *Vegetation Treatments Using Herbicides on Bureau of Land Management Lands in 17 Western States Programmatic Environmental Impact Statement* (USDI 2007a), and adopted by its Record of Decision. In other words, no potentially significant adverse effect identified in the 17 States analysis remained at the programmatic scale after the PEIS Mitigation Measures were adopted. Like the Standard Operating Procedures, application of the Mitigation Measures is assumed in the analysis in this EA

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.

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* (USDI 2010a). Application of these measures is also assumed in the analysis in this EA. 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 to conditions on the District. 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, fluridone, or tebuthiuron) and application methods (i.e., aerial herbicide application) that are not proposed for use on the 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.

In addition, Standard Operating Procedures and Mitigation Measures for wild horse and burro herds and livestock are not included in this appendix, as they are not present on the Northwest Oregon District.

Guidance Documents

In addition to resource-specific guidance (listed below, under various resource headings), Standard Operating Procedures are also taken from the following BLM handbooks or manuals:

Fire Use

BLM handbook H-9211-1 (Fire Management Activity Planning Procedures) and manuals 1112 (Safety), 9200 (Fire Program Management) and 9211 (Fire Planning)

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 *Air Resource Management Manual* (7300).

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.

Water Resources

Standard Operating Procedures for water resources are taken from BLM's *Water Quality Manual* (7240).

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 D-1 and D-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 proposals to 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-4180-1 (*Rangeland Health Standards 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 D-1 and D-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 D-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 Other Aquatic Species

Standard Operating Procedures for fish and other aquatic organisms are taken from BLM Manuals, including Manuals 6500 (*Wildlife and Fisheries Management*) and 6500 (*Wildlife and Fisheries Management*)

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 D-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, hexazinone or triclopyr, where feasible. (MM)

- Minimize the size of application areas, where practical, when applying 2,4-D and Overdrive®[17] to limit impacts to wildlife, particularly through contamination of food items. (MM)
- Where practical, limit glyphosate and hexazinone to spot applications in grazing land and wildlife habitat areas to avoid contamination of wildlife food items. (MM)
- Do not use the adjuvant R-11 (MM)
- 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.

[17] Overdrive is a trade name for a formulation of diflufenzopyr + dicamba.

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.

Cultural Resources

Standard Operating Procedures for cultural resources are taken from BLM handbook H-8120-1 (*Guidelines for Conducting Tribal Consultation*); BLM manual 8100 (*The Foundations for Managing Cultural Resources*); and, BLM manual 8120 (*Tribal Consultation Under Cultural Resource Authorities*)[18]

See also:

- The 2015 *State Protocol between the Oregon-Washington State Director of the BLM and the Oregon State Historic Preservation Officer regarding the manner in which the Bureau of Land Management will meet its responsibilities under the National Historic Preservation Act*; and,
- The 2012 *National Programmatic Agreement among the BLM, the Advisory Council on Historic Preservation, and the National Conference of State Historic Preservation Officers*.

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.
- 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.

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.

[18] This manual has been superseded by Handbook H-1780-1 (Improving and Sustaining BLM-Tribal Relations). Guidance from this new handbook does not change Standard Operating Procedures described in this section.

- 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, hexazinone and triclopyr in known traditional use areas. (MM)

Paleontological Resources

Standard Operating Procedures for paleontological resources are taken from BLM handbook H-8270-1 (*General Procedural Guidance for Paleontological Resource Management*) and BLM manual 8270 (*Paleontological Resource Management*).

General

- 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.

Fire Use

- Monitor significant paleontological and cultural resources for potential looting of materials where they have been exposed by fire.

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[19].

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.

[19] These are referred to as visual resource management areas in the *Northwestern and Coastal Oregon Resource Management Plan* (USDI 2016d).

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

Standard Operating Procedures for Designated Wilderness, Wilderness Study Areas, Areas of Critical Environmental Concern, 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 6400 (*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[20] onto BLM lands.
- Encourage stock users to tie and / or hold stock in such a way as to minimize soil disturbance and loss of native vegetation.
- Revegetate disturbed sites with native species if there is no reasonable expectation of natural regeneration.
- Provide educational materials at trailheads and other Wilderness entry points to educate the public on the need to prevent the spread of weeds.
- 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.

[20] By policy, weed-free hay and straw is required on all BLM-administered lands in Oregon and Washington (USDI 2017).

- 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 Other Aquatic Species, Wildlife Resources, and Human Health and Safety). (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 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 and Safety

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, hexazinone, 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)
- Do not apply hexazinone with an over-the-shoulder broadcast applicator (backpack sprayer). (MM)
- Consideration should be given to herbicides other than 2,4-D; use of 2,4-D should be limited to situations where other herbicides are ineffective or in situations in which the risks posed by 2,4-D can be mitigated (Oregon FEIS MM).

Table D-1. *Buffer Distances to Minimize Risk to Vegetation from Off-Site Drift of BLM-Evaluated Herbicides*

Application Scenario	Chlorsulfuron	Imazapic	Diflufenzopyr + Dicamba	Sulfometuron methyl
Buffer Distance (feet) from Non-target Aquatic Plants				
Typical Application Rate - Low Boom[1]	0	0	100	900
Maximum Application Rate - Low Boom	0	0	900	900
Buffer Distance (feet) from Non-target Terrestrial Plants				
Typical Application Rate - Low Boom	900	0	0	0
Maximum Application Rate - Low Boom	1,000	0	100	0
Buffer Distance (feet) from Threatened, Endangered, and Sensitive Plants				
Typical Application Rate - Low Boom	1,000	0	100	1,100
Maximum Application Rate - Low Boom	1,050	0	900	1,100

1 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 D-2*. Buffer Distances to Minimize Risk to Vegetation from Off-Site Drift of Forest Service-Evaluated Herbicides*

Application Scenario	Dicamba	Clopyralid	Glyphosate	Hexazinone	Imazapyr	Metsulfuron methyl	Picloram	Triclopyr
	Buffer Distance (feet) from Susceptible Plants[1]							
Typical Rate - Low Boom	300	900	50	NE	900	900	>900	300
Maximum Rate - Low Boom	900	1 000	300	NE	>900	>900	>900	>900
	Buffer Distance (feet) from Tolerant Terrestrial Plants							
Typical Rate - Low Boom	0	0	25	0	25	25	25	NE
Maximum Rate - Low Boom	0	25	25	100	50	25	25	NE

NE = Not evaluated.
Buffer distances are the smallest modeled distance at which no risk was predicted. In some cases, buffer distances were extrapolated if the largest distance modeled still resulted in risk, or interpolated if greater precision was required.
1 Mitigation Measures for Bureau Sensitive or federally listed species use these buffer distances

***Table D-3**. Buffer Distances to Minimize Risk to Fish and Aquatic Invertebrates from Off-Site Drift of BLM-Evaluated Herbicides*

Application Scenario	Chlorsulfuron	Imazapic	Diflufenzopyr + Dicamba	Sulfometuron methyl
Minimum Buffer Distance (feet) from Fish and Aquatic Invertebrates				
Typical Rate - Low Boom	0	0	0	0
Maximum Rate - Low Boom	0	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 D-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 Rate - Low Boom[1]	25	100	100
Maximum Rate - Low Boom	100	400	400
Buffer Distance (feet) from Terrestrial Threatened, Endangered, and Sensitive Plants			
Typical Rate - Low Boom	100	100	100
Maximum Rate - Low Boom	400	600	400
Buffer Distance (feet) from Non-Target Aquatic Plants[2]			
Typical Rate - Low Boom	NA	NA	100
Maximum Rate - Low Boom	NA	NA	100

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.
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.
1 20 inches above ground.
2 Aquatic plants in ponds and streams were considered in the Ecological Risk Assessments. The largest buffer distances are presented in this table.

Protection Measures for Federally Listed Species

The Northwest Oregon District has 17 federally listed species that are known or have potential to occur on the District (see Table D-5)[21].

***Table D-5**. Listed Species on the Northwest Oregon District*

Taxon	Common Name	Scientific Name	Population	Status
Plant	Willamette valley daisy	*Erigeron decumbens* var. *decumbens*		Endangered
Plant	Bradshaw's lomatium	*Lomatium bradshawii*		Endangered
Plant	Kincaid's lupine	*Lupinus oreganus*		Threatened
Plant	Nelson's checker-mallow	*Sidalcea nelsoniana*		Threatened
Plant	golden paintbrush	*Castilleja levisecta*		Threatened
Plant	water howellia	*Howellia aquatilis*		Threatened
Anadromous Fish	Coho salmon	*Oncorhynchus kisutch*	Oregon Coast, Lower Columbia River	Threatened
Anadromous Fish	steelhead	*Oncorhynchus mykiss*	Upper Willamette River, Lower Columbia River	Threatened
Anadromous Fish	Chinook salmon	*Oncorhynchus tshawytscha*	Upper Willamette River, Lower Columbia River	Threatened
Anadromous Fish	Pacific eulachon	*Thaleichthys pacificus*	Southern	Threatened
Resident Fish	bull trout	*Salvelinus confluentus*	All	Threatened
Insect	Fender's blue butterfly	*Plebejus icarioides fenderi*		Endangered
Insect	Taylor's checkerspot butterfly	*Euphydryas editha taylori*		Endangered

[21] More information about the effects to these species can be found in the Issue 4 (federally listed plants), Issues 2 and 10 (federally listed fish), Issue 7 (federally listed birds), and Issue 9 (federally listed butterflies).

Taxon	Common Name	Scientific Name	Population	Status
Insect	Oregon silverspot butterfly	*Speyeria zerene hippolyta*		Threatened
Bird	streaked horned lark	*Eremophila alpestris strigata*		Threatened
Bird	northern spotted owl	*Strix occidentalis caurina*		Threatened
Bird	marbled murrelet	*Brachyramphus marmoratus*		Threatened

Formal and informal consultation that covers herbicides and other invasive plant treatments on the District has occurred with the U.S. Fish and Wildlife Service (FWS) and National Marine Fisheries Service (NMFS) on numerous occasions (see Table D-6). The BLM submits annual reports to the Services in compliance with these consultations at both the State- and District-level.

***Table D-6**. 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) *Vegetation Treatments on BLM Lands in 17 Western States Programmatic Environmental Report* (USDI 2007d) *Vegetation Treatments on BLM Lands in 17 Western States Biological Assessment* (USDI 2007c)	BLM - 17 Western States	2007	FWS Letter of Concurrence (Reference: FWS/AES/DCHRS/027171) NMFS Biological Opinion (Tracking Number: FPR-2004-1502)
Vegetation Treatments Using Herbicides on BLM Lands in Oregon (USDI 2010a) *Vegetation Treatments on BLM Lands in 17 Western States Biological Assessment* (USDI 2007c)	BLM - Oregon	2010	FWS Letter of Concurrence (TAILS Number: 13420-2010-I-0173) NMFS Biological Opinion (Number: 2009/05539)
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 Tracking Number: NWP-2013-9664) (FWS Reference: 01EOFW00-2013-F-0090)
Biological Assessment for the Resource Management Plan for the West Eugene Wetlands in Lane County, Oregon on the US BLM – Eugene District (USDI 2014a)	BLM - West Eugene Wetlands	2014	Biological Opinion (FWS) (Reference: 01EOFW00-2014-F-0139)
Biological Assessment (USDI 2016c) *for Vegetation Treatments Using Aminopyralid, Fluroxypyr, and Rimsulfuron PEIS* (USDI 2016a)	BLM - 17 Western States	2015 / 2016	FWS Letter of Concurrence (Reference: FWS/AES/DER/BCH/061446) NMFS Biological Opinion (Tracking Number: PCTS FPR-2015-9121)

Endangered Species Act consultation with U.S. Fish and Wildlife Service and NMFS 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).

For the 2007 PEIS, the BLM consulted with the U.S. Fish and Wildlife Service and NMFS 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 to minimize impacts to these species and habitats.

The U.S. Fish and Wildlife Service issued a Letter of Concurrence that 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 U.S. Fish and Wildlife Service. In addition, the U.S. Fish and Wildlife Service recognized that any future site-specific actions

carried out under the PEIS would undergo additional consultation as appropriate (USDI 2007b). In 2010, the U.S. Fish and Wildlife Service 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 U.S. Fish and Wildlife Service 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[22] 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 Lower Columbia River 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, 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, fluridone, hexazinone, or rimsulfuron (five of the herbicides analyzed in this analysis) nor does it cover aquatic invasive plant treatments.

In 2014, the BLM consulted with the U.S. Fish and Wildlife Service regarding management of the West Eugene Wetlands to contribute to the recovery of federally-listed species while providing other benefits, particularly water quality enhancement, and storm water and flood control, habitat for native plant and animal communities, and recreation and environmental education opportunities, to the extent compatible with threatened and endangered species management. This includes invasive plant treatments with herbicides (clopyralid, glyphosate, triclopyr, and limited amounts of fluazifop-p-butyl and aminopyralid) to allow for habitat enhancement and restoration. The U.S. Fish and Wildlife Service determined that the proposed action was not likely to jeopardize the continued existence nor adversely modify the critical habitat of any of the listed species present in the West Eugene Wetlands (Fender's blue butterfly, Taylor's checkerspot butterfly, streaked horned lark, Willamette daisy, Kincaid's lupine, and Bradshaw's lomatium).

Consultation resulted in the identification of Conservation Measures and Project Design Criteria to protect District-listed species from treatments are provided below.

[22] "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).

In addition, the BLM is preparing Biological Assessments. The BLM will consult with the National Marine Fisheries Service to address:

- The use of fluazifop-P-butyl at distances up to 300 feet from listed anadromous fish habitat (Alternatives 2 and 3)
- Treatments of aquatic invasive plant infestations in waterbodies that contain federally threatened or endangered anadromous fish species or provide critical habitat (Alternative 3)

The BLM will consult with the U.S. Fish and Wildlife Service to address:

- The use of fluazifop-P-butyl, rimsulfuron, fluroxypyr, and hexazinone in listed species habitat (Alternatives 2 and 3)
- Treatments of terrestrial invasive plant infestations in Taylor's checkerspot butterfly, Fender's blue butterfly, and streaked horned lark critical habitat (Alternatives 2 and 3)
- Treatments of terrestrial invasive plant infestations in upland federally threatened or endangered plant habitats (Alternatives 2 and 3)

The BLM would adopt any additional Project Design Criteria that result from consultation with either agency.

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). Conservation Measures for mammals, birds, arthropods, and terrestrial mollusks are generally species specific. Federally listed 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.

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[23] 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.

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.

[23] Federally listed as threatened or endangered, or proposed for such listing.

- Establishment of site-specific no activity buffers by a qualified botanist, biologist, or ecologist in areas of occupied habitat within the proposed project area. To protect occupied habitat, treatment activities would not occur within these buffers.
- Collection of baseline information on the existing condition of TEP plant species and their habitats in the proposed project area.
- Establishment of pre-treatment monitoring programs to track the size and vigor of TEP populations and the state of their habitats. These monitoring programs would help in anticipating the future effects of vegetation treatments on TEP plant species.
- Assessment of the need for site revegetation post treatment to minimize the opportunity for noxious weed invasion and establishment.

At a minimum, the following must be included in all management plans:

- Given the high risk for damage to TEP plants and their habitat from burning, mechanical treatments, and use of domestic animals to contain weeds, none of these treatment methods should be utilized within 330 feet of sensitive plant populations unless the treatments are specifically designed to maintain or improve the existing population.
- Off-highway use of motorized vehicles associated with treatments should be avoided in suitable or occupied habitat.
- Biological control agents (except for domestic animals) that affect target plants in the same genus as TEP species must not be used to control target species occurring within the dispersal distance of the agent.
- Prior to use of biological control agents that affect target plants in the same family as TEP species, the specificity of the agent with respect to factors such as physiology and morphology should be evaluated, and a determination as to risks to the TEP species made.
- Post-treatment monitoring should be conducted to determine the effectiveness of the project.

