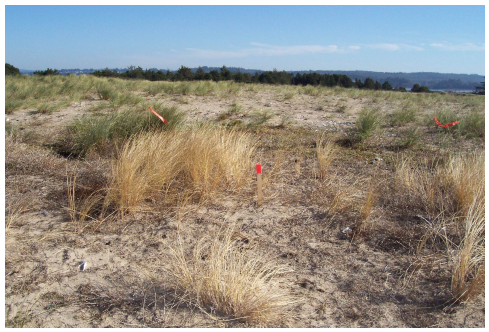
Gorse

Tansy ragwort & cinnibar moth



European beachgrass

Canada thistle

Scotch broom

Integrated Invasive Plant Management for the Coos Bay District

Environmental Assessment

(June 2018)

(DOI-BLM-ORWA-C000-2017-0003-EA)

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

Coos Bay District
1300 Airport Lane
North Bend, OR 97459

BLM
COOS BAY DISTRICT
June 2018

Acronyms and Abbreviations

ACEC	Area of Critical Environmental Concern
A.E.	Acid Equivalent
A.I.	Active Ingredient
ALS	Acetolactate synthase
APHIS	Animal and Plant Health Inspection Service
ARBO II	Aquatic Restoration Biological Opinion (2013)
BEE	With triclopyr, butoxyethyl ester
BLM	Bureau of Land Management
CFR	Code of Federal Regulation
CWMA	Cooperative Weed Management Area
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
FEIS	Final Environmental Impact Statement
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
GUS	Groundwater Ubiquity Score
HUC	Hydrologic Unit Code
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
LOC	Level of Concern
NEPA	National Environmental Policy Act
NISIMS	National Invasive Species Information Management System
NMFS	National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
OAR	Oregon Administrative Rule
ODA	Oregon Department of Agriculture
ODEQ	Oregon Department of Environmental Quality
ODFW	Oregon Department of Fish and Wildlife
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	Polyoxyethylenamine, a surfactant found in some glyphosate formulations
SHPO	State Historic Preservation Office
TEA	With triclopyr, triethylamine salt
TEP	Federally listed as threatened or endangered, or proposed for such listing
TMDL	Total Maximum Daily Load
WHO	World Health Organization
WQRP	Water Quality Restoration Plan

Table of Contents

Tables

Figures

Maps

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

Chapter 1 – Purpose and Need

The Coos Bay District manages approximately 322,700 acres of public lands[1] located primarily in Curry, Coos and Douglas Counties with smaller portions in Josephine and Lane Counties[2] (see Map 1-1; maps are located at the end of this printed document or in a separate downloadable file, available on the Bureau of Land Management (BLM) ePlanning website). The District is proposing to update its existing integrated noxious weed management program on these lands. The District currently controls noxious weeds following existing BLM policy and direction and a district-wide 1997 *Integrated Noxious Weed Program on the Coos Bay District Environmental Assessment* (EA) and Decision Record, using a range of methods including manual (hand-pulling), mechanical (mowing, string trimmers, discing), biological control agents, targeted grazing, competitive seeding and planting, prescribed fire, and herbicides (primarily glyphosate, but also limited amounts of 2,4-D, dicamba, and picloram).

Invasive plants are nonnative 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 County-, State-, or federally-listed as injurious to public health, agriculture, recreation, wildlife, or any public or private property.

Thus, the term "invasive plants" includes noxious weeds in this EA (Oregon FEIS – USDI 2010a).

The District proposes to update and expand this program by:

- Broadening the scope of the program to include terrestrial invasive plants as well as noxious weeds;
- Increasing the herbicide active ingredients[3] available for use; and,
- Using additional non-herbicide control methods, including weed barrier mats and propane torch spot treatments.

The proposed updates to the 1997 plan allow the use of treatment methods that are generally more selective, provide better control, and have fewer adverse environmental effects. The additional herbicides are generally effective at lower rates, control a wider range of invasive plants species, decrease the potential for herbicide resistance, and can be used to make associated non-herbicide methods more available and more effective (USDI 2010b:19-25). Allowing the treatment of all invasive plants permits the District to protect resources threatened by species that are not listed as noxious weeds. This would better align the program with the principles of integrated pest management: protecting, maintaining, and restoring ecologically diverse and properly functioning native plant communities on public lands (USDI 2008a).

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

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

[1]The 2018 *Western Oregon Tribal Fairness Act* begins the conveyance of just under 10,000 acres of Coos Bay District lands in the Umpqua Field Office to the Confederated Tribes of the Coos, Lower Umpqua and Siuslaw Indians. Once the conveyance is complete, the BLM would no longer treat invasive plants on those acres, but they are considered in this analysis since the conveyance has not been completed.

[2] Approximately 3,740.5 acres of the Coos Bay District are administered by the Medford District. The effects of BLM's invasive plant program on these acres were analyzed in the Medford District's 2017 *Integrated Invasive Plant Management EA* (USDI 2017a).

[3] 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 B.

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

A 1984 U.S. District Court injunction, amended in 1987, had limited the BLM to using only four herbicides and restricting their use to noxious weeds only (USDI 2010a:3). This injunction was amended following completion of the 2010 Oregon FEIS and Record of Decision permitting the use of additional herbicides and targeting additional species once site-specific *National Environmental Policy Act* (NEPA) analysis was completed.[4] These analyses must be tiered to the Oregon FEIS, the 2007 PEIS, or subsequent analysis[5] at the national or state level.

This EA examines the environmental effects of BLM's proposal to expand and update its integrated weed management program at a site-specific scale within the District. It will replace the Coos Bay District's 1997 *Integrated Noxious Weed Program on the Coos Bay District Environmental Assessment* (USDI 1997).

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

The Need

Species of terrestrial invasive plants on the District have been mapped on over 18,000 gross[6] acres (over 2,000 net acres) in over 19,000 separate known locations[7], with individual locations ranging from a few plants to a 251-acre site (net) of Himalayan blackberry (*Rubus armeniacus*). In addition, there are tens of thousands of acres of unmapped invasive plants known on the District; for example, European beachgrass (*Ammophila arenaria*) is estimated to occupy over 1,500 acres. Despite the efforts of the existing noxious weed program, noxious weeds[8] are continuing to spread at an estimated rate of 10 percent per year (USDI 2010a:595).

For some noxious weed species such as Canada thistle (*Cirsium arvense*), neither non-herbicide methods nor the four herbicides currently available on the District provide effective control. The existing program also does not have an effective method for selectively[9] controlling a host of other invasive plants that are not noxious weeds, such as wild radish (*Raphanus* species*)*, false dandelions (*Hypochaeris* species), big quakinggrass (*Briza maxima*), ripgut brome (*Bromus rigidus)*, or reed canarygrass (*Phalaris arundinaceae)*.

[4] In addition, the injunction states that BLM shall not aerially spray herbicides west of the Cascade crest and shall not spray herbicides for the production of livestock forage or timber production.
[5] Such as the 2016 PEIS.
[6] Gross acres are the area of land defined by drawing a line around the general perimeter of the infestation; the net acres are the actual acres of canopy cover of the plants.
[7] Summarized on Table 2-1 in Chapter 2.
[8] Noxious weeds are a subset of invasive plants that are County, State, or federally listed as injurious to public health, agriculture, recreation, wildlife, or any public or private property.
[9] 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 unaffected.

Herbicides that are more selective are available to treat invasive plants. These herbicides are effective at lower quantities and pose less environmental and human health safety risk[10] than the herbicides the BLM is currently authorized to use (USDI 2010a:80 and others). Furthermore, if these additional herbicides could be used on the Coos Bay District, it is estimated that the efficacy of BLM's invasive plant treatment would improve from 60 percent under the No Action Alternative to 80 percent under the Proposed Action (USDI 2010a:136).

In addition, there are invasive plants on neighboring (non-BLM-managed) lands that may spread to BLM-managed lands at any time. Adverse effects of invasive plants include resource loss or degradation of ecosystem function including displacement of native vegetation; reduction in habitat and forage for wildlife; loss of habitat for federally listed and other Special Status species; reduced water quality; and reduced wilderness and recreation values (USDI 2010a:7). Invasive plant infestations are also responsible for economic losses. A 2014 Oregon Department of Agriculture (ODA) report estimates that 25 of Oregon's noxious weeds cost the State an estimated 83.5 million dollars a year (ODA 2014). While much of this loss is to agricultural areas, invasive plants on BLM-managed lands may spread to adjacent non-BLM-managed lands, increasing control costs for affected landowners and degrading land values. For the past several decades, the BLM has participated in cooperative invasive plant control efforts with other private, governmental, and non-governmental entities, such as adjacent timber owners, the Oregon Department of Agriculture, and the Coos, Coquille, and Curry Watershed Associations. However, the BLM's current inability to use herbicides commonly used on adjacent lands results in less effective control and coordination challenges.

Executive Order 13112 (February 1999, amended December 2016) requires Federal agencies to "(i) prevent the introduction of invasive species; (ii) detect and respond rapidly to and control populations of such species in a cost-effective and environmentally sound manner; (iii) monitor invasive species populations accurately and reliably; [and] (iv) provide for restoration of native species and habitat conditions in ecosystems that have been invaded…"

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

The Purposes

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

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

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

[10] 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.

Issues

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

Issues are analyzed when—

- Analysis is necessary for making a reasoned choice from among the alternatives in determining:
    - How well the proposed action or alternatives responds to the purpose and need, or
    - If there is a meaningful difference between alternatives with respect to the issues analyzed;
- Analysis is necessary to determine the potential for significant environmental effect.

Several issues identified during internal and external scoping were considered but not analyzed in detail in this EA. In general, the issues not analyzed in detail in this EA have already been addressed in documents to which this EA tiers and a) there is not enough difference between the alternatives relative to the issue for additional analysis to aid the decision-maker and b), there is negligible likelihood of significant effects due to the requirement to implement Protection Measures (see Appendix A, *Protection Measures*). In the list below, the issues are framed as questions. Further information about the following issues (both those analyzed in detail and not analyzed in detail) is included in Chapter 3.

Issues Analyzed in Detail

Invasive Plants

- **Issue 1:** How does the availability of additional herbicides under each alternative affect treatment effectiveness for individual invasive plant species?

Native Vegetation

- **Issue 1:** How would treatment methods affect unique plant communities in Areas of Critical Environmental Concern (ACECs) and other areas with Special Status plant species?

Wildlife

- **Issue 1**: How would mechanical and herbicide treatment methods affect the western snowy plover?

Water Quality

- **Issue 1**: How would herbicide use affect the quality of surface water and groundwater used for domestic water supply?

Implementation Cost

- **Issue 1:** How would the increased availability of herbicides to treat European beachgrass in western snowy plover habitat restoration areas under Alternative 3 affect treatment costs at the North Spit and New River?

Issues Not Analyzed in Detail

Invasive Plants

- **Issue 2:** How would invasive plant treatments under each alternative affect the spread rate of invasive plants?
- **Issue 3:** How would climate change affect the spread of invasive plants?

Native Vegetation

- **Issue 2:** How would invasive plant treatments, especially herbicides, affect Special Status and edible fungi?
- **Issue 3:** Even though herbicides would not be used for timber production, would more effective invasive plant treatments indirectly decrease or increase timber harvest volume or quality?

Fish and Aquatic Organisms

- **Issue 1**: How would invasive plant treatments in riparian areas affect aquatic organisms or their habitat, including riparian vegetation?

Wildlife

- **Issue 2:** How do invasive plants affect wildlife?
- **Issue 3:** How would contact with or ingestion of herbicides affect wildlife species, especially Special Status wildlife species?
    - How would treatments affect birds (Special Status species, migratory birds, birds of conservation concern, and game birds below desired conditions) that may use potential treatment areas, especially during the nesting season?
    - How would herbicide treatments affect insects such as the Mardon skipper?
    - How would herbicide use affect pollinators, especially Special Status pollinators?

Human Health

- **Issue 1:** What are the effects to human health from incidentally coming into contact with herbicides used on BLM-managed lands?
    - What are the human health effects to people who regularly consume or come in contact with contaminated vegetation, water, or wildlife? How would herbicide use affect the health of people gathering, handling, ingesting plants, fish, or wildlife, or handling fossils or artifacts that are in or near the area of herbicide use? What are the human health and safety hazards to those harvesting and consuming special forest products, such as greenery, herbs, berries, and mushrooms?
    - What are the human health hazards to susceptible members of the public (including children, pregnant women, the elderly, sick people, and those with chemical-sensitive conditions) associated with herbicide applications?
    - What are the human health effects of herbicides applied near natural springs, private wells, and irrigation sources?
- **Issue 2:** What are the hazards to workers treating invasive plants?
- **Issue 3:** What are effects to human health of mixing two or more herbicides? Are these combinations more toxic than herbicides used individually?
- **Issue 4:** What are effects to human health of using glyphosate, which the International Agency for Research on Cancer (IARC) recently declared a cancer hazard and California lists as cancer causing and may be linked to non-Hodgkin lymphoma and leukemia?

Soil

- **Issue 1:** Would invasive plant treatments lead to increased soil compaction and erosion?
- **Issue 2:** How do herbicides break down and move through soils?
- **Issue 3:** Do herbicides affect soils?

Air Quality

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

Fire

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

Archeological and Cultural Resources

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

Traditional and Cultural Uses

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

Socioeconomics

- **Issue 1:** What are the economic impacts of invasive plants on the Coos Bay District on local area timber production, agriculture, and recreation?
- **Issue 2:** Given the checkerboard land ownership pattern, what is the potential for herbicide contamination of yards, gardens, organic farms, vineyards, and beehives on private lands?
- **Issue 3:** How would the alternatives affect permitted land uses, including rights-of-way and administrative site grant and leaseholders?
- **Issue 4:** How and when will the public and Tribes be notified of herbicide application?

Recreation

- **Issue 1:** How would herbicide treatments at recreation sites affect visitor access and recreational experiences?
- **Issue 2:** What are the effects of herbicides on horses, dogs, and other pets that accompany recreationists?

Decision to Be Made

The decision whether to adopt the Proposed Action or a different alternative and whether to modify the action based on environmental analysis and any other factors identified during public review of this EA and unsigned Finding of No Significant Impact will be made by the District Manager for the Coos Bay District. The decision-maker will make the decision based on the analysis of the issues and how well the alternatives respond to the need and purposes. The decision-maker will also decide whether the analysis reveals a likelihood of significant adverse effects from the selected alternative that cannot be mitigated or that were not already revealed in one or more of the Environmental Impact Statements that this EA tiers to. The decision would apply to all invasive plant control activities conducted on BLM-managed lands within the Coos Bay District[11] (henceforth, District) by its own personnel, contractors, grant holders, lessees, cooperators, and others conducting activities on BLM-managed lands. This decision applies to the approximately 10,000 acres of Coos Bay District lands that will be conveyed to the Confederated Tribes of the Coos, Lower Umpqua and Siuslaw Indians until those lands are conveyed to the Tribes.

Additional consultation with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service would be required if the BLM decides to adopt Alternative 3 in listed anadromous fish, western lily, or western snowy plover habitat. Further information can be found in the *Consultation* section, later in this chapter.

[11] With the exception of the portion of the District managed by the Medford District, which is addressed in that District's 2018 *Integrated Invasive Plant Management Plan*.

Public Involvement

Scoping

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

The BLM sent a scoping letter to interested members of the public in June 2011, and six scoping responses were received. Comments received in 2011 focused on the effects of invasive plants (including effects to native species and wildlife, as well as socioeconomic effects), the effects of herbicides, or suggested reducing or eliminating herbicide use and changing land management practices. Concerns about herbicides were related to human health and the unintended effects of herbicides on native vegetation, neighboring private land uses, soil, water, air, and wildlife.

The BLM reopened scoping from April 10, 2017 through May 10, 2017 due to the lag in time since initiation of scoping and changes to the Proposed Action. Letters were sent to approximately 60 individuals, agencies, and organizations, including those who commented in 2011, and posted on the BLM's ePlanning website. The District received no comment letters in response to the 2017 scoping letter.

Public Comment Period

This EA has been made available for a 30-day public comment period (July 2018) on BLM's ePlanning site and interested members of the public were notified of the availability of the EA for review. This mailing list is contained in the project record file.

Consultation

Tribes

The BLM initiated Tribal consultation in 2009 with letters to the Coquille Indian Tribe and the Confederated Tribes of Coos, Lower Umpqua and Siuslaw Indians. Additional letters were sent in June 2011 to the same groups. The letters described the proposed EA, announced that scoping would begin, and invited the Tribes to enter into government-to-government consultation. Following a delay in the preparation of this EA, the District contacted these Tribes again in May 2017 and described the purpose and need and the alternatives and invited the Tribes to enter into government-to-government consultation and be involved with the process. The BLM contacted the following Tribes: Coquille Indian Tribe; Confederated Tribes of Coos, Lower Umpqua and Siuslaw Indians; Confederated Tribes of Grand Ronde; Confederated Tribes of Siletz; Cow Creek Band of Umpqua Tribe of Indians; and, Tolowa Dee-ni' Nation Tribes in March 2018. Depending on Tribal staff availability, conversations occurred in person and via telephone or resulted in voice messaging to invite discussion regarding the project and if the Tribes were interested in reviewing the EA. Tribes who were directly contacted or expressed an interest in the project are: Coquille Indian Tribe; Confederated Tribes of Coos, Lower Umpqua and Siuslaw Indians; Confederated Tribes of Grand Ronde; and Tolowa Dee-ni' Nation. Discussions focused on developing Tribal consultation strategies that would allow adequate time for notification prior to invasive plant treatments. The consultation process would introduce locations proposed for integrated invasive plant management and work toward determining Tribal areas of concern, which would be refined as needed. The EA was also sent to these Tribes for a 6-week review period

beginning June 18, 2018. Additional consultation with the federally recognized Tribes will be conducted if Tribes desire, which could include face-to-face meetings with the Tribes. Tribal consultation would include an emphasis on identifying traditional gathering areas, species of culturally significant plants, and the effects of herbicide use on plant populations of interest to the Tribes.

State Historic Preservation Office

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

The BLM will follow the 2015 State Protocol between the Oregon BLM and the Oregon SHPO regarding the manner in which the Bureau of Land Management 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 (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 Coos Bay District has seven federally listed species that are known to occur on the District (see Table 1-1) [12].

Table 1-1. *Listed Species on the Coos Bay District*

Taxon	Common Name	Scientific Name	Population	Status
Plant	western lily	*Lilium occidentale*		Endangered
Bird	marbled murrelet	*Brachyramphus marmoratus*		Threatened
Bird	western snowy plover	*Charadrius nivosus*	Pacific Coastal Population	Threatened
Bird	northern spotted owl	*Strix occidentalis caurina*		Threatened
Anadromous Fish	coho salmon	*Oncorhynchus kisutch*	S. Oregon/N. California Coast	Threatened
			Oregon Coast	
Anadromous Fish	green sturgeon	*Acipenser medirostris*	Southern	Threatened
Anadromous Fish	Pacific eulachon	*Thaleichthys pacificus*	Southern DPS	Threatened

Formal and informal consultation that covers herbicides and other invasive plant treatments on the Coos Bay District has occurred with the U.S. Fish and Wildlife Service (FWS) and National Marine Fisheries Service (NMFS) on numerous occasions (see Table 1-2). The BLM submits annual reports to the Services in compliance with these consultations at both the State- and District-level.

Table 1-2*. Endangered Species Act Consultation*

Program and Biological Assessment	Agency - Area	Year	Consultation
Vegetation Treatments Using Herbicides on BLM Lands in 17 Western States PEIS (USDI 2007a) and *Vegetation Treatments on BLM Lands in 17 Western States Programmatic Environmental Report* (USDI 2007d) and *Vegetation Treatments on BLM Lands in 17 Western States Biological Assessment* (USDI 2007c)	BLM - 17 Western States	2007	Letter of Concurrence (FWS) Biological Opinion (NMFS)

[12] More information about the effects to these species can be found in *Native Vegetation* Issue 1 (for federally listed plants), *Fish and Aquatic Organisms* Issue 1 (for federally listed fish), and *Wildlife* Issue 2 (for the federally listed birds).

Program and Biological Assessment	Agency - Area	Year	Consultation
Biological Assessment of the BLM's North Spit Plan as it may affect the Threatened Western Snowy Plover and its Critical Habitat (USDI 2007f)	BLM - Coos Bay District, North Spit	2008-2018, extended to 2022	Biological Opinion (FWS)
Biological Assessment of the Effects of the New River Foredune Management Project (USDI 2009b)	BLM - Coos Bay District, New River ACEC	2009	Letter of Concurrence (NMFS)
Vegetation Treatments Using Herbicides on BLM Lands in Oregon (USDI 2010a) and *Vegetation Treatments on BLM Lands in 17 Western States Biological Assessment* (USDI 2007c)	BLM - Oregon	2010	Letter of Concurrence (FWS) Biological Opinion (NMFS)
Management of the Western Snowy Plover on Federal Lands Within the New River Area of Critical Environmental Concern during the 2011-2021 Nesting and Wintering Seasons (USDI 2011)	BLM – Coos Bay District, New River ACEC	2011-2021	Biological Opinion (FWS)
Aquatic Restoration Biological Assessment II (USDA et al. 2013, NMFS 2013)	BLM and Forest Service - OR, WA, plus parts of CA, NV, and ID	2013	Aquatic Restoration Biological Opinion (ARBO II – FWS and NMFS)
Fiscal Years 2014-2018 Programmatic Suite of Activities that May Affect Spotted Owls, Murrelets and their designated Critical Habitats Proposed by The Coos Bay District BLM and the Coquille Indian Tribe Biological Assessment (USDI 2014a)[1]	BLM - Coos Bay District	2014 - 2018	Biological Opinion (FWS)
Vegetation Treatments Using Aminopyralid, Fluroxypyr, and Rimsulfuron PEIS (USDI 2016a) and *Biological Assessment* (USDI 2016c)	BLM - 17 Western States	2015 and 2016	Letter of Concurrence (FWS) Biological Opinion (NMFS)

1. Amended by the *2016 Programmatic Suite of Activities that May Affect Spotted Owls, Murrelets and their designated Critical Habitats Proposed by The Coos Bay District BLM and the Coquille Indian Tribe Biological Opinion* (USDI 2016f).

Consultation resulted in Conservation Measures and Project Design Criteria identified to protect Coos Bay District listed species from treatments. These are listed in Appendix A, in the *Protection Measures for Federally Listed Species* section. More details about the 2007, 2008, 2010, 2011, 2013, 2014, and 2016 consultations can be found at the start of that section.

Additional consultation with the National Marine Fisheries Service and the U.S. Fish and Wildlife Service would occur before the BLM could select and implement Alternative 3. Specifically—

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

- The use of hexazinone, fluroxypyr, rimsulfuron, or fluazifop-P-butyl is proposed within 1,500 feet of listed fish habitat[13].

Additional consultation with the U.S. Fish and Wildlife Service would occur if—

- Any herbicide use is proposed in western snowy plover habitat, with the exception of 24 acres annually of glyphosate on the Coos Bay North Spit that was addressed in 2007 consultation (see Table 1-2).
- The use of hexazinone, fluroxypyr, rimsulfuron, or fluazifop-P-butyl is proposed within the same watershed[14] as western snowy plover or western lily habitat.

The Proposed Action and Alternative 3 are not expected to adversely affect the northern spotted owl or the marbled murrelet. Effects to these species are not anticipated because proposed invasive plant treatments would not modify habitat for either species and would not affect the owl's prey species. Potential disturbance near nest

[13] As determined by consultation with NMFS for the 2010 Oregon FEIS. More information can be found in the *Protection Measures for Federally Listed Species* section of Appendix A.
[14] Fifth field hydrological unit code (HUC).

sites is not anticipated because projects are usually short in duration, spatially limited, and affected areas receive baseline disturbance from vehicle traffic and other activities. These species would likely be acclimated to the potential noise disturbance associated with invasive plant treatments.

Tiering and Reference

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

For its non-herbicide treatments, this EA tiers to the 1985 *Northwest Area Noxious Weed Control Program Final EIS* and 1987 Supplement (USDI 1985, 1987). This EA also incorporates by reference elements of the 2007 *Vegetation Treatments on BLM Lands in 17 Western States Programmatic Environmental Report,* which describes the integrated vegetation management program and discloses the general effects associated with non-herbicide control methods (USDI 2007d).

The EA also tiers to the *Proposed Resource Management Plan and Final Environmental Impact Statement for Resource Management Plans for Western Oregon* (USDI 2016e), which contains analysis of invasive plant control activities. Where relevant to specific effects, the analysis in Chapter 3 will tier to this document (see *Fire*, *Archaeological and Cultural Resources*, *Traditional and Cultural Uses (Native American Interests)*, and *Socioeconomics* Issues).

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

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 on Federal lands. (The *Plant Protection Act* replaced, in part, the *Federal Noxious Weed Act* of 1974 (7 U.S.C. §

2814(a)), which established a program to manage undesirable plants, implemented cooperative agreements with State agencies, and established integrated management systems to control undesirable plant species.)

Land Use Plans on the Coos Bay 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 Coos Bay District are covered by the *Northwestern and Coastal Oregon Resource Management Plan and Record of Decision* (USDI 2016d).

Northwestern and Coastal Oregon Resource Management Plan

The *Northwestern and Coastal Oregon Resource Management Plan* provides direction for the management of all resources on BLM-managed lands in the Coos Bay District, Northwest Oregon District, and the Swiftwater Field Office of the Roseburg District. Goals and management direction related to invasive species management are included in the following sections of the Resource Management Plan. This EA is consistent with the objectives and directions of the Resource Management Plan.

Invasive Species

Management Objective (USDI 2016d:80)

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

Management Direction (USDI 2016d:80)

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

District-Designated Reserve – Areas of Critical Environmental Concern

Management Objective (USDI 2016d:57)

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

Management Direction (USDI 2016d:57)

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

District-Designated Reserve – Lands Managed for their Wilderness Characteristics

Management Direction (USDI 2016d:58)

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

reductions in wilderness characteristics are temporary and wilderness characteristics are protected over the long term.

Riparian Reserve

Management Objective (USDI 2016d:68)

- Contribute to the conservation and recovery of ESA [*Endangered Species Act*]-listed fish species and their habitats and provide for conservation of Bureau Special Status fish and other Bureau Special Status riparian-associated species.
- Maintain and restore natural channel dynamics, processes, and the proper functioning condition of riparian areas, stream channels, and wetlands by providing forest shade, sediment filtering, wood recruitment, stream bank and channel stability, water storage and release, vegetation diversity, nutrient cycling, and cool and moist microclimates.
- Maintain water quality and streamflows within the range of natural variability, to protect aquatic biodiversity, provide quality water for contact recreation and drinking water sources.
- Meet Oregon Department of Environmental Quality (ODEQ) water quality criteria.
- Maintain high quality water and contribute to the restoration of degraded water quality for 303(d)-listed streams.
- Maintain high quality waters within ODEQ-designated Source Water Protection watersheds.

Hydrology

Management Objective (USDI 2016d:79)

- Maintain water quality within the range of natural variability that meets ODEQ water quality standards for drinking water, contact recreation, and aquatic biodiversity.

Rare Plants and Fungi

Management Objective (USDI 2016d:86)

- Support the persistence and resilience of natural communities, including those associated with forests, oak woodlands, shrublands, grasslands, cliffs, rock outcrops, talus slopes, meadows, and wetlands. Support ecological processes and disturbance mechanisms to allow for a range of seral conditions.

Management Direction (USDI 2016d:87)

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

Soil Resources

Management Direction (USDI 2016d:89-90)

- Apply BMPs [Best Management Practices] (Appendix C [of the Resource Management Plan]) as needed to maintain or restore soil functions and soil quality, and limit detrimental soil disturbance.
- Limit detrimental soil disturbance from forest management operations to a total of < 20 percent of the harvest unit area. Where the combined detrimental soil disturbance from implementation of current forest management operations and detrimental soil disturbance from past management operations exceeds 20 percent of the unit area, apply mitigation or amelioration to reduce the total detrimental soil disturbance to < 20 percent of the harvest unit area. Detrimental soil disturbance can occur from erosion, loss of organic matter, severe heating to seeds or microbes, soil displacement, or compaction.

- Do not till soils where tillage will cause soils to become unstable due to increasing the soil moisture content.

Other Management Plans on the Coos Bay District

North Spit Plan (2005)

This EA is consistent with the *North Spit Plan* (USDI 2005), which provides the current direction for comprehensive management of the North Spit. Prior planning efforts by BLM for the North Spit include the *Coos Bay Shorelands Draft Management Plan* (USDI 1989) and the *Coos Bay Shorelands Draft Management Plan and Environmental Assessment* (USDI 1994). The 2005 update reflects changes in land ownership and environmental conditions. A portion of the BLM-managed lands on the North Spit is designated as an Area of Critical Environmental Concern (725 acres) primarily for the conservation of its outstanding biological values with a unique assemblage of habitats in a relatively confined area including estuarine, fresh water wetlands, mudflats, and forested uplands. The Spit was also designated as an ACEC for its cultural and historic resources, and its scenic value to the communities of North Bend and Coos Bay. The Spit is also a Special Recreation Management Area with specific recreational activities and experience opportunities. The Plan identifies invasive plants as a threat to the area's natural resources, displacing native vegetation and consequently diminishing habitat quality for wildlife such as the western snowy plover. Invasive plant species of concern include European beachgrass, brooms, gorse, Himalayan blackberry, English ivy, and thistles (USDI 2005:43).