In addition, the following guidance must be considered in all management plans in which herbicide treatments are proposed to minimize or avoid risks to TEP species. The exact Conservation Measures to be included in management plans would depend on the herbicide that would be used, the desired mode of application, and the conditions of the site. Given the potential for off-site drift and surface runoff, populations of TEP species on lands not administered by the BLM would need to be considered if they are located near proposed herbicide treatment sites.

- Herbicide treatments should not be conducted in areas where TEP plant species may be subject to direct spray by herbicides during treatments.
- Applicators should review, understand, and conform to the “Environmental Hazards” section on herbicide labels (this section warns of known pesticide risks and provides practical ways to avoid harm to organisms or the environment).
- To avoid negative effects to TEP plant species from off-site drift, surface runoff, and/or wind erosion, suitable buffer zones should be established between treatment sites and populations (confirmed or suspected) of TEP plant species, and site-specific precautions should be taken (refer to the guidance provided below).
- Follow all instructions and Standard Operating Procedures to avoid spill and direct spray scenarios into aquatic habitats that support TEP plant species.
- Follow all BLM operating procedures for avoiding herbicide treatments during climatic conditions that would increase the likelihood of spray drift or surface runoff.

Conservation Measures were created at the National level with the 2007 and 2016 PEISs and 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[24].
- If using a low boom at the maximum application rate, do not apply within 400 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).

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

- 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 maximum 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.
- 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.

[24] 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.

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 low boom at the maximum application rate, 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.

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.
- 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

- 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.

Hexazinone

- Only apply this herbicide by ground methods using a low boom within ½ mile of terrestrial TEP plant species and aquatic habitats that support aquatic TEP species.
- Do not apply by ground methods at the typical application rate within 300 feet of terrestrial TEP plant species or aquatic habitats that support aquatic TEP plant species.
- Do not apply by ground methods at the maximum application rate within 900 feet of terrestrial TEP plant species or aquatic habitats that support aquatic TEP plant species.
- In areas where wind erosion is likely, do not apply within ½ mile of TEP plant species.

Imazapic

- Do not apply by ground methods within 25 feet of terrestrial TEP species or aquatic habitats where TEP plant species occur.

Imazapyr

- 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

- 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.

Diflufenzopyr + dicamba

- 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.
- 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, do not apply within 400 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

- Use only a low boom during ground applications of this herbicide within ½ mile of terrestrial TEP plant species.
- 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

- 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 2007c:4-113 to 4-126) 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, non-native species should not be used for revegetation.
- Certified noxious weed seed free seed must be used in suitable habitat, and preference should be given to seeding appropriate plant species when rehabilitation is appropriate.
- Straw and hay bales used for erosion control in suitable habitat must be certified weed- and seed-free.
- Vehicles and heavy equipment used during treatment activities should be washed prior to arriving at a new location to avoid the transfer of noxious weeds.

When BAs are drafted at the local level for treatment programs, additional Conservation Measures may be added to this list. Where BLM plans that consider the effects of vegetation treatments on TEP plant species already exist, these plans should be consulted, and incorporated (e.g., any guidance or Conservation Measures they provide) into local level BAs for vegetation treatments.

Aquatic Animals Conservation Measures

Many local BLM offices already have management plans in place that ensure the protection of these species, and have completed formal or informal consultations on similar treatment activities. These consultations have identified protection zones alongside aquatic habitats that support these species. The Conservation Measures discussed below are probable steps required of the BLM to ensure that vegetation treatments would minimize impacts to TEP species. These Conservation Measures are intended as broad guidance at the programmatic level; further analysis of treatment programs and species habitats at the local level is required to better reduce potential impacts from proposed vegetation treatments. Completion of consultation at the local level will fine-tune Conservation Measures associated with treatment activities and ensure consistency of the treatments with ESA requirements.

The aquatic TEP species considered in 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. 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 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 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, hexazinone, imazapyr, metsulfuron methyl, picloram, and triclopyr.
- Do not broadcast spray glyphosate, picloram, or triclopyr BEE in upland habitats adjacent to aquatic habitats that support (or may potentially support) aquatic TEP species under conditions that would likely result in off-site drift.
- In watersheds that support TEP species or their habitat, do not apply triclopyr BEE in upland habitats within ½ mile upslope of aquatic habitats that support aquatic TEP species under conditions that would likely result in surface runoff.

Numerous Conservation Measures were developed from information provided in 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 U.S. Fish and Wildlife Service).

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.

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 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 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, hexazinone, imazapyr, picloram, and triclopyr.
- If conducting manual spot applications of glyphosate, hexazinone, or triclopyr to vegetation in TEP butterfly or moth habitat, utilize the typical, rather than the maximum, application rate.

Bird Conservation Measures

Sand Nesters: Western Snowy Plover, Piping Plover, Least Tern and Streaked Horned Lark[25]

- Survey for western snowy plovers, piping plovers, interior least terns and streaked horned larks(and their nests) in suitable areas on proposed treatment areas, prior to developing treatment plans.
- Do not treat vegetation in nesting areas during the breeding season (as determined by a qualified biologist).
- Do not allow human (or domestic animal) disturbance within ¼ mile of nest sites during the nesting period.
- Ensure that nest sites are at least 1 mile from downwind smoke effects during the nesting period.
- Conduct beachgrass treatments during the plant's flowering stage, during periods of active growth.
- 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.

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, hexazinone, imazapyr, metsulfuron methyl, picloram, and triclopyr.
- Do not broadcast spray clopyralid, glyphosate, hexazinone, 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 hexazinone, or triclopyr to vegetation in marbled murrelet, or northern spotted owl habitat, utilize the typical, rather than the maximum, application rate.

[25] Of these sand nesting bird species, only the streaked horned lark is suspected or documented on the Northwest Oregon District.

- Follow all instructions and SOPs to avoid spill and direct spray scenarios into aquatic habitats, particularly marine habitats where murrelets forage for prey.

Essential Fish Habitat Conservation Measures

Conservation Measures have been incorporated into the action alternatives 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.

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 [Fishery Management Plan] 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 Species from ARBO II (NMFS 2013, USDI 2013a)

Project Design Criteria established through consultation with NMFS and U.S. Fish and Wildlife Service are adopted for federally listed species 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)
- USDI Fish and Wildlife Service. 2013. Endangered Species Act - Section 7 Consultation *Programmatic Biological Opinion for Aquatic Restoration Activities in the States of Oregon, Washington and portions of California, Idaho and Nevada (ARBO II),* FWS Reference: 01EOFW00-2013-F-0090 (USDI 2013a)

Text (in gray italics) was added to the ARBO II Project Design Criteria below for clarification purposes

Listed Anadromous Fish (NMFS 2013)

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, LW ***[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 1994b) 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):[26]
      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)

[26] 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.

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)
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[27] (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.

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

[27] *Broadcast spraying in this EA is described as potentially occurring with a backpack sprayer or other handheld device.*

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 D-7). 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 D-7*. No-application buffer widths 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[1]	Spot Spraying	Hand Selective	Broadcast Spraying[1]	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
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	100	50	50	100	50	50
2,4-D (ester)	100	50	50	100	50	50

[1] Including broadcast spraying with a backpack sprayer or other handheld sprayers.

Listed Terrestrial and Fish Species (USDI 2013a)

1.4 General Conservation Measures and Project Design Criteria for All Terrestrial and Fish Species

1. The following CMs apply to all listed terrestrial species for all programmatic activities:
   a. Aquatic restoration actions will not remove or downgrade suitable habitat (on either public or private land) for any listed terrestrial species.
   b. Effects of danger tree removal will be either discountable or insignificant to ESA-listed terrestrial species and their critical habitat.
   c. All restoration activities must have the unit's botanist and terrestrial wildlife biologist input/analysis of the project design and their site-specific species assessment to proceed. This includes a plant survey and nest analysis (or survey if deemed appropriate by the unit biologist, and suitable habitat is known to occur within the project prior to project implementation).
   d. There will be no disturbance allowed from blasting activities as they are not part of the proposed action.
   e. The unit wildlife biologist is responsible for ensuring that the correct effects determination is made for each project. The unit wildlife biologist may increase or decrease disturbance distances according to the best available scientific information and site-specific conditions. Refer to Tables D-10 and D-11. For instance, if a known spotted owl site is surveyed to protocol and the owls are determined to be non-nesting, the unit biologist may determine that no disturbance or disruption would occur and lift the associated restrictions on activities within disruption distances during the year of survey.

***Table D-8**. Disturbance Distances and Time Periods When Disturbance (and Possibly Disruption) May Occur for Terrestrial Species**

Species	Disturbance Distance (in miles)	Time Period Applicable
Northern spotted owl (nesting)	See Table D-10	Mar 1 – September 30
Marbled murrelet (nesting)	See Table D-11	Apr 1 – Sept 15***
All Plants	0.25**	Jan 1 – Dec 31
*See PDCs below for additional details. **If project is within 0.25 mile of a listed plant, then measures must be taken to minimize threats to NE or NLAA the species to be covered by this programmatic consultation. ***General Conservation Measure MM1 requires daily timing restrictions. The first work restriction stops two hours after sunrise and the work restriction starts again 2 hours before sunset.		

Listed Plants (USDI 2013a)

1.4.3. Plants: For threatened or endangered plant species that may occur in project areas within the scope of this ARBO II, the following criteria will be applied:

a. All Listed Plant Species

i. **PL1**: A unit botanist will have the following input in all project designs: (a) the botanist will determine whether there are known listed plants or suitable habitat for listed plants in the project area; (b) If a known site of a listed plant is within 0.25-mile of the project action area, or that suitable or potential habitat may be affected by project activities, then a botanist will conduct a site visit/vegetation survey to determine whether listed plants are within the project area. This visit and survey will be conducted at the appropriate time of year to identify the species and determine whether individual listed plants or potential habitat are present and may be adversely affected by project activities (see Table D-9).

ii. **PL2**: If one or more listed plants are present and likely to be adversely affected by the project, then the project is not covered by this BO and consultation with the FWS under Section 7 of the ESA must be initiated. If a project will have no effect or is NLAA listed plants it is covered under this ARBA II. Project design criteria should address both the

critical life cycle of listed plant species as well as the effective biotic and abiotic environmental factors sustaining rare plant taxa.

iii. **PL3**: Due to soil disturbance that may occur during aquatic restoration activities and use of heavy equipment that could carry seeds and plant parts into project areas, all appropriate prevention measures will be incorporated into contract or equipment rental agreements to avoid introduction of invasive plants and noxious weeds into project areas.

Table D-9*. Optimal Survey Times for Flowering Periods of Listed Plants in Oregon and Washington*

Species	Optimal Survey Time Period[1]
Bradshaw's lomatium	April to mid-May
Golden paintbrush	April to September
Kincaid's lupine	May through June
Nelson's checker-mallow	Late May to Mid-July
Water Howellia	June through August
Willamette valley daisy	Mid-June to early July

1. This is a guideline. The local botanist will survey when the time is appropriate

Listed Insects (USDI 2013a)

1.4.4. Insects: To avoid adverse effects to Fenders blue butterfly the following will be applied:

a. Fenders Blue Butterfly
   i. **FBB1**: No project included in this assessment will remove or disturb Kincaid's lupine, spur lupine (*Lupinus laxiflorus = L. arbustus*) or sickle- keeled lupine (*L. albicaulis*) within the range of the Fender's blue butterfly.
   ii. **FBB2**: No project included in the assessment will remove habitat including the following nectar sources: wild onion (*Allium amplectans*); cat's ear mariposa lily (*Calachortus tolmiei*); common camas (*Camassia quamash*); Oregon sunshine (*Eriophyllum lanatum*); and rose checkermallow (*Sidalcea virgata*) within the range of the Fender's blue butterfly.

Listed Fish (USDI 2013a)

1.4.5. Fish: To lesson adverse effects to bull trout the following measures will be applied:

b. Bull Trout
   i. Projects that would expose populations of bull trout to non-native fish such as brook trout or brown trout where such exposure does not currently exist must be approved by the USFWS Division or Field Manager.
   ii. The driving of steel or concrete piles within the wetted width of a stream or within the wetted area of a lake are not covered under this BO. If steel or concrete piles are to be driven adjacent to bull trout SR habitat, the action agencies will work with the USFWS Level 1 Team member to determine what (if any) site-specific PDCs or CMs are needed to reduce potential impacts to bull trout.

Listed Birds (USDI 2013a)

1.4.6. Birds: ARBO II attempts to minimize or avoid adverse effects to listed birds by implementing aquatic restoration actions outside of critical nesting period windows and/or outside of disturbance or disruption distances from occupied habitat. However, some aquatic restoration activities must occur within a listed bird critical nesting period or within a disturbance or disruption distance. A limited number of aquatic restoration activities that adversely affect listed birds will therefore occur under this proposed action.

a. Conditions common to all programmatic activities that will be applied to avoid disturbance or disruption of listed bird species include:

i. The proposed activities included in this document are consistent with the Northwest Forest Plan (USDA and USDI 1994a) and FS Land and Resource Management Plans and BLM Resource Management Plans as amended by the Record of Decision for Amendments to the Survey and Manage, Protection Buffer, and Other Mitigation Measures Standards and Guidelines, USDA Forest Service and USDI BLM (USDA and USDI 2001, USDA and USDI 2008 as amended by the 2011 agreement).
ii. The proposed activities do not include those that would result in loss of suitable habitat (on either public or private land) for the identified ESA- listed species.
iii. The proposed activities must have wildlife biologist input/analysis to proceed.
iv. As a general rule, a disruption site is defined as approximately 100 meters radius around the project site. However, the unit wildlife biologist has the discretion to adjust disturbance and disruption distances, based on site- specific conditions.

b. Northern spotted owl
i. **NSO1**: To reduce adverse effects to spotted owl, projects will not generally occur during the critical breeding period, generally between March1 – July 15, but may vary by location (July 7 for the Oregon North Coast Planning Province) if there is an active known owl site, predicted owl site (as determined through an approved modeling process), RPO (Reference Point Owl) and/or occupied habitat within the disruption distance of the project area. Projects should (a) be delayed until after the critical breeding season (unless action involves Type I helicopters, which extend critical nesting window to September 30); (b) delayed until it is determined that young are not present.
ii. **NSO2**: The unit wildlife biologist may extend the restricted season based on site-specific information (such as a late or recycle nesting attempt).
iii. **NSO3**: Table D-10 shows disruption distances applicable to the equipment types proposed in the ARBO II. These distances can be locally altered based on current information.
iv. **NSO4**: No activity within this BO will cause adverse effects to spotted owl critical habitat when analyzed against the appropriate local scale as determined by the unit wildlife biologist.
v. **NSO5**: For LW projects follow project design as outlined within section 22. e.
vi. **NSO6**: No hovering or lifting within 500 feet of the ground within occupied spotted owl habitat during the critical breeding season by ICS Type I or II helicopters would occur as part of any proposed action addressed by this assessment.

***Table D-10**. Disturbance, disruption (harass) and/or physical injury (harm) distance thresholds for Spotted Owls. Distances are to a known occupied spotted owl nest tree or suitable nest trees in unsurveyed nesting habitat.*

Project Activity	**No Effect (Mar 1 –Sept. 30)**	**NLAA** "may affect" disturbance distance **(Mar 1 – Sept. 30)**	**LAA – Harass** early nesting season disruption distance (**Mar 1–Jul 15**[1])	**LAA – Harass** late nesting season disruption distance (**Jul 16**[1]**–Sep 30**)	**LAA** – **Harm** direct injury and/or mortality (**Mar 1 – Sept. 30)**
Light maintenance (e.g., road brushing and grading) at campgrounds, administrative facilities, and heavily-used roads	>0.25 mile	≤ 0.25 mile	NA[2]	NA	NA
Chainsaws (includes felling hazard/danger trees)	>0.25 mile -	66 yards to 0.25 mile -	≤ 65 yards[3]	NA	NA
Burning (prescribed fires, pile burning)	>1 mile	0.25 mile to 1 mile	**≤** 0.25 mile[4]	NA	N A

NLAA = "not likely to adversely affect." **LAA** = "likely to adversely affect" **≥ is greater than or equal to, ≤ is less than or equal to.**
1. The exact dates are variable by physiographic province, and differences by locality. Work with the USFWS to select the proper dates when planning or implementing projects.