BLM annually removes European beachgrass to create suitable open, sandy habitat for snowy plovers. However, beachgrass contributes to the stability of the area; it traps migrating sand, causing the creation and elevation of the foredune, which greatly increases the Spit's stability (Beckham 2000 cited in USDI 2005:38). The threatened western snowy plover nests above the high tide line and behind the foredune. The North Spit provides nesting habitat for the largest breeding population of coastal snowy plovers in Oregon (USDI FWS 1993 cited in USDI 2005:46).

The North Spit Plan includes the following management objectives and actions that relate to invasive plant management—

Vegetation and Wildlife Resources

Management Objective (USDI 2005:8)*:*

- Conserve, enhance, or restore natural habitats, with an emphasis on habitats that support Special Status plant and wildlife species.

Actions Ongoing:

- Coordinate with other agencies and institutions to restore degraded and disturbed plant communities.
- European beachgrass is removed annually from plover areas.
- Continue to implement snowy plover conservation actions:
- Removing beachgrass from the inland snowy plover areas to maintain open, sandy habitat suitable for nesting plovers.
- Monitor plover nesting to gauge the success of management actions and progress toward plover recovery.

Actions Proposed:

- On the North Spit Area of Critical Environmental Concern: Implement beach and dune ecosystem restoration.

- Continue treatments to remove noxious and exotic species. Restore treated areas with native seeds and plants.
- Use best management practices to prevent the further spread of exotic plants and noxious weeds.
- Actively manage habitats to promote the conservation of Special Status species and raptors.

Monitoring

Management Objective (USDI 2005:9)*:*

- Facilitate improved management of the Spit through monitoring to learn more about the natural and cultural resources of the area and to assess the effects of management actions.

Actions Ongoing

- Monitor noxious weed species to document existing population areas, effectiveness of management actions for removal, and the spread of these species to new sites. (ongoing)

Actions Proposed:

- Track elevation changes on the ocean foredune and monitor the effects of weather and beachgrass removal on foredune erosion.

New River Foredune Management EA and Decision Record (2009)

This EA is consistent with western snowy plover habitat restoration plans, including the New River Foredune Management EA and associated Decision Record (USDI 2009a), which works towards re-establishing the geomorphic stability of the New River foredune.

In 1998, the BLM prepared an EA to enhance and restore habitat for the western snowy plover on lands within the New River ACEC. The action consisted of removing European beachgrass (a county-listed noxious weed) to provide open sand habitat for breeding western snowy plovers. Based on the successful response of plovers to this activity, another Environmental Assessment was prepared in 2000 to increase the total amount of acres available for treatment. However, in 2003, scientists studying the New River area started documenting sand mobilization of the dunes and deposition into the river channel associated with the removal of European beachgrass, which in turn had impacts to both western snowy plover and listed anadromous fish. The selected alternative in the 2009 EA develops two vegetated foredunes along the east and west edges of the New River Spit (one along the ocean and one along the river), which reduces the risk of shoreline change associated with western snowy plover restoration activities. While the District would continue to generally treat other European beachgrass in western snowy plover habitat, these two foredunes would be stabilized with European beachgrass (USDI 2009a). As further described in the Alternatives section in Chapter 2, this EA does not propose to modify the foredune re-establishment described and selected in the 2009 *New River Foredune Management EA and Decision Record*.

Other BLM Direction

State and National Environmental Analyses on Herbicide Use

This EA tiers to, and is consistent with, the 2010 Oregon FEIS and Record of Decision. The Record of Decision requires, with a few specific exceptions[15], the preparation of new site-specific analyses before herbicides other than 2,4-D, dicamba, glyphosate, or picloram can be used (USDI 2010b). This EA provides the site-specific analysis

[15] 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).

for the Coos Bay District. The alternatives (including the No Action Alternative) must adhere to restrictions (USDI 2010b:30), which include:

- Standard Operating Procedures from the 2007 PEIS.
- Mitigation Measures[16] from the 2007 PEIS.
- Conservation Measures for Special Status species from the 2007 PEIS Biological Assessment.
- Mitigation Measures from the 2010 Oregon FEIS Record of Decision.
- Typical and maximum herbicide application rates analyzed in the 2010 Oregon FEIS.

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

Integrated Vegetation Management (BLM Handbook 1740-2)

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

National Policy

Federal Insecticide, Fungicide and Rodenticide Act

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

Clean Water Act - Section 303(d)

Under Section 303(d) of the *Clean Water Act*, the Oregon Department of Environmental Quality (ODEQ) establishes standards for the maximum amount of a pollutant that can be received by water quality limited waterbodies in the State of Oregon. The Rogue and Umpqua Basins and portions of the South Coast Basin (Upper South Fork Coquille Watershed and Tenmile Lakes Watershed) have Total Maximum Daily Loads (TMDLs) in place as required by the ODEQ and Environmental Protection Agency (EPA). The BLM is required to publish a Water Quality Restoration Plan (WQRP) for basins with an existing TMDL. These WQRPs address how the BLM will manage land and water to not further limit water quality as defined in the TMDL. As plans are completed, the BLM incorporates the goals, objectives, and provisions from the WQRP into the Coos Bay District integrated invasive plant management program. The goals, objectives, provisions of future WQRPs will be consistent with the action alternatives.

The *Clean Water Act* requires a National Pollution Discharge Elimination System (NPDES) permit for herbicide use that may directly enter streams. The permit is needed for herbicide treatments within three feet of streams, wetlands, and other seasonally wet areas when water is present, including conveyances with a hydrologic surface connection to a water body (e.g., near a road culvert that runs water to a creek). Treatments on small portions of infestations (currently mapped or detected in the future) may meet those criteria. BLM holds a NPDES Pesticide

[16] Mitigation Measures are practices or limitations adopted to mitigate potential adverse effects identified in the PEIS and Oregon FEIS analysis. Like the Standard Operating Procedures, application of the Mitigation Measures is assumed in the analysis in this EA, and on-site determinations would decide if their application is unnecessary to achieve the intended purpose or protection.

General Permit, which complies with ODEQ requirements for implementing any treatments in which herbicide could be directly introduced into surface waters. This generally includes treatment within stream banks or for target plants that emerge from or overhang water bodies.

Federal Strategy to Promote the Health of Pollinators

On June 20, 2014, the President issued a memorandum directing the establishment of a Pollinator Health Task Force, chaired by the Secretary of Agriculture and Administrator of the EPA. The memorandum directs the creation of a National Pollinator Health Strategy with research, education, and public-private partnership objectives. It further directs agencies to develop plans and practices for increasing and improving pollinator habitat, including the use of pollinator-friendly species in future restoration and rehabilitation projects, following wildfires, and in landscaping. To support these habitat-focused efforts, the U.S. Department of Agriculture and the U.S. Department of the Interior issued a set of *Pollinator-Friendly Best Management Practices for Federal Lands* (USDA and USDI 2015a), which include direction to identify and remove invasive species. Direction includes, "Management of invasive species may include felling by hand or machine, machine mulching, applying spot treatments of herbicide to bark, cut stumps, or leaves, controlled burning, mowing, or combinations of the approaches" (USDA and USDI 2015a). The National Pollinator Health Strategy states that agencies "shall, as appropriate, take immediate measures to support pollinators during the 2014 growing season and thereafter. These measures may include avoiding the use of pesticides[17] in sensitive pollinator habitats through integrated vegetation and pest management practices."

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

EPA Ruling on Inert Ingredients

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

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

Chapter 2 – Integrated Invasive Plant Management and the Alternatives

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

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

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

Invasive Plants

An invasive plant thrives and spreads aggressively outside its natural range. An invasive plant 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, proximity to infested areas, and the biological and evolving genetic traits of the invading species.

Categories of Invasive Plant Infestations

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

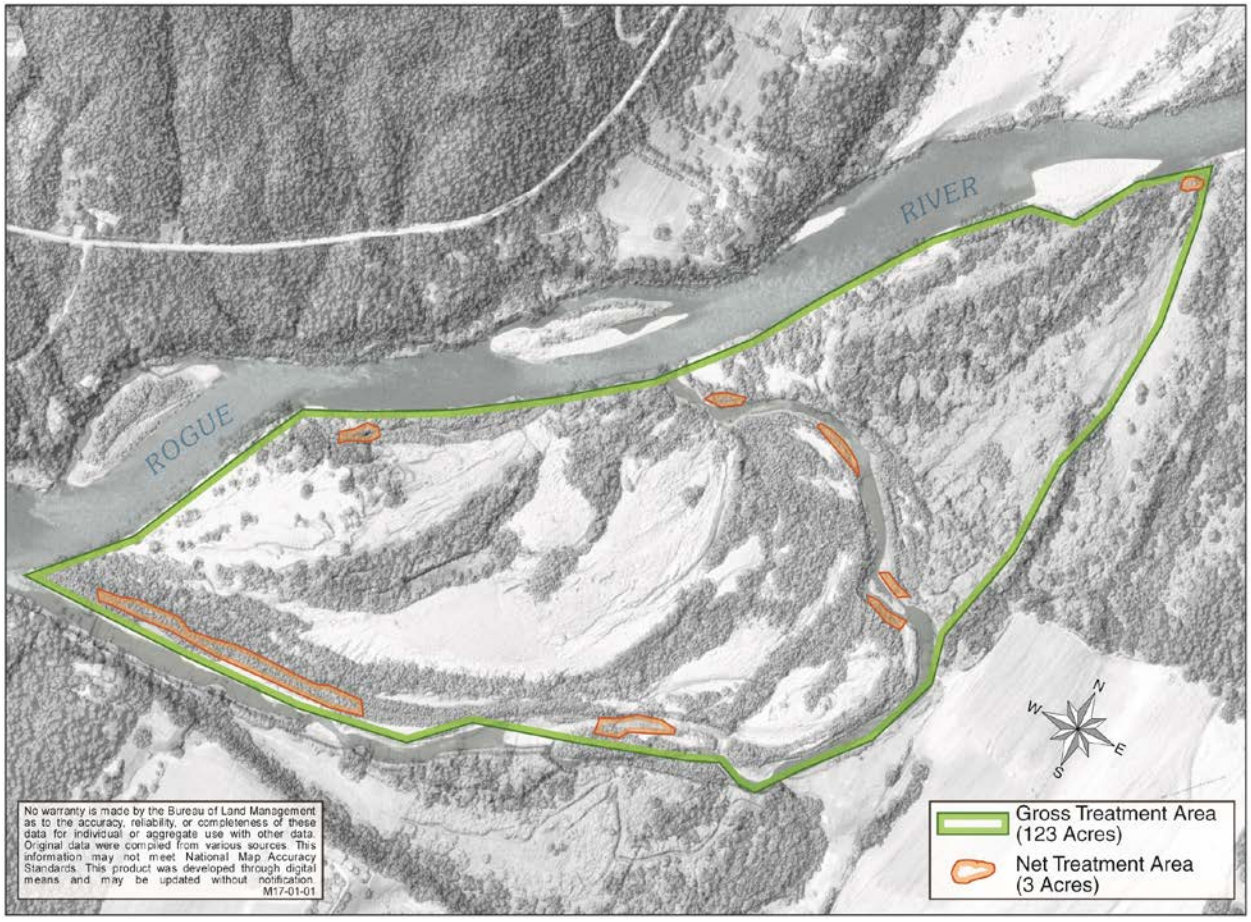
Category I: Invasive Plants Currently Known on District

Invasive plant surveys[18] on the District generally focus on locations where invasive plants are most likely to occur and spread from, such as road corridors and other rights-of-way, riparian areas, campgrounds, and mining and common materials sites. The BLM also conducts surveys in advance of planned projects, such as forest management projects, so that the District can take measures to prevent the introduction and spread of invasive plants into and from project areas. While certain surveys may be specific to invasive plant management, surveys conducted for other purposes also record the presence of invasive plants. Such surveys include clearance surveys for Special Status species or cultural resources, and inventories of special management areas, like New River and Dean Creek Elk Viewing Area. The BLM also maps and documents invasive plant infestations detected during

[18] 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.

implementation monitoring for forest management, engineering, recreation, and other ground-disturbing projects. BLM policy requires monitoring of new project areas with high likelihood of noxious weed introduction[19] for the first three years after completion (USDI 1992b).

Figure 2-1. *Gross and Net Treatment Acres*



Survey and inventory results are uploaded to the BLM's National Invasive Species Information Management System (NISIMS), which links to BLM planning and reporting systems. NISIMS records include the infestation's spatial location, size, and shape; the invasive plant's abundance and distribution pattern; treatment records; and other associated characteristics. Sites where the species appears to have been eradicated are retained in NISIMS to guide future site monitoring. As the current program is focused on noxious weeds, most data in NISIMS concern noxious weeds[20].

Category I includes known locations of invasive plants mapped in NISIMS on the District. The most prevalent species are brooms, thistles, and blackberry. As shown in Table 2-1, Category I includes 35 different invasive plant species mapped in NISIMS on 18,100 gross acres on 19,284 sites on the District. As shown in Figure 2-1, 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 canopy 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

[19] Generally, any type of project resulting in ground disturbance, such as slash/pile/burn units, timber harvest areas, road or bridge construction, and trail construction.
[20] In 2018, the BLM made NISIMS data about invasive plant sites and treatment history accessible to the public.

infestation. In addition, to the mapped acres, this Category includes species and infestations known to occur on the District, but are not mapped in NISIMS. These species are generally widespread and dispersed throughout the District. District botany, invasive plant, and silviculture staff estimated these unmapped areas based on their professional judgement and field experience and while the locations have not been mapped, it is possible to characterize the areas and habitat where invasive plant species may occur. This includes additional unmapped sites for all mapped species, as well as an additional 47 invasive plant species. The majority of the species that are not mapped are not listed as noxious weeds (and hence have not been part of the existing integrated weed management program; thus, they generally have not been recorded during surveys or in NISIMS). While the precise acreage occupied by these species on the Coos Bay District is unknown, the treatment acres column in Table 2-1 indicates how many gross acres are estimated to be in need of treatment.

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

Common Name ***Scientific Name***	**NISIMS Gross/*Net Acres*[1] (Sites)**	**Gross Treatment Acres**	**Treatment Group[2]**	**Primary Locations**	**Noxious Weed?[3]**	**Treatment Priority[4]**
American/European sea-rocket *Cakile edentula/C. maritima*	None	232	Mustard Family	North Spit, New River, dunes	No	High
Annual ryegrass *Lolium multiflorum*	None	10	Annual Grasses	North Spit, New River, Dean Creek, Spruce Reach Island	No	Low
Biddy-biddy *Acaena novae-zealandiae*	18.33/*1.50* (16)	20	Misc. Herbaceous	Indian Creek, Cape Blanco, New River, roadsides, disturbed areas where there is little competition	Yes (Oregon)	Highest
Big quakinggrass *Briza maxima*	None	30	Annual Grasses	North Spit, New River, dunes, coastal terraces, Spruce Reach Island, roadsides	No	Moderate
Bigleaf/common periwinkle *Vinca major/V. minor*	0.10/*0.01* (1)	5	Misc. Herbaceous	roadsides, forest edges	No	Low
Birdsfoot trefoil *Lotus corniculatus/ L. angustissimus/ L. pedunculatus*	2.57/*0.14* (4)	20	Pea Family	roadsides, meadows, riparian areas, disturbed areas	No	Low
Blessed milkthistle *Silybum marianum*	None	1	Sunflower Family	roadsides and pastures	Yes (Oregon)	Highest
Brome fescue *Vulpia bromoides*	None	15	Annual Grasses	New River, roadsides	No	Low
Bull thistle *Cirsium vulgare*	999.89/*30.51* (2,825)	500	Sunflower Family	roadsides, open disturbed areas such as harvest areas or pastures	Yes (Oregon)	High
Burdock *Arctium minus*	None	10	Sunflower Family	roadsides, disturbed areas along forest edges	No	High
Butterfly bush *Buddleja davidii*	3.00/*0.03* (3)	5	Woody Species	roadsides, forest edges, riparian areas	Yes (Oregon)	High
Calla lily *Zantedeschia aethiopica*	0.00/*0.00* (1)	1	Lilies, Iris, Sedges, Rushes	Smith River Road, roadsides, coastal bluffs and headlands	No	Low
Canada thistle *Cirsium arvense*	188.02/*5.70* (558)	800	Sunflower Family	roadsides, harvest areas, open disturbed areas	Yes (Oregon)	High
Cape ivy *Delairea odorata*	None	1	Woody Species	Pistol River School, Myers Creek Road, coastal bluffs and forests below 660' including on serpentine soil	Yes (Oregon)	Highest
Catchfly *Silene gallica*	None	5	Carnation Family	New River, dunes, roadsides	No	Low

Common Name ***Scientific Name***	**NISIMS Gross/*Net Acres*[1] (Sites)**	**Gross Treatment Acres**	**Treatment Group**[2]	**Primary Locations**	**Noxious Weed?**[3]	**Treatment Priority**[4]
Coastal burnweed *Erechtites (*Syn. *Senecio) minimus*	None	20	Sunflower Family	roadsides, harvest units	Yes (County)	Moderate
Common ragweed *Ambrosia artemisiifolia*	None	1	Sunflower Family	New River, dunes, sandy soil	Yes (Oregon)	High
Common sow thistle *Sonchus oleraceus*	None	40	Sunflower Family	New River, roadsides, waste areas, forest edges	No	Low
Corn spurry/sandspurry *Spergula arvensis/ Spergularia maritima/S. rubra*	None	1	Carnation Family	North Spit, New River, dunes	No	Moderate
Cotoneaster *Cotoneaster franchetii/C. lacteus*	None	20	Woody Species	roadsides, forest edges	No	Moderate
Creeping buttercup *Ranunculus repens*	None	50	Misc. Herbaceous	forested roadsides, rights-of-way, recreation sites	No	Moderate
Creeping yellow cress *Rorippa sylvestris*	None	1	Mustard Family	Hunter Creek ACEC, riparian, marsh	Yes (Oregon)	Moderate
Dandelion *Taraxacum officinale*	None	5	Sunflower Family	North Spit, New River, roadsides, trail sides	No	Low
Darwin's barberry *Berberis darwinii*	None	5	Woody Species	North Spit, forest edges, sandy soil	No	Highest
English holly *Ilex aquifolium*	0.77/*0.01* (1)	10	Woody Species	forestland, roadsides, recreation sites	Yes (County)	Low
English/Atlantic ivy *Hedera helix*	24.63/*0.41* (28)	100	Woody Species	forested areas, roadsides, riparian areas	Yes (Oregon)	High
European beachgrass *Ammophila arenaria*	58.73/*26.54* (13)	240	Perennial Grasses	New River, North Spit, coastal sand dunes to coastal meadows	Yes (County)	High
Evergreen/cutleaf blackberry *Rubus laciniatus*	63.34/*3.31* (315)	100	Woody Species	roadsides, riparian areas	Yes (County)	High
False brome *Brachypodium sylvaticum*	78.26/*5.93* (19)	200	Perennial Grasses	roadsides, rights-of-way, forest edges	Yes (Oregon)	High
False dandelion *Hypochaeris radicata/H. glabra*	None	25	Sunflower Family	North Spit, New River, roadsides, trails, open areas	No	Lowest
Fennel *Foeniculum vulgare*	0.10/*0.00* (1)	10	Perennial Parsley Family	North Spit Boat Ramp, Umpqua Eden cultural site, roadsides, waste areas	Yes (County)	High
Field bindweed *Convolvulus arvensis*	0.20/*0.00* (2)	10	Misc. Herbaceous	roadsides, waste areas, sunny disturbed areas	Yes (Oregon)	Moderate
French broom *Genista monspessulana*	370.62/*12.60* (329)	500	Woody Species	North Spit, New River, dunes, roadsides, forest edges, timber harvest areas	Yes (Oregon)	High
Giant knotweed *Polygonum sachalinense*	1.10/*0.01* (10)	100	Knotweed Family	riparian areas, North Fork Coquille, Smith and Coos Rivers	Yes (Oregon)	High
Gorse *Ulex europaeus*	28.90/*0.53* (119)	40	Woody Species	North Spit, New River, rights-of-way, dunes	Yes (Oregon)	Highest
Hawkbit *Leontodon saxatalis*	None	1	Sunflower Family	North Spit, New River, dunes roadsides, meadows, trails	No	Low

Common Name ***Scientific Name***	**NISIMS Gross/*Net Acres*[1] (Sites)**	**Gross Treatment Acres**	**Treatment Group**[2]	**Primary Locations**	**Noxious Weed?**[3]	**Treatment Priority**[4]
Herb Robert *Geranium robertianaum*	77.12/*5.83* (206)	25	Geranium Family	Dean Creek, Spruce Reach Island, New River, roadsides, stabilized dunes	Yes (Oregon)	Moderate
Himalayan blackberry *Rubus armeniacus*	5,880.08/*700.86* (4,210)	5,000	Woody Species	roadsides, riparian, open areas	Yes (Oregon)	High
Hyssop loosestrife *Lythrum hyssopifolia*	None	5	Loosestrifes	New River, seasonal wetlands, ditches, mudflats	No	Highest
Iceplant *Carpobrotus chilensis*	None	1	Misc. Herbaceous	Cape Blanco, coastal headlands	No	Highest
Italian/slenderflower thistle *Carduus pycnocephalus/ C. tenuiflorus*	0.2/*0.2 (1)*	20	Sunflower Family	roadsides, open areas	Yes (Oregon)	Highest
Japanese knotweed *Polygonum cuspidatum*	11.10/*0.11* (89)	100	Knotweed Family	riparian areas, North Fork Coquille, Smith and Coos Rivers	Yes (Oregon)	High
Jubata grass *Cortaderia jubata*	0.60/*0.00* (9)	10	Perennial Grasses	North Spit, New River, roadsides, dunes, coastal bluffs and headlands, timber harvest areas	Yes (Oregon)	High
Lance-leaved plantain *Plantago lanceolata*	None	10	Misc. Herbaceous	New River	No	Low
Marestail/horseweed *Conyza bonariensis*	None	50	Sunflower Family	North Spit, New River, roadsides, grassland	Yes (County)	Moderate
Meadow knapweed *Centaurea x moncktonii*	177.89/*2.93* (285)	500	Sunflower Family	roadsides	Yes (Oregon)	High
Montbretia *Crocosmia x crocosmiflora*	None	5	Lilies, Iris, Sedges, Rushes	roadsides, forest edges	No	Moderate
Old man's beard *Clematis vitalba*	9.65/*0.16* (15)	10	Woody Species	Coos River watershed, roadsides and forests	Yes (Oregon)	High
Old-man-in-the-spring *Senecio vulgaris*	None	50	Sunflower Family	ACECs, roadsides, recreation sites, harvest units	No	Low
One seed hawthorn *Crataegus monogyna*	1.58/*0.37* (2)	1	Woody Species	Elkton area, open areas	Yes (County)	Moderate
Oxeye daisy *Leucanthemum vulgare*	3.35/*0.25* (4)	50	Sunflower Family	North Spit, New River, Dean Creek, Spruce Reach Island, Hunter Creek, roadsides, meadows	No	Low
Pampas grass *Cortaderia selloana*	None	10	Perennial Grasses	North Spit, New River, roadsides, dunes, bluffs, road cuts, harvest areas	No	High
Pennyroyal *Mentha pulegium*	None	20	Perennial Mints	Dean Creek, Spruce Reach, open moist fields, roadsides	Yes (County)	Low
Perennial peavine *Lathyrus latifolia*	8.78/*0.29* (41)	100	Pea Family	roadsides, pastures, meadows	Yes (Oregon)	Moderate
Perennial ryegrass *Lolium perenne*	None	10	Perennial Grasses	North Spit, New River, Dean Creek, Spruce Reach Island	No	Low
Poison hemlock *Conium maculatum*	None	10	Perennial Parsley Family	North Spit, roadside, ditches, moist meadow edges	Yes (Oregon)	Moderate
Purple deadnettle *Lamium purpureum*	None	20	Misc. Annual Herbaceous	Dean Creek, Spruce Reach, open moist areas	No	Low

Common Name ***Scientific Name***	**NISIMS Gross/*Net Acres*[1] (Sites)**	**Gross Treatment Acres**	**Treatment Group**[2]	**Primary Locations**	**Noxious Weed?**[3]	**Treatment Priority**[4]
Purple loosestrife *Lythrum salicaria*	17.09/*1.44* (29)	25	Loosestrifes	Dean Creek, Spruce Reach Island, wetlands, wetland areas	Yes (Oregon)	Highest
Rat-tail fescue *Vulpia myuros*	None	10	Annual Grasses	New River, areas of sparse vegetation	No	Low
Reed canarygrass *Phalaris arundinacea*	0.36/*0.00* (1)	1,200	Perennial Grasses	Dean Creek, wetland, riparian areas	No	High
Ripgut brome *Bromus diandrus*	None	30	Annual Grasses	North Spit, New River, Spruce Reach, Dean Creek, roadsides.	No	Moderate
Rose campion *Lychnis coronaria*	None	50	Carnation Family	forest edges, roadsides, moist areas	No	Low
Saltmeadow rush *Juncus gerardi* ssp. *gerardi*	None	1	Perennial Grasses	North Spit, New River	No	Moderate
Scotch broom *Cytisus scoparius*	9,961.22/*1,190.50* (9,887)	2,000	Woody Species	North Spit, New River, roadsides, dunes, forest edges, timber harvest areas	Yes (Oregon)	High
Sheep sorrel *Rumex acetosella*	None	40	Knotweed Family	North Spit, New River, Dean Creek, Spruce Reach Island, roadsides	No	Moderate
Silver wattle *Acacia dealbata*	0.12/*0.02* (2)	1	Woody Species	New River	Yes (County)	Highest
Spiny sow thistle *Sonchus asper*	None	20	Sunflower Family	New River, roadsides, meadows	No	Low
Spotted knapweed *Centaurea stoebe*	None	10	Sunflower Family	Coquille Valley, Gold Beach, Coos Bay, roadsides	Yes (Oregon)	Highest
Spotted medick *Medicago arabica*	None	20	Pea Family	New River, roadsides, recreation sites	No	Low
St. Johnswort *Hypericum perforatum*	11.99/*0.31* (29)	20	Misc. Herbaceous	roadsides, open areas	Yes (Oregon)	Moderate
Stinging nettle *Urtica dioica* ssp. *dioica*	None	1	Misc. Herbaceous	roadsides, recreation areas, meadows, riparian	No	Low
Subterranean clover *Trifolium subterraneum*	None	20	Pea Family	North Spit, New River, Dean Creek, Spruce Reach Island, roadsides	No	Low
Sweet vernal grass *Anthoxanthum odoratum*	None	25	Perennial Grasses	North Spit, New River, Dean Creek, Spruce Reach Island, dunes, roadside	No	Low
Tall fescue *Schedonorus arundinaceus*	None	10	Perennial Grasses	New River, coastal scrub, roadsides, ditches	No	Low
Tansy ragwort *Senecio jacobaea*	45.79/*3.23* (109)	50	Sunflower Family	Dean Creek pastures, roadsides	Yes (Oregon)	Moderate
Teasel/Fuller's teasel *Dipsacus fullonum*	31.11/*1.26* (38)	50	Teasels	wetland edges, ditches	No	Moderate
Three-sided leek *Allium triquetrum*	None	1	Lilies, Iris, Sedges, Rushes	roadsides, meadows	No	Moderate
Tree-of-heaven *Ailanthus altissima*	None	1	Woody Species	open disturbed areas	Yes (Oregon)	Highest
Velvetgrass *Holcus lanatus*	None	20	Perennial Grasses	Dean Creek, North Spit, New River	No	Low
White/yellow sweetclover *Melilotus albus/M. officianalis*	20.51/*7.89* (69)	50	Pea Family	roadsides	No	Moderate

Common Name ***Scientific Name***	**NISIMS Gross/*Net Acres*[1] (Sites)**	**Gross Treatment Acres**	**Treatment Group[2]**	**Primary Locations**	**Noxious Weed?[3]**	**Treatment Priority[4]**
Wild radish *Raphanus raphanistrum/R. sativas*	None	232	Mustard Family	North Spit, New River, roadsides, fields	No	High
Woodland tansy *Senecio sylvaticus*	None	100	Sunflower Family	ACECs, roadsides, harvest areas	No	Low
Yellow flag iris *Iris psuedacorus*	0.00/*0.00* (1)	5	Lilies, Iris, Sedges, Rushes	New River, Spruce Reach Island, spits, wetland edges, ditches	Yes (Oregon)	Highest
Yellow glandweed *Parentucellia viscosa*	None	40	Snapdragon Family	open areas, roadsides	Yes (County)	Low
Yellow nutsedge *Cyperus esculentus*	None	1	Lilies, Iris, Sedges, Rushes	North Spit	Yes (Oregon)	High
Yellow starthistle *Centaurea solstitialis*	None	1	Sunflower Family	roadsides, river gravels, dunes	Yes (Oregon)	Highest

1. Acres are rounded to two decimal places; acres that are shown as 0.00 are smaller than 0.005 acres.
2. Species of invasive plants that would be treated in the same manner have been arranged into treatment groups. Further information about treatment methods for these treatment groups can be found in Table 2-10, *Treatment Key*.
3. Noxious weeds are classified by the ODA or Coos, Curry, or Douglas County for the purpose of prioritizing and implementing noxious weed control projects. "Oregon" indicates that the plant species is listed as a noxious weed by the ODA, and "County" indicates that the species is listed as a noxious weed by one or more of the counties in the District. Under the No Action Alternative, only species that are listed as noxious weeds can be treated.
4. See *Prioritization of Treatments*, under *Planning*, later in this chapter for more information. Highest: treat for eradication; high: treat for control and then to reduce the existing infestation; moderate: treat for containment; low: treat to prevent spread to other areas.