2. NA = not applicable. Based on information presented in Tempel and Gutiérrez (2003, p. 700), Delaney et al. (1999, p. 69), and Kerns and Allwardt (1992, p. 9), we anticipate that spotted owls that select nest sites in close proximity to open roads either are undisturbed by or habituate to the normal range of sounds and activities associated with these roads.
3. Based on Delaney et al. (1999, p. 67) which indicates that spotted owl flush responses to above-ambient equipment sound levels and associated activities are most likely to occur at a distance of 65 yards (60 m) or less.
4. Based on recommendations presented in *Smoke Effects to Northern Spotted Owls* (USFWS 2008e, p. 4).

c. Marbled Murrelet
   i. **MM1**: Projects will not occur within the applicable disruption and disturbance distances for marbled murrelets within their critical nesting period (Table D-11), unless a protocol survey determines marbled murrelets are not present. Otherwise the project would be LAA and either delayed until August 6 (with 2-hr timing restrictions) or until it is determined that young are not present or counted toward the limited number of LAA projects covered under this programmatic (with 2-hr timing restrictions).
   ii. **MM2**: Projects within the applicable disruption and disturbance distances for marbled murrelets implemented between August 6 and September 15 would not begin until 2 hours after sunrise and would end 2 hours before sunset.
   iii. **MM3**: No suitable, potential, or critical marbled murrelet habitat is to be removed or downgraded as part of this action.
   iv. **MM4**: Garbage containing food and food trash generated by workers in project areas is secured or removed to minimize attraction of corvids, which have been identified as predators of murrelet eggs and young.
   v. **MM5**: Table D-11 shows marbled murrelet disruption distances that are applicable to the proposed actions under this BO. Distances and times can be locally revised based on current information.
   vi. **MM6**: For LW projects follow project design as outlined within section 22. e.

Table D-11*. Disturbance, disruption (harass) and/or physical injury (harm) distance thresholds for Marbled Murrelet during the nesting season (April 1 to September 15). Distances are to a known occupied marbled murrelet nest tree or suitable nest trees in unsurveyed nesting habitat.*

Action	Action not likely detected above ambient levels	ACTION LIKELY DETECTED BY BREEDING MURRELETS disturbance distances	disruption distances	direct physical injury and/or mortality
Light maintenance (e.g., road brushing and grading) at campgrounds, administrative facilities, and heavily-used roads	> 0.25 mile	≤ 0.25 mile	NA[1]	NA
Chainsaws (includes felling hazard/danger trees)	>0.25 mile	111 yards to 0.25 mile	≤ 110 yards[2]	Potential for mortality if trees felled contain platforms
Burning (prescribed fires, pile burning)	>1 mile	0.25 mile to 1 mile	≤ 0.25 mile[3]	NA

1. NA = not applicable. We anticipate that marbled murrelets that select nest sites in close proximity to heavily used roads are either undisturbed by or habituate to the sounds and activities associated with these roads (Hamer and Nelson 1998, p. 21).
2. Based on recommendations from murrelet researchers that advised buffers of greater than 100 meters to reduce potential noise and visual disturbance to murrelets (Hamer and Nelson 1998, p. 13, USFWS 2012d, pp.6-9).
3. Based on recommendations presented in *Smoke Effects to Northern Spotted Owls* (USFWS 2008d, p. 4).

Appendix E: Herbicides Formulations and Adjuvants

The herbicides proposed for use in Oregon are a subset of the hundreds of herbicides registered for use in the United States. They were chosen by the BLM nationally for maximum effectiveness against wildland weeds and least environmental and non-target species' risks. Table B-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, and typical and maximum rates. **Table E-1, *General Constraints from Herbicide Labels***, supplements Table B-2, *Herbicide Information*, by listing a summary of general label constraints.

Herbicides can be categorized as selective or non-selective (see Table B-2). Selective herbicides kill only a specific type of plant. For example, an herbicide selective for broadleaved plants can be used to manage such species while maintaining desirable grass species in rangeland communities. Non-selective herbicides kill all types of plants, and thus must be applied only to the target species. Herbicides can be used selectively to control specific types of vegetation (e.g., killing a specific invasive 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 B-2).

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 C.F.R. 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 is the only restricted use herbicide analyzed in this EA.

Table E-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 F) and otherwise suitable for wildland use.

Table E-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 F) and are known not to contain R-11, POEA, petroleum, and other products prohibited by Mitigation Measures (see Appendix D), or that are otherwise considered unsuitable for wildland use. Table E-3 also identifies those adjuvants identified by the National Marine Fisheries Service and U.S. Fish and Wildlife Service in their 2013 *Biological Opinion for Fish Habitat Restoration Activities Affecting ESA-listed Animal and Plant Species and their Designated Critical Habitat found in Oregon, Washington and parts of California, Idaho and Nevada* (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 E-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 groundwater contamination. Groundwater contamination may occur in areas where soils are permeable or coarse and groundwater 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.
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.

Herbicides	General Constraints from Labels *(follow all label requirements)*
	• 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.
Hexazinone	• Do not apply directly to water, or to areas where surface water is present, or to intertidal areas below the mean high water mark. Do not contaminate water when disposing of equipment wash-water. • Use care where soils are permeable to avoid groundwater contamination. • Will kill grasses.
Imazapic	• Do not apply directly to water, or to areas where surface water is present, or to intertidal areas below the mean high water mark. • Do not contaminate water when disposing of equipment wash-water. • To reduce run-off, avoid applications when rain is forecast w/in 48 hours.
Imazapyr	• 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 groundwater 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. • Do not treat frozen soil. • Do not apply in or on irrigation ditches or canals, including their outer banks.

Herbicides	General Constraints from Labels *(follow all label requirements)*
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 groundwater under certain conditions as a result of label use. This chemical may leach into groundwater 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 groundwater. • 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.
Sethoxydim	• Avoid all direct or indirect contract with any desired grass crop (e.g. corn, rice, small grains, sorghum, and ornamental grasses and turfgrass). • Do not apply to grass weeds or crops under stress because of lack of moisture, hail damage, flooding, herbicide injury, or widely fluctuating temperatures. Unsatisfactory control may result. In irrigated areas, it may be necessary to irrigate before application to ensure active grass weed growth. • A minimum of 14 days is required between sequential applications. • Do not use selective application equipment such as recirculating sprayers, wiper applicators or shielded applicators. • Do not apply through any type of irrigation equipment. • Is rainfast 1 hour after application.

Table E-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	Albaugh, 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
Hexazinone	Pronone 10G	Pro-Serve	33560-21
Hexazinone	Pronone 25G	Pro-Serve	33560-45
Hexazinone	Pronone MG	Pro-Serve	33560-21
Hexazinone	Pronone Power Pellet	Pro-Serve	33560-41
Hexazinone	Velossa	Helena Chemical Company	5905-579
Hexazinone	Velpar DF	DuPont Crop Protection	352-581
Hexazinone	Velpar DF VU	Bayer Environmental Science	432-1576
Hexazinone	Velpar L	DuPont Crop Protection	352-392
Hexazinone	Velpar L VU	Bayer Environmental Science	432-1573
Hexazinone	Velpar ULW	DuPont Crop Protection	352-450

Active Ingredient	Trade Name	Manufacturer	EPA Registration Number
Hexazinone + Sulfometuron methyl	Oustar	Bayer Environmental Science	432-1553
Hexazinone + Sulfometuron methyl	Oustar	DuPont Crop Protection	352-603
Hexazinone + Sulfometuron methyl	Westar	Bayer Environmental Science	432-1558
Hexazinone + Sulfometuron methyl	Westar	DuPont Crop Protection	352-626
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
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

Active Ingredient	Trade Name	Manufacturer	EPA Registration Number
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
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 E-3. *Adjuvants Approved for Use on BLM Administered Lands*[1]

Adjuvant Type	Trade Name	Manufacturer	ARBO[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	

Adjuvant Type	Trade Name	Manufacturer	ARBO[2]
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)	
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	

Adjuvant Type	Trade Name	Manufacturer	ARBO[2]
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	
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.	

Adjuvant Type	Trade Name	Manufacturer	ARBO[2]
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.	
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.	✓

Adjuvant Type	Trade Name	Manufacturer	ARBO[2]
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.	
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	

Adjuvant Type	Trade Name	Manufacturer	ARBO[2]
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	
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.	

Adjuvant Type	Trade Name	Manufacturer	ARBO[2]
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.	
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 F: Herbicide Risk Assessment Summaries

The risk tables presented in this appendix are used in the individual analysis in Chapter 3 and Appendix G. This appendix was adapted from the Oregon FEIS (USDI 2010a:85-91).

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}[28]. 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 F-1 shows the three categories that the EPA uses for classifying herbicides (USDI 1992a).

***Table F-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

[28] or LC_{50} (lethal concentration) in the case of aquatic organisms.

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[29] 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: *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 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[30] 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 F-2). The Risk Assessments, related separate analyses, and the PEISs include analysis of degradates and other 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 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.

[29] Lethal or sub-lethal.
[30] An ecological entity such as a human, fish, plant, or slug.

***Table F-2**. Human Health and Ecological Risk Assessment Sources*

Herbicide	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
Fluroxypyr	BLM (2016)	
Glyphosate	Forest Service	
Hexazinone	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]	
Sethoxydim	Forest Service[2]	

1. Scoping/screening level Risk Assessment, not adopted by the BLM.
2. 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 PEIS and Oregon FEIS are the source for much of the individual herbicide information presented in each of the effects analyses 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 appendix.

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; and 4) using additives that increase spray viscosity. 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 to 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 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[31] 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. Thus, 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 (details provided in the individual Risk Assessments). 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.

[31] An herbicide not included in this analysis.

BLM Human Health Risk Assessments (2007 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

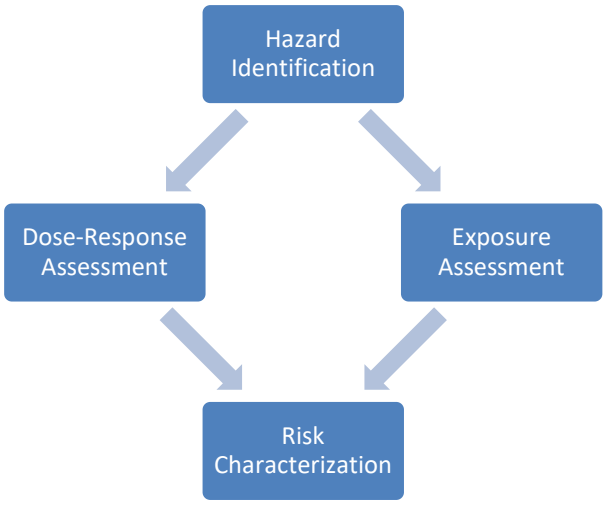
The ARI is a formula for combining LOCs for all exposure avenues (oral, dermal, inhalation), each with different uncertainty factors, and comparing them with the exposure levels that would occur in the scenarios in the Risk Assessments. ARIs less than 1 indicate a concern from at least one of the exposure avenues (USEPA 2001:51-55).

Forest Service Risk Assessments

The Forest Service Risk Assessments are very similar to the BLM's Ecological Risk Assessments. 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 LOC32 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

***Figure F-1**. Basis for Risk Assessments*



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 F-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).

[32] 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)

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, for example. Uncertainty factors are added to address hypersensitive individuals, or accommodate uncertainties in the measurements, such as inferring effects to one species based on actual tests on other species. Uncertainty factors are typically multiples of 10, so the assumed Lowest Observable Effects (LOAEL) dose could have been inflated 10, 100, or even 1,000 times for uncertainties. Thus, exposure of the average individual to the dose identified as having an effect, probably would not have an effect. Nevertheless, the L or low rating indicates risks start at that point. Moderate (M) 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 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 (see Conservation Measures in Appendix D). The zero, low, moderate, or high human health risk categories shown on Tables F-3 through F-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 F-3 and F-6 show herbicide risks to vegetation, from BLM and Forest Service Risk Assessments respectively. Tables F-4 and F-7 show herbicide risks to wildlife, fish, and aquatic invertebrates and Tables F-5 and F-8 show the risks to human health. Further information about the Human Health Risk Assessments can be found in the *Human Health and Safety* section of Chapter 4 of the Oregon FEIS.

Uncertainty in the Risk Assessment Process

The Risk Assessments conducted by the BLM and Forest Service incorporate various conservative assumptions to compensate for uncertainties in the Risk Assessment process. Within any of the steps of the human health risk evaluation process, assumptions were made due to a lack of absolute scientific knowledge. Some of the assumptions are supported by considerable scientific evidence, while others have less support. Every assumption introduces some degree of uncertainty into the risk evaluation process. Regulatory risk evaluation methodology requires that conservative assumptions be made throughout the Risk Assessment process to ensure that public health is protected. This conservatism, both in estimating exposures and in setting toxicity levels likely led to an exaggeration of the real risks of the vegetation management program to err on the side of protecting human health and other species.

Cumulative effects of long-term use of herbicides may have different outcomes than Risk Assessments can anticipate. Although identification of adverse effects from chronic exposures is one of the parameters examined in the Risk Assessment process, it is possible there are long-term sub-lethal effects on reproductive or migratory behavior from low concentrations of herbicides or additives that are not documented in the Risk Assessments.

See additional information about uncertainty near the end of Appendix 13 of the Oregon FEIS.

Table F-3. *BLM-Evaluated Herbicide Risk Categories[1] for Vegetation*

Application Scenario	Chlorsulfuron		Imazapic		Diflufenzopyr + Dicamba		Fluridone		Sulfometuron		Aminopyralid		Fluroxypyr		Rimsulfuron	
	Typ[2]	Max[2]	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max
Direct Spray																
Terrestrial plants	H[1] [1:1]	H [1:1]	L [1:1]	M [1:1]	M [1:1]	H [1:1]	NE	NE	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]	L [1:1]	M [1:1]	H [1:1]	H [1:1]	NE	NE	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]	L [1:2]	L [2:2]	M [1:2]	M [1:2]	0 [2:2]	0 [2:2]	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]	L [2:2]	M [2:2]	M [1:2]	H [1:2]	0 [2:2]	0 [2:2]	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	H [2:2]	NE	M [1:1]	NE	L [2:2]	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]	0 [18:18]	0 [13:18]	0 [5:6]	0 [4:6]	NE	NE	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]	0 [17:18]	0 [13:18]	L [3:6]	L [4:6]	NE	NE	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]	0 [36:36]	0 [34:36]	0 [12:12]	0 [12:12]	NE	NE	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]	0 [36:36]	0 [33:36]	0 [8:12]	0 [6:12]	NE	NE	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]	0 [42:42]	0 [42:42]	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]
Special Status terrestrial plants	0 [42:42]	0 [42:42]	0 [42:42]	0 [42:42]	0 [34:42]	0 [33:42]	NE	NE	0 [32:42]	0 [28:42]	0 [42:42]	0 [42:42]	0 [42:42]	0 [42:42]	0 [42:42]	0 [42:42]
Aquatic plants, pond	0 [64:84]	0 [53:84]	0 [80:84]	0 [62:84]	0 [70:84]	0 [67:84]	NE	NE	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]	0 [84:84]	0 [83:84]	0 [84:84]	0 [84:84]	NE	NE	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]	0 [9:9]	0 [9:9]	0 [9:9]	0 [9:9]	NE	NE	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]	0 [9:9]	0 [9:9]	0 [9:9]	0 [9:9]	NE	NE	0 [9:9]	0 [9:9]	0 [8:9]	0 [8:9]	0 [8:9]	0 [7:9]	0 [8:9]	0 [8:9]

Shading denotes herbicides that are limited by Mitigation Measures to typical application rates where feasible.

1. 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.