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

Infestation Size (in Acres)	Number of Sites *(percent of total sites[1])*		Total Acres *(percent of total acres[1])*	
< 0.1	9,029	43%	774.35	4%
0.1 to < 0.5	5,761	28%	1,769.03	9%
0.5 to < 1	2,650	13%	1,913.89	10%
1 to < 5	3,175	15%	6,136.20	31%
5 to < 20	261	1%	2,207.07	11%
20 to <100	56	0%	2,105.94	11%
>100	6	0%	4,941.63	25%

1. Rounded to the nearest percent.

Approximately 83 percent of sites mapped in NISIMS are smaller than one (gross) acre each (see Table 2-2 and Table D-1, *Invasive Plants Mapped in NISIMS by Infestation Size* in Appendix D). However, a relatively small number of large sites account for a majority of infested acres (about 47 percent of the mapped acres are on sites that are larger than five (gross) acres).

Category II: Spread from Existing Invasive Plant Sites

The current spread rate for noxious weeds on the Coos Bay District is estimated to be about 10 percent annually[21] (USDI 2010a:595) and new sites are found on the District with each invasive plant inventory. Invasive plants can spread quickly and over long distances by wind, water, animals, and humans through vehicle and foot traffic. Infestations begin mostly on sparsely vegetated or disturbed sites such as roads and trails, logged areas, wildlife and livestock concentration areas, mining areas, and recreation sites. Livestock and wildlife (including birds) can introduce invasive plant seeds from their coats and feces. The checkerboard ownership pattern and patchiness of vegetation increases opportunities for invasive plant movement onto the District.

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

[21] In other words, the invasive plant infestations discussed in Category I are estimated to grow 10 percent per year.

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

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

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

Material sites such as quarries and areas where mulch, gravel, rocks, oyster shells, or fence posts are stored are continuously disturbed and may have numerous users. Despite precautions, the site may be vulnerable to establishment and spread of invasive plants.

Category III: Invasive Plants Not Yet Known on District

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. The BLM periodically checks common routes of spread (e.g., roads and waterways). Species of concern not yet documented on the District but documented on adjacent lands include Portuguese broom (*Cytisus striatus*), Spanish heath (*Erica lusitanica*), pine echium (*Echium pininana*), and various toadflaxes (*Linaria* spp.) (see Table 2-3). For example, Portuguese broom and Spanish heath are present along Highway 101, within the District, but have yet to be detected on BLM-managed lands. The District works with numerous entities to coordinate early detection activities across jurisdictional boundaries and educate the public about new invasive plants that occur or are likely to invade. All of these invasive plant species are a high priority for treatment in order to prevent them from becoming established on the District (see further information in the *Prioritizing Areas for Treatment* section later in this chapter). It is assumed that if they were found on the District, the infestations would be small (generally a few plants) and would be high priority for treatment; thus eradicating the invasive plant infestation before it can spread further. Hence, the BLM would treat few acres in this Category.

***Table 2-3**. Invasive Plants Documented on Neighboring Lands but Not Known to Occur on the District*

Common Name	Scientific Name	Treatment Group	Noxious Weed[1] *(State or Coos, Curry, or Douglas County)*
Annual yellow sweetclover	*Melilotus indicus*	Pea Family	-
Bindweed	*Solanum dulcamara*	Misc. Herbaceous	-
Black locust	*Robinia pseudoacacia*	Woody Species	-
Buffalobur nightshade	*Solanum rostratum*	Misc. Annual Herbaceous	Oregon B, Coos A, Douglas A, T
Common reed	*Phragmites australis*	Perennial Grasses	Oregon B
Cut leaf teasel	*Dipsacus laciniatus*	Teasels	Oregon B
Dalmatian toadflax	*Linaria dalmatica*	Snapdragon Family	Oregon B, Coos A
Earth loosestrife	*Lysimachia terrestris*	Loosestrifes	-
Garden yellow loosestrife	*Lysimachia vulgaris*	Loosestrifes	Oregon A
Garlic mustard	*Alliaria petiolata*	Mustard Family	Oregon B, Coos A

Common Name	Scientific Name	Treatment Group	Noxious Weed[1] *(State or Coos, Curry, or Douglas County)*
Giant hogweed	*Heracleum mantegazzianum*	Misc. Annual Herbaceous	Oregon A, Coos A
Ground ivy	*Glechoma hederacea*	Perennial Mints	-
Himalayan knotweed	*Polygonum polystachyum*	Knotweed Family	Oregon B, Coos B, T
Japanese (Field) brome	*Bromis japonicus (B. arvensis)*	Annual Grasses	-
Jimsonweed	*Datura stramonium*	Misc. Annual Herbaceous	-
Lesser swinecress	*Coronopus (*Syn. *Lepidium) didymus*	Mustard Family	-
Maltese starthistle	*Centaurea melitensis*	Sunflower Family	Douglas B
Matgrass	*Nardus stricta*	Perennial Grasses	Oregon A
Mediterranean rabbitsfoot grass	*Polypogon maritimus*	Annual Grasses	-
Morning-glory	*Ipomoea purpurea*	Misc. Herbaceous	-
New Zealand geranium	*Geranium core-core*	Geranium Family	-
Pine echium	*Echium pininana*	Borage Family	Coos A
Policemen's helmet	*Impatiens glandulifera*	Misc. Herbaceous	Oregon B, Coos B
Portuguese broom	*Cytisus striatus*	Woody Species	Oregon B, Coos A, Curry A, T, Douglas A, T
Puncturevine	*Tribulus terrestris*	Misc. Annual Herbaceous	Oregon B, Douglas B
Red valerian	*Centranthus ruber*	Misc. Herbaceous	Curry Watch list
Ribbongrass	*Phalaris arundinacea* var *picta*	Perennial Grasses	Oregon B
Scotch thistle	*Onopordum acanthium*	Sunflower Family	Oregon B, Curry A, Douglas A
Shiny leaf geranium	*Geranium lucidum*	Geranium Family	Oregon B
Small flower buttercup	*Ranunculus parviflorus*	Misc. Herbaceous	-
Spanish broom	*Spartium junceum*	Woody Species	Oregon B, Curry A, T, Douglas B
Spanish heath	*Erica lusitanica*	Woody Species	Oregon B, Coos A
Spurge laurel	*Daphne laureola*	Woody Species	Oregon B
Sulfur cinquefoil	*Potentilla recta*	Misc. Herbaceous	Oregon B, Douglas B
Sweetbriar rose	*Rosa rubiginosa*	Woody Species	-
White ramping fumitory	*Fumaria capreolata*	Misc. Herbaceous	Coos A
Yellow archangel	*Lamiastrum galeobdolon*	Perennial Mints	Oregon B
Yellow foxtail	*Setaria pumila*	Annual Grasses	-
Yellow toadflax	*Linaria vulgaris*	Snapdragon Family	Oregon B, Coos A; Douglas A

1. Noxious weeds are classified by the counties or the ODA for the purpose of prioritizing and implementing noxious weed control projects (ODA 2017):

A List: A weed of known economic importance that occurs in the State or County in small enough infestations to make eradication or containment possible.

B List: A weed of economic importance which is regionally abundant, but which may have limited distribution in some areas.

T list: A designated group of species that are selected and will be the focus for prevention and control by the State or County. Action against these will receive priority. T designated noxious weeds indicate the need to develop and implement a management plan. T designated noxious weeds are species that are also on the A or B list.

2. Species of invasive plants that would be treated in the same manner have been arranged into treatment groups. Further information about treatment methods for these treatment groups can be found in Table 2-10, *Treatment Key*.

Category IV: Lower Priority Invasive Plants

Additional invasive plants (other than those in the above Categories) are known on the District. They are generally not inventoried because they are currently a low priority for treatment. These plants are less likely (than Category I or III plants) to interfere with a management objective as the harm they cause is still below the threshold level for action in most areas. However, in the future these plants may become problematic in specific conditions and would require treatments (e.g., in an ACEC or in Special Status plant habitat). In addition, the BLM may treat these plants in conjunction with other invasive plants being treated in the immediate area; for example, velvet grass

(*Holcus lanatus*) may be treated incidentally when treating higher priority grasses like pampas grass or jubata grass, as treatment methods would be the same. Category IV does not include any species where more than 10 gross acres of treatments are anticipated over the next 20 years. A full list of these species is part of Table D-2, *Further Information about Invasive Plant Species* in Appendix D.

Integrated Invasive Plant Management

As noted in Chapter 1, the action alternatives would update the direct control methods that are available to the existing noxious weed management program, including increasing the number of herbicides available for use. In addition, the action alternatives would add other invasive plants that are not listed as noxious weeds to the plant species that can be treated. As described in the alternatives, these additional herbicides and additional invasive plants would cause the use of some treatment methods to increase. 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.

Prevention, Education, and Awareness

Prevention, education, and awareness are the highest priority for the management of invasive plants, as was described in the 1997 *Integrated Noxious Weed Program on the Coos Bay District Environmental Assessment* (USDI 1997). The District maintains a District Weed Prevention Schedule (see Appendix E, *Prevention*) that outlines prevention steps like inspecting vehicles and equipment for invasive plant materials (e.g., seeds) and helping with community invasive plant education events. Specific responsibilities are assigned for keeping administrative sites free of invasive plants, reestablishing desirable vegetation on disturbed sites, inspecting gravel and other materials sites, and including invasive plant prevention measures in all planning documents, contracts, and leases. Other activities include the continuing education of employees, contractors, and the public. The BLM, in cooperation with other groups[22], publishes news articles, signs recreation sites, and conducts invasive plant awareness meetings and lessons in communities and local schools. In addition, in cooperation with Coos County Weed Board, the BLM participates in an invasive plant education booth at the Coos County fair.

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 (see Appendix E, USDI 1992b).[23] If there is a moderate or high risk of spread, actions to reduce the risk must be implemented and monitoring of the site (see *Monitoring* section below) must be conducted to prevent establishment of new infestations (USDI 1992b). A list of prevention measures applicable to projects or vegetation treatment actions is included in Appendix E, *Invasive Plant Prevention Measures*.

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

[22] Such as Coos County Weed Advisory Board, Oregon Dunes Cooperative Weed Management Area (CWMA), the South Coast CWMA, the Gorse Action Group, South Slough National Estuarine Research Reserve, and the Coos and Coquille Watershed Association.

[23] 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).

Coordination and Cooperation

The District has worked cooperatively with several entities, including local, State, and Federal agencies, non-governmental organizations, and private landowners for several decades. 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 adjacent timber owners; the Gorse Action Group; the Oregon Dunes Cooperative Weed Management Area (CWMA); Coos-Curry CWMA; the Coos, Curry, Umpqua, and Douglas Soil and Water Conservation Districts (SWCD); the South Coast, Smith River, Coos and Coquille Watershed Associations; Partnership for Umpqua Rivers; Coos County; Oregon Parks and Recreation Department; Oregon Department of Agriculture; and the Rogue River/Siskiyou and Siuslaw National Forests. Invasive plant treatments on neighboring lands may occur through interagency and cooperative agreements in which grant monies and BLM contributions (in-kind and monetary) help fund invasive plant treatments on BLM and adjacent lands.

Planning

Integrated invasive plant management includes a process to determine when and where to take action. The *Integrated Vegetation Management Manual* (USDI 2008a:59) describes an adaptive management approach based on clearly identified outcomes (see *Prioritization of 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 Table 2-10, *Treatment Key*). An example of how this would be implemented can be found in Appendix D, *Invasive Plant Infestations*, in the *Invasive Plant Treatments Example* section.

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

Prioritization of Treatments

The number of acres treated annually varies and is based on factors such as available funding and weather. In general, the District's strategy is to manage invasive plants to minimize adverse effects to ecological function and economic values. Priorities are as follows:

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

Within the above broad categories, 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, special management areas (such as ACECs), and recreation. Other considerations include: the risk of spread (e.g. if it is along a road or recreation site where it can be easily picked up and moved long distances, or if it is next to a site-disturbing activity into which it may spread); the species and its priority on State and County noxious weed control lists; the size of the infested area and whether the site is isolated or near others; and, the control priorities of BLM neighbors and cooperators. Knowledge of the control methods that would work for each species and that are appropriate for the lands infested also informs the prioritization process.

Monitoring

Monitoring involves repeated assessment or measurement of a site or infestation to document changes over time. Monitoring is required for many resources managed by the BLM. Some of this monitoring, even if not directly done because of the invasive plant program, can reveal information about the program. For example, monitoring Special Status plant populations is required to determine whether management objectives are being met, and can also reveal invasive plant infestations (*Special Status Species Management Manual*, USDI 2008b). Directly related to the invasive plant program, 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

Where the BLM uses herbicides, BLM policy and the EPA require monitoring. The BLM completes Pesticide Use Proposals prior to application that identify the site, target species, herbicide (product and active ingredient) and application rate, adjuvants, and anticipated effects to non-target species and susceptible areas. 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 planning and application requirements have been met. Similar records are also kept for non-herbicide treatments.

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

Effectiveness Monitoring

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

An example of how effectiveness monitoring would be implemented can be found in Appendix D, *Invasive Plant Infestations*, in the *Invasive Plant Treatments Example* section.

Direct Control Methods

Direct control methods will vary by alternative. Selection of a treatment method considers methods that would be effective for each species and what is appropriate for the lands infested (including what nearby resources may be affected). For many species, small infestations may be controlled with manual or other non-herbicide treatments. Others may require herbicides to obtain control or reduce 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 the environment" and requires bureaus to "[e]stablish site management objectives and then choose the lowest risk, most effective approach that is feasible for each pest management project" (USDI 2007e).

Manual Treatment Methods

Manual treatment methods (such as pulling, digging, and grubbing) can be used to control some invasive plants, particularly if the infestation is relatively small. These techniques can be extremely target specific and are often used to minimize damage to adjacent desirable plants. However, they can be labor and time intensive. Treatments often must be conducted several times annually to prevent the invasive plant from re-establishing, which often makes manual treatments of invasive plants in remote locations unpractical. Manual techniques are used on small infestations or where a large pool of labor is available. They can be used in combination with other techniques. For example, shrubs can be pulled and cut, and re-sprouts and seedlings can be treated with herbicides several weeks or months later (Tu et al. 2001). English ivy is another example; the cuticle on ivy effectively repels herbicide, so ivy must be manually (or mechanically) removed before herbicide application could be effective on young plants without fully developed cuticles.

The placement of weed barriers involves putting a plastic sheet or tarp over an area for up to six months. Weed barriers can be used in areas where invasive plants are not intermingled with native vegetation. It is often done as site preparation in advance of seeding and planting.

Mechanical Treatment Methods

Mechanical treatment methods include tractors with mowers or discs or bulldozers. Some methods (e.g., chainsaws and string trimmers) can be more target-specific than others. String trimmer and mowing methods are commonly used in administrative sites, like communication and recreation sites, to prevent invasive plants from spreading and to maintain clear access. Propane torches can be used in parking lots, sidewalks, dunes, or other areas where the substrate is not flammable. Propane torches do not work by burning the plant; rather, the torch applies heat approximately two inches from the plant, causing the water in the invasive plants' cells to boil and burst. Leaves wilt and dry out in two to three days. Once the heat destroys any section of a stem, for instance, water and nutrients cannot reach the leaves, and the top part of the plant dies.

Competitive Seeding and Planting

When revegetating disturbed sites, the District uses locally adapted, weed-free native grass and forb seeds and mulches. Plant materials are generally 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 locally sourced

seed and container plants often occurs in conjunction with other treatments but can also occur independently as a measure to prevent invasive plant establishment. Seeding is primarily accomplished by hand spreading to achieve a specific density of seed per area. Mulching with weed-free straw often occurs in conjunction with seeding, unless the site is difficult to access. Mulch reduces seed herbivory, prevents seeds from blowing or washing off site, retains moisture to increase successful germination, and reduces soil erosion. Plugs and potted plants are used to complement seeding at sites where immediate vegetation cover is desired or to include native species that do not establish well from seed.

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

Perennial grasses are seeded on roadsides, landings, and other areas of bare soil to prevent invasive plant establishment and soil erosion. The native perennial grasses used on the District are cool-season growers and do best if planted in fall or early spring when moisture and soil temperatures are favorable for plant establishment. Unlike annual grasses, perennial grasses generally grow slowly during the first year and many native perennial grasses might take two years to express their potential as a solid stand (Pacific Coast Seed 2010). A sterile triticale hybrid is added to some native grass seed mixes, particularly those planted in spring and summer when growing conditions are less favorable. The sterile hybrid is an annual and serves as a nurse crop to assist in establishment of perennial native grasses (it greens up rapidly and holds soil until the perennials can establish). Informal monitoring has shown that native perennial grasses used on Coos Bay District lands take 2 to 3 years to establish (Jeanne Standley, Coos Bay Weed Coordinator, 2017 personal communication).

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.

(Propane torches are used to heat plants to boil the water in invasive plant cells, not to consume plants with fire. 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, sheep, or cattle) 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 infestation to an acceptable level by stressing target plants and reducing competition with native plant species.

Biological Control Agents

Classical biological control refers to a subset of organisms (or “agents”) that includes plant-eating insects, nematodes, mites, or pathogens. Biological control agents are usually acquired from the same ecosystems where the target invasive plant originated, and are rigorously tested by the Federal Animal and Plant Health Inspection Service (APHIS) Plant Protection and Quarantine Program to ensure that they are host specific and feed only on the

target plant and not on crops or native flora. Issuance of permits by APHIS for the environmental release of nonindigenous invasive plant biological control organisms is considered a Federal action and triggers compliance with the *Endangered Species Act* and NEPA. The ODA's Noxious Weed Control Program coordinates releases and monitors populations. Since the biological control agents are not successful unless there are enough invasive plants for them to feed upon, typically only large infestations are targeted. Often, several biological control agents are used together to reduce the density of invasive plants but biological controls seldom remove an invasive plant infestation entirely. Many biological control agents are common and widespread on noxious weeds throughout Oregon. The primary factors for when and where to release additional biocontrols are infestation size and availability of effective agents for the specific site. Table 2-4 shows biocontrols that are active within the Coos Bay District boundary (those marked with a "5").

***Table 2-4**. Biocontrol Releases within the Coos Bay District Boundary*

Invasive plant (host)	Biocontrol (agent)	Status, by County[1]		
		Coos	Curry	Douglas
Blessed milkthistle - *Silybum marianum*	*Rhinocyllus conicus* - seed head weevil	**5**	**5**	**5**
Bull thistle - *Cirsium vulgare*	*Rhinocyllus conicus* - seed head weevil	**5**	**5**	**5**
	Trichosirocalus horridus - crown/root weevil	0	0	**5**
	Urophora stylata - seed head gall fly	4	2	**5**
Canada thistle - *Cirsium arvense*	*Ceutorhynchus litura* - crown/root weevil	1	1	1
	Rhinocyllus conicus - seed head weevil	**5**	**5**	**5**
	Urophora cardui - stem gall fly	4	2	4
Field bindweed - *Convolvulus arvensis*	*Aceria malherbae* - eriophyid mite	2	0	0
	Tyta luctuosa - defoliating moth	1	1	2
French broom – *Genista monspessulana*	*Bruchidius villosus* - seed beetle	2	2	**5**
Gorse - *Ulex europaeus*	*Exapion ulicis* - seed weevil	**5**	**5**	**5**
	Tetranychus lintearius - spider mite	**5**	**5**	**5**
Italian thistle - *Carduus pycnocephalus*	*Rhinocyllus conicus* - seed head weevil	**5**	**5**	**5**
	Trichosirocalus horridus - crown/root weevil	0	0	**5**
Meadow knapweed - *Centaurea x moncktonii*	*Larinus minutus* - seed head weevil	0	0	4
	Larinus obtusus - seed head weevil	1	1	**5**
	Urophora affinis - seed head gall fly	0	0	1
	Urophora quadrifasciata - seed head gall fly	**5**	**5**	**5**
Purple loosestrife - *Lythrum salicaria*	*Galerucella calmariensis* - defoliating beetle	**5**	2	4
	Galerucella pusilla - defoliating beetle	**5**	2	4
	Hylobius transversovittatus - root weevil	2	2	2
	Nanophyes marmoratus **-** seed head weevil	2	1	**5**
Scotch broom - *Cytisus scoparius*	*Bruchidius villosus* - seed beetle	2	2	**5**
	Exapion fuscirostre - seed weevil	**5**	3	**5**
	Leucoptera spartifoliella - twig mining moth	**5**	**5**	**5**
St. Johnswort - *Hypericum perforatum*	*Agrilus hyperici* - root/stem boring beetle	1	1	4
	Aplocera plagiata - defoliating moth	1	1	4
	Chrysolina hyperici - defoliating beetle	**5**	**5**	**5**
	Chrysolina quadrigemina - defoliating beetle	**5**	**5**	**5**
Tansy ragwort - *Senecio jacobaea*	*Botanophila seneciella* - seed head fly	**5**	**5**	**5**
	Longitarsus jacobaeae - root/defoliating flea beetle	**5**	**5**	**5**
	Tyria jacobaeae - defoliating moth	**5**	**5**	**5**
	Cheilosia corydon - crown/root fly	**5**	**5**	**5**
	Eustenopus villosus - seed head weevil	0	1	**5**
	Larinus curtus - seed head weevil	0	1	**5**
	Puccinia jacea var. *solstitialis* - rust fungus	0	1	6
	Urophora sirunaseva - seed head fly	0	**5**	**5**

1: Numbers indicate the following: 0: Invasive plant not present, 1: Invasive plant present, no biocontrol released, 2: Biocontrol released, status unknown, 3: Biocontrol recovered, nursery sites established, 4: Biocontrol limited in distribution, being collected and redistributed, **5**: **Biocontrol widespread within host range (occurs on at least 50 percent of plants)**, 6: Biocontrol released, failed to establish.

Targeted Grazing

Targeted grazing[24] 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 prefer shrubs, while cattle graze on grasses. Grazing can be seasonally timed for when the target plant is most palatable to livestock and to minimize effects to non-target plants and surrounding resources. Typically, a full-time herder or fencing is required to keep the grazing focused on the target areas and species. Employing grazing prescriptions may be particularly useful in areas with limited access, steep slopes, or where the most effective herbicide for a particular plant species cannot be applied (e.g., a non-aquatic herbicide application near water). Although targeted grazing with livestock can reduce invasive plant abundance and vigor at a particular site, grazing rarely, if ever, eradicates invasive plants. As with many other treatments, targeted grazing with livestock can be most effective when used in combination with other treatments (USDI 2010a:75).

Herbicide Treatment Methods

Herbicides used on BLM-managed lands must be approved by the BLM National Office, and must, by policy, be subject to detailed ecological and human health Risk Assessments for wildland applications to help satisfy the requirements of NEPA (USDI 2010a:37). However, BLM practice allows for limited and controlled use of herbicides that do not have Risk Assessments on demonstration plots up to 5 acres in size, with a maximum of 15 acres per Field Office.[25] Approval to use an herbicide for research and demonstration is provided by the BLM National Office after an initial evaluation of *Federal Insecticide, Fungicide and Rodenticide Act* registration materials, Risk Assessments, and the appropriate level of NEPA analysis (USDI 2010a:478). Herbicides analyzed in this EA are shown on Table 2-5, *Herbicide Information* and Table 2-6, *Herbicide Characteristics*.

Herbicides are utilized:

- on stands of an 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 over several years to control;
- on plants whose characteristics make them difficult or unfeasible to remove with non-herbicide methods;[26]
- 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 silver wattle can be controlled by cutting stems close to the ground in the fall and then spraying the cut stumps with an herbicide registered for this use).

Herbicides are applied only to lands and uses for which they are labeled and only by certified or licensed applicators or persons working under their direct supervision (USDI 2010a:85). A Pesticide Application Record is completed within 24 hours of the application documenting environmental conditions at the time of treatment as

[24] Also referred to as directed livestock grazing or prescribed grazing.
[25] Not an annual limit. If research and demonstration results appear favorable, then the BLM further considers the herbicide for general approval. 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.
[26] For example, Canada thistle root fragments readily resprout and some plants can be injurious to workers attempting to manually remove them.

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, handling, deposition, or application of the herbicide) must be on the BLM lists of approved herbicides and adjuvants and in accordance with current NEPA documents at the time of application. The current lists are included in Appendix B, *The Herbicides, Formulations, and Adjuvants*. For applications with a potential to enter streams or other waterbodies, herbicides are limited to aquatic formulations. For applications with a potential to affect federally listed and Bureau Sensitive fish, aquatic-approved adjuvants[27] would also be used.

Ground-based herbicide applications are primarily done with a hand-directed sprayer. This is usually done in small areas and in areas where invasive plants are scattered. A hand-directed sprayer is used because it can target specific plants, so effects to non-target species can be kept to a minimum. Hand-directed sprayers include motorized, truck mounted sprayers, and backpacks. Herbicides are primarily applied to plant foliage, but some herbicides may be applied to the soil. For woody invasive plants (like tree–of-heaven), herbicides may also be basally applied with a wick (wiped on), or wand (sprayed on). Herbicides can be applied to trees around the circumference of the trunk on the intact bark (basal bark), to cuts in the trunk or stem (frill, or "hack and squirt"), to cut stems and stumps (cut stump), or injected into the inner bark.

Ground-based herbicide application is also accomplished from off-highway vehicles with vehicle-mounted spraying systems using handguns, boom-less nozzles, or booms. Spray tank sizes generally vary from 4 to 100 gallons. Using a larger tank (as is typical for vehicle-mounted sprayers) provides the advantage of less mixing and loading of herbicides, which, in turn, leads to less risk of accidental spills of concentrated products. Most vehicle applications are done from an existing road as spot treatments. Treatments that cannot be reached from the roadway (further than 300 feet away) are done with backpack sprayers. Aerial applications are not authorized and would not occur.

Table 2-5*. Herbicide Information*

Herbicide: Representative Trade Names[1] *Common Targets*	**Alternatives**			**Selective to Plant Types** Pre or post emergent *Point of application*	**Areas Where Registered Use is Appropriate**[2]							**Application Rate**[3] **(lbs./acre/year)**	
	No Action	*Proposed Action*	*Alternative 3*		*Rangeland*	*Forest and Woodland*	*Riparian or Seasonal Wetland*	*Aquatic or Wetland*	*Oil, Gas, & Mineral Sites*	*Rights-of-Way*	*Recreation & Cultural Sites*	Typical	Max[4]
2, 4-D: Many, including Weedone LV6 *Broadleaf plants*	✓	✓	✓	**broadleaf** Post *Foliar*	✓	✓	✓	✓[2]	✓	✓	✓	1	(1.9 or 2) [5]
Aminopyralid: Milestone *Starthistles, thistles, knapweeds*		✓	✓	**broadleaf** Post *Foliar*	✓	✓	✓		✓	✓	✓	0.078	0.11
Chlorsulfuron: Telar *Perennial mustards*		✓	✓	**broadleaf** Pre and early post *Foliar*	✓		✓		✓	✓	✓	0.047	0.141

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

Herbicide: Representative Trade Names[1] *Common Targets*	**Alternatives**			**Selective to Plant Types** Pre or post emergent *Point of application*	**Areas Where Registered Use is Appropriate**[2]							**Application Rate**[3] **(lbs./acre/year)**	
	No Action	*Proposed Action*	*Alternative 3*		*Rangeland*	*Forest and Woodland*	*Riparian or Seasonal Wetland*	*Aquatic or Wetland*	*Oil, Gas, & Mineral Sites*	*Rights-of-Way*	*Recreation & Cultural Sites*	Typical	Max[4]
Clopyralid: Transline, Stinger, Spur *knapweed, biennial thistles, starthistles*		✓	✓	**broadleaf** Post *Foliar*	✓	✓	✓		✓	✓	✓	0.35	0.5
Dicamba: Vanquish, Banvel, Diablo, Vision, Clarity *Perennial mustards, biennial thistles, field bindweed, puncturevine*	✓	✓	✓	**broadleaf, woody plants** Pre and post *Foliar*	✓		✓		✓	✓	✓	0.3	2[6]
Diflufenzopyr + Dicamba: Overdrive, Distinct *Field bindweed, oxeye daisy, St Johnswort* Dicamba Diflufenzopyr		✓	✓	**broadleaf** Post *Foliar*	✓				✓	✓	✓	0.2625 0.1875 0.075	0.4375 0.25 0.1
Fluroxypyr: Comet, Vista *Mustards, spurge, blackberry*			✓	**broadleaf** Post *Foliar*	✓	✓	✓		✓	✓	✓	0.26	0.5
Glyphosate: Many, including Accord, (Rodeo), AquaNeat, AquaMaster *Grasses, trees and shrubs, yellow flag iris*	✓	✓	✓	**no** Post *Foliar*	✓	✓	✓	✓[2]	✓	✓	✓	2	3 or 7[7, 8]
Hexazinone: Velpar *Grasses in rights-of-way*			✓	**Grasses, broadleaf, woody plants** Pre and post *Foliar*	✓	✓			✓	✓	✓	2	(4)[8]
Imazapic: Plateau, Panoramic *Annual grasses*		✓	✓	**some broadleaf and grasses** Pre and post *Soil*	✓	✓	✓		✓	✓	✓	0.0313	0.1875
Imazapyr: Arsenal, Stalker, Habitat, Polaris *Starthistles, trees and shrubs, yellow flag iris*		✓	✓	**no** Pre and post *Foliar*	✓	✓	✓	✓	✓	✓	✓	0.45	1.5[6]
Metsulfuron methyl: Escort, Patriot, PureStand *Trees and shrubs, perennial mustards, St. Johnswort, biennial thistles*		✓	✓	**broadleaf** Pre and post *Foliar*	✓	✓	✓		✓	✓	✓	0.03	0.15[6]
Picloram: Triumph, OutPost, Tordon *field bindweed, knapweed, St. Johnswort, starthistles, biennial thistles*	✓	✓	✓	**broadleaf, woody plants** Pre and post *Foliar*	✓	✓			✓	✓	✓	0.35	1
Rimsulfuron: Matrix *Annual grasses*			✓	**annual grasses** Pre and post *Soil*	✓	✓	✓		✓	✓	✓	0.0469	0.0625
Sulfometuron methyl: Oust, Spyder *Annual grasses*		✓	✓	**no** Pre and post *Foliar*		✓	✓		✓	✓	✓	0.14	0.38

Herbicide: Representative Trade Names[1] *Common Targets*	**Alternatives**			**Selective to Plant Types** Pre or post emergent *Point of application*	**Areas Where Registered Use is Appropriate**[2]							**Application Rate**[3] **(lbs./acre/year)**	
	No Action	*Proposed Action*	*Alternative 3*		*Rangeland*	*Forest and Woodland*	*Riparian or Seasonal Wetland*	*Aquatic or Wetland*	*Oil, Gas, & Mineral Sites*	*Rights-of-Way*	*Recreation & Cultural Sites*	Typical	Max[4]
Triclopyr: Garlon, Renovate, Element *Purple loosestrife, trees, and shrubs*		✓	✓	**broadleaf, woody plants** Post *Foliar*	✓	✓	✓	✓[2]	✓	✓	✓	1	(10)
Proposed For Research and Demonstration													
Fluazifop-P-butyl[9]**:** Fusilade DX *Annual and perennial grasses*			✓	**grasses** Post *Foliar*	✓	✓			✓	✓		Single application: 0.1 to 0.375. Maximum seasonal application 1.125[9]	

1. See Table B-2, *Herbicide Formulations Approved for use on BLM-managed Lands*, in Appendix B for the full list of herbicide trade names approved for use on lands managed by the BLM in Oregon, including formulations with two or more active ingredients.
2. 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).
3. Actual intended application rates can be found in Table 2-10, *Treatment Key*.
4. Maximums are determined by herbicide product label and information analyzed in Risk Assessments. In cases where these two rates differ, the lower of the two rates is the maximum that can be applied on BLM-managed lands. Parentheticals denote herbicides that are limited by PEIS Mitigation Measures to typical application rates where feasible.
5. One (typical) and 1.9 (maximum) lbs./acre under the No Action, 1 and 2 lbs./acre for the Proposed Action for annual and perennial species.
6. 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."
7. Three lbs./acre acid equivalent for the No Action Alternative and 7 lbs./acre under the Proposed Action. The 1987 Integrated Weed Control Plan and EA relies on a 1985 glyphosate Risk Assessment that analyzes glyphosate at 3 lbs./acre acid equivalent, based on the maximum application rate on a Rodeo © label. The 2011 glyphosate Risk Assessment analyzes a maximum rate of 7 lbs./acre. Maximum rates on formulated product labels listed in Table B-2 (Appendix B) range from 7 lbs./acre to 14 lbs./acre.
8. 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."
9. Information from SERA (2014). BLM maximum and typical rates have yet to be calculated, but would not exceed labeled rate.

Table 2-6*. Herbicide Characteristics*

Herbicides analyzed for Research and Demonstration	
Fluazifop-P-butyl	Fluazifop-P-butyl is effective on annual and perennial grasses, but does not affect broadleaf plants.
Herbicides approved for use on BLM-managed lands	
2,4-D	2,4-D is effective on a wide range of broadleaf invasive plants while not affecting most grasses. 2,4-D can help inhibit seed production, prevent herbicide resistance, and effectively treat multiple invasive plant species when a variety are encountered in a particular treatment area. While having additional herbicides available can allow for more target specific control, having one herbicide that controls a vast range of vegetation can be beneficial when an area is dominated by a variety of invasive broadleaved plants. In addition, adding 2,4-D to a tank mix can often improve the effectiveness of the other herbicides and reduce the likelihood of an invasive plant 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 likelihood of volatilization.
Aminopyralid	Aminopyralid is selective for broadleaf species, particularly members of the sunflower and legume families and is also effective on certain species in the carrot, nightshade, and knotweed families. It is

	effective at controlling yellow starthistle, 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). It is more effective than clopyralid on tough to control members of the sunflower family. In mixtures with other active ingredients like metsulfuron methyl, it can be used on hard-to-control species like poison hemlock (DiTomaso et al. 2013).
Chlorsulfuron	Chlorsulfuron is especially effective on broadleaf plants such as toadflax 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 such as meadow foxtail, some brome species, and timothy.
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. It is effective on invasive broadleaves but offers little 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.
Fluroxypyr	Fluroxypyr is effective on annual and biennial invasive plants. It would be used to manage annuals in the carrot, sunflower, pea, knotweed, and nightshade families. 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 riparian areas if additional aquatic formulations were available since glyphosate and 2,4-D have been the only two aquatic herbicides available to the District for the past 30 years. Aminopyralid would replace glyphosate for many terrestrial broadleaf species. The BLM does not use glyphosate formulated with polyoxyethylenamine (POEA).
Hexazinone	Hexazinone is effective on grasses, broadleaf and woody plants, both pre- and post- emergent. It could also be used to treat new invaders to the District where appropriate. Common targets could include invasive perennial grasses (especially false brome) and invasive broadleaf plants. Hexazinone is primarily used on roadsides.
Imazapic	Imazapic is a broad-spectrum herbicide for broadleaf and grass species, but is particularly effective on invasive annual grasses. 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, gorse, and blackberry. It is also used to treat perennial grasses, knotweeds, and European beachgrass. Imazapyr may be used for the control of yellow flag iris in and around standing and flowing water, as well as in riparian settings.
Metsulfuron methyl	Metsulfuron methyl has similar targets and effects as chlorsulfuron. It could be used on mustards and thistles. It can be used in combination with aminopyralid (Opensight) to treat annual forbs.
Picloram	Picloram is effective on knapweeds, toadflax, and thistles, and provides good residual control. Appropriate at sites where soils are not sandy or gravelly. Aminopyralid and clopyralid target many of the same species and are more selective.
Rimsulfuron	Rimsulfuron is effective against annual grasses in the fall pre-emergence or post-emergence in the fall or spring when soil temperature is cool and rainfall is available to activate the herbicide. It provides a longer window of control than imazapic, although it must be used at the highest label rates for effective spring applications. It would not be applied near water.
Sulfometuron methyl	Like imazapic, sulfometuron methyl is effective on invasive annual grasses 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 will control many annual and perennial grass and broadleaf species. At low rates, it is safe on perennial grasses while controlling forbs and annual grasses.
Triclopyr	Triclopyr is effective on woody plants, and would be used on brooms, gorse, trees, and shrubs. The aquatic formulations are also the most effective herbicide for treatment of purple loosestrife. Triclopyr BEE, the ester formulation, 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, in addition to foliar applications.

Stressors such as imperfect growing conditions (too wet, too dry, or poor soil nutrients) may prevent the herbicide from acting optimally. As described in the *Issue* sections in Chapter 3, 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.[28]

Resistance and Rotation

Herbicide resistance[29] 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 (University of Idaho 2011). Resistance can result from repeated use of the same herbicides, or several herbicides with the same site of action. BLM has been limited to use of the same four herbicides for over 30 years, which may have inadvertently contributed to resistant invasive plant species.

The use of additional herbicides would help prevent herbicide resistance by adding chemicals that control the plants through different modes (sites) of action. More effective rotation of herbicides (see Table 2-7), when coupled with integrated invasive plant management, would help prevent the development of herbicide resistance. Many product labels for the acetolactate synthase (ALS)-inhibitors (such as chlorsulfuron and metsulfuron methyl) recommend tank-mix partners, sequential herbicide applications that have different modes of action, or both.

***Table 2-7**. Guide for Herbicide Rotation*[1]

Herbicide Group	Herbicide Chemical Family	Herbicide Common Name	Resistant Plants[2]	States with Resistant Plants
ACCase Inhibitors	Aryloxyphenoxy-propanoates	Fluazifop-P-butyl	cheatgrass	Oregon
ALS-Inhibitors	Imidazolinones	Imazapic	none	none
		Imazapyr	none	none
	Sulfonylureas	Chlorsulfuron	prickly lettuce kochia Russian thistle annual ryegrass dogfennel littlepod falseflax	Idaho, Oregon, Washington Idaho, Oregon, Washington Idaho, Oregon, Washington Oregon Idaho, Washington Oregon
		Metsulfuron methyl	prickly lettuce kochia	Idaho, Oregon Oregon

[28] See the *Alternatives* section for treatment efficiency under each of the alternatives.
[29] 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.

Herbicide Group	Herbicide Chemical Family	Herbicide Common Name	Resistant Plants[2]	States with Resistant Plants
			Russian thistle littlepod falseflax	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	Shepard's-purse	Oregon
ESPS synthase inhibitors	Glycines	Glyphosate	annual ryegrass kochia	Oregon Oregon, Idaho

1. Adapted from *Herbicide-resistant Weeds and Their Management* (University of Idaho 2011). 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.
2. Some species not present on Coos Bay District

Human Health and Ecological Risk Assessments

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

One of the purposes identified in Chapter 1 is *Prevent control treatments from having unacceptable adverse effects to applicators and the public, to desirable flora and fauna, and to soil, air, and water*. To help address this purpose, the EA (and the 2007 PEIS, the 2010 Oregon FEIS, and the 2016 PEIS to which the EA tiers) rely on BLM and U.S. Forest Service-prepared Human Health and Ecological Risk Assessments for the herbicides included in this EA. The BLM prepared or adopted these Risk Assessments as part of the 2007 and 2016 PEIS process and they are included as appendices to those documents. These Risk Assessments are used to quantitatively evaluate the probability (i.e., risk) that herbicide use in wildland settings might pose harm to humans or other species in the environment. As such, they address many of the risks that would be faced by humans, plants, and animals, including Special Status species, from exposure to the herbicides. The level of detail in the Risk Assessments for wildland use exceeds that normally found in the EPA's registration examination. Court decisions and others have affirmed that although the BLM can use EPA toxicology data, the BLM is still required to do an independent assessment of the safety of pesticides rather than relying on *Federal Insecticide, Fungicide and Rodenticide Act* registration alone.

A summary of the risk ratings from the various Risk Assessments, along with an explanation of how the risk ratings were derived, are included in Appendix C, *Herbicide Risk Assessment Summaries*.

The risk ratings are the source for much of the individual herbicide information, including the high-moderate-low-no (0) risk ratings, presented in Chapter 3.

Risk is defined as the likelihood that an effect (such as skin or eye irritation, leaf damage, mortality, etc.) may result from a specific set of circumstances. Risks to non-target species associated with herbicide use are often approximated via the use of surrogate species, as toxicological data does not exist for most native non-target species. Survival, growth, reproduction, and other important processes of both terrestrial and aquatic non-target species are considered. The Risk Assessments consider acute and chronic toxicity data. The Risk Assessments analyze the exposures of receptors[30] to direct spray, surface runoff, wind erosion, and accidental spills.

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

The Risk Assessments, related separate analyses, the Oregon FEIS, and the 2007 and 2016 PEISs include analyses of inert ingredients and degradates for which information is available and not constrained by confidential business information restrictions[31]. To the degree a toxic substance is known to pose a significant human or ecological risk, the BLM and U.S. Forest Service have undertaken analyses to assess their effects through Risk Assessments. Information about uncertainty in Risk Assessments is included in the Oregon FEIS, Appendix 13.

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

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

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

Standard Operating Procedures and other Protection Measures

The BLM has identified Standard Operating Procedures to reduce adverse effects to environmental and human resources from vegetation treatment activities based on guidance in BLM manuals and handbooks, regulations, and standard BLM and industry practices (listed in Appendix A, *Protection Measures*). Effects described in this EA are predicated on application of the Standard Operating Procedures or equivalent, unless an on-site determination is made that their application is unnecessary to achieve their intended purpose or protection. For example, the Standard Operating Procedure to "Provide alternative forage sites for livestock, if possible" would not need to be applied where livestock are not present.

Mitigation Measures were identified for all potential adverse effects identified for herbicide applications in the 2007 and 2016 PEISs (USDI 2007a, USDI 2016a), and adopted by their Records of Decision (also listed in Appendix A). In other words, no potentially significant adverse effect identified in the PEIS analyses remained at the programmatic scale after the Mitigation Measures were adopted. Like the Standard Operating Procedures, application of the Mitigation Measures is assumed in the analysis in this EA. Mitigation Measures were also identified and adopted for adverse effects identified in the Oregon FEIS (USDI 2010a). In the analysis in this EA, application of these measures (also listed in Appendix A) is assumed. No potentially significant adverse effect was identified at the programmatic scale in the Oregon FEIS with the Standard Operating Procedures and Mitigation Measures applied.

In addition, consultation regarding federally listed species resulted in the identification of Conservation Measures and Project Design Criteria to protect Coos Bay District listed species from treatments. These are provided in Appendix A, in the *Protection Measures for Federally Listed Species* section. Project Design Features were also identified to prevent unwanted effects from treatments under the Proposed Action and Alternative 3 in this EA.

The District would also follow applicable Best Management Practices listed in the *Northwest and Coastal Oregon Resource Management Plan* (USDI 2016d:139-180). These can be found in Appendix C of the *Resource Management Plan*.

[31] Under the *Toxic Substances Control Act*, an herbicide manufacturer may request that certain proprietary information, the release of which would cause substantial business injury to the owner, be kept confidential by the EPA.

The Alternatives

This section describes three alternatives in detail, the No Action Alternative (Alternative 1), the Proposed Action (Alternative 2), and Alternative 3. These are the alternatives addressed in the effects analysis in Chapter 3. This section also describes the other alternatives that were considered but were not carried forward for detailed analysis. The alternatives address the dynamic nature of invasive plants, including increasing numbers of invasive plant[32] species and changing conditions of infestations. Due to the nature of invasive plants, the size of the land base involved, and the nature of multiple uses that take place on it, invasive plant control would remain an ongoing need. For the purposes of this analysis, it is assumed the alternatives would be implemented for a period of 20 years. The intent is to manage invasive plants in order to minimize adverse ecological and economic effects. A comparison of the treatment methods used under each alternative is shown in Table 2-11, *Comparison of the Alternatives, Treatment Methods*.

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

The No Action Alternative – Noxious Weed Management (Alternative 1)

Under the No Action Alternative, the District would continue to implement the district-wide 1997 *Integrated Noxious Weed Program on the Coos Bay District Environmental Assessment* (USDI 1997), consistent with the Resource Management Plan and other Coos Bay District direction. Treatment methods analyzed in the 1997 EA include herbicides, biological control agents (or biocontrols), targeted grazing, prescribed fire, and manual and mechanical methods to treat noxious weeds. The herbicides available for noxious weed management efforts are 2,4-D, dicamba, glyphosate, and picloram.

Direct control treatments on the District have consisted primarily of manual methods (hand pulling) and mechanical methods (e.g., bulldozers, discing, mowing, or chainsaws), competitive seeding and planting, biocontrols, targeted grazing with cattle, and the herbicide glyphosate. Prescribed fire and the herbicides 2,4-D, picloram, and dicamba are also occasionally used (see Table 2-8).

Under this alternative, the District would treat approximately 1,000 gross acres annually. Approximately 80 percent of those treatments would be with herbicides, 10 percent would be manual methods, 10 percent would be mechanical, and less than 1 percent would be targeted grazing and biocontrols. Mechanical treatments with large machinery (e.g., bulldozers) would only be done in the North Spit, New River, and Dean Creek areas. Of the herbicides, about 95 percent of the herbicide treatments would be with glyphosate and 5 percent would be with 2,4-D, dicamba, picloram, or a tank mix of two or more of those (see Table 2-10, *Treatment Key*). The *Annual Treatment Summary* table (Table 2-8) shows the last six years of treatments. All herbicide applications are done as spot treatments with a hand-directed sprayer.

[32] The inclusive term “invasive plants” is used here for simplicity. Herbicide use under the No Action Alternative is limited to noxious weeds, a subset of invasive plants.

***Figure 2-2**. Western Snowy Plover Habitat Restoration Areas (North Spit and New River)*

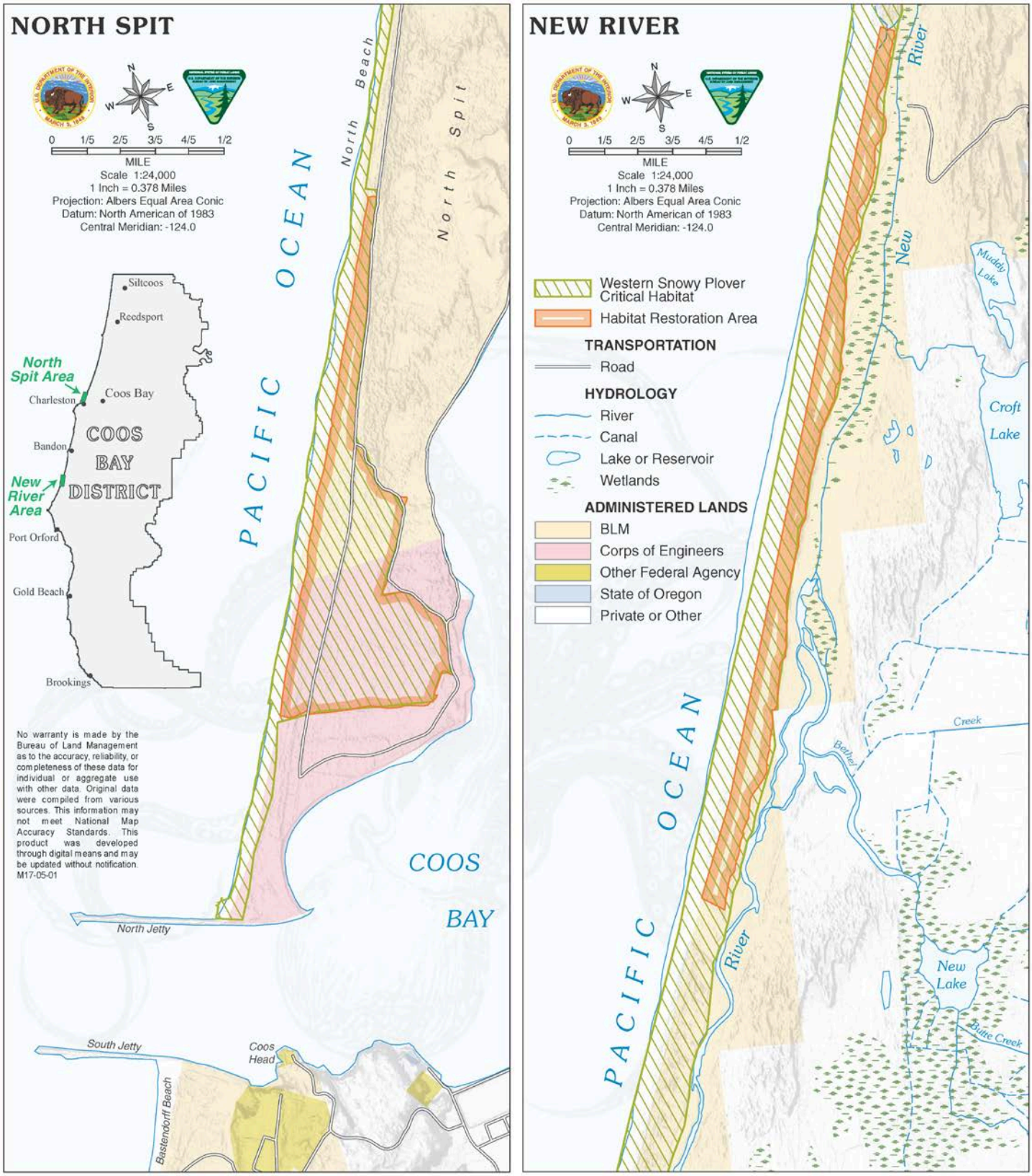


***Table 2-8**. Annual Treatment Summary (2012-2017)*

Treatment Method[1]	Acres[2] Treated					
	2012	2013	2014	2015	2016	2017
Herbicide (total)	*1,346.5*	*725.7*	*469.0*	*1,071.6*	*613.3*	*155.9*
2,4-D (only)	82.0	9.0	-	-	-	-
Dicamba (only)	-	-	-	-	-	-
Glyphosate (only)	1,201.0	644.3	269.0	757.9	581.0	155.4
Picloram (only)	-	-	19.5	-	-	-
2,4-D + Dicamba	63.5	64.4	185.5	313.7	32.3	-
2,4-D + Glyphosate	-	-	-	-	-	0.5
2,4-D + Picloram	-	8.0	-	-	-	-
Manual	55.0	38.0	85.0	246.0	112.0	42.0
Mechanical	480.0	402.0	35.0	175.0	292.0	240.0
Biocontrol[3]	-	-	-	-	-	-
Targeted Grazing	10.0	10.0	10.0	10.0	10.0	10.0
Re-vegetation or Seeding	47.0	69.0	77.0	54.0	70.0	52.0
Inventory	3,825.0	3,100.0	350.0	3,100.0	813.0	116.0

1. Prescribed fire has been used on the District to remove invasive plants not listed as a noxious weed. This has been done as habitat restoration (not as part of the noxious weed program) and has occurred on 50 to 100 acres annually.
2. Acres of plants treated each year should be considered gross and not net, as mapping accuracy and reporting has not been consistent between applicators.
3. Biocontrols are present and widespread on the District (see Table 2-4, *Biocontrol Releases within the Coos Bay District Boundary*) but no biocontrols have been released on BLM-managed lands in the last five years.

For the No Action Alternative, Table 2-10, *Treatment Key*, shows treatment options by treatment group. (Treatment groups are indicated in Tables 2-1, 2-3, and D-5, which describe the different Categories of invasive plants on the District.) In addition, the District would use competitive seeding and planting on an average of 100 acres/year of noxious weed infestations; these sites would generally be about ½ acre and would occur in conjunction with direct control methods. In Dean Creek, tilling may be done in advance of seeding and planting if soil compaction has occurred. Plants excluded from treatment would be invasive plants not listed as noxious weeds, and most infestations of noxious weeds not reasonably controlled by the four herbicides and other treatment methods available under this alternative.

In western snowy plover habitat, 172 acres are designated as habitat restoration areas, including 100 acres at New River and 72 acres at the North Spit (see Figure 2-2). These acres are infested with European beachgrass and other noxious weeds. In these habitat restoration areas, approximately 100 acres of European beachgrass would primarily be treated mechanically twice a year, with heavy equipment such as tractor-mounted discs or bulldozers.

At New River, no herbicides would be used in the plover habitat restoration area and, as described in the *New River Foredune Management EA* (USDI 2009a), European beachgrass stabilizing the 50-foot-wide vegetated foredunes along New River would not be treated.

At the North Spit, in BLM-managed snowy plover habitat restoration areas, the BLM would treat up to 24 acres annually with glyphosate. In addition to treatments on BLM managed lands, the BLM has a 2012 interagency agreement to treat western snowy plover habitat restoration area land managed by the U.S. Army Corps of Engineers. Invasive plant treatments on land managed by the U.S. Army Corps of Engineers are not covered by this EA; however, treatments on BLM-managed lands would follow the guidelines described in the interagency agreement, or updated equivalent[33]. The 2012 interagency agreement specifies that European beachgrass on the ocean foredune as well as a vegetated buffer east of it would not be treated, except for plover access cuts, where treatments would avoid the removal of the root system. While treatments in western snowy plover habitat primarily target European beachgrass, approximately three acres (net) of other noxious weed species (such as Scotch broom and field bindweed) in this area would be treated with manual or mechanical methods or glyphosate.

All treatments are constrained by the Standard Operating Procedures and other measures listed in Appendix A, by the herbicide application rates listed on Table 2-5 (*Herbicide Information)*, and by the other policy constraints described earlier in the *Integrated Invasive Plant Management* section of this chapter.

[33] Provided any updates to the interagency agreement continued to follow guidance in the *North Spit Plan* (USDI 2005) and *Biological Assessment of the BLM's North Spit Plan as it may affect the Threatened Western Snowy Plover and its Critical Habitat* (USDI 2007f) and associated Biological Opinion.

As described in the Oregon FEIS to which this EA tiers, the use of these herbicides along with non-herbicide methods would continue to slow the spread of noxious weeds within the District. However, certain noxious weeds and most of the other invasive plants would continue to spread. For example, the spread of Canada thistle and false brome can be slowed but not adequately controlled under this alternative; available treatments for these species only reduce the vigor or seed development. Invasive grasses cannot be effectively treated because there is no herbicide available that is selective to these grasses. Roughly half of the treatments in a given year would be re-treatments of areas treated in previous years, because the treatments available under this alternative are estimated to be 60 percent effective at controlling small infestations with one treatment (USDI 2010a:136). The site-specific analysis of this can be found in Chapter 3.

Proposed Action – Invasive Plant Management with ARBO II Consultation (Alternative 2)

The Proposed Action allows all terrestrial invasive plants (not just noxious weeds) to be treated, and is expanded to include the use of nine additional herbicides. Herbicides and treatment methods would be limited to those consulted on in the 2013 Aquatic Restoration Biological Opinions (ARBO II, USDI 2013a, NMFS 2013), which programmatically addressed the effects of aquatic restoration activities (including invasive plant management) in Oregon and Washington. In addition to the manual and mechanical treatment methods, biological control agents, targeted grazing, and seeding and planting used under the No Action Alternative, non-herbicide direct control methods would increase the use of prescribed fire and add the use of weed barrier mats and propane torch spot treatments. Herbicides available for use under the Proposed Action would include 2,4-D, aminopyralid, chlorsulfuron, clopyralid, dicamba, dicamba + diflufenzopyr, glyphosate, imazapic, imazapyr, metsulfuron methyl, picloram, sulfometuron methyl, and triclopyr.

The District would continue to treat approximately 1,000 gross acres annually with herbicides, manual and mechanical methods, and targeted grazing. Approximately 90 percent of those treatments would be with herbicides. As described under the No Action Alternative, mechanical treatments with large machinery (e.g., bulldozers or tractors with discs, plows, or mowers attached) would only be done in the North Spit, New River, and Dean Creek Elk Viewing areas. Of the herbicide treatments, more than 40 percent of the treatments would be with triclopyr, which is effective on woody species, like brooms, gorse, and blackberry. Aminopyralid (effective on thistles, starthistles, and knapweeds) would account for about 15 percent of treatments, and glyphosate would drop from about 95 percent (under the No Action) to approximately 15 percent. Table 2-10, *Treatment Key*, shows treatment options by treatment group, including considerations as to why a specific treatment would be used. Of the herbicide treatments, approximately 95 percent would be spot treatments and 5 percent would be broadcast treatments.

In addition to the treatments described in the Treatment Key, the District would continue to use competitive seeding and planting to complement other treatment methods on an average of 100 acres/year. In Dean Creek, tilling may be done in advance of seeding and planting if soil compaction has occurred. Weed barrier mats would be used in conjunction with some seeding and planting; this would happen on approximately ¼ acre annually in administrative sites and recreation sites, and treatments would occur over two to six months. Examples of areas where this may occur are a 4 or 5 foot strip next to the fence line at Dean Creek Elk Viewing Area or as a 30 by 100 foot tarp at the boat ramp at the North Spit.

Prescribed fire would also be used in meadows and on dunes to control invasive plants, primarily[34] grasses. For example, in the Hunter Creek and New River ACECs, prescribed fire would be used to reduce seed and thatch of

[34] Approximately 95 percent of species treated with prescribed fire would be invasive annual or perennial grasses. Scotch broom and annual species like yellow starthistle could also be treated in meadows when intermixed with these invasive grasses.

invasive annual and perennial grasses; in the Dean Creek Elk Viewing Area, it would be used primarily to reduce thatch and vigor of perennial reed canarygrass; and on dunes, it would be used to reduce thatch and vigor of perennial European beachgrass. These treatments have been done in previous years as habitat restoration but would be done as part of the invasive plant program under the Proposed Action. Prescribed fire would typically be used in conjunction with other treatments, such as seeding or application of herbicides. This would happen on approximately 100 acres annually. Project sizes would generally be between 1 to 20 acres, except in the Dean Creek Elk Viewing Area, where prescribed fire treatments would be up to 100 acres. Prescribed fire would happen in conjunction with an agency administrator-approved burn plan.