2. Typ = Typical application rate; and Max = Maximum application rate.

Table F-4*. BLM-Evaluated Herbicide Risk Categories[1] for Wildlife, Fish, and Aquatic Species*

Application Scenario	Chlorsulfuron		Imazapic		Diflufenzopyr + Dicamba		Fluridone		Sulfometuron methyl		Aminopyralid		Fluroxypyr		Rimsulfuron	
	Typ[2]	Max[2]	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[1]	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
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	0	0	0	0	L	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	0	0	0	0	L	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	0	0	0	0	L	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	0	0	0	0	M	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	0	0	0	0	L	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	0	0	0	0	H	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	0	0	0	0	L	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		Imazapic		Diflufenzopyr + Dicamba		Fluridone		Sulfometuron methyl		Aminopyralid		Fluroxypyr		Rimsulfuron	
	Typ[2]	Max[2]	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	L	M	0	0	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	0	0	0	0	L	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	L	M	0	0	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	0	NE	0	NE	M	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	0	NE	0	NE	H	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	0	NE	0	NE	M	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	0	NE	0	NE	H	NE	0	0 [2:2]	0 [4:4]	0 [2:2]	0 [3:4]	0 [2:2]	0 [4:4]
Off-Site Drift																
Non Special Status Species																
Fish, pond	0	0	0	0	0	0	NE	NE	0	0	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]
Fish, stream	0	0	0	0	0	0	NE	NE	0	0	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]

Application Scenario	Chlorsulfuron		Imazapic		Diflufenzopyr + Dicamba		Fluridone		Sulfometuron methyl		Aminopyralid		Fluroxypyr		Rimsulfuron	
	Typ[2]	Max[2]	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max
Aquatic invertebrates, pond	0	0	0	0	0	0	NE	NE	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	0	0	0	0	NE	NE	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	0	0	0	0	NE	NE	0	0	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]
Fish, stream	0	0	0	0	0	0	NE	NE	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	0	0	0	0	NE	NE	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	0	0	0	0	NE	NE	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	0	0	0	0	NE	NE	0	0	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]
Fish, stream	0	0	0	0	0	0	NE	NE	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	0	0	0	0	NE	NE	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	0	0	0	0	NE	NE	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	0	0	0	0	NE	NE	0	0	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]
Fish, stream	0	0	0	0	0	0	NE	NE	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	0	0	0	0	NE	NE	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	0	0	0	0	NE	NE	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. 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.

2. Typ = Typical application rate; and Max = Maximum application rate.

***Table F-5**. BLM-Evaluated Herbicide Risk Categories[1] for Human Health*

Receptor	Diflufenzopyr			Fluridone			Imazapic			Sulfometuron			Aminopyralid			Fluroxypyr			Rimsulfuron[3]		
	Typ[2]	Max[2]	Accid	Typ	Max	Accid	Typ	Max	Accid	Typ	Max	Accid	Typ	Max	Accid	Typ	Max	Accid	Typ	Max	Accid
Hiker/hunter (adult)	01	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[4]	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
Truck - applicator[4]	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. 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.

2. 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.

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. ATV and Truck categories include spot and boom/broadcast application scenarios.

***Table F-6**. Forest Service-Evaluated Herbicide Risk Categories[1] for Vegetation*

Scenario	2,4-D[2, 4]		Clopyralid		Dicamba		Glyphosate[3, 4]		Hexazinone		Imazapyr[3]		Metsulfuron methyl		Picloram[3]		Triclopyr[3,4]		Fluazifop-P-butyl[6]		Sethoxydim	
	Typ[5]	Max[5]	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	0.1[6]	0.375[6]	Typ	Max
Terrestrial Plants																						
Direct spray, susceptible plants	H[1]	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	M	M	M	M
Direct spray, tolerant plants	L	L	0	L	0	0	L	M	M	M	L	L	L	M	L	M	0	L	0	0	M	M
Off-site drift, low boom, susceptible plants	L [3:6]	L [3:6]	L [4:6]	M [3:6]	L [3:6]	H [3:6]	M [3:6]	M [4:6]	L [4:6]	M [3:6]	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]	0 [5:6]	0 [4:6]
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 [5:6]	0 [4:6]	0 [6:6]	0 [6:6]	0 [6:6]	0 [6:6]	0 [6:6]	0 [6:6]	0 [6:6]	0 [6:6]	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]	L [3:6]	L [4:6]	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]	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]	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]	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	0 [18:30]	0 [17:30]	H	H	0 [21:30]	0 [18:30]	H	H	L	M	0	0	0 [18:30]	0 [17:30]
Surface runoff, tolerant plants	0 [30:30]	0 [29:30]	0 [30:30]	0 [28:30]	0 [30:30]	0 [30:30]	0	0	0 [22:30]	0 [22:30]	L	M	0 [25:30]	0 [22:30]	0	0	0	0	0	0	0 [30:30]	0 [30:30]
Aquatic Plants																						
Accidental spill, susceptible macrophytes	H	H	H	H	NE	NE	H	H	NE	NE	H	H	H	H	NE	NE	H	H	NE	NE	NE	NE
Accidental spill, susceptible algae	H	H	L	L	H	H	H	H	H	H	L	L	M	H	H	H	H	H	H	H	M	M
Accidental spill, tolerant algae	L	M	0	0	0	L	M	M	H	H	0	0	L	M	0	0	M	H	L	L	M	M
Acute exposure, susceptible macrophytes	M	M	0	0	NE	NE	L	L	NE	NE	M	H	L	L	NE	NE	0	L	NE	NE	NE	NE
Acute exposure, susceptible algae	L	L	0	0	0	L	L	L	H	H	0	0	0	0	L	L	M	H	M	M	0	0
Acute exposure, tolerant algae	0	0	0	0	0	0	0	0	L	M	0	0	0	0	0	0	0	0	0	0	0	0
Chronic exposure, susceptible macrophytes	0	L	0	0	NE	NE	0	0	NE	NE	M	M	0	0	NE	NE	H	H	NE	NE	NE	NE
Chronic exposure, susceptible algae	0	0	0	0	0	0	0	0	M	M	0	0	0	0	0	0	0	0	L	M	0	0
Chronic exposure, tolerant algae	0	0	0	0	0	0	0	0	0	L	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. 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 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.

2. In the 2010 FEIS, 2,4-D maximum risk ratings were calculated at 4 lbs./acre, although the 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.

3. 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 FEIS.

4. Risk categories for the more toxic formulations are presented here.

5. Typ = Typical application rate; and Max = Maximum application rate.

6. Taken from scoping/screening level Risk Assessment Final Report (SERA 2014).

Table F-7*. Forest Service-Evaluated Herbicide Risk Categories[1] for Wildlife, Fish, and Aquatic Species*

Scenario	2,4-D[2,4]		Clopyralid		Dicamba		Glyphosate[3,4]		Hexazinone		Imazapyr[3]		Metsulfuron methyl		Picloram[3]		Triclopyr[3,4]		Fluazifop-P-butyl[6]		Sethoxydim	
	Typ[5]	Max[5]	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	0.16	0.376	Typ	Max
Mammals																						
Acute/Accidental Exposures																						
Direct spray, small mammal, 1st order absorption	0[1]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Direct spray, small animal, 100% absorption	L	L	L	L	0	0	0	L	L	L	0	0	0	L	0	0	0	L	0	0	0	0
Consumption of contaminated fruit, small mammal	L	L	0	0	0	L	0	L	0	0	0	0	0	0	0	0	0	L	0	0	0	0
Consumption of contaminated grass, large mammal	L	L	L	L	L	M	L	L	L	L	0	0	0	L	0	0	M	H	0	0	0	0
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	0	0	0	0
Consumption of contaminated water, small mammal, stream	NE	NE	0	0	0	0	NE	NE	0	0	NE	NE	0	0	NE	NE	NE	NE	0	0	0	0
Consumption of contaminated insects, small mammal	L	L	L	L	L	M	L	L	L	L	0	0	0	L	0	0	0	L	0	0	0	0
Consumption of contaminated small mammal, predatory mammal	L	L	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	L	0	0	0	0
Chronic Exposures																						
Consumption of contaminated vegetation, small mammal, on- site	M	M	0	0	0	0	L	L	0	0	0	0	0	0	L	M	L	M	L	M	0	0
Consumption of contaminated vegetation, small mammal, off- site	NE	NE	0	0	0	0	NE	NE	0	0	NE	NE	0	0	NE	NE	NE	NE	NE	NE	NE	NE
Consumption of contaminated vegetation, large mammal, on- site	L	L	0	L	0	0	0	0	L	M	0	0	0	0	0	L	M	H	L	L	0	0
Consumption of contaminated vegetation, large mammal, off -site	NE	NE	0	0	0	0	NE	NE	0	0	NE	NE	0	0	NE	NE	NE	NE	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	0	0	0	0
Birds																						
Acute/Accidental Exposures																						

Scenario	2,4-D[2,4]		Clopyralid		Dicamba		Glyphosate[3,4]		Hexazinone		Imazapyr[3]		Metsulfuron methyl		Picloram[3]		Triclopyr[3,4]		Fluazifop-P-butyl[6]		Sethoxydim	
	Typ[5]	Max[5]	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	0.16	0.376	Typ	Max
Consumption of contaminated grass, large bird	0	0	0	L	L	M	0	L	L	L	0	0	0	0	0	0	L	M	0	0	0	0
Consumption of contaminated insects, small bird	0	L	0	L	L	M	0	L	L	L	0	0	0	0	0	0	L	M	0	0	0	0
Consumption of contaminated small mammal, predatory bird	0	0	0	0	0	0	0	L	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Consumption of contaminated fish, predatory bird, spill	0	0	0	0	0	0	0	L	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chronic Exposures																						
Consumption of contaminated vegetation, large bird, on-site	0	0	0	L	0	0	L	L	0	0	0	0	0	0	0	L	L	M	L	M	0	0
Consumption of contaminated vegetation, large bird, off-site	NE	NE	0	0	0	0	NE	NE	0	0	NE	NE	0	0	NE	NE	NE	NE	NE	NE	0	0
Consumption of contaminated fish, predatory bird	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	L	0	0
Aquatic Species																						
Acute/Accidental Exposures																						
Fish (susceptible species[7]) – accidental spill	H	H	L	L	0	L	H	H	L	L	0	L	0	L	M	M	H	H	M	M	L	L
Fish (tolerant species) – accidental spill	L	L	0	0	0	0	M	H	0	L	NE	NE	0	0	0	L	M	H	M	M	L	L
Fish (susceptible species) – acute exposure, peak EEC	L	L	0	0	0	0	L	M	0	0	0	0	0	0	0	0	0	L	0	0	0	0
Fish (tolerant species) – acute exposure, peak EEC	0	0	0	0	0	0	0	L	0	0	NE	NE	0	0	0	0	0	0	0	0	0	0
Aquatic invertebrates – accidental spill	0	0	L	M	L	M	M	M	L	L	0	0	0	0	0	0	L	M	L	L	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	0	0	0	0
Chronic Exposures																						
Fish – chronic exposure	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NE	NE	NE	NE
Aquatic invertebrates – chronic exposure	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NE	NE
Insects																						
Acute Exposures																						
Direct spray, bee, 100% absorption	L	L	0	L	NE	NE	NE	NE	L	L	NE	NE	0	0	NE	NE	NE	NE	NE	NE	NE	NE
Consumption of fruit by a herbivorous insect	NE	NE	NE	NE	NE	NE	0	0	NE	NE	0	0	NE	NE	0	0	0	0	0	0	NE	NE
Consumption of broadleaf/small Insects by a herbivorous Insect	NE	NE	NE	NE	NE	NE	L	L	NE	NE	0	0	NE	NE	0	0	0	L	0	0	NE	NE

Scenario	2,4-D[2,4]		Clopyralid		Dicamba		Glyphosate[3,4]		Hexazinone		Imazapyr[3]		Metsulfuron methyl		Picloram[3]		Triclopyr[3,4]		Fluazifop-P-butyl[6]		Sethoxydim	
	Typ[5]	Max[5]	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	0.16	0.376	Typ	Max
Consumption of short grass by a herbivorous insect	NE	NE	NE	NE	NE	NE	L	L	NE	NE	0	0	NE	NE	0	0	0	L	0	0	NE	NE
Consumption of tall grass by a herbivorous insect	NE	NE	NE	NE	NE	NE	L	L	NE	NE	0	0	NE	NE	0	0	0	L	0	0	NE	NE

Shading denotes herbicides that are limited by Mitigation Measures to typical application rates where feasible.

1. 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.
2. In the 2010 FEIS, 2,4-D maximum risk ratings were calculated at 4 lbs./acre, although the 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.
3. 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 FEIS.
4. Risk levels for the more toxic formulations are presented here.
5. Typ = typical application rate; and Max = maximum application rate.
6. Taken from scoping/screening level Risk Assessment Final Report (SERA 2014).
7. Fish susceptible species include coldwater fish, such as trout, salmon, and federally listed species. Fish tolerant species include warm water fish, such as fathead minnows.

***Table F-8**. Forest Service-Evaluated Herbicide Risk Categories[1] for Human Health*

Scenario	2,4-D[2,4]		Chlorsulfuron		Clopyralid		Dicamba		Glyphosate[3,4]		Hexazinone		Imazapyr[3]		Metsulfuron methyl		Picloram[3]		Triclopyr[3,4]		Fluazifop-P-butyl[6]		Sethoxydim	
	Typ[5]	Max[5]	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	0.1[6]	0.375[6]	Typ	Max
Workers																								
General Exposures																								
Directed foliar and spot treatments (backpack)	L[1]	L	0	0	0	0	0	0	0	0	0	L	0	0	0	0	0	0	0	L	0	0	0	0
Broadcast ground spray (boom spray)	L	L	0	L	0	0	0	L	0	0	0	L	0	0	0	0	0	0	0	L	0	0	0	0
Aquatic applications	L	L	NE	NE	NE	NE	NE	NE	0	0	0	NE	0	0	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
Accidental/Incidental Exposures																								
Immersion of hands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wearing contaminated gloves	M	M	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	L	0	0	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	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	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	0	0	0	0
Direct spray - woman, lower legs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	L	0	0	0	0
Dermal - contaminated vegetation, woman	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	L	0	0	0	0
Consumption of contaminated fruit	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	L	0	0	0	0
Consumption of contaminated water - pond, spill	NE	NE	0	0	0	L	0	L	NE	NE	0	0	NE	NE	0	0	NE	NE	NE	NE	NE	NE	NE	NE

Scenario	2,4-D[2,4]		Chlorsulfuron		Clopyralid		Dicamba		Glyphosate[3,4]		Hexazinone		Imazapyr[3]		Metsulfuron methyl		Picloram[3]		Triclopyr[3,4]		Fluazifop-P-butyl[6]		Sethoxydim	
	Typ[5]	Max[5]	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	0.1[6]	0.375[6]	Typ	Max
Consumption of contaminated water - stream, ambient	NE	NE	0	0	0	0	0	0	NE	NE	0	0	NE	NE	0	0	NE	NE	NE	NE	NE	NE	NE	NE
Consumption of contaminated water - child	0	0	NE	NE	NE	NE	NE	NE	0	L	NE	NE	0	0	NE	NE	0	0	0	L	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	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	0	L	0	0
Chronic/Longer-term Exposures																								
Consumption of contaminated fruit	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	L	0	0	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	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	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	0	0	0	0

Shading denotes herbicides that are limited by Mitigation Measures to typical application rates where feasible.

1. 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.
2. In the 2010 FEIS, 2,4-D maximum risk ratings were calculated at 4 lbs./acre, although the 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.
3. 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 FEIS.
4. Where different formulations exist, risks reported are the most conservative.
5. Typ = Typical application rate; and Max = Maximum application rate.
6. Taken from scoping/screening level Risk Assessment Final Report (SERA 2014).

Appendix G: Issues Not Analyzed in Detail

Several issues identified during internal and external scoping were considered but not analyzed in detail in this EA. Issues are not analyzed in detail if:

- the issue does not respond to the purpose and need;
- there is no potential for significant effects related to the issue; or,
- the issue has already been appropriately analyzed in documents to which this EA tiers.

Issues analyzed in detail (Issues 1, 2, and 3) are included in Chapter 3.

Issue 4 (Native Vegetation): What are the effects of invasive plant treatments on desirable plant communities and Special Status plants?

The BLM received comments raising the concern of how other plants would be impacted by invasive plant treatments. Some comments expressed specific concerns related to herbicides and non-target plants (including rare plants) and effects to forest health. To consider this issue, the BLM looked at how the invasive plant program impacts native plant communities, Special Status plants, and forest health.

The effects of non-herbicide treatment methods on native plants are not analyzed in detail because they were adequately analyzed in the *Northwest Area Noxious Weed Control Program Final EIS and Supplement* (USDI 1985, 1987a) to which this EA tiers. Similar to the *Vegetation Treatments Programmatic Environmental Report*, that EIS describes that some injury or loss of non-target vegetation would occur but that, in the long-term, non-target species will become reestablished (USDI 1985:12, 40). The effects of most of the herbicides (i.e., all herbicides except sethoxydim and District-wide use of fluazifop-P-butyl) on native vegetation are not analyzed in detail because these effects were analyzed in NEPA analyses to which this EA tiers: the 2007 and 2016 PEISs (done at the national level), the 2010 Oregon FEIS, and the EIS done for the West Eugene Wetlands Resource Management Plan (USDI 2010a:139-155, USDI 2007a:4-44 to 4-76, USDI 2016a:4-25 to 4-41, USDI 2015a:172-187). There are no new circumstances or information at the District level that would change the effects anticipated for this EA. Application of fluazifop-P-butyl and sethoxydim would be highly limited in areal extent, consistent with Research and Demonstration purposes of application. Given the limited areas that they would be used in and their selectivity to grasses, there would be no potential for significant adverse effects.

As described in the Oregon FEIS, the Northwest Oregon District is composed of two biomes[33], the Western Forest Biome (including the Western Cascades and Oregon Coast Range) and the Willamette Valley Biome. The Western Forest Biome is dominated by dense conifer forests. The biome also includes sand dunes, meadows, marshes, bogs, rock outcrops, and woodlands. Dense shade producing forests are the least likely areas to provide opportunities for sun loving invasive plants to establish (Quigley and Arbelbide cited in USDI 2010a:140), but some species such as English ivy, false brome, garlic mustard, and blackberry have adversely affected native species in this biome. A 2008 forest inventory showed 47 percent of plots in the Oregon Coast Range and 68 percent of plots in the Western Cascades (across all ownerships) had invasive plants present, and 6.2 percent of all plant cover in forests was easily identifiable non-native weeds (Donnegan et al. 2008 cited in USDI 2010a:140). The Willamette Valley biome was historically dominated by native oak woodlands, oak savannahs, and upland or wet prairies. These areas have been largely transformed by cultivation, timber harvest, development, and invasive plants. With

[33] Areas with similar climatic conditions, geomorphology, and soils, which influences the composition and functioning of vegetative communities.

only remnant populations of native plants remaining, many unique Willamette Valley plant communities are imperiled (USDI 2010a:140).

There are 105 Special Status plants documented on the District, including 60 vascular plants, 16 liverworts, 13 mosses, and 16 lichens (USDA and USDI 2015). This includes four federally listed vascular plants. Special Status plants occur in a variety of habitats on the District, including open meadows, old growth forest, and aquatic systems. These rare species display narrow ecological amplitudes and are geographically restricted, making them particularly vulnerable to degradation from invasive plants (USDI 2010a:149). There are 58 Special Status plant species that are within 100 feet of an invasive plant species on 416 sites. Populations threatened by invasive plant infestations include three federally listed species: Willamette valley daisy, Bradshaw's lomatium, and Kincaid's lupine. As described in the Oregon FEIS, loss of native plant communities in the Willamette Valley biome has led to the Federal listing of Kincaid's lupine, golden paintbrush (suspected but not documented on the District), and Willamette Valley daisy (USDI 2010a:140). Invasive plants also contributed to the listing of Bradshaw's lomatium and Nelson's checkermallow.

As described in the Oregon FEIS, invasive plant treatments on the District would primarily benefit native vegetation in the long-term. Treatments would result in a short-term loss of native vegetation, but the long-term effects of these treatments are expected to benefit native ecosystems, as treatments reduce the density and distribution of invasive plant species. Invasive plant invasions displace native plants, adversely affecting the composition and structure of the plant community and thus the other elements of the ecosystem that are dependent on it. The Oregon FEIS lists the other effects of invasive plants on native plant communities including increased competition, decreased species diversity, and reduced structural complexity (USDI 2010a:148-149). The Oregon FEIS described that with limited treatment options and invasive plant species without effective treatment methods, native plant communities will suffer loss of native species and alteration of community function in the long term almost regardless of the level of effort or priority given to their consideration (USDI 2010a:152). The effectiveness of the treatment programs under each alternative on managing invasive plant populations is analyzed in detail in Chapter 3 (see Issue 1).

Although the protection of sites known to be occupied by Special Status species is a priority for BLM weed control efforts, success of those efforts will vary depending upon the likelihood of those sites being invaded and whether effective weed treatment tools are available (USDI 2010a:149). As described in the Oregon FEIS, there would be no potential for treatments of invasive plants to cause a significant effect to Special Status plants. Projects that have the potential to disturb Special Status plants and plant habitat require pre-project clearances, including review for potential habitat and surveys in suitable habitat to identify populations and necessary protection measures[34] (USDI 2010a:142-144).

The Oregon FEIS showed that the direct effects of invasive plant treatments on forest health, whether accomplished with herbicide or non-herbicide methods, are expected to be negligible (not be detectable or measurable). Though invasive plant treatments would be implemented to control the spread of invasive plants and not for the purpose of timber production, indirect effects of invasive plant treatments to timber production would be positive as invasive plants that compete with desirable conifers are removed (USDI 2010a:280). Treatments on invasive plants are generally focused on specific plants, and collateral damage to crop trees is rare (USDI 2010a:280). Invasive plants such as Scotch broom can populate a recently harvested site more quickly than native species and will compete with desired conifers if left untreated. While this results in decreased timber growth, the effects are gradual; current silvicultural methods are already dealing with some level of invasive plants. Yield predictions are based in part on the performance of existing stands, and quantifying the growth loss from the current or future percentage of invasive plants has not been done (USDI 2010a:281).

[34] For example, using spray shields, buckets, or tarps to protect nearby plants from drift during herbicide application.

The type of actions and the amount of treatments under all alternatives are wholly within the actions analyzed in the EISs to which this analysis tiers. All Standard Operating Procedures and Mitigation Measures analyzed in those documents would be applied to all alternatives.

Issue 5 (Fungi): How would invasive plant treatments affect fungi?

The BLM received a comment raising a concern about the potential for invasive plant treatments, especially herbicides, to harm fungi. This issue is not analyzed in detail because this issue has already been adequately analyzed in documents to which this EA tiers and there is no potential for significant effects.

There are a variety of fungi on the District including edible fungi (such as chanterelles, matsutakes, hedgehogs, oysters, morels, and king boletes) that are collected by the public and 24 Special Status fungi. Treatment methods that have the potential to impact fungi include manual methods, prescribed fire, and some herbicides. As described in the Oregon FEIS, 2,4-D, triclopyr, sulfometuron methyl, and glyphosate have been shown to inhibit the growth of fungi in laboratory experiments (USDI 2010a:144-147), although in studies using similar rates or amounts proposed for use on BLM-administered lands, fungi seemed unimpacted (USDI 2010a:144). Manual treatment methods could have the potential to affect fungi due to the potential to disturb the mycelia (the underground body of the fungi). However, there would be no potential for effects due to spatial differences. As described in the Oregon FEIS, invasive plant treatments in forest habitat would be primarily accomplished along rights-of-way, rather than healthy forests where species are dependent on the roots (ectomycorrhizae) of conifer trees (USDI 2010a:145). Fire has been shown to promote the fruiting of some fungi species, but prescribed fire used as an invasive plant treatment is not expected to affect mycelia; prescribed fires burn at lower temperatures than wildfires that would harm mycelia.

The type of actions and the amount of treatments under all alternatives are wholly within the actions analyzed in the EISs to which this analysis tiers. All Standard Operating Procedures and Mitigation Measures analyzed in those documents would be applied to all alternatives.

Issue 6 (Wildlife): How would integrated invasive plant management affect wildlife of conservation concern?

The BLM received several comments expressing concern about the potential for adverse effects from invasive plant treatments (especially herbicides) to wildlife. To consider this issue, the BLM looked at the program's effects on wildlife of conservation concern as representative species that have the potential to be affected by invasive plant treatments. Wildlife of conservation concern, for the purposes of this analysis, include Special Status wildlife species, bald and golden eagles, U.S. Fish and Wildlife Service Birds of Conservation Concern (USDI 2008e), Partners in Flight Species of Continental Concern (Rosenberg et al. 2016), and big game.

This issue is not analyzed in detail because the effects of the herbicides on wildlife were adequately 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 4-113, USDI 2016a:4-51 to 4-64). The effects of non-herbicide methods were previously described in the *Northwest Area Noxious Weed Control Program Final EIS and Supplement* (USDI 1985:43-47, 1987a) to which this EA tiers.

There are no new circumstances or information at the District 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 Northwest Oregon District manages approximately 714,000 acres of land with a wide variety of habitats including forest, meadows, dunes, oak woodlands, pine savannas, marshes, and streams. These habitats support a rich diversity of wildlife species. While some wildlife would benefit from or tolerate invasive plants (e.g. American black bear consuming Himalayan blackberry fruit), invasive plants seldom provide the same food and cover quality as native species (USDI 2010a:251). The International Union for the Conservation of Nature ranks invasive species as one of the top 10 threats to currently threatened species (IUCN 2008 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 to wildlife species (USDI 2010a:251-253). 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). The Oregon FEIS concludes that long-term beneficial effects to native wildlife populations occur with treatment of invasive plants as adverse habitat changes can result from invasive plants (USDI 2010a:252).

Under all alternatives, the type of actions and the amount of treatments are wholly within 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. Under the action alternatives, 95 percent of herbicide treatments on the Northwest Oregon District would be spot treatments to target specific plants, which would minimize effects to non-target species, including wildlife. Standard Operating Procedures and Mitigation Measures including limitations on the herbicide active ingredients 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 potential for adverse effects to wildlife species, including Special Status species. Effects to birds and pollinators are further described in Issues 7 and 8, respectively.

Issue 7 (Birds): How would treatments affect birds that may use potential treatment areas, especially during the nesting season?

The BLM received two comments expressing concern about invasive plant treatments disturbing birds. This issue is not analyzed in detail because these effects were adequately analyzed in the 2010 Oregon FEIS (USDI 2010a: 253-254) and the *Proposed Resource Management Plan and Final Environmental Impact Statement for the Bureau of Land Management West Eugene Wetlands Resource Management Plan* (USDI 2015a:85, 157). There are no new circumstances or information at the District level that would change the effects anticipated for this EA. The type of actions and the amount of treatments under all alternatives are wholly within the actions analyzed in the 2010 Oregon FEIS and the analysis for the West Eugene Wetlands Resource Management Plan.

The Oregon FEIS determined that birds would avoid the treatment area during treatment because of noise and activity (USDI 2010a:253-254). As described in the Oregon FEIS, disturbance may disrupt normal behavior to the extent that survival of adults is impaired or reproduction compromised. Effects would depend on the intensity of disturbance, extent of habitat affected, duration of the activity, and whether the activity occurs during a vulnerable time such as when the animal is restricted to a nest, breeding area, or winter range (USDI 2010a:253). Associated with herbicide application, 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). 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[35] (USDI 2010a:246-250). However, herbicide treatments on the Northwest Oregon District are done with hand-directed sprayers and applied selectively (i.e. 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 or maximum rates.

[35] 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 F, *Herbicide Risk Assessment Summaries*.

Specific to nesting birds, the Oregon FEIS found that 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.

The federally threatened streaked horned lark inhabits flat (less than 5 percent slope), treeless landscapes with sparsely vegetated ground cover of at least 300 acres in size or with visual access to open water or fields (USDI 2013b). Short-statured grasses and forbs are important habitat elements for horned larks. Control of invasive plants would benefit streaked horned lark, as this would increase the amount of short-statured native (as opposed to tall-statured non-native) grasses and forbs. Streaked horned larks occur at the West Eugene Wetlands, and no other habitat for the species occurs on the District. The effects of integrated vegetation management on this species is not analyzed in detail because effects would be consistent with the analysis in the FEIS for the *Proposed Resource Management Plan and Final Environmental Impact Statement for the Bureau of Land Management West Eugene Wetlands Resource Management Plan* (USDI 2015a:85, 157). The additional herbicides that would be authorized for use under the action alternatives are not expected to affect the streaked horned lark any differently than the herbicides already used in the species' habitat under the No Action Alternative.

The action alternatives are not expected to adversely affect the marbled murrelet or the northern spotted owl because proposed invasive plant treatments would not modify habitat and would not affect the northern spotted owl or marbled murrelet's prey species. Disturbance near nest sites of either species is not anticipated because projects are usually short in duration, spatially limited, and affected areas receive baseline disturbance from vehicle traffic and other activities. Northern spotted owls and marbled murrelets would likely be acclimated to the level of noise disturbance that BLM expects invasive plant treatments to generate.

Issue 8 (Pollinators): How would herbicide treatments affect pollinators, especially Special Status pollinator species?

The BLM received two comments expressing concern about herbicides harming rare pollinators. This issue is not analyzed in detail because the effects of the herbicides on wildlife were adequately analyzed in four NEPA analyses to which this EA tiers: the 2007 and 2016 PEISs, the 2010 Oregon FEIS, and the *Proposed Resource Management Plan and Final Environmental Impact Statement for the Bureau of Land Management West Eugene Wetlands Resource Management Plan* (USDI 2010a:241-257, USDI 2007a:4-96 to 4-113, USDI 2016a:4-51 to 4-64, USDI 2015a:174). There are no new circumstances or information at the District level that would change the effects anticipated for this EA.

Seven Special Status wildlife species serve as pollinators on the Northwest Oregon District: the western bumblebee, and six butterflies. The Oregon FEIS explains that adult honeybees were used as a surrogate for all invertebrates in Risk Assessments. The Risk Assessments (see Appendix F) indicate that there is low risk to honeybees or other insects in direct spray or vegetation consumption scenarios involving 2,4-D, clopyralid, fluroxypyr, glyphosate, hexazinone, and triclopyr at typical (fluroxypyr, glyphosate, and hexazinone) or maximum (clopyralid and triclopyr) rates and no risk from all other herbicides evaluated in this EA.

As described in the *Proposed Resource Management Plan and Final Environmental Impact Statement for the Bureau of Land Management West Eugene Wetlands Resource Management Plan*, several biological opinions from the U.S. Fish and Wildlife Service articulate the appropriateness and efficacy of fluazifop-P-butyl use for prairie restoration in the Willamette Valley, especially in and around Fender's blue butterfly sites. Research and Demonstration use would help the BLM evaluate the effectiveness of fluazifop-P-butyl in controlling non-native grasses in prairie restoration without adversely affecting native prairie plant species such as the host and nectar plants of Fender's blue butterflies (USDI 2015a:174).

The 2016 PEIS states that treatments that remove non-native plant 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 occurs in the short term, but in general the long-term effects of more effective methods to remove invasive plants would improve wildlife habitat (USDI 2016a:4-54-56).

The alternatives would conform with recommendations from the 2014 Presidential Pollinator Task Force; Standard Operating Procedures and Mitigation Measures for pollinators outlined in Appendix D conform to the *National Strategy to Promote the Health of Honey Bees and Other Pollinator*s. Conservation Measures were identified in the 2007 and 2016 Biological Assessments for Special Status species, including the following for Special Status insect pollinators:

- Do not use 2,4-D in TEP[36] 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.

Herbicide use may inadvertently cause the short-term damage of Oregon sunshine and other common nectar sources of Fender's blue butterfly, Taylor's checkerspot, and Oregon silverspot. It may also cause short-term damage to host plants[37] of these species (e.g., sickle-keeled lupine is a common native species and serves as a host plant for Fender's blue butterfly). As treatments would reduce the prevalence of invasive plant species, which are a major threat to all listed butterflies (USDI 2010e), such treatments would have long-term benefits to listed butterflies. BLM is consulting with the U.S. Fish and Wildlife Service on the effects of these five chemicals on listed butterflies. BLM will adopt any additional Project Design Criteria that result from this consultation.