Treatments in western snowy plover habitat would be implemented as described under the No Action Alternative, with the exception that invasive plants that are not listed as noxious weeds would be treated as well. As described in the No Action Alternative, 172 acres are designated as western snowy plover habitat restoration areas (100 acres at New River and 72 acres at the North Spit; see Figure 2-2). These acres are infested with European beachgrass and other invasive plants. In these habitat restoration areas, European beachgrass would primarily be treated mechanically twice a year, with heavy equipment such as discs or bulldozers.

At New River, no herbicides would be used in the plover habitat restoration area and, as described in the *New River Foredune Management EA* (USDI 2009a), European beachgrass stabilizing the 50-foot-wide vegetated foredunes along New River would not be treated.

At the North Spit, in BLM-managed snowy plover habitat restoration areas, the BLM would treat up to 24 acres annually with glyphosate. In addition to treatments on BLM managed lands, the BLM has a 2012 interagency agreement to treat western snowy plover habitat restoration areas on North Spit land managed by the U.S. Army Corps of Engineers. Invasive plant treatments on land managed by the Corps is not covered by this EA; however, treatments on BLM-managed lands would follow the guidelines described in the interagency agreement, or updated equivalent[35]. This agreement specifies that European beachgrass on the ocean foredune as well as a vegetated buffer east of it would not be treated, except for plover access cuts, where treatments would avoid the removal of the root system. While treatments in western snowy plover habitat primarily target European beachgrass, other invasive plant species (such as Scotch broom, field bindweed, sea-rocket, false dandelions, wild radish, annual grasses, and sheep sorrel) in this area would be treated with manual or mechanical methods or glyphosate.

As with the No Action Alternative, all treatments are constrained by the Standard Operating Procedures and other measures listed in Appendix A, by the herbicide application rates listed on Table 2-5 (*Herbicide Information)*, and by the other policy constraints described earlier in the *Integrated Invasive Plant Management* section of this chapter.

As described in the Oregon FEIS to which this EA tiers, the wider range of herbicides from which to choose would generally 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 that the invasive plant would be controlled with fewer retreatments (USDI 2010a:135-136). Treatments described under this alternative are efective on almost all of the types of invasive plants 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.

[35] Provided any updates to the interagency agreement continued to follow guidance in the *North Spit Plan* (USDI 2005) and *Biological Assessment of the BLM's North Spit Plan as it may affect the Threatened Western Snowy Plover and its Critical Habitat* (USDI 2007f) and associated Biological Opinion.

Annual Treatment Plans

The District determines potential treatments based in part on available tools and funding, and develops a district-wide Annual Treatment Plan prior to the beginning of control treatments. In addition, specific area or project treatment plans are developed in coordination with partners. Annual Treatment Plans are subject to an interdisciplinary team[36] review to ensure there is no new information or changed circumstances that would change the Decision that results from this EA or substantially alter this EA's analysis. If there is relevant new information or changed circumstances, the District would revise the Annual Treatment Plan to comply with the Decision or the appropriate level of NEPA analysis would be completed and a new Decision would be issued. Annual Treatment Plans help the District ensure that treatments conform to design and mitigation standards in the relevant NEPA documents[37], and that the required Pesticide Use Proposals, Biological Control Agent Release Proposals, and other authorizations, obligations, and commitments[38] are completed prior to implementation. Every control treatment, however, is not always on the Annual Treatment Plan. Unexpected events such as increased or decreased funding, new invaders, wildfire, or weather conditions could alter implementation of the Annual Treatment Plan.

This year's invasive plant control activities planned for the District are summarized on Table 2-9 to present an example of how priorities and treatment methods would be implemented.

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

Table 2-9. *Annual Treatment Plan*

Field Office or Area	Project Name	Gross Acres	Primary Treatment Methods[1]	Anticipated Treatment Window	Target Species	Objective and Comments
District-wide	New invaders	5	Manual and herbicide	Year-round	Gorse or new invaders	Inventory and treat reported infestations of gorse or new invaders. All sites would be less than 0.1 acres and are typically on roadsides.
District-wide	Recreation Sites	40	Mechanical, manual, and herbicide	Year-round	Scotch broom, blackberry, other invasive plants	Prevent spread and preserve recreation access. Most treatments would be with string trimmers or mowers. Fall application of herbicides on dense blackberry patches.
District-wide	Revegetation with native seed	90	Revegetation	Fall or early spring	All non-natives	Prevention. Post project revegetation of bare soil following soil disturbance.
Myrtlewood	Bosely Butte	20	Herbicide and manual	Spring to early summer	Brooms, all invasive plants	Habitat enhancement for Gasquet manzanita.
Myrtlewood	Gorse Outliers Priority Sites	50	Herbicide and manual	Year-round	Gorse	Eradicate gorse on power line rights-of-way, roadsides and in forest areas. Herbicide spring and fall. Manual when soil is moist.
Myrtlewood	Grizzly Mountain	1	Manual	Spring, early summer, fall	Brooms, all non-natives	Habitat enhancement for Gasquet manzanita.
Myrtlewood	Hunter Creek ACEC	25	Herbicide or manual	Late spring, early summer or fall	Canada thistle, bristly dogtail grass, annual grasses, tansy ragwort, woodland tansy, coastal burnweed	Habitat enhancement for Mardon skipper and other rare butterflies. Herbicide needed for control of Canada thistle and annual grasses.
Myrtlewood	Hunter Creek Bog Trail	1	Manual or herbicide	Late spring, summer, fall	All invasive plants	Inventory and treat or monitor and treat.
Myrtlewood	Myrtlewood Roadside	100	Herbicide	Late spring or early summer to fall	Scotch broom, French broom, blackberry, meadow knapweed, Japanese knotweed, biddy-biddy	Prevent from spreading into planned project areas and down roads. Mostly roadside except Japanese knotweed (riparian).
Myrtlewood	New River - Floras Lake	5	Manual, propane torch or herbicide	Year-round	European beachgrass, big quakinggrass, ripgut brome, rattail fescue, tall fescue, sweet vernal grass, lance-leafed plantain, false dandelion, catchfly, birdsfoot trefoil, other invasive plants	Habitat enhancement for silvery phacelia, many-leafed gilia, and coastal cryptantha at Floras Lake. Propane burner used to destroy seed heads. Herbicide would be used in fall, winter to early spring.
Myrtlewood	New River - Lost Lake	40	Herbicide, manual, and mechanical	Year-round	Gorse	Prevent from producing seed or spreading. Goal: eradication. Herbicide would be used in spring and fall. Manual treatments when soil is moist and mechanical in summer.
Myrtlewood	New River - Lost Lake	20	Herbicide and manual	Summer and fall	European beachgrass, lance-leafed plantain	Habitat enhancement for silvery phacelia and coastal sagewort.
Myrtlewood	New River ACEC	30	Herbicide and manual	Late spring, summer, and fall	Gorse, brooms, meadow knapweed, yellow flag iris, Canada thistle, Himalayan blackberry, silver wattle	Prevent spread and preserve native plant communities.
Myrtlewood	New River ACEC	100	Mechanical, manual, and herbicide	September 16 - March 14	European beachgrass	Habitat enhancement for western snowy plover, pink sand verbena. (Herbicides only available under Alternative 3.)

Field Office or Area	Project Name	Gross Acres	Primary Treatment Methods[1]	Anticipated Treatment Window	Target Species	Objective and Comments
Myrtlewood	New River-Open Sand	20	Herbicide and manual	Year-round	European beachgrass, annual grasses, plantain	Habitat enhancement for pink sand verbena. Herbicides used summer-fall, manual year-round.
Myrtlewood	North Fork Coquille	50	Herbicide	Late summer, fall	Japanese knotweed	Ongoing control of priority infestation.
Myrtlewood	Palmer Butte	1	Manual	Spring, summer, fall	Brooms, all non-natives	Habitat enhancement for Gasquet manzanita. Done when soil is moist.
Myrtlewood	Roadside Weed Control	100	Herbicide	Fall and spring	Brooms, blackberry, false brome, meadow knapweed	Reduce or prevent spread on roadsides and into planned project areas.
Umpqua	North Spit	200	Mechanical, manual or herbicide	Year-round	European beachgrass, gorse, Scotch broom, English ivy, field bindweed, Darwin's barberry	Invasive plant treatment and habitat enhancement for pink sand verbena, western snowy plover, salt marsh bird's beak, western rosemary. Treatments in habitat restoration areas limited to Sept. 16 to March 14. Manual treatments year round in other areas. Herbicides used in spring and fall.
Umpqua	Dean Creek Elk Viewing Area	50	Herbicide and manual	Spring, summer, fall	Tansy ragwort, Canada thistle, bull thistle, Scotch broom, purple loosestrife, Himalayan blackberry	Habitat enhancement
Umpqua	Dean Creek Elk Viewing Area	5	Manual, mechanical, or herbicide	Year round	Tansy ragwort, woodland tansy, bull thistle, Scotch broom, invasive grasses, invasive clovers, false dandelions, herb Robert	Ongoing control of invasive plants in visitor areas and plantings. Herbicides used in spring and fall.
Umpqua	Dean Creek Elk Viewing Area	100	Mechanical, prescribed fire	Early summer	Reed canarygrass	Habitat enhancement for elk forage. Mowing followed by grass removal or prescribed fire.
Umpqua	Spruce Reach Island	5	Herbicide	Spring and fall	Himalayan blackberry, Scotch broom, butterfly bush, herb Robert, creeping buttercup, yellow flag iris	Preserve historical garden and surrounding wetland supporting Henderson's checkermallow.
Umpqua	Umpqua Roadside	800	Herbicide	Spring to early summer and fall	Scotch broom, French broom, blackberry, meadow knapweed, Japanese knotweed	Maintain road access, preserve forest and riparian health.
Umpqua	W Fork Smith Timber Sale	50	Herbicide	Spring to early summer	Brooms, all invasive plants	Prevention. Pre-timber sale to remove invasive plants prior to ground disturbance.
Umpqua	Wassen Creek	20	Herbicide	Spring to early summer	Scotch broom, blackberry	Prevent spread from roads into ACEC to preserve relevant and important values.
Umpqua	Wells Creek	1	Herbicide	Fall	Japanese knotweed	Eradication

1. All herbicide treatments in this table would be spot treatments with hand directed application, Treatments are listed in order of probable use; e.g., "manual, herbicide" means that manual treatments would be used more often than herbicide.

Additional Monitoring Under the Proposed Action

For treatment methods that are new to the Coos Bay District, for the first three years after the plan is implemented, the BLM would closely monitor the response of Special Status plants to invasive plant treatments. Monitoring would happen yearly and would measure Special Status plant numbers, plant size, and whether plants are reproductive or not. No more than five percent of a Special Status plant population would be included within a treatment area until effects to Special Status plants can be determined. If adverse effects occur (e.g., impacts or loss of a few individual Special Status plants), the BLM would weigh the consequences of these effects against the long-term impacts of invasive plants, including continued spread, that would be expected in the absence of treatments. By monitoring community-level treatment effects and refining prescriptions for subsequent treatments, adverse effects are expected to decline with increasing experience. The BLM would accept short-term adverse effects in Special Status plant communities if treatments were expected to benefit conditions and ecosystem function in the long-term. It is expected that information gained from this monitoring will provide additional information to consider as part of Table 2-10, *Treatment Key*; helping to refine future prescriptions for greater success.

Project Design Features of the Proposed Action

In addition to Standard Operating Procedures, Mitigation Measures adopted with the 2007 and 2016 PEISs and 2010 Oregon FEIS, and protection measures designed to protect federally listed species (all described in Appendix A), the following Project Design Features are included in the Proposed Action to reduce potential adverse effects of the Proposed Action:

Bureau Sensitive Species (Plants, Fish, and Wildlife)

- Follow the Bureau Sensitive Species Treatment Conditions flowchart (Figure 3-2, *Bureau Sensitive Species Treatment Conditions*) when working in potential habitat for Bureau Sensitive species.

Special Status Plants

- When using prescribed fire in western snowy plover habitat restoration areas, reseed with pink sand verbena or other appropriate native species in areas where revegetation will not occur through natural processes.

Fish and Aquatic Organisms

- 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 or Strategic fish and other aquatic species (see Appendix A).

Wildlife

- In listed species habitat, follow all Project Design Criteria outlined in the *Coos Bay BLM District Bureau of Indian Affairs/Coquille Indian Tribe FY2014 – 2018 Land Management Activities That May Affect Northern Spotted Owls or Marbled Murrelets* (USDI 2014a) (see Appendix A, *Protection Measures*) or future updates.
- Conservation Measures (see Appendix A) applicable to butterflies and moths will be applied, as appropriate, for other Special Status insects.

Archaeological and Cultural Resources

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

Traditional and Cultural Uses (Native American Interests)

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

Invasive Plant Management with Additional Endangered Species Act Consultation (Alternative 3)

Alternative 3 is the same as the Proposed Action (approximately 1,000 acres of invasive plants treated annually with herbicides, manual and mechanical methods, and targeted grazing), except that it also includes the use of the herbicides hexazinone, rimsulfuron, and fluroxypyr and allows herbicides other than glyphosate to be used in western snowy plover habitat restoration areas. In addition, there would be limited and controlled use of fluazifop-P-butyl, which does not have a Risk Assessment created or adopted by the BLM. This would occur on research and demonstration plots up to 5 acres in size, with a maximum of 15 acres per Field Office.[39]

Hexazinone, rimsulfuron, and fluazifop-P-butyl would be used to treat invasive grasses: hexazinone would be used primarily to treat false brome (a perennial grass) along rights-of-way in forests; rimsulfuron would be used in rotation with imazapic to treat annual grasses, and fluazifop-P-butyl would be used in limited situations to treat perennial grasses like pampas grass, jubata grass, and sweet vernal grass. Fluroxypyr would be used on miscellaneous annual herbaceous invasive plants and on invasive plants in the geranium family. Hexazinone and rimsulfuron would be used approximately one percent of the time when herbicides are used, and fluazifop-P-butyl and fluroxypyr would be very rarely used (30 acres and 3.7 acres over the life of the plan, respectively).

In western snowy plover habitat, 172 acres are designated as habitat restoration areas (100 acres at New River and 72 acres at the North Spit; see Figure 2-2, *Western Snowy Plover Habitat Restoration Areas (North Spit and New River*). These acres are infested with European beachgrass and other invasive plants. In these habitat restoration areas, imazapyr, glyphosate, or imazapyr mixed with glyphosate would be used to treat European beachgrass. While this could occur on all 172 acres in one year, it would generally happen on approximately 100 acres annually. The use of these more effective herbicides on European beachgrass would reduce the treatments done by heavy equipment. In the next five years, this is anticipated to result in greater than 75 percent reduction in the use of bulldozers or tractors with discs or plows (or approximately once every two years). While treatments in western snowy plover habitat primarily target European beachgrass, approximately 25 acres (net) of other invasive plant species (such as Scotch broom, field bindweed, sea-rocket, false dandelions, wild radish, annual grasses, and sheep sorrel) in this area could be treated with manual or mechanical methods or herbicides[40]. As described below, all treatments in western snowy plover habitat restoration areas would follow guidelines established in future NEPA coordinated with the U.S. Army Corps of Engineers to protect the North Spit foredune, as well as project design criteria identified in future consultation with the U.S. Fish and Wildlife Service.

For more information on proposed treatment methods and invasive plants treated, see Table 2-10, *Treatment Key*.

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

[40] Treatments on invasive plants other than European beachgrass could be done with the herbicides available under Alternative 3 (not just imazapyr and glyphosate). See Table 2-10, *Treatment Key*, for more information on potential treatment methods.

Similar to the Proposed Action and as described in the Oregon FEIS to which this EA tiers, the wider range of herbicides from which to choose would increase the effectiveness of the average treatment to an estimated 80 percent (USDI 2010a:136). Although some level of retreatment would still take place, the additional herbicides would substantially improve the chances invasive plants would be controlled with fewer retreatments (USDI 2010a:135-136). Treatments described under this alternative are effective on almost all 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.

Project Design Features of Alternative 3

In addition to Project Design Features included with the Proposed Action, the following Project Design Features are included to reduce effects of Alternative 3:

Fish and Aquatic Organisms

- All applicable Project Design Criteria identified in potential future consultations with the National Marine Fisheries Service will be incorporated into all treatments in listed anadromous fish habitat.
- The use of fluazifop-P-butyl will be confined to flat dry ground located greater than 1,500 feet from any aquatic features to prevent runoff to surface water or leaching to groundwater.
- Use only ARBO II (NMFS 2013) approved herbicides, adjuvants, and buffer distances in the New River western snowy plover habitat restoration areas (see Appendix A).

Wildlife

- Do not use dicamba, triclopyr, or fluazifop-P-butyl (herbicides with a low or moderate risk to birds) in areas that are currently capable of supporting western snowy plovers. (Dicamba in formulation with diflufenzopyr has no risk to birds and can be used in these areas.)
- Implement all current (see Appendix A) and future reasonable and prudent measures and terms and conditions identified by the U.S. Fish and Wildlife Service through consultation on western snowy plovers.
- Do not use fluroxypyr at known Mardon skipper sites.

Soil

- All guidelines established in potential future North Spit western snowy plover NEPA would be done in conjunction with the U.S. Army Corps of Engineers.

***Table 2-10**. Treatment Key (All Alternatives)[1] (treatments ordered by preferred treatment method)*

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 and Notes 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 Standard Operating Procedures or label restrictions that limit areas an herbicide could be used in.

Treatment Group[2] [Categories][3] *Gross Treatment Acres[4]*	**Treatment Method**	**Lbs./Acre[5]**	**Percent of Acres where Treatment Would be Used[6]**			**Treatment Consideration and Notes[7]**
			No Action	**Proposed Action**	**Alt. 3**	
Annual Grasses [I, II, III, IV] *170 acres (noxious weeds: 0 acres)*	Imazapic	**0.06** to **0.12**	NA	90%	50%	Apply at the pre-emergent stage in the fall, when desirable grasses and forbs are dormant.
	Rimsulfuron	0.03 to **0.06**	NA	NA	40%	Apply pre-emergence to early post-emergence when target plants are young and actively growing. Add surfactant per label. Perennial grasses are tolerant to fall applications.
	Glyphosate	**<3.00**	NA	<1%	<1%	Apply at the seedling stage. Since it is non-selective, minimize exposure to non-target plants. Use aquatic formulations near water.
	Fluazifop-P-butyl	**0.38**	NA	NA	<1%	See Special Local Needs Label (FIFRA Sec 24) OR-120016. Add 0.5 to 1 percent crop oil concentrate or 0.25% to 0.5% nonionic surfactant. Apply to actively growing grasses. Repeat applications may be needed. Do not apply more than 72 fluid oz./ac. per year.
	Sulfometuron methyl	0.05 to 0.09	NA	<1%	<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	<1%	Apply pre-emergence or early post emergence. Use primarily on road rights-of-way.
	Targeted grazing (cattle)	NA	NA	<1%	<1%	Can reduce biomass of invasive plants especially on sand dunes. Fencing or herding required.
	Propane torch	NA	NA	5%	5%	Most effective on small plants. Use only on infestations on non-flammable substrate (e.g., sand, gravel, concrete).
	Mechanical control	NA	NA	<1%	<1%	Target plants are suppressed with mowing or weed whackers before seed set, but non-selectively removes growth of desirable species. May require multiple treatments per year for effective weed control.
	Manual control	NA	NA	5%	5%	Hand pull scattered plants or for areas where other control methods are not feasible. Limited to small infestations.
Borage Family [III, IV] *2 acres (noxious weeds: 0 acres)*	Manual control	NA	NA	50%	50%	Hand pull scattered plants or for areas where other control methods are not feasible. Limited to small infestations.
	Glyphosate	**<3.00**	NA	15%	15%	Apply when plants are actively growing.
	Chlorsulfuron + 2,4-D	**0.06** + 0.95	NA	15%	15%	Apply to budding or blooming plants to prevent seed formation or set or where resistance to sulfonylureas[8] is a concern.
	Metsulfuron methyl + 2,4-D	**0.04** + 0.95	NA	10%	10%	Use to prevent seed formation or set or where resistance to sulfonylureas[8] is a concern. More likely than chlorsulfuron to harm non-target wet meadow grass species.
	2,4-D	**1.90**	NA	5%	5%	Apply in spring when plants are actively growing.

Treatment Group[2] [Categories][3] *Gross Treatment Acres*[4]	**Treatment Method**	**Lbs./Acre**[5]	**Percent of Acres where Treatment Would be Used**[6]			**Treatment Consideration and Notes**[7]
			No Action	**Proposed Action**	**Alt. 3**	
	Propane torch	NA	NA	<1%	<1%	Most effective on small plants. Use only on infestations on non-flammable substrate (e.g., sand, gravel, concrete).
	Aminopyralid + Metsulfuron methyl	**0.08** to **0.11** + **0.12** to **0.15**	NA	<1%	<1%	Apply pre-emergence in fall or when target plants are in the seedling to rosette stage.
	Chlorsulfuron	0.04 to **0.05**	NA	<1%	<1%	Apply in spring from bud to bloom stage or fall rosettes. Do not use with acidifying spray adjuvants, such as LI-700, per label restrictions.
	Imazapic	**0.13** to **0.19**	NA	<1%	<1%	Apply pre-emergence or early post-emergence. Add methylated seed oil if applied post-emergence.
	Imazapyr	**0.75**	NA	<1%	<1%	Apply in spring when plants are growing rapidly or apply in mid-fall to dormant infestation.
	Metsulfuron methyl	**0.04** to **0.08**	NA	5%	5%	Apply early when plants are small and rapidly growing.
	Sulfometuron methyl + Chlorsulfuron	0.05 + **0.14**	NA	<1%	<1%	Apply at or before early weed growth. May be used in seasonally wet areas when water is not present.
Carnation Family [I, II, IV] *78 acres (noxious weeds: 0 acres)*	Manual control	NA	NA	85%	85%	Hand pull scattered plants or for areas where other control methods are not feasible. Limited to small infestations.
	Glyphosate	**<3.00**	NA	5%	5%	Apply in spring to actively growing plants from germination to bolting, with green basal leaves.
	Aminopyralid + Metsulfuron methyl	**0.08** to **0.11** + **0.12** to **0.15**	NA	3%	3%	Apply pre-emergence in fall or when target plants are in the seedling to rosette stage.
	Imazapic	**0.06** to **0.12**	NA	3%	3%	Apply in spring or to bolting plants with green basal leaves.
	Dicamba + 2,4-D	**0.50** + 0.95	NA	2%	2%	Apply in spring from rosettes to bolting, on plants with green basal leaves. Use a non-ionic surfactant.
	2,4-D	0.95	NA	2%	2%	Apply to spring rosettes or to bolting plants with green basal leaves.
Geranium Family [I, II, III, IV] *56 acres (noxious weeds: 25 acres)*	Manual control	NA	10%	5%	5%	Pull, dig, or till before flowers and seeds.
	Mechanical control	NA	5%	5%	5%	Target plants are suppressed with mowing or weed whackers before seed set, but non-selectively removes growth of desirable species. May require multiple treatments per year for effective weed control.
	Propane torch	NA	NA	5%	5%	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	20%	20%	Apply in spring before flowering on rapidly growing plants.
	Aminopyralid	0.05 to **0.11**	NA	20%	20%	Apply in spring on rosette to flowering stages or in fall to seedlings or rosettes.
	Imazapyr	0.38 to **0.75**	NA	15%	15%	Apply pre- or post-emergence to control visible plants and seeds.
	Dicamba + Diflufenzopyr	0.18 to **0.35**	NA	10%	10%	Apply in spring to actively growing invasive plants. Use higher rates on perennials or large plants. Use non-ionic surfactant or methylated seed oil surfactant.

Treatment Group[2] [Categories][3] *Gross Treatment Acres*[4]	**Treatment Method**	**Lbs./Acre**[5]	**Percent of Acres where Treatment Would be Used**[6]			**Treatment Consideration and Notes**[7]
			No Action	**Proposed Action**	**Alt. 3**	
	Dicamba + 2,4-D	**0.75** + 0.25	5%	5%	5%	Apply in spring before flowering on rapidly growing plants.
	Fluroxypyr	**0.49**	NA	NA	5%	Apply in spring on rapidly growing plants.
	2,4-D	0.95	40%	5%	5%	Apply from seedling to flowering, to actively growing plants.
	Glyphosate	**<3.00**	40%	10%	5%	Apply to rapidly growing plants. Use higher rates on larger plants. Add a non-ionic surfactant.
Knotweed Family [I, II, III, IV] *276 acres (noxious weeds: 200 acres)*	Imazapyr	**0.75** to **1.00**	NA	50%	50%	Apply in mid-summer to fall. Most effective for large plants.
	Glyphosate	**<3.00**	100%	40%	40%	Apply mid-summer to fall, when plants are fully leafed. Injection treatments are also effective.
	Triclopyr	0.50 to **2.00**	NA	10%	10%	Add 0.25% to 0.5% surfactant. Apply midsummer to actively growing plants.
	Triclopyr + 2 4-D	**1.50** + 0.95	NA	<1%	<1%	Apply midsummer to actively growing plants.
	Aminopyralid	**0.11**	NA	<1%	<1%	Apply mid-summer to fall when plants are 3-4 feet tall. Repeat applications may be necessary.
	Manual control	NA	<1%	<1%	<1%	Recommended when rhizomes can be completely removed.
Lilies, Iris, Sedges, Rushes [I, II, III, IV] *28 acres (noxious weeds: 5 acres)*	Imazapyr	**0.75** to **1.00**	NA	50%	50%	Apply to plants at pre-bloom stage or in the fall to late season plants.
	Glyphosate	**<3.00**	25%	15%	15%	Apply when plants are actively growing, before flowering. Use a non-ionic surfactant in aquatic areas.
	2,4-D	**1.90**	10%	5%	5%	Apply in spring before bloom or in fall. Use a surfactant.
	Mechanical control	NA	10%	5%	5%	Target plants are suppressed with mowing or weed whackers before seed set, but non-selectively removes growth of desirable species. May require multiple treatments per year for effective weed control.
	Manual control	NA	5%	5%	5%	Effective on small infestations when entire plant and rhizome are removed.
	Hexazinone	0.75	NA	NA	10%	Apply pre-emergence or early post emergence. Use primarily on road rights-of-way.
	Imazapic	**0.13** to **0.19**	NA	5%	5%	Apply pre-emergence or post-emergence to yellow nutsedge, rushes, and iris. Typically suppresses but does not control rushes.
	Metsulfuron methyl	**0.04** to **0.08**	NA	5%	5%	Apply in spring from seedling or rosette to flowering stages.
	No effective control[9]	NA	50%	10%	NA	
Loosestrifes [I, II, IV] *30 acres (noxious weeds: 25 acres)*	Biological control agents	NA	50%	50%	50%	Three widespread agents with high attack rates provide good to excellent control on purple loosestrife.
	Imazapyr	**0.75** to **1.00**	NA	5%	5%	Apply in summer to rapidly growing plants.
	Glyphosate	**<3.00**	25%	5%	5%	Apply to rapidly growing plants in full to late flowering. Treat seedlings in spring.
	Triclopyr	**1.00**	NA	5%	5%	Apply to rapidly growing plants at mid to full bloom. Use non-ionic surfactant. Use formulations labeled for aquatic use if treatments near water.
	Metsulfuron methyl	**0.04** to **0.08**	NA	10%	10%	Apply in spring from seedling or rosette to flowering stage.
	Manual control	NA	25%	25%	25%	Hand pulling is effective on small infestations when the root system can be removed.