The Risk Assessment indicates that fluroxypyr has a low risk under typical and maximum rates to susceptible pollinating insects 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 Northwest Oregon District:

- 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.

In addition, the following Project Design Feature provides additional protections to other pollinators of conservation concern:

- Apply Conservation Measures applicable to butterflies and moths, as appropriate, for other Bureau Sensitive terrestrial invertebrates.

Issue 9 (Turtles): How would the treatment of aquatic invasive plants affect the western pond turtle and painted turtle?

The BLM received two comments expressing concern about the effects of invasive plant treatments to aquatic wildlife. Aquatic wildlife species other than turtles are addressed in Issue 2 (see Chapter 3). This issue is not analyzed in detail; the effects of the herbicides on turtles were adequately 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 4-113, USDI 2016a:4-51 to 4-64).

[36] Federally listed as threatened or endangered, or proposed for such listing.
[37] A plant upon which an organism (such as an insect) lodges and subsists.

Effects of non-herbicide treatments are not analyzed in detail because there is no potential for significant effects. As described in Issue 2 (see Chapter 3), most manual and mechanical methods would cause temporary disturbances, but fauna would quickly return to the area. However, painted and western pond turtles often estivate at the bottom of ponds when temperatures are too hot (between mid-July and mid-August) or too cold (after mid-September to the start of May). The following Project Design Feature minimizes the potential for bottom barriers / weed mats to suffocate turtles and suction harvest/tractors to physically harm or kill individuals:

- Survey for western pond turtles and painted turtles before applying bottom barriers / weed mats or diver-assisted suction harvest/tractors in the habitat of these species[38] (e.g., ponds and streams/rivers with pools and/or coves). If either species is present, restrict these types of treatments to only occur between May 7 and July 15 or between August 15 and September 15.

Western pond turtles and painted turtles are Bureau Sensitive species that would benefit from treatments of aquatic invasive plant species under Alternative 3. Western pond turtles are not likely to inhabit ponds that are heavily infested with parrot feather or other aquatic invasive plants that form contiguous mats of vegetation (Chris Yee, Oregon Department of Fish and Wildlife Assistant District Wildlife Biologist, 2018 personal communication). Treatments are expected to improve habitat diversity to support various life stages and increase oxygen levels in turtle habitat.

Issue 10 (Fish and Aquatic Organisms): What are the effects of terrestrial herbicide treatments along streams to fish and aquatic organisms?

The BLM received comments raising the concern about what herbicide treatments along streams might do to fish and aquatic organisms. To consider this issue, the BLM looked at the invasive plant program within the riparian area (150 to 220 feet from waterbodies).

This issue was not analyzed in detail because there is no potential for significant effects to fish and aquatic organisms beyond the effects of herbicides that were described in the NEPA analyses to which this EA tiers; the 2007 and 2016 PEISs and the 2010 Oregon FEIS (USDI 2010a:208-240, USDI 2007a:4-36 to 4-4-96, USDI 2016a:4-41 to 4-51). The nature of the disturbance associated with terrestrial invasive plant treatments would not affect fish and other aquatic organisms, including those that are federally listed or Bureau Sensitive, or their habitat in dispersed areas across the District in any given year. Depending on the site, streamside treatments would remove invasive vegetation that often supports fewer native insects than native plant species, which could temporarily affect food availability for insectivorous fish species, such as salmonids (USDI 2010a:230). The BLM would apply herbicides consistent with the aquatic no-herbicide application buffers specified in the Aquatic Restoration Biological Opinion II (NMFS 2013) to all waterbodies with known or suitable habitat for Bureau Sensitive fish and other Bureau Sensitive aquatic species. The BLM would also confine the use of fluazifop-P-butyl to flat, dry ground located greater than 300 feet from any surface water connected to a stream network outside the West Eugene Wetlands. These actions are wholly within the actions evaluated in the EISs to which this EA tiers, and no new or changed circumstances apply to change the effects of those actions at the scale evaluated in this EA.

Issue 11 (Human Health): What are the effects to human health from incidentally coming into contact with herbicides used on BLM-administered lands?

The BLM received several comments expressing concern that human health would be adversely affected by herbicide use. These comments raised concern that the recreating public could inadvertently be harmed, but also

[38] This can be identified during the interdisciplinary team review of the Annual Treatment Plan.

expressed concern that more susceptible populations (including children, pregnant women, the elderly, sick people, and those with chemical-sensitive conditions) or populations that regularly consumed or came into contact with contaminated vegetation, water, or wildlife might be even more at risk.

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 District level that would change the effects anticipated for this EA.

The administrative boundaries of the Northwest Oregon District include the largest metropolitan areas (Portland, Eugene, and Salem) in Oregon. As described in Issue 25, over 2.5 million recreators visit the District's recreation sites annually. As described in Issue 21, local Tribes have treaty rights on BLM-administered lands which allow them to hunt, fish, gather, and 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.

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 F 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 G-1 and G-2 display a summary of information showing the herbicides that have 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. Human health Risk Assessments include scenarios that address subsistence populations and Native American populations (see Appendix F).

***Table G-1**. Human Health Herbicide Risk Summary, Public*

Herbicides	**Risk Category** (worst-case scenario, one or more scenarios)				**How Often Herbicide Would be Used**	
	Typical rate	**Maximum rate**				
		Direct Spray	*Dermal Exposure*	*Consumption of Contaminated Substance*[2]	*No Action Alternative*	*Action Alternatives*
2,4-D[3]	0	L[1]	0[1]	0[1,2]	<1% (Cascades Field Office)	5%[4]
Clopyralid	0	0	0	L (water)	<1% (West Eugene Wetlands)	7%
Dicamba	0	0	0	L (water)	1% (Cascades Field Office)	5%
Fluazifop-P-butyl	0	0	0	L (fish)	<1% (West Eugene Wetlands)	<1%
Glyphosate[3]	0	0	0	L (water)	98% (Cascades, Tillamook, and Marys Peak Field Offices and West Eugene Wetlands)	19%
Triclopyr[3]	0	L[1]	L[1]	L[1,2] (water and fruit)	<1% (West Eugene Wetlands)	23%

1. Limited by Mitigation Measures to typical rate where feasible.
2. Contaminated vegetation, fruit, water, or fish. Consumption of contaminated mammals was not evaluated for human health; large mammalian carnivores had detectable 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.
4. 2,4-D would generally be used as part of a tank mix (to prevent resistance). 2,4-D by itself would be used less than 1 percent of the time.

***Table G-2**. Summary of Effects of Herbicides[1] on Human Health*
Additional information about the risk ratings discussed below can be found in Appendix F, *Herbicide Risk Assessment Summaries*.

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.
Clopyralid	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.
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.
Fluazifop-P-butyl	There is low risk to subsistence population consuming fish from fluazifop-P-butyl applications at the maximum rate after an accidental spill into a pond.
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 Issue 14.
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), the 2016 PEIS (USDI 2016a:4-87 to 4-103), and the fluazifop-P-butyl Risk Assessment (SERA 2014).

Ratings are based on various exposure scenarios. Standard Operating Procedures and Mitigation Measures including limitations 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. All of the herbicides proposed for use in the action alternatives have zero risk at typical rates. As shown in Appendix C (*Treatment Key*), 2,4-D, dicamba, and triclopyr would not be used at the maximum rates. However, clopyralid, fluazifop-P-butyl, and glyphosate would be used at the maximum rate for a few species. Specifically,

- Clopyralid would be used to control species in the hawkweed and Canada thistle species groups.
- Fluazifop-P-butyl would be used on perennial grasses.
- Glyphosate would be used on snapdragons, perennial peas, perennial grasses, perennial mustards, miscellaneous herbaceous (perennial and annual), and buttercup species groups.

The only scenarios with risk that are theoretically possible under the alternatives are associated with an accidental spill of herbicides into water:

- a low risk to the public from consuming clopyralid contaminated water after an accidental spill;
- a low risk to a subsistence population from eating contaminated fish after an accidental spill of fluazifop-P-butyl; or,
- a low risk to a small child from consuming glyphosate contaminated water after an accidental spill.

As described in the 2010 Oregon FEIS, accidental spills directly into water are not expected to occur; targeted application methods and Protection Measures would prevent these scenarios from happening. Clopyralid and fluazifop-P-butyl are not registered for aquatic use and would be buffered from any waterbodies (see Appendix C for buffers).

The Oregon FEIS describes that the Risk Assessments apply uncertainty factors (multiplying the lowest observable effects by a factor of 10, 100, or even 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 of 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). The *Human Health* sections of those Risk Assessments also include scenarios with children and women (see Appendix F, *Herbicide Risk Assessment Summaries*).

In addition, there would be no potential for effects due to spatial and temporal differences. Treatments in this EA are targeted towards invasive plants, which – with some exceptions – are not plant species being collected or ingested. Triclopyr would 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 typically happen when fruit is not present, either during the flowering stage or in the fall when the leaves start to turn yellow. Signs are posted at treatment areas to inform the public of the application of herbicides. Similarly, most fungi on the Northwest District emerge after the rains begin later in the fall and are done fruiting by early winter. Invasive plant treatments are not conducted when mushrooms (the fruiting body of the fungi) are present, and as described in Issue 5, fungi are generally not expected to occur where invasive plants occur.

Standard Operating Procedures, PEIS Mitigation Measures, and Oregon FEIS Mitigation Measures designed to reduce potential unintended effects to human health are listed in Appendix D. Specific Standard Operating Procedures and Mitigation Measures pertinent to this analysis include:

- Prepare an operational and spill contingency plan in advance of treatment.
- 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[39].
- Use the typical application rate, where feasible, when applying 2,4-D and triclopyr[40] 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.
- 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.
- Conduct mixing and loading operations in an area where an accidental spill would not contaminate an aquatic body.
- 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.
- 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.

[39] A Project Design Feature states that Annual Treatment Plans will be presented to the Tribes showing planned treatments. Any resultant coordination will identify if treatments should be delayed, where cultural features must be avoided or protected, and where posting signs would help Tribe members avoid areas (see Issue 21).
[40] An Oregon FEIS Mitigation Measure stating, "do not apply triclopyr by any broadcast method" is not applied in this analysis because an updated Risk Assessment for triclopyr found zero risk for all worker and public exposure scenarios at the typical rate.

Herbicide use under all alternatives would be scattered and infrequent (typically once per year at a site) and not comparable to industrial uses on neighboring farms or timberlands (USDI 2010a:744). The BLM manages 6.7 percent of the land within the Northwest Oregon District boundary and the BLM use of herbicides is a small fraction (0.01 percent) of the pounds of pesticides used in the water basins containing these District-managed lands (ODA 2009). Herbicides would not be sprayed aerially and drift reduction strategies would be applied to spot and broadcast treatments.

As detailed in the Protection Measures, the BLM would notify the public prior to herbicide applications. The Northwest District sends news releases to local newspapers and signs treatment areas prior to the treatment. An Annual Treatment Plan would be prepared prior to the beginning of control treatments each year and the resulting Determination of NEPA Adequacy, or additional NEPA analysis if warranted, would be made available to the public on ePlanning and shared with the Tribes as part of ongoing consultation (see also Issue 21). In addition, the BLM is in the process of making NISIMS, the database that contains spatial information on invasive plant infestations, accessible to the public, which will allow the public to access data about invasive plant sites.

The type of actions and the amount of treatments under all alternatives are wholly within 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.

Issue 12 (Human Health): What are the hazards to workers treating invasive plants?

The BLM received comments raising the concern that workers treating invasive plants could be harmed. 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 District level that would change the effects anticipated for this EA.

As described in the *Human Health and Safety* section of the Oregon FEIS, there are difficulties in establishing correlations between work conditions and disease and only certain illnesses have been linked to occupational hazards in national and state-level studies (USDI 2010a:343). Manual, mechanical, and chemical treatments can all present health hazards to workers. Hazards could include falling objects (e.g. when cutting trees such as the invasive tree-of-heaven and hawthorn), 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 G-3 shows herbicides that have some level of risk (greater than 0) to applicators in one or more Risk Assessment-modeled scenario.

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

Herbicides	Risk Category (worst-case scenario, one or more scenarios)			How Often Herbicide Would be Used		
	Typical rate	Maximum rate	Accidental Exposure	No Action Alternative	Alternative 2	Alternative 3
2,4-D	L	L[1]	M	<1% (Cascades Field Office)	5%[2]	5%[2]
Chlorsulfuron	0	L	0	Not used	3%	3%
Dicamba	0	L	0	1% (Cascades Field Office)	5%	5%
Fluridone	0	0	L-H	Not used	Not used	<1%
Hexazinone	0	L[1]	0	Not used	<1%	<1%
Rimsulfuron	0	0	M-H	Not used	<1%	<1%
Triclopyr	0	L[1]	L	<1% (West Eugene Wetlands)	23%	23%

1. Limited by Mitigation Measures to typical rate, where feasible.
2. As part of a tank mix. 2,4-D by itself would be used less than 1 percent of the time.

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 or eye irritation to applicators (USDI 2007a:4-184, USDI 2010a:350).
- Fluridone can cause reversible eye irritation (USDI 2007a:4-183, USDI 2010a:348).
- Workers applying hexazinone face low risk from spills on lower legs and wearing contaminated gloves. The most likely effects would include skin, eye, and respiratory tract irritation (USDI 2007a:4-184, USDI 2010a:350).
- Rimsulfuron has risks in accidental scenarios. It may cause reversible eye irritation. Long-term exposure at high rates (repeated accidental exposure) can cause health effects targeting multiple organs (USDI 2016a:4-102).

Further information about these modeled scenarios can be found in each herbicide's human health Risk Assessment (See Appendix F, *Herbicide Risk Assessment Summaries*).

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. BLM complies with Standard Operating Procedures, Mitigation Measures, and Occupational Safety and Health Administration (OSHA) standards and industry and manufacturers' recommendations, which reduces potential exposure and injury to workers (USDI 2010a:344-345). Herbicide treatments on BLM-administered lands in Oregon are 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 by completing a one-week EPA-compliant training course.

No injuries to herbicide applicators from herbicide exposure have been recorded for at least the past 20 years on BLM-administered lands in Oregon (Erin McConnell, Oregon BLM State Weed Coordinator, 2018 personal communication).

The type of actions and the amount of treatments under all alternatives are wholly within 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.

Issue 13 (Human Health): What are effects to human health of mixing two or more herbicides? What are the effects from adjuvants and other ingredients mixed with herbicides? What are the effects from the degradates when herbicides break down?

The BLM received several comments raising the concern that too many things were unknown about herbicides and these unknowns may have the potential to harm human health. Specific concerns included tank mixes, adjuvants, inerts, and degradates.

This issue was not analyzed in detail because the 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 District level that would change the effects anticipated for this EA. The effects described in Issue 11 (incidental / public exposure) and Issue 12 (worker exposure) reflect the potential effects of using two or more herbicides in combination, adjuvants or other ingredients added to an

herbicide product, and degradates. 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 (USDI 2010a:87).

The BLM is prohibited by law from disclosing the actual inert ingredients because they are considered proprietary information. However, the *Adjuvants, Impurities, and Other Ingredients* section in the Oregon FEIS describes the BLM analysis of inerts (USDI 2010a:63). The BLM maintains a list of specific products known to contain only the materials (including inerts and other ingredients) analyzed in the Risk Assessments. The list of approved herbicides and formulations is updated annually (see Appendix E). This nationally approved herbicide formulations list is based on the Risk Assessments, which included evaluations of common tank mixes and current research on synergistic effects (with other pollutants found in water, for example). Some formulations (brands) approved for use on BLM-administered lands contain more than one herbicide active ingredient. Others can be mixed in the field (tank mix). BLM can only use herbicides in combinations if each one is included on the BLM-approved herbicide list and the label allows for the combination. All herbicides included in the combination must be registered for the type of land being treated (forestland, rangeland, etc.). The Risk Assessments consider risks from mixing two herbicides together in a tank mix, assuming the products act in an additive manner. When two or more active ingredients are used, the risk ratings and Mitigation Measures for all ingredients apply; they are not averaged. The combination may be more hazardous to non-target plants than any of the individual herbicides being mixed; for example, a few ounces of 2,4-D are sometimes added to other herbicides to increase effectiveness and decrease the likelihood of missing otherwise resistant plants (USDI 2010a:62).