Treatment Group[2] [Categories][3] *Gross Treatment Acres*[4]	**Treatment Method**	**Lbs./Acre**[5]	**Percent of Acres where Treatment Would be Used**[6]			**Treatment Consideration and Notes**[7]
			No Action	**Proposed Action**	**Alt. 3**	
Misc. Annual Herbaceous [I, II, III, IV] *45 acres (noxious weeds: 0 acres)*	Manual control	NA	NA	5%	5%	Hand pulling is effective on single plants or small infestations. May require multiple treatments per year.
	Mechanical control	NA	NA	5%	5%	Suppressed with mowing or weed whackers before seed set, but non-selectively removes growth of desirable species. May require multiple treatments per year.
	Propane torch	NA	NA	1%	1%	Most effective on small plants. Use only on infestations on non-flammable substrate (e.g., sand, gravel, concrete).
	Aminopyralid	0.05 to **0.11**	NA	15%	15%	Apply early when plants are small and rapidly growing.
	Imazapic	**0.06** to **0.12**	NA	7%	5%	Apply to forbs after summer dry period when plants begin to grow.
	Aminopyralid + Metsulfuron methyl	**0.08** to **0.11** + **0.12** to **0.15**	NA	15%	15%	Apply pre-emergence in fall, or in the seedling to rosette stage.
	Chlorsulfuron + 2,4-D	**0.06** + 0.95	NA	5%	5%	Apply pre or early post-emergence when invasive plants are actively germinating or growing. Use when resistance is a concern, especially to sulfonylureas[8].
	Dicamba + Diflufenzopyr	0.18 to **0.35**	NA	10%	10%	Use to control invasive plants along roads or in disturbed areas.
	Fluroxypyr	0.13 to **0.49**	NA	NA	2%	Apply when plants are growing rapidly.
	Clopyralid	0.09 to 0.19	NA	5%	5%	Apply at early rosette stage.
	Rimsulfuron	0.03 to **0.06**	NA	NA	2%	Apply pre-emergence to early post-emergence when target plants are young and actively growing. Add surfactant per label. Native perennial grasses are tolerant to fall applications.
	Imazapic + Glyphosate	**0.06** to **0.09** + 0.13 to 0.19	NA	2%	2%	Apply early when target invasive plants emerge, if desirable plants are not present.
	Glyphosate + 2,4-D	0.50 + 0.70	NA	2%	2%	Apply when plants are actively growing, before flowering. Use a non-ionic surfactant in aquatic areas.
	Dicamba + 2,4-D	**0.50** + 0.95	NA	2%	2%	Apply in spring when plants are small and actively growing. Use a non-ionic surfactant.
	2,4-D	**1.90**	NA	2%	2%	Apply only aquatic formulations near water.
	Glyphosate	**<3.00**	NA	9%	7%	Apply in spring to actively growing plants with green basal leaves, from germination to bolting.
	Picloram	**0.50** to **0.95**	NA	<1%	<1%	Do not apply near trees or young grass seedlings.
	Imazapyr	**0.75**	NA	15%	15%	Apply post-emergence from seedling to flowering stage.
Misc. Herbaceous [I, II, III, IV] *170 acres*	Biological control agents	NA	20%	15%	15%	Three biological agents with high attack rates provide excellent control against St. Johnswort on the District. Biological control agents are used on widespread invasive plants when agents become available.
	Imazapyr	**0.75** to **1.00**	NA	20%	20%	Apply post-emergence from seedling to flowering stage.

Treatment Group[2] [Categories][3] *Gross Treatment Acres*[4] *(noxious weeds: 60 acres)*	**Treatment Method**	**Lbs./Acre**[5]	**Percent of Acres where Treatment Would be Used**[6]			**Treatment Consideration and Notes**[7]
			No Action	**Proposed Action**	**Alt. 3**	
	Glyphosate	**<3.00**	50%	20%	20%	Apply in spring to actively growing plants with green basal leaves from germination to bolting.
	Triclopyr	**2.00**	NA	10%	10%	Apply at flowering stage.
	Manual control	NA	10%	10%	10%	Hand pulling can be effective on single plants or small infestations.
	Glyphosate + 2,4-D	0.50 + 0.70	10%	5%	5%	Apply in late spring, prior to seed set.
	Dicamba + Diflufenzopyr	0.18 to **0.35**	NA	5%	5%	Apply in spring to actively growing invasive plants. Use higher rates on perennials or large plants. Use non-ionic surfactant or methylated seed oil surfactant.
	Dicamba + 2,4-D	**0.50** to **1.00** + 0.95	10%	9%	9%	Apply to actively growing plants. Use a non-ionic surfactant.
	Aminopyralid	0.05 to **0.11**	NA	4%	4%	Apply to actively growing plants. Use a non-ionic surfactant
	Metsulfuron methyl	0.01 to **0.08**	NA	2%	2%	Apply early when plants are small and rapidly growing.
	2,4-D	0.95	<1%	<1%	<1%	Apply in spring to rosettes.
	Picloram	**0.50** to **0.95**	<1%	<1%	<1%	Evaluate soil, slope, and proximity to water when considering this herbicide.
	Picloram + 2,4-D	**0.50** + 0.95	<1%	<1%	<1%	Evaluate soil, slope, and proximity to water when considering this herbicide. Apply from seedling to bud, before bloom.
	Targeted grazing (sheep)	NA	0%	<1%	<1%	Sheep selectively choose broadleaf species over grass. Fencing or herding required.
	Propane torch	NA	NA	<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%	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.
Mustard Family [I, II, III, IV] *475 acres (noxious weeds: 1 acre)*	Manual control	NA	NA	50%	50%	Hand pulling is effective on small infestations when the root system can be removed.
	Chlorsulfuron + 2,4-D	**0.06** + 0.95	NA	15%	15%	Apply when annual invasive plants are germinating or actively growing. Apply when perennial invasive plants are from bud to bloom or fall rosette stage. Do not use with acidifying spray adjuvants, such as LI-700, per label restrictions. Use where resistance to sulfonylureas[8] is a concern.
	Aminopyralid + Metsulfuron methyl	**0.08** to **0.11** + **0.12** to **0.15**	NA	5%	5%	Apply when the plants are in the bloom stage for optimum control.
	Glyphosate	**<3.00**	NA	25%	25%	Apply in spring to actively growing plants with green basal leaves from germination to bolting.
	Aminopyralid	0.05 to **0.11**	NA	5%	5%	Apply early when plants are small and actively growing.
	2,4-D	0.95 to **1.90**	NA	<1%	<1%	Apply in spring when plants are actively growing before budding.
	Imazapic	**0.13** to **0.19**	NA	<1%	<1%	Apply post or pre- emergence when plants are small and growing rapidly.

Treatment Group[2] [Categories][3] *Gross Treatment Acres*[4]	**Treatment Method**	**Lbs./Acre**[5]	**Percent of Acres where Treatment Would be Used**[6]			**Treatment Consideration and Notes**[7]
			No Action	**Proposed Action**	**Alt. 3**	
	Dicamba + 2,4-D	**0.50** + 0.95	NA	<1%	<1%	Apply in spring before budding when plants are actively growing. Use a non-ionic surfactant.
	Propane torch	NA	NA	<1%	<1%	Most effective on small plants. Use only on infestations on non-flammable substrate (e.g., sand, gravel, concrete).
	Mechanical control	NA	NA	<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.
Pea Family [I, II, III, IV] *308 acres (noxious weeds: 100 acres)*	Manual control	NA	80%	25%	25%	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	35%	35%	Apply in spring before flowering.
	Clopyralid	0.23 to **0.49**	NA	15%	15%	Apply in spring before flowering.
	Triclopyr	**2.00**	NA	15%	15%	Apply in spring when plants are rapidly growing.
	Glyphosate	**<3.00**	5%	5%	5%	Apply in spring before flowering.
	2,4-D	0.95	NA	5%	5%	Apply in spring to actively growing plants, particularly at bud to flower stage.
	Picloram	**0.50** to **0.95**	5%	<1%	<1%	Evaluate soil, slope, and proximity to water when considering this herbicide. Apply when plants are growing rapidly in spring before full bloom or in late summer to early fall.
	Mechanical control	NA	10%	<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.
	Targeted grazing (goats or sheep)	NA	<1%	<1%	<1%	Delay spring grazing until plants are at least 8 inches tall.
	Propane torch	NA	NA	<1%	<1%	Most effective on small plants. Use only on infestations on non-flammable substrate (e.g., sand, gravel, concrete).
Perennial Grasses [I, II, III, IV] *1,743 acres (noxious weeds: 450 acres)*	Fluazifop-P-butyl	**0.38**	NA	NA	<1%	See Special Local Needs Label (FIFRA Sec 24) OR-120016. Add 0.5 to 1 percent crop oil concentrate or 0.25 to 0.5 percent nonionic surfactant. Apply to actively growing grasses. Repeat applications may be needed. Do not apply more than 72 fluid oz./ac. per year.
	Imazapyr	**0.75** to **1.50**	NA	15%	10%	Apply in early spring.
	Imazapyr + Glyphosate	**0.75** to **1.50** + **3.00**	NA	20%	20%	Preferred treatment for European beachgrass.
	Rimsulfuron	0.03 to **0.06**	NA	NA	5%	Apply pre-emergence to early post-emergence when target plants are young and actively growing. Add surfactant per label. Perennial grasses are tolerant to fall applications.
	Imazapic	**0.13** to **0.19**	NA	5%	5%	Apply before plants germinate, when desirable grasses and forbs are dormant in the fall.

Treatment Group[2] [Categories][3] *Gross Treatment Acres*[4]	**Treatment Method**	**Lbs./Acre**[5]	**Percent of Acres where Treatment Would be Used**[6]			**Treatment Consideration and Notes**[7]
			No Action	**Proposed Action**	**Alt. 3**	
	Imazapic + Glyphosate	**0.06** to **0.19** + 0.13 to 0.38	NA	10%	10%	Apply early when target plants emerge, if desirable plants are not present.
	Glyphosate	**<3.00**	10%	<1%	<1%	Apply at the seedling stage. Minimize damage to non-targets. Use aquatic formulations near water.
	Hexazinone	**2.00**	NA	NA	20%	Especially for use on false brome. Apply pre-emergence or early post emergence. Use primarily on road rights-of-way.
	Propane torch	NA	NA	<1%	<1%	Most effective on small plants. Use only on infestations on non-flammable substrate (e.g., sand, gravel, concrete).
	Mechanical control	NA	65%	30%	30%	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.
	Manual control	NA	<1%	<1%	<1%	Only practical for sites with a few plants.
	No effective control[9]	NA	25%	20%	NA	
Perennial Mints [I, II, III, IV] *26 acres (noxious weeds: 20 acres)*	Manual control	NA	10%	10%	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	45%	45%	Apply when plants are mature. Most effective when they have bolted but before seed production.
	2,4-D	**1.90**	15%	15%	15%	Apply after bolting and before seed production.
	Propane torch	NA	NA	10%	10%	Most effective on small plants. Use only on infestations on non-flammable substrate (e.g., sand, gravel, concrete).
	Glyphosate	**<3.00**	10%	10%	10%	Apply when plants are bolting but before seed production.
	Mechanical control	NA	15%	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.
	Clopyralid	0.25 to **0.38**	NA	5%	5%	Apply in spring or fall to control small actively growing plant.
	No effective control[9]	NA	50%	NA	NA	
Perennial Parsley Family [I, II, IV] *30 acres (noxious weeds: 20 acres)*	Manual control	NA	1%	1%	1%	Hand removal is recommended for small infestations. Remove taproot. Wear gloves and wash hands after pulling plants.
	Aminopyralid + Metsulfuron methyl	**0.08** to **0.11** + **0.12** to **0.15**	NA	50%	50%	Apply in seedling to rosette stage or pre-emergence in the fall.
	Imazapic	**0.13** to **0.19**	NA	5%	5%	Apply pre-emergence or early when plants are germinating and actively growing.
	Triclopyr	0.75 to **5.00**	NA	14%	14%	Apply in spring when plants are rapidly growing.
	Metsulfuron methyl	0.01 to 0.02	NA	3%	3%	Apply when plants are actively growing.

Treatment Group[2] [Categories][3] *Gross Treatment Acres*[4]	**Treatment Method**	**Lbs./Acre**[5]	**Percent of Acres where Treatment Would be Used**[6]			**Treatment Consideration and Notes**[7]
			No Action	**Proposed Action**	**Alt. 3**	
	Dicamba + 2,4-D	**0.50** to **2.00** + 0.95	20%	5%	5%	Apply in seedling to rosette stage.
	Sulfometuron methyl	**0.19**	NA	2%	2%	Apply pre-emergence or early when plants are germinating and actively growing.
	Imazapyr	**1.00** to **1.50**	NA	10%	10%	Apply from germination to rosette.
	Glyphosate	**<3.00**	75%	10%	10%	Apply in spring to fully developed leaves but before flowering. Control is less effective once plant has bolted.
	Chlorsulfuron	**0.05** to **0.12**	NA	<1%	<1%	Apply in spring from bud to bloom or fall rosettes. Do not use with acidifying spray adjuvants, such as LI-700, per label restrictions.
	Picloram + 2,4-D	**0.50** + 0.95	4%	<1%	<1%	Apply from early to mid-spring when the target plants are less than 3 inches in height.
	Mechanical control	NA	<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.
Snapdragon Family [I, II, III, IV] *67 acres (noxious weeds: 40 acres)*	Manual control	NA	NA	10%	10%	Hand pulling is only effective on seedlings and in sand before plants become established.
	Glyphosate + 2,4-D	0.50 + 0.70	NA	10%	10%	Apply to rapidly growing plants. Use higher rates on larger plants and add a non-ionic surfactant.
	Aminopyralid + Metsulfuron methyl	**0.08** to **0.11** + **0.12** to **0.15**	NA	10%	10%	Apply in spring or fall to plants in the rosette stage or to bolting plants less than 12 inches tall.
	Aminopyralid	0.05 to **0.11**	NA	10%	10%	Apply in spring from the rosette stage to early bolting.
	Propane torch	NA	NA	10%	10%	Most effective on small plants. Use only on infestations on non-flammable substrate (e.g., sand, gravel, concrete).
	Glyphosate	**<3.00**	NA	10%	10%	Apply in spring to rapidly growing plants.
	Chlorsulfuron	**0.05**	NA	10%	10%	Apply in fall for most consistent control.
	Imazapyr	**0.75** to **1.50**	NA	5%	5%	Apply in spring when plants are growing rapidly or apply in mid-fall to dormant infestation.
	Dicamba	**1.00**	NA	10%	10%	Apply in spring before flowering.
	Imazapic	**0.06** to **0.12**	NA	5%	5%	Apply in fall when top 25 percent of plant is necrotic, usually after a hard frost.
	Dicamba + 2,4-D	**1.00** + 0.95	NA	10%	10%	Apply from seedling to bud stage, before bloom. Use a non-ionic surfactant.
	Picloram + 2,4-D	**0.50** + **1.50**	NA	<1%	<1%	Apply from seedling to bud stage, before bloom.
	Picloram	**0.50** to 0.95	NA	<1%	<1%	Evaluate soil, slope, and proximity to water when considering this herbicide. Apply when plants are growing rapidly in spring before full bloom or in late summer to early fall.

Treatment Group[2] [Categories][3] *Gross Treatment Acres*[4]	**Treatment Method**	**Lbs./Acre**[5]	**Percent of Acres where Treatment Would be Used**[6]			**Treatment Consideration and Notes**[7]
			No Action	**Proposed Action**	**Alt. 3**	
	Mechanical control	NA	NA	<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.
	Biological control agents	NA	NA	0%	0%	Agents are available for toadflaxes and could be used if infestations become large enough to support a population.
Sunflower Family [I, II, III, IV] *2,323 acres (noxious weeds: 1,963 acres)*	Manual control	NA	5%	5%	5%	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.
	Biological control agents	NA	5%	5%	5%	Numerous agents are available for thistles, knapweeds, and tansy ragwort.
	Aminopyralid	0.05 to **0.11**	NA	50%	50%	Apply in spring at bud stage. Preferred treatment when desirable plants in susceptible families not present. Longer soil residual than clopyralid.
	Clopyralid	0.23 to **0.49**	NA	5%	5%	Apply at the rosette to bolting stage.
	Glyphosate	**<3.00**	54%	10%	10%	Apply in spring to rapidly growing plants before flowering.
	Aminopyralid + Metsulfuron methyl	**0.08** to **0.11** + **0.12** to **0.15**	NA	5%	5%	Apply to plants in spring.
	Clopyralid + 2,4-D	**0.38** + 0.95	NA	5%	5%	Apply in spring from germination to flowering when plants are actively growing.
	Dicamba + Diflufenzopyr	0.18 to **0.35**	NA	5%	5%	Apply in spring to actively growing plants. Use higher rates on perennials or large plants. Use non-ionic surfactant or methylated seed oil adjuvant.
	Metsulfuron methyl	0.02 to **0.04**	NA	5%	5%	Use to prevent seed formation or set. Primarily on roadsides.
	Picloram + 2,4-D	0.25 + 0.95	<1%	<1%	<1%	Evaluate soil, slope, and proximity to water when considering this herbicide. Apply pre- or post-emergence to control visible plants and seeds.
	Dicamba + 2,4-D	**0.50** + 0.95	5%	<1%	<1%	Apply in spring or fall to rosettes. Use a non-ionic surfactant.
	Chlorsulfuron + Clopyralid + 2,4-D	**0.05** + **0.38** + 0.95	NA	2%	2%	Apply when annual plants are germinating or actively growing. Apply when perennial plants are from bud to bloom or fall rosettes. Do not use with acidifying spray adjuvants, such as LI-700, per label restrictions. Use where resistance to sulfonylureas[8] is a concern.
	Chlorsulfuron + 2,4-D	**0.05** + 0.95	NA	1%	1%	Apply when annual plants are germinating or actively growing. Apply when perennial plants are from bud to bloom or fall rosette stage. Do not use with acidifying spray adjuvants, such as LI-700, per label restrictions. Use where resistance to sulfonylureas[8] is a concern. Use aquatic 2,4-D near water.
	Chlorsulfuron	**0.05**	NA	1%	1%	Apply when annual plants are germinating or actively growing. Apply when perennial plants are from bud to bloom or fall rosette stage. Do not use with acidifying spray adjuvants, such as LI-700, per label restrictions.

Treatment Group[2] [Categories][3] *Gross Treatment Acres[4]*	**Treatment Method**	**Lbs./Acre[5]**	**Percent of Acres where Treatment Would be Used[6]**			**Treatment Consideration and Notes[7]**
			No Action	**Proposed Action**	**Alt. 3**	
	Picloram + 2,4-D + Dicamba	0.25 + 0.95 + **0.50**	1%	1%	1%	Evaluate soil, slope, and proximity to water when considering this herbicide. Apply in spring. Use lower rate when plants are less than 3 inches tall, use higher rate when plants are greater than 3 inches until early flowering.
	Hexazinone	**2.00** to **4.00**	NA	NA	<1%	Apply pre-emergence or early post emergence. Use primarily on road rights-of-way.
	Propane torch	NA	NA	<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%	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 effective control[9]	NA	30%	NA	NA	Canada thistle cannot be controlled with currently available tools.
Teasels [I, II, III] *50 acres (noxious weeds: 0 acres)*	Manual control	NA	NA	10%	10%	Digging or hand pulling before flowering are effective controls. When digging, sever the root below the soil surface.
	Glyphosate	**<3.00**	NA	30%	30%	Apply in spring or fall to rapidly growing plants from rosette to bolting stage.
	Chlorsulfuron	**0.05**	NA	30%	30%	Apply in spring from rosette to bolting stage.
	2,4-D	0.95	NA	10%	10%	Apply in spring to rosettes.
	Imazapic	**0.13** to **0.19**	NA	10%	10%	Apply to rosettes and add a methylated seed oil.
	Dicamba + 2,4-D	**0.50** + 0.95	NA	2%	2%	Apply in spring or fall to rosettes. Use a non-ionic surfactant.
	Metsulfuron methyl	0.02 to **0.04**	NA	2%	2%	Apply from seedling or rosette to flowering stage.
	Clopyralid	0.23 to **0.49**	NA	2%	2%	Apply from the rosette to young bolting stage. Add a non-ionic surfactant.
	Dicamba + Diflufenzopyr	0.18 to **0.35**	NA	2%	2%	Apply in spring to actively growing plants. Use higher rates on perennials or large plants. Use a non-ionic surfactant or methylated seed oil adjuvant.
	Clopyralid + 2,4-D	0.16 to **0.38** + **1.00** to **1.90**	NA	2%	2%	Apply from the rosette to young bolting stage. Add a non-ionic surfactant.
	Mechanical control	NA	NA	<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.
Woody Species [I, II, III, IV] *7,806 acres (noxious weeds: 7,789 acres)*	Triclopyr	**2.00**	NA	53%	53%	Apply as a foliar treatment mid-summer to early fall to smaller plants.
	Glyphosate	**<3.00**	81%	12%	12%	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	5%	5%	Apply late summer to early fall.
	Triclopyr + 2 4-D	**2.00** + 0.95	NA	10%	10%	Apply when plants are actively growing.
	Mechanical control	NA	2%	2%	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.
	Manual control	NA	2%	2%	2%	Grubbing can effectively control small infestations.

Treatment Group[2] [Categories][3] *Gross Treatment Acres[4]*	**Treatment Method**	**Lbs./Acre[5]**	**Percent of Acres where Treatment Would be Used[6]**			**Treatment Consideration and Notes[7]**
			No Action	**Proposed Action**	**Alt. 3**	
	Triclopyr	**<6.00**	NA	5%	5%	Used primarily as a cut stump treatment. Use formulations labeled for aquatic use if treatments near water.
	Aminopyralid + Triclopyr	**0.11** + **1.00**	NA	2%	2%	Apply before bud to early flowering.
	Aminopyralid	0.05 to **0.11**	NA	2%	2%	Apply after full leaf expansion, generally around flowering period. Apply pre-emergence to control seedlings.
	Metsulfuron methyl	0.02 to **0.04**	NA	2%	2%	Apply when fully leafed and before fall coloration.
	Picloram	**1.00**	<1%	<1%	<1%	Apply when plants are actively growing and at or beyond full bloom.
	Biological control agents	NA	10%	5%	5%	Widespread biocontrol agents with high attack rates provide good control on gorse, Scotch and French brooms.
	Targeted grazing (goats)	NA	<1%	<1%	<1%	Effective at defoliating blackberries, but does not provide long-term control. Limited to areas without desirable plants or vehicle traffic.
	No effective control[9]	NA	5%	NA	NA	

NA: Herbicide not available under the alternative or plant species is not listed as a noxious weed; invasive plants that are not noxious weeds would not be treated with herbicides under the No Action Alternative.

1. Most treatments are suggested by *Weed Treatments in Natural Areas in the Western United States* (DiTomaso et al. 2013) and the *Pacific Northwest Weed Management Handbook* (OSU 2017).
2. Species of invasive plants that would be treated in the same manner have been arranged into treatment groups. Information about which plants species are in which group can be found in Table 2-1, *Summary of Known Invasive Plant Sites*, Table 2-3, *Invasive Plants Documented on Neighboring Lands but Not Known to Occur on the District*, and Table D-2, *Further Information about Invasive Plant Species*.
3. See the *Categories of Invasive Plant Infestations* section at the start of this chapter. Indicates which Categories are included in each treatment group. For example, the Loosestrifes treatment group includes Category I (invasive plant species known on the District), Category II (spread from sites), and Category IV (lower priority invasive plant species), but does not include Category III (invasive plants not yet known on the District).
4. The treatment acres column indicates how many acres are currently estimated to need treatments over a 20-year analysis period. More information about treatment acres can be found in the *Category I: Invasive Plants Currently Known on District* section at the start of this chapter.
5. Amounts listed are averages. Actual formulations may vary slightly, depending on mixes of herbicides or surfactants, timing, and other factors that could increase effectiveness on individual plants. Competitive planting and seeding using manual methods may also occur to revegetate areas in conjunction with other treatment methods. Lbs./acre calculated from rates per acre on the label, and can vary based on formulation. Typical and maximum application rates are listed on Table 2-5, *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.
6. Within each species group, and by alternative, these add up to 100 percent and show how often a treatment method would be used when a species is found. For example, under the Proposed Action, knotweeds would be controlled with imazapyr 50 percent of the time, treated with glyphosate 40 percent of the time, treated with triclopyr 10 percent of the time, and otherwise treated with manual methods, aminopyralid, or triclopyr + 2,4-D (less than 1 percent of the time each). These estimates are generally based on treatment of known sites. These percentages are based on net 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 listed as 50 percent each.
7. This includes common treatment considerations and is not an exhaustive list.
8. The sulfonylureas are chlorsulfuron, metsulfuron methyl, rimsulfuron, and sulfometuron methyl. The Oregon FEIS states that sulfonylureas can quickly confer resistance to plant populations, particularly where they are used extensively as the primary invasive plant control method in cropping systems (USDI 2010a:145).
9. Indicates percent of acres that cannot be controlled because an effective control method is unavailable.

***Table 2-11**. Comparison of the Alternatives, Treatment Methods*

Direct Control Method	No Action Alternative	Proposed Action	Alternative 3
Non-Herbicide Methods			
Biological control agents	Allowed	Allowed	Allowed
Manual control	Allowed	Allowed	Allowed
Mechanical control	Allowed	Allowed	Allowed
Weed barrier mats	Not allowed	Allowed	Allowed
Prescribed fire (broadcast)	Allowed	Allowed	Allowed
Propane torch (spot)	Not allowed	Allowed	Allowed
Targeted grazing (cattle, sheep, goats)	Allowed	Allowed	Allowed
Seeding and planting	Allowed	Allowed	Allowed
Herbicides			
2,4-D	Allowed	Allowed	Allowed
Aminopyralid	Not allowed	Allowed	Allowed
Chlorsulfuron	Not allowed	Allowed	Allowed
Clopyralid	Not allowed	Allowed	Allowed
Dicamba	Allowed	Allowed	Allowed
Dicamba + diflufenzopyr	Not allowed	Allowed	Allowed
Fluroxypyr	Not allowed	Not allowed	Allowed
Glyphosate	Allowed	Allowed	Allowed
Hexazinone	Not Allowed	Not allowed	Allowed
Imazapic	Not allowed	Allowed	Allowed
Imazapyr	Not allowed	Allowed	Allowed
Metsulfuron methyl	Not allowed	Allowed	Allowed
Picloram	Allowed	Allowed	Allowed
Rimsulfuron	Not allowed	Not allowed	Allowed
Sulfometuron methyl	Not allowed	Allowed	Allowed
Triclopyr	Not allowed	Allowed	Allowed
Allowed in limited areas as part of Research and Demonstration			
Fluazifop-P-butyl	Not allowed	Not allowed	Allowed (up to 15 acres per Field Office)

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

Use Fewer Herbicides than Analyzed Under the Proposed Action

This alternative was suggested during scoping. An alternative was considered that would remove one or more herbicides from consideration in the Proposed Action for various reasons including stated risks or apparent lack of need. All of the herbicides available in the Proposed Action have specific species or conditions for which they are the most suitable control. This proposed alternative would not meet the purpose and need; having this range of herbicides available 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. This allows the BLM to more effectively control invasive plants to protect native ecosystems and the flora and fauna that depends on them. Specific treatments and treatment considerations are shown in the *Treatment Key* (Table 2-10) 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 considered in the alternatives. 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 Proposed Action.

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-managed lands. Herbicides used on BLM-managed lands must be approved by the BLM National Office, and are, by policy, subject to detailed ecological and human health Risk Assessments for wildland applications to help satisfy the requirements of NEPA (USDI 2010a:37). However, BLM practice allows for limited and controlled use of new herbicides on demonstration plots up to five acres in size, with a maximum of 15 acres per Field Office. Approval to use an herbicide for research and demonstration is provided by the BLM National Office after an initial evaluation of *Federal Insecticide, Fungicide and Rodenticide Act* (FIFRA) registration materials and Risk Assessments (USDI 2010a:478).

In addition to the herbicides analyzed in this EA, Risk Assessments have been completed or adopted by the BLM for bromacil, diquat, diuron, fluridone, and tebuthiuron, and the results have been evaluated through the NEPA process (USDI 2010b). Research and demonstration has been approved on numerous herbicides, including one that the Coos Bay District analyzes in this EA (fluazifop-P-butyl). 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 almost all of the invasive plants species currently 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 there would be no difference in effects between the alternatives.

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

This alternative was suggested during scoping. 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 Proposed Action and Alternative 3 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 will decrease in the foreseeable future (USDI 2010a:139); therefore, this alternative would not meet the purpose and need, and is inconsistent with the basic policy objectives for the management of the area.

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[41] 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 is 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 Resource Management Plans and plans that tier to them.

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.

[41] Treatment of small, new infestations while there is high likelihood for eradication.

Reduce Management Activities Implicated in Invasive Plant Spread

This alternative was suggested during scoping. This alternative would curtail or restrict various management and public use activities taking place on BLM-managed lands (such as timber harvest, grazing, mining, off-highway vehicle use, 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 Resource Management Plan. This alternative is not considered in detail because a reconsideration of the level of various land uses is the purview of the land management planning process described in the *Federal Land Policy and Management Act* (FLPMA) and it 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, the *Oregon and California Lands Act*, and 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).

Ongoing and Reasonably Foreseeable Actions

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

Neighboring Lands

Pesticide Use

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

Ninety-four percent of the BLM-managed lands on the Coos Bay District lie within the Southern Oregon Coast drainage basin[42] (see Figure 2-3); hence, a rough comparison between pounds of pesticides used under each alternative and pounds of pesticides used in these basins as a whole is possible. Thirty-three percent of the Southern Oregon Coast drainage basin is managed by the Coos Bay District and 29 percent of the Southern Oregon Coast drainage basin is managed by the Medford District.

In 2008, 3,098,503 pounds of pesticides (including herbicides) were reported used in the Southern Oregon Coastal basin. Under the alternatives in this EA, the annual pounds of herbicides used annually by the BLM would be approximately 1,250 (No Action) and 1,060 (Proposed Action and Alternative 3). (With the exception of the pesticide use described below for other Districts and Sudden Oak Death management, the BLM uses no other pesticides in this basin.) This represents about 0.04 (No Action) and 0.03 (Proposed Action and Alternative 3) percent of the pounds of pesticides used in the basin.

[42] Two percent and four percent of the District (respectively) are in the Northern California Coastal and Northern Oregon Coastal drainage basin.