Prediction of potential toxic effects from single or synergistic exposure to herbicides and their adjuvants, inerts, and degradates, natural and synthesized, necessarily involves incomplete and unavailable information regarding the complexity and unpredictability of potential multiple exposures. To address these uncertainties, the Risk Assessments use the most conservative observed response and then apply uncertainty factors at each step. The combination (product) of these uncertainty factors can be in the tens of thousands in cases where test results were sparse or uncertain; the factors applied at each step depend on the level of confidence at that step that the results will apply to the full range of potentially affected individuals (USDI 2010a:87).

Issue 14 (Human Health): What are effects to human health of using glyphosate, which a California court recently found to be cancer-causing, the International Agency for Research on Cancer (IARC) has declared a cancer hazard, and has been found in breakfast cereal?

The BLM received a comment expressing concern about the potential of glyphosate to cause cancer. This issue was not analyzed in detail because 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 District level.

Endocrine disrupting chemicals, predominately found in man-made materials, are suspected of causing endocrine-related cancers (breast, endometrial, ovarian, prostate, testicular and thyroid) (Bergman et al. 2012). The Oregon FEIS discussed the potential for glyphosate to act as an endocrine disruptor as analyzed in the Risk Assessments[41], stating, “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” (USDI 2010a:350).

[41] The Oregon FEIS discusses results from a 2002 Risk Assessment. The 2011 Risk Assessment (SERA 2011a), also done by SERA, includes no new information that would change the analysis.

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 JMPR and the IARC were "different, yet complementary" noting "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." 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). Based on evidence presented showing IARC's classification of glyphosate and their evidence submitted in support of that classification, in August 2018, a California Superior Court jury ruled that glyphosate had caused the cancer of a groundskeeper (Levin and Greenfield 2018).

In June 2016, Reuters reported that court documents from an ongoing legal case against Monsanto (the maker of RoundUp herbicide products) 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, a U.S. National Cancer Institute epidemiologist, 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 and made plans to require cancer warnings on products. Monsanto challenged the product-labeling as "unwarranted on the basis of science and the law" (Plum 2017) and in February 2018, a Federal judge in U.S. District Court ruled that "Given the heavy weight of evidence in the record that glyphosate is not in fact known to cause cancer, the required warning is factually inaccurate and controversial" (National Association of Wheat Growers et al. v. Lauren Zeise, director of OEHHA, et al., U.S. District Court, Eastern District of California, No. 17-cv-02401).

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). Similar conclusions were found in a recent review and meta-analysis of available research examining glyphosate exposure and the risk of lymphohematopoietic cancers (which includes non-Hodgkin lymphoma and leukemia) found a "positive and marginally statistically significant association with the use of glyphosate," but "the overall body of literature is methodologically limited and findings are not strong or consistent" and that bias and confounding (the presence of another variable that may influence the results) were possible. As a result, the report said a causal relationship between glyphosate and lymphohematopoietic cancers could not be established (Chang and Delzell 2016).

In August 2018, a report published by the Environmental Working Group found that trace amounts of glyphosate were in all but 2 of the 45 products it had tested that were made with conventionally grown oats (Temkin 2018). In response, Monsanto issued a statement, saying:

> *It is not uncommon to find trace amounts of pesticides in food since some food is grown using pesticides, which protect crops from insects, disease, and weeds. Importantly, these levels are not even remotely close to any level of concern. Regulatory authorities have strict rules when it comes to pesticide residues. The Environmental Protection Agency (EPA), for example, sets daily exposure limits at least 100 times below levels shown to have no negative effect in safety studies.*

> *Even at the highest level reported by the EWG (1,300 ppb), an adult would have to eat 118 pounds of the food item every day for the rest of their life to reach the EPA's limit.* (Monsanto 2018)

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 (USDI 2010a:344).

Issue 15 (Human Health): What are the effects to human health from invasive plants (allergies, rashes, etc.)?

The BLM received a comment expressing concern about the spread of invasive plants having human health effects, such as increased incidences of allergies and rashes from coming into contact with invasive plants. This issue was not analyzed in detail because the issue does not relate to how the alternatives respond to the purpose and need, nor would the alternatives have a potential for significant effects related to this issue. Invasive plants can cause harm to human health ranging from scrapes from thorns (e.g., blackberry), rashes and burns from chemical compounds produced by a plant (e.g., giant hogweed), or allergic reactions to pollen. One of the factors considered by the State in weed risk assessments during the listing process for noxious weeds is how poisonous, injurious, or otherwise harmful to humans and/or animals the species is (ODA 2017). While it is one of the listing criteria, many noxious weeds do not have an adverse impact on human health; the species meets other criteria sufficient for listing. Some species such as tansy ragwort and Scotch broom produce pollen that can cause allergic reactions, but this characteristic is not unique to invasive plants and the effects from that one species cannot be distinguished from native species that are also concurrently producing pollen. Similarly, native plants such as poison oak, poison ivy, and stinging nettle that could repopulate an area formerly occupied by invasive plants can cause skin irritation. Though invasive plants are controlled to varying degrees in the alternatives, the effects to human health associated with effects such as allergies and burns across the District cannot be distinguished.

Issue 16 (Soil): How do herbicides detrimentally affect soils?

The BLM received comments expressing concern about herbicides moving through and persisting in the soil and harming soil microbiota as well as non-target vegetation that may grow in the soil. 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:178-187, USDI 2007a:a4-16, USDI 2016a:4-10 to 4-13) and additional analysis at the District level would not change the conclusions from the Oregon FEIS and the 2007 and 2016 PEISs. Proposed herbicide use would not cause negative effects to soil due to the limited scale (an average of 450 acres per year under the No Action Alternatives and 750 acres under Alternatives 2 and 3) and methods of herbicide application (almost entirely spot treatments under the No Action and 95 percent spot treatments under the action alternatives). In addition, if there were site conditions in which adverse effects could occur (e.g., broadcast treatments), the BLM would apply Protection Measures that minimize the potential for effects.

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, slope, and vegetative cover) (USDI 2010a:178-187, USDI 2007a:4-16, USDI 2016a:4-10 to 4-13). Soils on the District range in texture classes from sandy loams to clays (weighted average of 23 percent clay), and are high in organic matter (weighted average of 14 percent), meaning soils within the District have high adsorption capacity and herbicides applied to soils may attach to and potentially move with them (USDI 2010a:179-181, USDI 2007a:4-14, USDI 2016a:4-11). In the cases where herbicides move down through the soil, the main concern is groundwater contamination (discussed further in Issue 17).

The Oregon FEIS describes that in the event herbicides do make contact with the soil, herbicides affect few soil organisms directly (USDI 2010a:178). While there are varying amounts of information available for each herbicide,

chlorsulfuron, picloram, and metsulfuron methyl would reduce the presence of soil biota for a period of up to three weeks; the remaining herbicides have no or slight adverse effects (USDI 2010a:182-185, USDI 2007a:4-16, 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. Hexazinone and imazapyr have little data about their effects to soil life, and available studies had application rates many times higher than proposed for BLM-administered land (USDI 2010a:178).

Fluazifop-P-butyl and sethoxydim, proposed for use in limited areas for research and demonstration, were not analyzed in the EISs to which this document tiers. These herbicides would not be expected to have short (within the growing season of the treatment) or long term (after the growing season of the treatment) soil effects due to their chemical characteristics and because each would only ever be used on 15 acres or less per field office. The Risk Assessment for fluazifop-P-butyl discusses adverse effects on terrestrial arthropods at the treated site, and explains that 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). Sethoxydim's Risk Assessment indicates it is relatively non-toxic to terrestrial animals including some invertebrates at higher application rates than are proposed in this EA (SERA 2001).

The type of actions and the amount of treatments under all alternatives are wholly within 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 (see Appendix D). Given the quantity used and the distribution across the District, localized effects to soil function from all other herbicides would be negligible (not be detectable or measurable).

Issue 17 (Water): How do herbicides treating terrestrial weeds affect water quality, including ground and surface water used for domestic and municipal supply?

The BLM received comments expressing concern that herbicides may inadvertently end up in surface and groundwater that could be used for drinking, irrigation, or other human uses. 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:204-206, 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 type of actions and the amount of treatments under all alternatives are wholly within the actions analyzed in the 2010 Oregon FEIS and 2016 PEIS.

The routes for herbicides to contaminate water include accidental spills, drift into streams from spraying, runoff (e.g., from a rainstorm soon after application), and leaching through soil into groundwater. The potential for groundwater contamination is influenced by depth to groundwater, soil conditions, and rainfall. The proportion of herbicide that is on or in the plant, soil, and water after application influences whether an herbicide will runoff or drift; application method, weather conditions (application timing), herbicide formulation and application rate, and amount and type of vegetation and groundcover influence this proportion (Kerle et al. 2007). The potential for impacts from herbicide drift, runoff, or spills would be reduced by Standard Operating Procedures that require buffers from water; the Oregon FEIS describes that buffers are effective at reducing the movement of herbicide to streams (Berg 2004, Dent and Robben 2000, Rashin and Graber 1993 all cited in USDI 2010a:205). The BLM would primarily use spot treatments for herbicide applications because the applicator can target specific plants and minimize herbicide contact with the soil or water. Drift reduction agents would be used when necessary. The BLM would apply herbicides primarily during the dry season (May through September with applications outside this period only if rainfall is not expected) allowing time for microbial, chemical, and photo degradation prior to rainfall.

During preparation of the Annual Treatment Plan, the BLM would identify domestic water sources, areas with shallow groundwater, and areas of groundwater-surface water interaction and suggest appropriate treatment methods to minimize the risk of herbicide leaching. There are many exempt uses for groundwater that do not require a water right (OWRD 2013) so it is possible that unknown wells exist on BLM-administered land. BLM notification of adjoining landowners prior to herbicide application gives the public an opportunity to disclose the location of water systems so the BLM can implement water quality protection measures. In conjunction with the interdisciplinary team review of the Annual Treatment Plan, District hydrologists would consult these records to make sure that water right holders are aware of proposed herbicide treatments in their area, and to eliminate or minimize the risk of water contamination. Wells or springs, when proximate to treatment areas, would be buffered from herbicide treatments.

If herbicides do reach domestic-use water sources despite Protection Measures, Risk Assessments for human consumption of contaminated water show no risk at typical rates of application for all herbicides and low risk for clopyralid, dicamba, triclopyr, and glyphosate applied at the maximum rate (see Issue 11 for additional detail). Mitigation Measures limit triclopyr application to the typical rate where feasible, and BLM would apply clopyralid at typical to less than maximum application rates, thereby reducing the already low risk associated with these herbicides.

Issue 18 (Water): How do herbicide treatments of aquatic invasive plants affect water quality?

As described in Issue 17, the BLM received comments that requested analysis for the potential for herbicides to affect water quality. This issue examines the use of herbicide treatment of aquatic invasive plants as proposed under Alternative 3. This issue was not analyzed in detail because effects were previously described in the analysis for the 2007 PEIS and the Oregon FEIS (USDI 2010a:205) and there are no new circumstances or information at the District level that would change the effects anticipated for this EA. All of the herbicides proposed for treatment of aquatic invasive plants in this EA were analyzed in the PEIS and the Oregon FEIS. The Oregon FEIS concluded that treating aquatic invasive plants would result in improved water quality (USDI 2010a:205).

There are 8,225 miles of water quality limited streams and lakes within the analysis area, some of which are impaired due to the presence of aquatic invasive plants. Under Alternative 3, fluridone and aquatic formulations of 2,4-D, glyphosate, imazapyr, and triclopyr would be available to treat submerged and floating aquatic invasive plants and emergent aquatic invasive plant infestations. Although these herbicides could be applied across the Northwest Oregon District, at present, the only aquatic infestations known to occur on the District include areas that total less than one acre: three sites at the Hult Pond (parrot feather) and one site along Kelly Creek (yellow flag iris). These aquatic treatments are a high priority for the Northwest Oregon District to prevent them from spreading further.

As described in Chapter 2, 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. Aquatic invasive plants in streams and rivers would only be treated with herbicides when water levels are at their lowest and the invasive plants that were previously submerged or floating are no longer in flowing water: 2,4-D, glyphosate, imazapyr, and triclopyr would be applied to the plants above the water line (foliage sticking out of the water or foliage on banks that had previously been submerged).

As described in the 2007 PEIS, glyphosate dissipates rapidly from surface water through adsorption to organic substances and inorganic clays and by biodegradation. It does not photodegrade, and in water has an estimated half-life of 12 days to 10 weeks (USDI 2007a:4-30). The salt formulation of 2,4-D is registered for use in aquatic systems. There are conflicting conclusions regarding biodegradation of 2,4-D in aquatic systems. Biodegradation can take place in bottom sediments if the appropriate microbial population is present and the pH level is

sufficiently high, but it is not likely to occur in the water column (USDI 2007a:4-30). Imazapyr is water soluble and potentially mobile (SERA 2011b). Imazapyr is rapidly degraded by sunlight in aquatic solutions, with a half-life of approximately 2 days that decreases with increasing pH (USDI 2007e:4-30). Triclopyr TEA (the aquatic formulation) is soluble in water and photodegrades in several hours with adequate sunlight. Field studies have shown that it dissipates from water, with a half-life ranging from 0.5 to 10 days and a sediment dissipation half-life ranging from 3 to 13 days. The rate of degradation in water is generally dependent on water temperature, pH, and sediment content (USDI 2007a:4-31).

Water quality is not degraded when fluridone is used at a concentration of less than 20 ppb, and there are no label restrictions against swimming, fishing, or drinking treated water (Washington Department of Ecology 2002). Whole-lake treatments using fluridone are possible because the herbicide does not cause a rapid plant kill, which would otherwise result in oxygen-depleted water and reduced water quality (USDI 2010a:197). A Project Design Feature adopted for this EA would delay treating side channels and connected backwaters with any herbicide until periods of low flow or when the mainstem river is disconnected (see Chapter 3, Issue 2).

Issue 19 (Air): How would the alternatives affect air quality?

The BLM received a comment that requested analysis of the potential for invasive plant treatments to generate dust or vehicle emissions. 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 District level that would change the effects anticipated for this EA. Those documents concluded that prescribed fire is the only treatment method with the potential to affect air quality and that herbicide applications do not have an effect.

In general, the air quality in Northwest Oregon is good but with persistent problem areas where strong inversions tend to trap either carbon monoxide (CO) or particulate matter at certain times of the year concentrated around inland valleys. 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. The Northwest Oregon district includes the following National Ambient Air Quality Standards non-attainment or maintenance areas: Portland Metro, Salem, Eugene-Springfield, and Oakridge. The District includes the following Smoke Sensitive Receptor Areas: the entire floor of the Willamette Valley, Oakridge, Astoria, Tillamook, Lincoln City, and Newport (ODF 2016). Air quality and smoke clearances on the District are regulated by Oregon Department of Forestry and Lane Regional Air Protection Agency.

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 CO, nitrogen oxides (NO_x), sulfur dioxide (SO_2), and Volatile Organic Compound (VOCs) and 0.2 percent of particulate matter (PM) (USDI 2010a:167). 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 NO_x, VOCs, and PM (USDI 2010a:167). The Oregon FEIS did not discuss the effects of aminopyralid, fluroxypyr, or rimsulfuron; 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 are wholly within 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, including evaluating weather conditions prior to implementing treatments and coordinating with officials to obtain all applicable smoke management permits and ensure that burn plans comply with regulations and would minimize adverse effects. On the Northwest Oregon 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. All alternatives would have no effect on air quality.

Issue 20 (Air): How would the alternatives affect climate change, including greenhouse gas emissions and carbon storage?

The BLM received a comment that requested analysis of the potential for invasive plant treatments to affect greenhouse gases and climate change. 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 District 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:174).

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 Alternative 2 and Alternative 3 from 1,275 acres (No Action Alternative) to 1,013 acres (Alternative 2 and 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 are wholly within 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 (an average of 3,000 gross acres), there would be no difference in carbon storage between the alternatives. Alternative 2 and Alternative 3 would reduce invasive plant spread (see Issue 1 in Chapter 3), so there would be a net carbon storage capacity increase associated with those alternatives (USDI 2010a:173-174).

Issue 21 (Traditional and Cultural Uses): How would the treatment of invasive plants affect plant resources used by Native Americans 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 District level that would change the effects anticipated for this EA. The risk of adverse effects is further minimized as a result of a Project Design Feature included with the action alternatives, which requires additional consultation or coordination, if requested by the Tribe, to avoid conflict with tribal resource use.

Four federally recognized tribes have historic ties to the lands managed by the Northwest Oregon District of the BLM. These include ancestral or aboriginal lands and ceded lands, as well as usual and accustomed places. Historically, Native Americans managed, gathered, and utilized a wide array of plants from these lands. Tribal members today continue to gather culturally important plants from public lands for a multitude of purposes, and continue to 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 and often keep the location of these sites private; therefore, the BLM does not have knowledge of them. These areas are often considered sacred sites and places of traditional and cultural importance. The BLM manages the sites of which it is aware, in consultation with Tribes. In preparation of the *Resource Management Plans of Western Oregon*, to which this EA tiers, Tribes identified an interest in managing for culturally important plants within riparian habitat areas along the coast, though Tribal use is not limited to these areas (USDI 2016e:801). A list of common cultural plants of importance to Tribes in western Oregon was compiled for the Resource Management Plan and is incorporated by reference in this EA (USDI 2016e:1644).

Culturally important plants may occur near invasive plant treatment 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). Issues 11 through 14 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 Issue 11 and Table G-2, *Summary of Effects of Herbicides on Human Health*), the actual effects would be minimal because of how the herbicides are applied under all alternatives (spot sprayed in 95 percent of herbicide treatments, at lower rates than analyzed in the Risk Assessments) and because of Protection Measures described in Appendix D that are applicable to all alternatives. These include posting treated areas with signs 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 Issues 11 through 14 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 are wholly within 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 following Project Design Feature, included in the analysis of Alternatives 2 and 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 for the season, Annual Treatment Plans would be presented to potentially affected Tribes showing planned treatments and treatment areas. If these Tribes request coordination or consultation regarding proposed treatments, the BLM would seek to avoid conflict with tribal resource use by modifying the timing of treatments or posting signs to allow Tribal members to avoid treated areas. These proposed modifications would be determined in coordination with the Tribe and are not limited to those stated above. Additionally, modification to Annual Treatment Plans may be requested in order to avoid adverse affects to cultural features. Ultimately, a line officer will make an informed decision regarding the level of modification appropriate through tribal coordination or consultation.

Coordination may occur using a variety of methods. For example, the Tribes could share this information in Tribal newsletters and social media or work with the BLM to conduct seasonally appropriate site-specific field trips.

Additional information about the effects of treatment methods on non-target vegetation can be found in Issue 4 and effects from the consumption of treated vegetation can be found in Issue 11. Issue 11 also discusses how the public and Tribes will be notified of proposed herbicide treatments.

Issue 22 (Environmental Justice): How would the use of herbicides affect minorities and low-income populations?

The BLM received a comment that requested analysis of the effects of the alternatives on populations that could be considered environmental justice populations. This issue was not analyzed in detail because this issue was addressed in the 2010 Oregon FEIS (USDI 2010a:251-253). There are no new circumstances or information at the District level that would change the effects anticipated for this EA.

This EA incorporates by reference information presented in the *Proposed Resource Management Plan / Final Environmental Impact Statement for Resource Management Plans for Western Oregon* for the identification of the communities meeting environmental justice criteria within the Northwest Oregon District (USDI 2016e:725-733). Low-income and poverty populations are scattered throughout District boundaries (USDI 2016e:Map 3-9). Minority populations tend to be clustered in the Willamette Valley around the Portland and Salem metropolitan areas with a few populations and tribal lands located around Lincoln, Benton, Polk and Yamhill Counties (see USDI 2016e:Map 3-8).

The type of actions and the amount of treatments under all alternatives are wholly within 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. The FEIS analysis found a potential for contract and other crews to include a small disproportionate number of minority, poor (defined as below Federal poverty standards), or both 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 protection measures that 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. Issues 11 and 12 address the potential for public and worker exposure to herbicide and non-herbicide treatments and finds that while there is the potential for risk to workers or the public under some scenarios, that risk is low under all alternatives. The FEIS analysis also notes that the natural resources used for cultural or subsistence purposes would be adversely affected by the spread of invasive plants; this adverse effect would be greater under the No Action Alternative (USDI 2010a:333).

Issue 23 (Socioeconomics): What are the impacts to local timber production, forest products, agriculture, and recreation economies from the management of invasive plants in the Northwest Oregon District?

The BLM received comments concerning the effects of the invasive plant program on surrounding resource-based land uses such as forest-dependent industries, agriculture, and recreation. This issue was not analyzed in detail because the potential for significance of these effects was previously analyzed in the selected alternative for the 2010 Oregon FEIS and 2016 PEIS. That analysis concluded that the management of invasive plants by the BLM has an indirect beneficial effect on those parts of the local economy that rely on natural resource values (USDI 2010a:309) and that the level of risk to commercial activities on public lands and adjacent private property would not be affected by the alternatives (USDI 2016a:4-86). There is no new information at the District level that would change the effects anticipated beyond those considered in the 2010 Oregon FEIS and 2016 PEIS.

The Northwest Oregon District manages approximately 714,395 acres of public lands in 14 counties (see Map 1-1) and the administrative boundaries include the largest metropolitan areas in Oregon (Portland, Eugene, and Salem). Communities in the growing urban centers of the Willamette Valley value public land for recreational, commodity, and non-commodity uses (USDI 2010a:319). Outside of these urban areas, agricultural traditions are valued and are a part of the culture of many Oregonians. The forest products industry is important throughout the western Oregon regional economy, albeit not as large a percentage as other Districts in Oregon (such as Roseburg, Coos Bay, and Klamath Falls Resource Area) due to the overall size and diversity of the contributing components of the economy (USDI 2016e:667). Similarly, the Northwest Oregon District has the highest visitor-day counts and highest recreation values of any district in western Oregon (USDI 2016e:612).

The 2010 Oregon FEIS and 2016 PEIS describe how invasive plant management activities on BLM-administered lands would affect local economies (USDI 2010a:318, USDI 2016a:4-82). Invasive plants result in direct economic losses on agriculture and timber lands where invasive plants compete with desired crop species, which leads to lost harvest and land value (ODA 2014). Invasive plants can also limit recreation access and degrade the resource that the recreation relies on (e.g., water, wildlife, etc.) (USDI 2010a:304-305). Management of invasive plants contributes to costs that take away from overall economic benefits through increased unit costs and decreased profit margins (USDI 2010a:343). However, despite these costs, management of invasive plants reduces economic impacts overall. The 2010 Oregon FEIS states that treatments under the action alternatives would result in improvements in the conditions of BLM resources and would lead to increases in commodity, non-commodity, and non-market values (e.g. improved recreation opportunities or habitat improvements)(USDI 2010a:343).

A 2014 report described the direct negative economic impacts associated with resources losses from noxious weeds in the state of Oregon, the additional costs associated when noxious weeds expand to new areas, and the positive return on investment associated with control (ODA 2014[42]). That study estimated annual income losses of $83.5 million to the State's economy from 25 noxious weed species. If left uncontrolled, the study identified annual losses reaching $1.8 billion in personal income and 40,800 jobs (ODA 2014). Two of the 25 selected noxious weeds, Himalayan blackberry and Scotch broom (the latter being a particular problem in forests) are abundant (across western Oregon and on the Northwest Oregon District) and contribute $79.6 million to the current overall economic impact. A similar analysis found that in Washington State, invasive species created losses of $239.5 million in agriculture, $120 million in the livestock industry, $125 million in the timber industry, and $20 million in recreation. Scotch broom was found to be one of the most costly plant species (Community Attributes Inc. 2017). While neither of these studies was specific to the Northwest Oregon District, both demonstrate that invasive species have an economic effect on resources, lands, and opportunities.

The type of actions and the amount of treatments under all alternatives are wholly within the actions of the selected alternative 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. For example, as described in Issue 25, treatments would be scheduled to avoid peak recreational use times. Additionally, treatments with herbicides in developed recreation sites would be spot treatments to individual plants (not broadcast treatments), which would limit potential exposure to visitors. 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 (USDI 2007e).

Adjacent landowners, county, State, and other Federal lands benefit from the BLM having a broader range of herbicides available for consideration. Having the appropriate range of herbicides available to manage the invasive plants in the Northwest Oregon District would improve the BLM's ability to prevent invasive plant spread from BLM-administered lands to private, county, State, and other Federal lands. The effectiveness of herbicides on invasive plant management across boundaries is analyzed in detail under Issue 1 (see Chapter 3).

[42] ODA (2014) is an updated version of the Radtke and Davis (2000) report that was referenced in the Oregon FEIS.

Issue 24 (Socioeconomics): What is the potential for herbicide contamination of yards, gardens, organic farms, vineyards, and bee hives on private lands?

The BLM received comments raising a concern about herbicides drifting onto private lands that may support farms, gardens, and other agricultural uses. This issue was not analyzed in detail because effects were previously described in the analysis of the selected alternative for the 2010 Oregon FEIS and the 2016 PEIS (USDI 2010a:145, USDI 2016a:4-81). That analysis concluded that private lands are protected from BLM-applied herbicides by Standard Operating Procedures to prevent off-site movement from the treatment site. There is no new information at the District level that would change the effects anticipated for this EA beyond those considered in the 2010 Oregon FEIS and 2016 PEIS. The type of actions and the amount of treatments under all alternatives are wholly within the actions analyzed for the selected alternative in the 2010 Oregon FEIS and 2016 PEIS. The same Standard Operating Procedures and Mitigation Measures analyzed in those documents would be applied to all alternatives in this EA.

The 2010 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 that concluded those procedures would prevent effects on private land. The Standard Operating Procedures are also common to all alternatives in this EA and preclude ground spraying within 100 feet of a residence without written permission from the owner or occupant.

The herbicides that the BLM uses have very low vapor pressures and would not travel further than 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. Under the No Action Alternative, 85 percent of treatments would be with non-herbicide methods and almost all herbicide treatments would be spot treatments. Under the action alternatives, herbicide use would increase to 75 percent of treatments, but spot treatments would still be the method of application 95 percent of the time. Aerial applications have not and would not be used. Drift and methods for drift control are discussed further in Appendix F, *Herbicide Risk Assessment Summaries*.

Bees would not be directly affected by the BLM's herbicide use. The effects from herbicides to pollinators would be related to habitat (vegetation) loss, but treatments proposed under the alternatives would be small: 85 percent of known sites are less than 1 acre (see Table A-1, *Summary of Invasive Plants Documented in NISIMS by Infestation Size*). The alternatives would conform with recommendations from the 2014 Presidential Pollinator Task Force; Standard Operating Procedures and Mitigation Measures for pollinators outlined in Appendix D conform to the *National Strategy to Promote the Health of Honey Bees and Other Pollinator*s. The effects of herbicides on pollinators are addressed in Issue 8 and the effects of herbicides on vegetation are described in Issue 4.

Issue 25 (Recreation): How will invasive plant management affect the management and use of recreation sites?

The BLM received comments concerning the effects of the invasive plant program on access to public recreation opportunities. 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, recreation sites may be

temporarily closed, 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 reentry requirements of the herbicide label. When recreation sites are closed, BLM posts signs noting the exclusion area, the duration of the exclusion, and nearby alternative recreation areas that would provide substantially similar recreation opportunities. 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, which 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 District had 2,590,340 visitors in 2017. 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. Popular recreation sites on the District include Fishermen's Bend Campground, Shotgun Creek Day-Use, Yaquina Head Outstanding Natural Area, Carpenter's Bypass Trails, Upper Nestucca Off Highway Vehicle Trails, Shotgun Creek Off Highway Vehicle Trails, Sandy Ridge Trails, Wildwood Day-Use, and Fall Creek Trails. In total, the District has 38 developed recreation sites and numerous trailheads into trail systems such as the Molalla Shared Use Trail System and Table Rock Wilderness. Invasive plant species line recreation access roads and in some locations such as Fishermen's Bend, cover nearly the whole 177-acre site. As stated in a Standard Operating Procedure, most treatments would be scheduled to avoid peak recreational use times. Treatments with herbicides in developed recreation sites would generally be spot treatments[43] to target specific plants, which would limit potential exposure to visitors.

The type of actions and the amount of treatments under all alternatives are wholly within 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 effects of herbicides on human health in situations that are applicable to recreators are discussed in Issue 11 earlier in this EA. Recreation is also discussed in Issue 26.

Issue 26 (Recreation): What are the effects of herbicides on dogs, horses, and other pets that accompany recreationists?

The BLM received a comment raising a concern about the effects of herbicides on dogs. In consideration of this concern, the BLM also looked at the effects of herbicides on other pets that may accompany recreationists. This issue was not analyzed in detail because there is no potential for significant effects to pets and other animals that accompany recreationists (e.g., horses, dogs, llamas). As described in Issue 25, existing Protection Measures (Appendix D) such as temporary closures would limit the exposure of recreationists to herbicides. When feasible, treatments would be scheduled to avoid peak use and most treatments are spot treatments targeting individual plants in small areas (85 percent of sites are less than one gross acre) minimizing the likelihood that people and animals would be exposed. As required by existing Protection Measures (see Appendix D), treatment areas are posted to alert people to avoid areas and further minimize exposure potential.

Risk Assessments (summarized in Appendix F) indicate potential risks to small and large mammals. While there is some level of risk to some mammals under certain scenarios, these particular scenarios are unlikely to be applicable to pets or other domesticated animals. The Risk Assessments indicate that there is 0 risk to mammals under all direct spray scenarios (dermal exposure to herbicides) except for 100 percent absorption scenarios for 2,4-D, clopyralid, glyphosate, metsulfuron methyl, and triclopyr, where there would be a low risk. There is a potential for moderate or high risks to large mammals (e.g. horses) if they were to consume grass treated with

[43] While broadcast treatments are allowed 5 percent of the time under the action alternatives when herbicides are used, this would happen less than 1 percent of the time in developed recreation areas.

dicamba or triclopyr, but dicamba and triclopyr would not be used to treat invasive grasses (see Tables C-1 and C-19, *Treatment Key*) and the scenario assumed that the large mammal would feed on contaminated grass for an entire day (see Appendix F). Scenarios that involve small or large mammals consuming contaminated insects or smaller mammals are all 0 or low risk (see Appendix F). Because of the level of risk to mammals from these herbicides, the nature of invasive plant treatments, and Protection Measures applicable to all alternatives, adverse effects to pets because of exposure would not occur under any alternative.

Issue 27 (Wilderness / Wilderness Study Areas): How will invasive plant management affect Wilderness or Wilderness Study Areas on the District?

The BLM received a comment concerning the protection of special management areas by controlling invasive plants. To consider this issue, the BLM looked at how the invasive plant program affects Wilderness and Wilderness Study Areas. This issue was 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 District 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 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 more 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, which 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 4-79).

The type of actions and the amount of treatments under all alternatives are wholly within 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 Alternative 2 and Alternative 3 would allow the District to selectively treat invasive plants with fewer retreatments.

Issue 28 (Visual): Would the use of invasive plant treatments affect the visual quality of the landscape?

The BLM received a comment expressing concern that the use of herbicides would affect the visual quality of the landscape by leaving large dead areas and that many invasive plants are pretty. 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 District 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 would 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 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, which 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 are wholly within 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 Northwest Oregon District, treatments would not be noticeable at the viewshed scale; under the action alternatives, 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 D) 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.