***Figure 2-3**. Water Basins on the Coos Bay District*

A direct comparison of quantities of specific active ingredients is not possible. The State report provides the pounds of pesticides for the top five most-used active ingredients. The top five active ingredients used in the Southern Oregon Coastal basin are not herbicides; they are insecticides, algaecides, or wood preservatives, and together represent 72 percent of all reported pesticide use.

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

Forest landowners (e.g., timber companies) are responsible for reporting their proposed herbicide use to the Oregon Department of Forestry before they spray herbicides. (Reporting is required for herbicide applications where the desired outcome is forest management, but they are not required for vegetation management around households and personal property.) Between 2004 and 2014, 9,827 and 2,028 parcels respectively were sprayed in Coos and Curry Counties (ODF 2014).

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

Invasive Plants

The Oregon Department of Agriculture has mapped 52 current or historical[43] noxious weeds in Curry County, Coos County, or both (all ownerships). Of these, five current noxious weeds (cape ivy, dense flowered cordgrass (*Spartina densiflora*), matgrass, orange hawkweed (*Pilosella aurantiacum* (Syn. *Hieracium*)), and woolly distaff thistle (*Carthamus lanatus*)), and one historical weed (smooth cordgrass (*Spartina alterniflora*) are on the State's A list. The A list includes all invasive plant species of known economic importance which occur in the State in small enough infestations to make eradication or containment possible. The rest of the noxious weeds mapped by the Oregon Department of Agriculture are on the State's B list, which consists of invasive plants of economic importance which are regionally abundant, but which may have limited distribution in some counties. Eighteen of these B-listed noxious weeds are widespread throughout one or both the counties, including Himalayan blackberry; bull, Canada, Italian, milk, and slender flowered thistles; gorse; and French and Scotch broom. These noxious weeds also spread quickly and over long distances by multiple means and do well in disturbed areas like burned areas, harvested areas, and pastures (see Category II, *Spread from Existing Invasive Plant Sites*, for a detailed description). The Cooperative Weed Management Areas work with Federal, State, and local government agencies, Tribes, individuals, and various interested groups to manage invasive plants in these counties.

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

Other BLM Pesticide Use

Sudden Oak Death

On the Coos Bay District, the BLM uses glyphosate and imazapyr on tanoak to prevent the spread of Sudden Oak Death. *Phythophthora ramorum*, the pathogen that causes Sudden Oak Death, is subject to State quarantine regulations to prevent the spread of the pathogen when it is found. The methods to achieve this include glyphosate or imazapyr injection of tanoak prior to cutting to prevent resprouting, mechanical removal of infected host species and target hosts within a defined treatment area, and burning of all cut vegetation. Sites are retreated if this pathogen persists. Treatments generally occur on approximately 50 to 100 acres annually on the District.

Medford District

The Medford District BLM, east of the Coos Bay District, updated their Integrated Invasive Plant Management Plan in 2018 to add additional herbicides and to add invasive plants that are not noxious weeds to the vegetation that can be treated. Their plan is similar to Coos Bay's Proposed Action; however, their plan includes fluroxypyr and rimsulfuron, as well as the experimental use of fluazifop-P-butyl[44] and *Pseudomonas fluorescens* (a biopesticide for invasive annual grasses), and does not include picloram. The Medford District treats approximately 2,000 acres of noxious weeds each year – 75 percent with herbicides, and 25 percent with other methods (primarily manual).

In addition, the BLM manages two seed orchards in the Medford District – the 300-acre Provolt Seed Orchard located near Grants Pass and the 200-acre Sprague Seed Orchard near Merlin, managed under a 2006 Record of Decision (USDI 2006) for an Integrated Pest Management program on these seed orchards. Dicamba, glyphosate, hexazinone, picloram, and triclopyr are the herbicides allowed for vegetation treatments on these seed orchards, though BLM has only applied glyphosate for the past several years. Other pesticides that can be used include dimethoate, esfenvalerate, horticultural oil, imidacloprid, and insecticidal soap (insecticides) and chlorthalonil (fungicide). Acephate, chlorpyrifos, diazinon, and propargite (all for insects) are also allowed, but are very seldom or never used. Typically, less than one acre annually is treated with these pesticides on seed orchard lands.

Northwest Oregon District

The Northwest Oregon District BLM, north of the Coos Bay District, is in the process of updating their integrated weed control plan to add additional herbicides to the treatment methods that are currently approved. Until 2016, the Northwest Oregon District was managed as two districts – the Salem District and the Eugene District. Available invasive plant treatment methods have varied by field office and specific management areas. For example, invasive plant management in the West Eugene Wetlands has involved the use of prescribed fire, seeding, manual and mechanical methods, solarization, targeted grazing, and herbicides including glyphosate, triclopyr, and clopyralid, and research and demonstration plots of aminopyralid and fluazifop-P-butyl. The updated plan would allow treatment of all terrestrial invasive plants (not just noxious weeds) with herbicides, and would allow the use of additional herbicides. The non-herbicide direct control methods currently available would remain and would be permitted district-wide under the action alternatives. The District currently treats approximately 2,500 acres of invasive plants each year – 2,000 acres with herbicides and 500 acres by manual, mechanical, targeted grazing, fire, and biological control methods.

[44] Fluroxypyr, rimsulfuron, and the experimental use of fluazifop-P-butyl are analyzed in Alternative 3 (but not the Proposed Action) of this EA.

Roseburg District

The Roseburg District BLM, east of the Coos Bay District, is in the process of updating their Integrated Weed Control Plan to add up to 13 herbicides to the four that are currently approved (2,4-D, dicamba, glyphosate and picloram), and to treat invasive plants and certain native species in specified areas to meet restoration or safety objectives. The District currently treats approximately 2,500 acres of invasive plants each year – 2,000 acres with herbicides and 500 acres by manual, mechanical, fire, and biological control methods.

Other Federal and State Lands

U.S. Forest Service

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

The Siuslaw National Forest operates under a 2010 Forest Integrated Weed Management Project EA. The EA analyzes the use of glyphosate and imazapyr and focuses on high-priority invasive plant species and sites on the Forest. Target species include purple foxglove, oxeye daisy, common tansy, knotweed, European beachgrass, reed canarygrass, bull thistle, Canada thistle, Scotch broom, false brome, and meadow knapweed. In 2016, invasive plant management focused on sand dune and meadow restoration, forest landscape restoration, non-native species with limited occurrence, and rock pits identified for future development. Treatment methods included both manual and chemical. Manual methods were used on 313 acres and herbicide was applied on 790 acres.

On the Rogue River-Siskiyou National Forest, invasive plant treatments primarily target medusahead, Japanese knotweed, garlic mustard, dyer's woad, Scotch broom, spotted knapweed, yellowtuft, and yellow starthistle. The Rogue River-Siskiyou National Forest primarily uses triclopyr, imazapic, picloram, and glyphosate on sites addressed in a 1999 EA decision for the 1.7 million acre National Forest. In 2016, the National Forest treated 1,080 acres with herbicides; this includes 582 acres of spotted knapweed with picloram, 165.7 acres of Dalmatian toadflax and 178.9 acres of spotted knapweed with clopyralid, 133.9 acres of tansy ragwort and Scotch broom with glyphosate, and 19.5 acres of medusahead rye with imazapic. An additional 1,685 acres were hand-pulled, cut, or pulled with weed wrenches[45].

Bandon Marsh National Wildlife Refuge (U.S. Fish and Wildlife Service)

Bandon Marsh National Wildlife Refuge manages invasive plants according to their 2013 National Wildlife Refuge Comprehensive Conservation Plan (USDI 2013b). Because invasive plants and animals currently represent the greatest threat to the Refuge's wildlife and habitat, control of invasive species is a high priority management activity. Target species include reed canarygrass, Himalayan blackberry, English ivy, Scotch broom, gorse, spartina, and Japanese eelgrass. These are controlled with mechanical and manual methods, as well as herbicides to protect established trees and shrubs.

[45] A manually operated tool designed to remove woody plants by uprooting them.

Coquille Forest (Coquille Indian Tribe)

Noxious weeds on the Coquille Forest have been managed under the BLM's 1997 *Integrated Noxious Weed Program on the Coos Bay District Environmental Assessment*. The Coquille Tribe does not plan to manage invasive plants as described in this plan's Proposed Action and it is assumed that the Tribe will continue to manage noxious weeds on the forest under the 1997 plan (the No Action Alternative) until the Tribe implements a new forest plan.

Elliot State Forest

The Elliot State Forest operates under a 2011 forest management plan that allows it to treat invasive plants using an integrated weed management strategy (ODF 2011). Similar to previous years, Elliot State Forest planned to treat approximately 5,000 acres (gross) of Scotch broom along roadsides in 2017 using triclopyr.

Oregon State Parks

Oregon State Parks are managed by the Oregon Parks and Recreation Department. Invasive plants are common on State park lands and threaten natural native environments. Preventative methods of control include prohibiting collection of plant resources, excluding access to some areas, and requesting visitors to stay on trails. Within 20 state parks in Coos and Curry County, the Oregon Parks and Recreation District treated broom, gorse, knotweed, biddy-biddy, matgrass, yellow flag iris, fennel, and jubata grass with imazapyr, metsulfuron methyl, triclopyr, and glyphosate.

Oregon Department of Transportation (ODOT)

ODOT controls vegetation using a statewide integrated vegetation management approach, including mechanical methods, biological control agents, and herbicides. The local maintenance district plan maps locations of sensitive natural resources and identifies areas where herbicide spraying would not occur. It also identifies buffer limits and other restrictions around water resources, sensitive fish, and plant species. Herbicides are used to control invasive plants and roadside vegetation. From 2010 to 2015, ODOT reduced its herbicide use statewide by 44 percent, (measured in pounds of active ingredients) from the 2010 level of approximately 55,000 lbs./year, largely by switching to herbicides with less active ingredient (ODOT 2016).

Chapter 3 – Affected Environment and Environmental Effects

This chapter describes the natural, cultural, and social environment of BLM-managed lands on the Coos Bay District that would potentially be affected by the alternatives under consideration. It focuses on resource issues that were identified during scoping, and presents the consequences of the Proposed Action and Alternative 3 as opposed to continuing current management (the No Action Alternative) relative to those issues.

Determination of Effects in this Environmental Analysis

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

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

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

- **Estimated Gross Treatment Acres** (see Tables D-3 and D-4, *Estimated Total Treatment Acres, 20-Year Analysis Period*): Acres provided both for annual estimates and total acres potentially treated over the life of the plan.

- **Protection Measures**: Standard Operating Procedures have been identified to reduce adverse effects to humans and environmental 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 these Conservation Measures to other Special Status species. Project Design Criteria adopted in ARBO II (USDI 2013a, NMFS 2013) further protect federally listed species. In addition, Project Design Features are included as part of this analysis' action alternatives.

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

- **Cumulative Effects:** These are defined in the Council on Environmental Quality (CEQ) regulations as those that result from the incremental effects of a proposed action when added to other past, present and reasonably foreseeable future actions, regardless of which agency or person undertakes them (40 CFR 1508.7). Effects from past actions are generally considered part of the description of the Affected Environment in the analysis in this chapter. Ongoing and reasonably foreseeable actions are addressed in the cumulative effects discussions for each issue as applicable.

Invasive Plants

Invasive Plants Issue 1

How does the availability of additional herbicides under each alternative affect treatment effectiveness for individual invasive plant species?

Analytical Assumptions and Methods

As described in the Oregon FEIS, invasive plant control treatments are not 100 percent effective at controlling all treated populations, as some level of retreatment may be necessary to achieve complete control (USDI 2010a:135-139). The Oregon FEIS found that program effectiveness (based on how often retreatments occur) had been 60 percent in a program where the districts were limited to glyphosate, picloram, dicamba, and 2,4-D. Hence, the BLM estimates treatment efficacy to be 60 percent under the No Action Alternative in this EA. The herbicides analyzed in the Oregon FEIS were chosen, in part, because they would be more effective at treating invasive plants that occur in the Pacific Northwest. Hence, an 80 percent treatment effectiveness rate was estimated for a program where a full range of treatment methods were available, as under the Proposed Action and Alternative 3. These projections of effectiveness should not be considered absolute, rather reasonable approximations of the relative differences among the alternatives. Program-wide treatment efficacy under each alternative is briefly described in this issue, however, it is not analyzed in detail. It was previously described in the analysis for the Oregon FEIS (USDI 2010a:135-139) and there are no new circumstances or information that would change the effects anticipated district-wide for this EA. The type of actions under all alternatives would be consistent with the actions analyzed in the 2010 Oregon FEIS.

However, these effectiveness estimates are not accurate for all invasive plant species on the District. Table 3-1 provides examples of species where the treatment effectiveness varies from the district-wide treatment efficacy assumptions.

Table 3-1. *Treatment Effectiveness under the Alternatives*

Species	Treatment Group	No Action Alternative	Proposed Action	Alternative 3
District-wide, all species	varies	60%	80%	80%
Canada thistle	Sunflower Family	10%	80%	80%
False brome	Perennial Grasses	60%	60%	80%
European beachgrass	Perennial Grasses	10%	10%	80%
St. Johnswort	Misc. Herbaceous	80%	80%	80%
Buffalobur nightshade	Misc. Annual Herbaceous	80%	80%	80%

The District has found that existing treatment methods have been 10 percent effective on Canada thistle, as the available treatment methods do not effectively control this species and retreatments occur at least annually. For perennial grasses such as false brome, there are no selective options under the No Action Alternative and (like other treatments under the No Action Alternative) effectiveness has been approximately 60 percent. The Proposed Action does not add treatment methods that are selective to perennial grasses, so effectiveness would remain at 60 percent. In western snowy plover habitat, European beachgrass treatments with bulldozers and discs and limited treatments with glyphosate (available under the No Action Alternative and the Proposed Action) have been found to be approximately 10 percent effective.

The availability of aminopyralid and clopyralid to treat Canada thistle (under the Proposed Action), fluazifop-P-butyl and hexazinone to treat false brome (under Alternative 3), and imazapyr and glyphosate to treat European beachgrass (under Alternative 3) is expected to provide the full range of treatment methods for these species. As

described above, an 80 percent treatment effectiveness rate was estimated for a program where a full range of treatment methods were available.

Conversely, some species are adequately controlled under the No Action Alternative, and the Proposed Action or Alternative 3 would not lead to an improvement in treatment efficacy. For example, three biological control agents currently provide excellent control against St. Johnswort on the District and treatment with this method would continue (see Table 2-10, *Treatment Key* (Misc. Herbaceous)). If buffalobur nightshade (Category III) were to be found on the District, the most appropriate control method under all alternatives would be glyphosate or handpulling (see Table 2-10, *Treatment Key* (Misc. Annual Herbaceous)). Where invasive plant treatments, and the effects of those treatments, would not differ between the alternatives (including the No Action Alternative), those treatments and effects are not discussed in detail.

The analysis area/geographic scale includes locations where invasive plants species are found on BLM-managed lands on the District (see *Affected Environment*). The temporal scale of the analysis is 20 years, the expected life of this plan; short-term effects include those that would last less than two growing seasons, long-term effects would last greater than two growing seasons. Treatments would be done according to the *Treatment Key* (Table 2-10), which lays out treatment options and considerations by treatment groups.

Affected Environment

The District has mapped 36 invasive plant species on 19,284 sites, totaling 18,100 infested acres (Table 2-1, *Summary of Known Invasive Plant Sites,* Map 2-1, *Invasive Plants Documented in NISIMS*). An additional 207 invasive plant species are known or suspected to occur on the District (Tables 2-1 and D-2, *Further Information about Invasive Plant Species*), but the BLM has not mapped infestations of these species. Most infestations on the Coos Bay District occur on roadsides within forests, at recreation sites, meadows, or sand dune communities where invasive plants have more access to sunlight and less competition from native woody plants. Chapter 2 describes in additional detail the District's invasive plant species and infestations.

Further information about the species described in detail in this issue can be found in Table 3-2. The treatment efficacy for these three species varies from the district-wide treatment efficacy assumptions described in the 2010 Oregon FEIS. As described in *Analytical Methods* section above and in the Oregon FEIS to which this EA tiers, treatment effectiveness for other species would be 60 percent under the No Action Alternative and 80 percent under the action alternatives (USDI 2010: 135-139); or the treatment efficiency does not vary between the alternatives (St. Johnswort and buffalo nightshade) and hence, these other species are not analyzed in detail.

Table 3-2*. Specific Species, Locations, and Extent*[1]

Species	NISIMS		Gross Treatment Acres[2]	Primary Locations
	Sites	Gross Acres		
Canada thistle	558	188	800	Roadsides, pastures, harvest areas, open disturbed areas
False brome	19	78	200	Roadsides, rights-of-way, forests
European beachgrass	13	59	240	New River, North Spit, coastal sand dunes to coastal meadows

1. Further information about these species and their extant and mapping in NISIMS can be found in the *Category I: Invasive Plants Currently Known on the District* section of Chapter 2.
2. As described in Category I and displayed in Table 2-1, *Summary of Known Invasive Plant Sites*, these gross acres are how many acres are estimated to be in need of treatment.

Environmental Consequences

No Action Alternative

Under the No Action Alternative, the District would treat approximately 1,000 gross acres per year. Invasive plants would continue to spread at their current rate, estimated at 10 percent per year (see *Invasive Plants* Issue 2 for additional detail about spread). Treatment efficacy would be limited because fewer treatment methods and only four herbicides are available. The BLM estimates that district-wide, treatment methods would be effective on 60 percent of treated acres (USDI 2010a:136), requiring multiple retreatments to meet management objectives.

Several noxious weed species would not be effectively controlled using the tools available under this alternative, including Canada thistle and noxious weeds in the perennial grasses treatment category[46]. Mowing Canada thistle is effective when it is repeated every 3 to 4 weeks over several growing seasons (DiTomaso et al. 2013), but this frequency of mowing is not practical (estimated at 3 to 6 times a year). In addition, topographic features like steep slopes and woody debris present on most BLM-managed lands precludes the use of mowing in many areas. Canada thistle can be effectively controlled with dicamba or picloram, but these herbicides are not registered for use in the wetland and riparian areas where this species commonly occurs. Perennial grasses could be controlled with glyphosate, but they are intermingled with desirable vegetation that would be damaged by glyphosate, a non-selective herbicide. Treatments generally happen in areas where damage to desirable vegetation can be avoided. In areas where perennial grasses are not treated, they continue to spread.

Some noxious weed species would be treated under this alternative because the treatment method reduces vigor or seed development, but the treatment does not actually eliminate the targeted plant or achieve treatment objectives. For example, European beachgrass can be manually pulled, but roots remain to resprout. Annual treatments of European beachgrass have been 10 percent effective, but beachgrass also spreads at about 10 percent a year. The entire 172 acres of beachgrass infestation in western snowy plover habitat restoration areas at New River and the North Spit is re-treated twice annually with heavy equipment such as discs or bulldozers. At the North Spit, up to 24 acres of beachgrass would be treated with glyphosate. However, the literature suggests that the effectiveness of glyphosate on European beachgrass is marginal because it has no soil activity[47] (DiTomaso et al. 2013:31).

Forty-one invasive plants listed in Category I would not be treated under this alternative unless the State of Oregon or a county within the District designates them as noxious weeds. In the meantime, they would continue to spread unchecked. Category IV, *Lower Priority Invasive Plants,* are also not listed as noxious weeds and would not be treated under this alternative. These species are currently below the threshold level for action but may become problematic in the future.

Following a noxious weed treatment, secondary invasions (an increase in abundance of non-target invasive plants following the treatment of a targeted invasive plant) often occur. For example, following treatment of Himalayan blackberry with mowers or glyphosate, Scotch broom, evergreen blackberry, and Canada thistle may appear. Under the No Action Alternative, Canada thistle does not have an effective treatment method and evergreen blackberry is only listed in Curry County as a noxious weed and would only be treated in this area of the District.

Limited treatment efficacy would affect the distribution and abundance of invasive plants across all ownerships within and surrounding the District. The inability to effectively control species on BLM-managed lands would result

[46] These include European beachgrass, false brome, jubata grass, pampas grass, perennial ryegrass, reed canarygrass, sweet vernal grass, tall fescue, and velvetgrass in Category I (Invasive Plants Currently Known on District) and common reed, matgrass, and ribbongrass in Category III (Invasive Plants Not Yet Known on District). In addition, there are numerous Category IV (Lower Priority Invasive Plants) perennial grasses (see Table D-2).
[47] Glyphosate binds to soil particles and is rapidly degraded by microbes, making it inactive in soil. See *Soil* Issues 2 and 3.

in the spread of infestations to other landowners. Even if those landowners have more effective treatment options, their long-term success would be reduced because infestations on BLM-managed lands would continue to provide a seed or propagule source. Thus, the opportunity to collaborate in an all-lands strategy to control these species would be compromised. Ultimately, limited treatment efficacy on BLM-managed lands would reduce treatment efficacy at the landscape scale. For example, gorse and brooms spread along roads and power line rights-of-way that cross multiple ownerships. Treatments used on neighboring lands are not available on BLM-managed lands. Hence, 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. The checkerboard nature of land ownership exacerbates spread when some parties are not able to participate fully. However, in western snowy plover habitat the BLM works closely with – and uses similar treatment methods to – the U.S. Army Corps of Engineers on treatments of European beachgrass in plover habitat restoration areas, as invasive plant treatments on Corps- and BLM-managed lands have the potential to destabilize the foredunes next to the shipping channel (see *Soil* Issue 1 and *Wildlife* Issue 1 for more information on treatments in western snowy plover habitat).

Proposed Action

Under the Proposed Action, the BLM would add additional treatment methods (including additional herbicides) and allow treatment methods to be used on invasive plants that are not listed as noxious weeds. This would result in a more effective integrated management program compared to the No Action Alternative. Invasive plants would continue to spread at an estimated 10 percent per year, but the BLM estimates that herbicide treatments would be effective on 80 percent of treated acres (USDI 2010a:136), requiring fewer retreatments to meet management objectives compared to the No Action Alternative. The improvement in herbicide efficacy would allow the BLM to focus non-herbicide treatments where they are most practical and effective, either as stand-alone treatments or in combination with herbicide treatments. The combination of tools available under the Proposed Action would be effective on most of the invasive plant species known or suspected to occur on the District, as well as potential new invaders. As a consequence, treatment objectives, such as reducing infestations to below damage levels for Special Status species and special communities (see *Native Vegetation* Issue 1), would be met more frequently and on more acres compared to the No Action Alternative.

Treatment effectiveness of Canada thistle would increase to approximately 80 percent. Canada thistle can be effectively controlled with aminopyralid or clopyralid, both of which would be available under this alternative. (However, aminopyralid has longer residual activity than clopyralid, and is less likely to harm neighboring desirable species (DiTomaso et al. 2013).)

Similar to the No Action Alternative, perennial grasses such as false brome and European beachgrass would not have effective treatment methods under this alternative. Treatments in western snowy plover habitat restoration areas would continue to be limited to discing, bulldozing, or plowing beachgrass, with limited treatments using glyphosate or methods that would leave the root system intact. Neighboring infestations of beachgrass could be treated with imazapyr and glyphosate, which would limit its spread into these areas. False brome and other perennial grasses infesting roadsides would be spot treated with glyphosate; however, glyphosate has no residual activity and would not control undetected seedlings, thus reducing overall treatment efficiency.

An important benefit of the more effective integrated invasive plant management under the Proposed Action would be the opportunity to better collaborate with partners on an all-lands strategy to reduce the impacts of invasive plants in coastal Douglas, Coos, and Curry Counties. Currently, adjacent landowners have not opted to do treatments in cooperation with the BLM due to the limited treatment options that are available; however, several major timberland operators have expressed an interest in doing cooperative treatments where applicators do not have to change herbicides or rates at property boundaries (Jeanne Standley, Coos Bay Weed Coordinator, 2018 personal communication).

Alternative 3

Alternative 3 is similar to the Proposed Action, except that four additional herbicides[48] would be available for use district-wide and additional treatment methods would be used in western snowy plover habitat restoration areas. These additional herbicides would include hexazinone and fluazifop-P-butyl, which are effective on perennial grasses. This is not expected to change the district-wide 80 percent effectiveness estimate, as these perennial grasses account for less than one percent of the currently mapped invasive plants on the District. (While these perennial grasses have not been mapped in part because these species have no effective treatment methods available under the other alternatives, the majority of the District's invasive plant species are woody species (trees, shrubs, and vines), which would be effectively treated under both the Proposed Action and Alternative 3.)

In western snowy plover habitat restoration areas, the BLM would use imazapyr and glyphosate to treat up to 172 acres of European beachgrass. Treatment effectiveness of European beachgrass would increase from approximately 10 percent to 80 percent with the addition of imazapyr and expansion of the area that could be treated with glyphosate. The addition of more effective treatments would decrease dependence on less effective mechanical treatments and reduce the need for heavy equipment treatments when compared to the No Action and Proposed Action from twice annually to once every two to three years.

Infestations of false brome currently occur on roadsides, where they can be easily accessed by people or crews doing invasive plant treatments. The most effective treatment on this species is glyphosate application in the midsummer to fall, followed by hexazinone the following spring to control germinants (OSU 2017). Under Alternative 3, this would replace mowing, which must be done multiple times a year to effectively treat infestations and can harm non-target vegetation. Effectively treating false brome on the roadsides with glyphosate and hexazinone would prevent the spread of this species into forests where it forms monocultures and crowds out other understory species.

Other effects remain as described under the Proposed Action.

Invasive Plants Issue 2 (Not Analyzed in Detail)

How would invasive plant treatments under each alternative affect the spread rate of invasive plants?

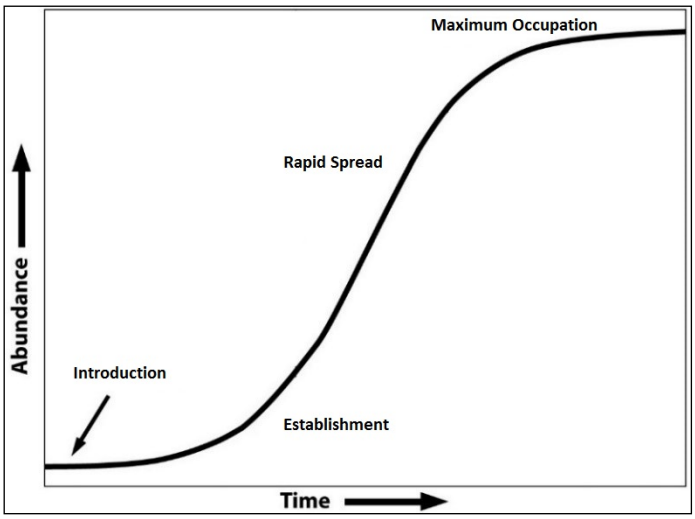
This issue is not analyzed in detail here; the spread rate does vary between the alternatives, as described in the analysis for the Oregon FEIS (USDI 2010a:131-139) but there are no new circumstances or information at the site-specific level that would change the effects anticipated for this EA. The type of actions under all alternatives would be consistent with the actions analyzed in the 2010 Oregon FEIS.

The rate of spread from existing infestations was estimated based on BLM and U.S. Forest Service data which showed that invasive plants spread at an estimated 10 to 15 percent annually (USDI 2010a:594-603), with 10 percent a more likely estimate west of the Cascades due primarily to the steeper, more vegetated landscape where wind-born species cannot spread as easily (USDI 2010a:595)[49]. Within particular plant communities or infestations, rate of spread fluctuates 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

[48] Rimsulfuron, hexazinone, fluroxypyr, and fluazifop-P-butyl.
[49] The Oregon FEIS projections 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.

(Figure 3-1)(USDI 2010a:132). In the earliest phases (between introduction and before rapid spread), control programs are the most effective.

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



Eighty-four percent of mapped invasive plant infestations are smaller than one acre (Table 2-2, *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, they can control the infestation and eradication is more likely. One percent of sites are larger than 5 acres, but account for 47 percent of mapped acres (Table 2-2). These larger sites would generally not be candidates for eradication but would be treated to prevent spread (containment).

Under the No Action Alternative, the District would treat approximately 1,000 gross acres per year. Invasive plants would continue to spread at their current rate, estimated at 10 percent per year. Given a 10 percent rate of spread and annual treatment of 1,000 gross acres per year at a 60 percent effective treatment rate, the 18,100 acres of mapped infestations is estimated to spread to 36,428 acres over the next decade and to 83,966 acres in 20 years. The effective annual rate of increase in infested acres in year 10 would be 101 percent, and in year 20 would be 364 percent, meaning that despite a combination of prevention efforts and control treatments (biocontrol, chemical, manual, and mechanical), rate of spread would rapidly outpace rate of control. Forty-one invasive plants listed in Category I would not be treated under this alternative unless the State of Oregon or a county designates them as noxious weeds. In the meantime, they would continue to spread unchecked. Category IV, *Lower Priority Invasive Plants,* are also not listed as noxious weeds and would not be treated under this alternative. These species are currently below the threshold level for action at the landscape scale; however, in limited areas treating them is a priority as they compete with Special Status plants and degrade unique plant communities in ACECs.

Under the Proposed Action, the BLM would add additional treatment methods (including additional herbicides) and allow treatment methods to be used on invasive plants that are not listed as noxious weeds. This would result in a more effective integrated invasive plant management program compared to the No Action Alternative. Given a 10 percent rate of spread and annual treatment of 1,000 gross acres per year at an 80 percent effective treatment rate, the 18,100 acres of mapped infestations are estimated to grow to 71,366 acres after 20 years of treatment (or 32,922 after 10 years), which is 12,600 fewer acres after 20 years (or 3,500 acres after 10 years) than under the No Action Alternative. This is a 294 percent increase to the existing infestation (compared to 364 percent under the No Action Alternative). However, given the more effective treatment methods available (as discussed in *Invasive Plant* Issue 1), as well as the existing prioritization of small invasive plant sites, many 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 2009)[50].

Alternative 3 is similar to the Proposed Action, except that four additional herbicides would be available for use district wide and additional treatment methods could be used in western snowy plover habitat restoration areas.

[50] An updated version of this 2009 report is cited in this EA as The Research Group, LLC (2014).

These additional four herbicides would include herbicides that are effective on perennial grasses. Although this would affect the spread rate of some individual species that would not be effectively treated under the other alternatives (for example, false brome; see *Invasive Plants* Issue 1), this is not expected to change the district-wide spread rate described under the Proposed Action.

Invasive Plants Issue 3 (Not Analyzed in Detail)

How would climate change affect the spread of invasive plants?

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

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

One recent (2017) study by the Oregon Climate Change Research Institute (OCCRI) reported similar conclusions as the Oregon FEIS. At present, there is no local-scale modeling of processes affecting the Southern Oregon coast (such as upwelling, coastal fog, etc.), and it is not feasible to deduce local-scale change from large-scale models. However, the OCCRI report documents and describes changes to communities and coastlines and, whenever possible, south coast-specific projections are detailed and inferred. On the coast, sea level rise will increase the risk of coastal erosion and flooding; warming waters and ocean acidification will degrade estuarine habitat crucial for salmon and shellfish and negatively affect nearshore fisheries; and forest vegetation in the Coast Range may shift. Future warming and changes in precipitation may considerably alter the spatial distribution of suitable climate for many important tree species and vegetation types in Oregon by the end of the 21st century. More frequent drought conditions projected for the future will likely increase forest susceptibility to disturbance agents (such as invasive plants) (Halofsky and Peterson 2016).

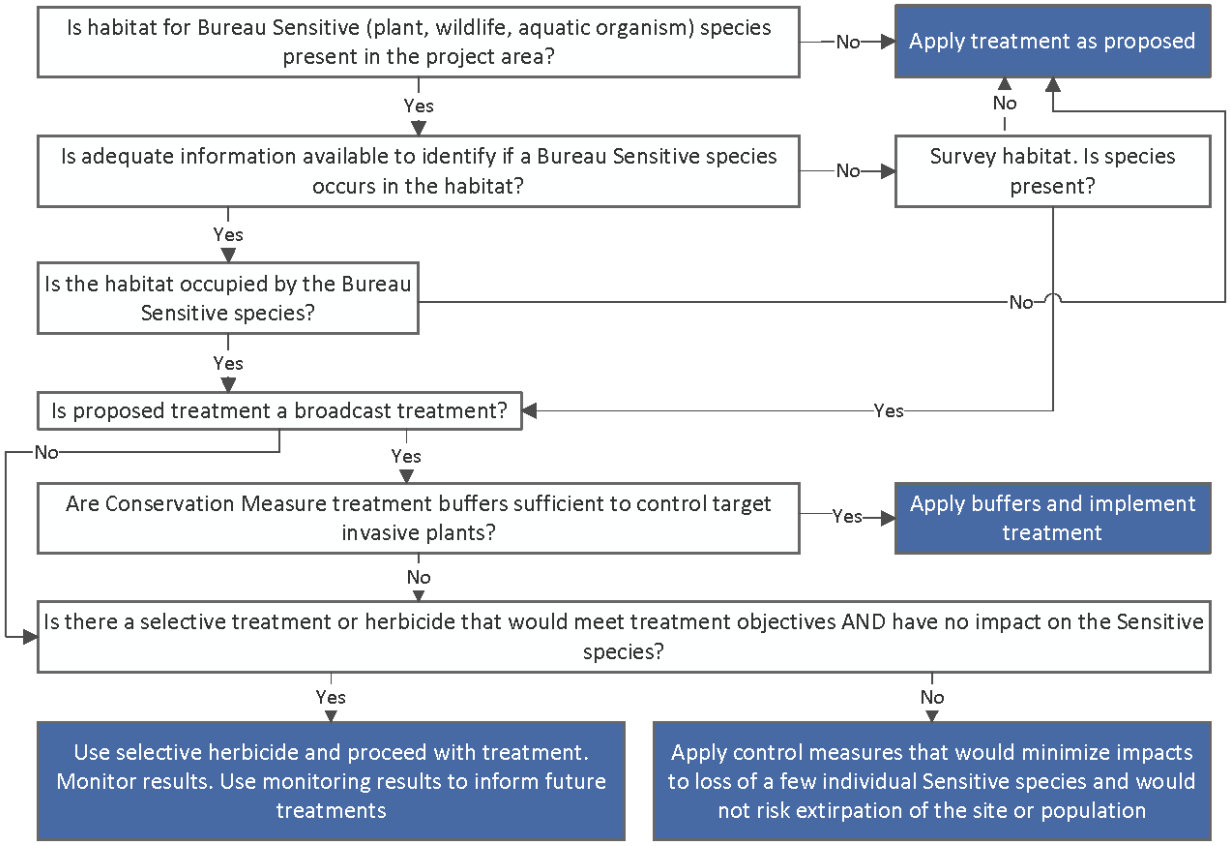
Background: Potential Effects to Non-Target Organisms

The following four Issue sections (*Native Vegetation*, *Fish and Aquatic Organisms*, *Wildlife*, and *Human Health*) rely on herbicide Risk Assessments to aid in analyzing and describing adverse effects. As further described in Chapter 2 and Appendix C, *Herbicide Risk Assessment Summaries*, these BLM and U.S. Forest Service-prepared Risk Assessments quantitatively evaluate the probability (i.e., risk) that herbicide use in wildland settings might pose harm to an organism. These Risk Assessments were done or adopted as part of the 2007 and 2016 PEISs and the 2010 Oregon FEIS. Risk Assessments are necessarily done on surrogate species in laboratory conditions, identified to represent a species group. Risk Assessments take a conservative approach at assessing risk, incorporating assumptions in the analysis to account for highly susceptible[51] individuals; testing builds in and accounts for uncertainty (multiplying the lowest observable effects by a factor of 10, 100, or even 1,000) and testing scenarios may be severe (e.g., soaking the test animal or consuming treated vegetation for an entire day). The likelihood of actual exposures comparable to those described in the Risk Assessments is reduced by application of Protection Measures (see Appendix A), as well as by the nature of the application and the location and actions of the

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

receptor[52]. The Risk Assessments are summarized in tables in Appendix C and show herbicide risk ratings for vegetation, wildlife, and humans at BLM maximum and typical application rates[53], in a variety of application scenarios.

***Figure 3-2**. Bureau Sensitive Species Treatment Conditions*



Three Issues sections (Native *Vegetation*, *Fish and Aquatic Organisms*, and *Wildlife*) include effects to Special Status species; species that are federally listed as threatened or endangered or proposed for listing, as well as Bureau Sensitive species; species that are rare, but are not federally listed or proposed for listing. Bureau Sensitive species are those for which population viability is a concern, as evidenced by significant current or predicted downward trends in population numbers or density and habitat capability that would reduce a species' existing distribution. Management of Bureau Sensitive species "must not result in a loss of species viability or create significant trends toward Federal listing" (USDI 2008b). Consultation with the U.S. Fish and Wildlife Service or the National Marine Fisheries Service has occurred for listed species on the District, including at the national level with the 2007 and 2016 PEISs. This consultation resulted in Conservation Measures applicable to listed species or species proposed for listing (see Appendix A, *Protection Measures*). (Consultation done at other levels has also resulted in other Protection Measures that are applicable to listed species; see Appendix A.) Mitigation Measures adopted with the Records of Decision for the 2007 and 2016 PEISs at the national level state that, "To protect Special Status wildlife species, implement Conservation Measures for terrestrial animals presented in the 2007 *Vegetation Treatments on Bureau of Land Management Lands in 17 Western States* and 2016 *Vegetation Treatments Using Aminopyralid, Fluroxypyr, and Rimsulfuron Biological Assessments*." These Conservation

[52] 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.
[53] Actual rates used are listed in Table 2-10 (*Treatment Key*). Maximum rates are rarely used.

Measures include herbicide-free buffers for non-target species. The following ***Project Design Feature***, included in the analysis of the Proposed Action, 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 are expected to improve habitat conditions, which would provide long-term benefits to the population.

- Follow the Bureau Sensitive Species Treatment Conditions flowchart (Figure 3-2) when working in potential habitat for Bureau Sensitive species.

Native Vegetation

Native Vegetation Issue 1

How would treatment methods affect unique plant communities in Areas of Critical Environmental Concern (ACECs) and other areas with Special Status plant species?

Analytical Methods

The analysis area includes the areas where invasive plants threaten unique plant communities: Special Status species habitat or ACECs within the Coos Bay District. These areas are located in estuarine areas, coastal sand dunes, Jeffrey pine savannah, rocky serpentine mountain tops, and Coast Range meadows. As described in the *Planning* section of Chapter 2, treatment of invasive plants in these areas is a high priority.

ACECs in late-successional forests, Darlingtonia fens, coastal wetlands and meadows, knobcone pine forests, and grassy knobs currently either contain no known invasive plants or the invasive plants are only found along roadsides where Special Status species are not found and will not be analyzed in detail because there is no potential for significant effects. In addition, a majority of the District's Special Status plant sites contain no invasive plants and will not be analyzed in detail because there is no potential for significant effects.

Analysis of effects to plants from herbicide treatments is based on the Risk Assessments conducted for the individual herbicides (see Appendix C, *Herbicide Risk Assessment Summaries*) and on proposed application rates, and treatment acres (described in Chapter 2 of this EA). Conclusions are based on the review of existing data; spatial data; utilization of professional research and literature; and professional expertise (both internal and external).

The following terms will be used to describe the intensity and duration of effects on Special Status plant species:

- Negligible: The effects on Special Status plants would be at or below the level of detection, and the changes would be so slight that they would not be of any measurable or perceptible consequences to individuals or the population as a whole. Effects on individuals would be detectable or measurable, but localized, and of little or no consequence to the population. A minor effect could include mortality of a few individuals from treatment methods. Mitigating measures, if needed to offset effects, would be simple to implement.
- Minor: Effects on Special Status plants would be detectable or measurable, but localized, and of little or no consequence to the population. A minor effect could include mortality of a few individuals from treatment methods. Mitigating measures, if needed to offset effects, would be simple to implement.
- Moderate: Effects on the individuals would be detectable and measurable and could cause some loss of the population. Mitigating measures would be needed to assure the viability and probability of persistence.

- Major: Effects on individuals or habitat conditions would include a measureable decline in population viability and probability of persistence. A major adverse effect could trigger a population decline that may not be reversible, even with extensive mitigating measures.

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

Affected Environment

Researchers have ranked invasion from non-native species as the second largest threat to endangered species in the United States (Wilcove et al. 1998). Rare plant species, including BLM Special Status species, generally display narrow ecological amplitudes, keeping them geographically restricted and unable to compete over a wide range of site conditions. Although effects vary depending on species, invasive plants have the potential to disrupt native plant communities through modification of nutrient cycles and disturbance regimes, competition for resources, changes in habitat structure, and effects on regeneration of native plants (Gordon 1998).

Unique Plant Communities

ACECs are designated to protect important natural resources and as a result, unique plant communities and habitat types are often found in ACECs. Coos Bay BLM manages these lands to maintain or restore the relevant and important values, which includes preservation of Special Status plant populations and their habitats. These unique plant communities include late-successional conifer forests, Port-Orford-cedar forests, knobcone pine forest, Jeffrey pine savannah, grasslands and meadows, grassy balds, coastal wetlands, and Darlingtonia fens. In addition, other unique plant communities that contain Special Status plants on the Coos Bay District include coastal sand dunes, estuarine habitats, and rocky serpentine mountain tops. Although most of these unique plant communities contain Special Status plant species, some sites face little risk from invasive plant species.

Unique plant communities in mid- to late-successional forest have no documented threats from invasive plant infestations as few invasive plants are shade tolerant. Noxious weeds such as ivy, old man's beard, herb Robert, and false brome are known to occur along roadsides, rights-of-way, or riparian areas but spread has been prevented to adjacent forest, and thus have not threatened any Special Status plants in forest habitat. The current infestation level of invasive plants in Darlingtonia fens, coastal wetlands, coastal meadows, and grassy balds is also low (less than 5 percent), with invasive plant species restricted to road rights-of-way that bisect or are adjacent to these habitats. No known Special Status plant sites are currently threatened by invasive plants in these communities and thus they will not be discussed further.

There are 263 acres of unique plant community habitat containing Special Status plants that are currently threatened by invasive plant species. The habitat with the greatest acreage is the coastal sand dune community in the New River and North Spit ACECs with about 238 acres of infestations from 10 invasive plant species. The remaining 25 acres are found in Jeffrey pine savannah, Coast Range meadows, estuarine habitat, and rocky serpentine mountain tops.

Table 3-3. *Plant Communities, Management Areas, Invasive Plants, and Species Affected*

Plant Community	Special Management Areas	Percent of Community Infested with Known Invasive Plants[1]	Special Status Species Threatened by Invasive Plants	Acres of Special Status Plant Habitat Threatened
Coastal sand dunes	New River ACEC, North Spit ACEC	>25% European beachgrass, Scotch broom, gorse, silver wattle, Canada thistle, field bindweed; ripgut brome, big quaking grass, bristly and crested dogtail grass, sweet vernal	Pink sand verbena, silvery phacelia, seaside gilia, coastal cryptantha, beach sagewort, and	238, including: North Spit HRA: 72 New River HRA: 100 Storm Ranch: 15 Lost Lake: 40

Plant Community	Special Management Areas	Percent of Community Infested with Known Invasive Plants[1]	Special Status Species Threatened by Invasive Plants	Acres of Special Status Plant Habitat Threatened
		grass, wild radish, sea rocket, sheep sorrel, false dandelion, English plantain	western snowy plover (bird, see *Wildlife* Issue 1)	Fourmile Creek: 1 Floras Lake: 10
Coast Range meadows	China Wall ACEC, meadow near Kenyon Mountain	>10% Canada thistle, blackberries (roadside), Scotch broom (roadside); sweet vernal grass, bristly dogtail grass	Oregon bensoniella	2
Estuarine	New River ACEC, North Spit ACEC, Dean Creek	>10% yellow flag iris, blackberries, purple loosestrife, Canada thistle, herb Robert European beachgrass; reed canarygrass, velvetgrass, birdsfoot trefoil, saltmeadow rush	Henderson's checkermallow, Point Reyes bird's beak, western marsh rosemary	2
Jeffrey pine savannah	North Fork Hunter Creek ACEC	<1% Canada thistle; bristly dogtail grass	Mardon skipper (butterfly; see *Wildlife* Issue 3)	20
Rocky serpentine mountain tops	Bosley Butte, Palmer Butte, and Grizzly Mountain Communication Sites	<1% Scotch broom	Gasquet manzanita	1

1. Known noxious weeds listed first followed by semicolon, then other invasive plants, if known.

The North Fork Hunter Creek ACEC contains a Jeffrey pine savannah with a unique relic grassland composed almost entirely of native perennial grasses, the only one known on the District. This native grass savannah provides habitat for the Mardon skipper, a Special Status butterfly and has recently been invaded by Canada thistle and bristly dogtail grass. The area is used for recreation and additional invasive plants are likely to be introduced from the surrounding areas.

Special Status Species

There are 80 Bureau Special Status plants and fungi documented or suspected to occur within the Coos Bay District, including 39 vascular plants, 9 liverworts, 10 mosses, 11 lichens, and 11 fungi (fungi are further discussed in *Native Vegetation* Issue 2). Special Status plants occur in a variety of habitats on the District. These rare species display narrow ecological amplitudes and are geographically restricted, making them particularly vulnerable to degradation from invasive plants (USDI 2010a:149). Of the 80 known or suspected Special Status species on the Coos Bay District, 46 are documented. Eleven of these species are currently threatened by invasive plants (see Table 3-4).

Table 3-4. *Special Status Plants Threatened by Invasive Plants*[1]

Family	Scientific Name	Common Name	Number of sites	Preferred Habitat on District
Asteraceae	*Artemisia pycnocephala*	Beach sagewort	2	Coastal sand dunes
Boraginaceae	*Cryptantha leiocarpa*	Coastal cryptantha	1	Coastal sand dunes
Hydrophyllaceae	*Phacelia argentea*	Silvery phacelia	4	Coastal sand dunes
Nyctaginaceae	*Abronia umbellata ssp. breviflora*	Pink sand verbena	4	Coastal sand dunes
Polemoniaceae	*Gilia millefoliata*	Seaside gilia	2	Coastal sand dunes
Saxifragaceae	*Bensoniella oregona*	Oregon bensoniella	1	Coast Range meadows
Malvaceae	*Sidalcea hendersonii*	Henderson's checkermallow	1	Estuarine
Orobanchaceae	*Cordylanthus maritimus*	Point Reyes bird's beak	1	Estuarine
Plumbaginaceae	*Limonium californicum*	Western marsh rosemary	1	Estuarine
Ericaceae	*Arctostaphylos hispidula*	Gasquet manzanita	3	Rocky serpentine mountain tops

Family	Scientific Name	Common Name	Number of sites	Preferred Habitat on District

1. All species in this table are Bureau Sensitive.

Five Special Status plants – pink sand verbena, silvery phacelia, coastal cryptantha, seaside gilia, and beach sagewort – occur at open coastal sand dune communities on the District and all are threatened by invasive plants, particularly dense monocultures of European beachgrass. When European beachgrass has been removed, other invasive plants colonize within one growing season. These other invasive plants include big quaking grass, ripgut brome, bristly dogtail grass, rat-tail fescue, sweet vernal grass, English plantain, and false dandelion. All pink sand verbena habitat is within the western snowy plover habitat restoration areas at the North Spit and New River. Beach sagewort, coastal cryptantha, silvery phacelia, and seaside gilia populations are only found in dune communities outside of the plover habitat restoration areas.

Almost all meadows on the District have a mix of native and invasive grasses. In some instances, invasive grasses dominate meadow communities yet the Special Status plant populations persist. For instance, dwarf brodiaea is a Special Status species that grows in meadows in the New River ACEC dominated by invasive sweet vernal grass. However, the sweet vernal grass has not appeared to affect the presence, abundance, or persistence of the dwarf brodiaea; therefore, control in these meadows would not occur unless invasive plants begin to have a measurable negative effect on the dwarf brodiaea (and thus they will not be discussed further). Another example is Oregon bensoniella, which is documented in one Coast Range meadow with a mix of native and invasive grasses. The invasive grasses have had a negligible effect on the Oregon bensoniella population for the last 20 years and therefore have not been treated. However, Canada thistle has recently invaded the meadow and, where it grows, Oregon bensoniella is absent. Control of Canada thistle is necessary for Oregon bensoniella to continue to persist on the District.

Estuarine habitat at the Dean Creek Elk Viewing Area and adjacent Spruce Reach Island hosts a population of Henderson's checkermallow. This Special Status species is threatened by noxious weeds: yellow flag iris, Canada thistle, butterfly bush, blackberries, herb Robert, and purple loosestrife, as well as other invasive plants that are not listed as noxious weeds, including reed canarygrass, creeping buttercup, birdsfoot trefoil, and velvetgrass. Estuarine habitat on the North Spit of Coos Bay provides habitat for two Special Status plants which grow side by side- Point Reyes bird's beak and western marsh rosemary. A noxious weed, European beachgrass, and an invasive weed, saltmeadow rush, have begun to invade this site.

The federally listed western lily has been documented at one site on the Coos Bay District. In addition to being located in forest habitat where invasive plant infestations are unlikely (see the *Unique Plant Communities* section, earlier in this Issue), there are no known invasive plant sites within a thousand feet of the western lily population. The western lily site is also located off-trail in a location where disturbance by visitors is minimal which also limits the exposure of the site to invasive plants that can spread along well-used trails and rights-of-way.

Treatments Planned Related to the Issue

No Action Alternative

There are 263 total acres of unique plant community habitat containing Special Status plants that are currently threatened by invasive plants; 172 of these acres fall within western snowy plover habitat restoration areas, where treatment of noxious weeds are limited to non-herbicide methods and a limited amount of glyphosate available for use at the North Spit. These acres are generally treated mechanically twice a year with non-selective heavy equipment such as tractor-mounted discs and plows, as well as bulldozers. Invasive plants that are not designated as noxious weeds would not be treated. On the other 91 acres of unique plant communities, herbicides, manual

and mechanical methods, competitive seeding and planting[54], prescribed fire, and targeted grazing would be used to treat noxious weeds and no treatments would be available for other invasive plant species. However, the BLM would generally treat noxious weeds in these Special Status plant sites using manual techniques. (Conservation Measures applicable to Special Status Plants include non-herbicide buffers of varying distance from Special Status plants. See Appendix A, *Protection Measures*.) Herbicides would include 2,4-D, dicamba, glyphosate, and picloram. A Conservation Measure prohibits the use of picloram within ½ mile of Special Status plant species, but it may be used in the Jeffrey pine savannah plant communities, where Special Status plants are not present. The BLM would use backpack sprayers or wipers to directly apply herbicide to foliage for all herbicide treatments.

Proposed Action

The Proposed Action would allow all terrestrial invasive plants (not just noxious weeds) to be treated and is expanded to include the use of additional herbicides. There are 263 total acres of unique plant community habitat containing Special Status plants that are currently threatened by invasive plant species. As described under the No Action Alternative, 172 of these acres fall within western snowy plover habitat restoration areas, where treatments are limited to non-herbicide methods and a limited amount of glyphosate at the North Spit. These acres are generally treated mechanically twice a year with non-selective heavy equipment such as tractor-mounted discs and plows, as well as bulldozers.

In addition to 2,4-D, dicamba, glyphosate, and picloram, the following herbicides would be available for treatment under this alternative: aminopyralid, chlorsulfuron, clopyralid, dicamba + diflufenzopyr, imazapic, imazapyr, metsulfuron methyl, sulfometuron methyl, and triclopyr. In coastal sand dune communities, imazapyr and glyphosate would be used to control European beachgrass, except in western snowy plover habitat restoration areas. In addition to methods used under the No Action Alternative, direct control methods would include the use of propane torches to selectively spot treat invasive plants within Special Status plant habitat and weed barrier mats at Dean Creek special management area adjacent to the Henderson checkermallow site and fence lines.

Alternative 3

Alternative 3 allows all terrestrial invasive plants to be treated and includes the use of herbicides available in the Proposed Action plus four additional: hexazinone, rimsulfuron, fluroxypyr, and fluazifop-P-butyl. However, hexazinone cannot not be used within 300 feet of Special Status plants (see *Protection Measures*, below) or near Mardon skipper habitat (see *Wildlife* Issue 3) and a Project Design Feature prohibits the use of fluroxypyr at known Mardon skipper sites (see *Wildlife* Issue 3).

In addition, this alternative allows the use of glyphosate and imazapyr in the 172 acres of western snowy plover habitat restoration areas where the Special Status plant pink sand verbena also occurs.

Other treatments remain as described under the Proposed Action.

Protection Measures

Standard Operating Procedures and Mitigation Measures Relevant to the Issue

Projects that have the potential to disturb Special Status plant habitat require pre-project clearances, including review for potential habitat and surveys in suitable habitat (USDI 2008b) to identify populations and necessary protection measures. The potential for adverse effects to Special Status plants would be reduced for all

[54] Competitive seeding and planting could include the reintroduction of Special Status plants to the area.

alternatives by implementing existing Standard Operating Procedures and Mitigation Measures (see Appendix A), including:

- Conduct pre-treatment reviews and surveys for sensitive habitat and Special Status species within or adjacent to proposed treatment areas.
- Provide clearances for Special Status species before treating an area as required by Special Status Species Program policy. Consider effects to Special Status plants when designing herbicide treatment programs.
- Use a selective herbicide and a wick or backpack sprayer to minimize risks to Special Status plants.
- Apply the least amount of herbicide needed to achieve the desired result.
- Manage animals [used for targeted grazing] to prevent overgrazing and minimize damage to sensitive areas.
- Avoid treating vegetation during time-sensitive periods (e.g., nesting and migration, sensitive life stages) for Special Status species in area to be treated.
- Minimize direct impacts [of prescribed fire] to species of concern, unless studies show that species will benefit from fire.
- 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* in Appendix A).

Conservation Measures include the following for picloram (applicable under all alternatives):

- Do not apply by ground methods, at any application rate, with ½ mile of terrestrial TEP[55] plant species.

Conservation Measures for hexazinone (applicable under Alternative 3) include:

- 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.

Project Design Features for the Proposed Action and Alternative 3

The following Project Design Feature would further reduce effects to Special Status plants under the Proposed Action and Alternative 3:

- When using prescribed fire in western snowy plover habitat restoration areas, reseed with pink sand verbena or other appropriate native species in areas where revegetation will not occur through natural processes.

Monitoring for the Proposed Action and Alternative 3

In addition to the implementation and effectiveness monitoring described in Chapter 2 that is applicable to all alternatives, for treatment methods that are new to the Coos Bay District, for the first three years after the plan is implemented, the BLM would closely monitor the response of Special Status plants to invasive plant treatments. Monitoring would happen yearly and would measure Special Status plant numbers, plant size, and whether plants are reproductive or not. No more than 5 percent of a Special Status plant population would be within the treatment area until effects to Special Status plants can be determined. If adverse effects occur (e.g., impacts or loss of a few individual Special Status plants), the BLM would weigh the consequences of these effects against the long-term impacts of invasive plants, including spread, that would be expected in the absence of treatments. By monitoring community-level treatment effects and refining prescriptions for subsequent treatments, undesirable outcomes would decline with increasing experience. The BLM would accept short-term adverse effects in Special

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

Status plant communities if treatments were expected to benefit conditions and ecosystem function in the long-term. It is expected that information gained from this monitoring will provide additional information to consider as part of Table 2-10, *Treatment Key*; which would inform future treatments, helping to refine prescriptions for greater success. This would also inform decisions made by following the Bureau Sensitive Species Treatment Conditions flowchart (Figure 3-2, *Bureau Sensitive Species Treatment Conditions*) when working in potential habitat for Bureau Sensitive plants.

Application of this flowchart, would allow the BLM to determine when Conservation Measures should not be followed because their implementation would result in greater harm from an untreated invasive plant infestation. For example, this would help identify whether treatment buffers or other control measures would be needed with the use of imazapyr in pink sand verbena habitat under Alternative 3.

Environmental Consequences

Direct and Indirect Effects

Common to All Alternatives

Although the protection of sites occupied by Special Status plants is a priority for BLM invasive plant control efforts – invasive plants compete for space, water, and nutrients and can also have adverse allelopathic[56] effects to other vegetation – the success of those efforts would vary depending upon the degree to which those sites are invaded and whether effective invasive plant control tools are available. Individual Special Status plants could be injured or killed by invasive plant treatments, but adverse effects to populations from treatments would be negligible to minor because implementation of Protection Measures (Appendix A) would reduce effects to below levels that could adversely affect populations or trend species toward listing. Annual Treatment Plan reviews would provide additional opportunities to develop site-specific treatment prescriptions and prescribe Protection Measures that would further reduce adverse effects to Special Status plants. Treatments would improve habitat conditions and provide long-term benefits to the population.

Manual and mechanical treatments in Special Status plant sites would cause injury and mortality to plants, reduce vigor, and reduce seed production. Habitat changes, such as reduced vegetated cover, soil disturbance, trampling, and germination of weed seeds could also reduce the vigor and reproductive output of Special Status plants in the short term. For selective treatments that target individual plants or patches, such as hand-pulling, digging, and grubbing, these short-term effects would be minor, affecting individual Special Status plants, but not entire populations. Long-term effects would benefit Special Status plants and their habitat. Discing and plowing are not selective, but would only be used in coastal sand dune communities where management of pink sand verbena (an annual or short-lived perennial) occurs in western snowy plover habitat restoration areas. (No other Special Status plants have been found in these habitat restoration areas.) All treatments would be done between September 15 and March 15, which is after most of the pink sand verbena has set seed. Sand verbena seed is collected before invasive plant treatments and distributed at the site in early spring. So, although mortality of sand verbena plants takes place during the treatments, the existing seed bank and additional seeding provides for persistence of sand verbena populations.

In general, seeding and planting would disturb soil and could damage above- and below-ground plant parts. Establishment of additional plant cover could also occupy niche space important to Special Status plants or exert pressure by competing for space, water, and nutrients that could reduce vigor and reproduction. The decision to

[56] Allelopathy is a biological phenomenon by which an organism produces one or more biochemicals that influence the germination, growth, survival, and reproduction of other organisms.

use competitive seeding or planting within Special Status species' habitat would weigh the benefits of reducing invasive plant cover against the risks of negative effects to Special Status plants.

Biological control agents are tested for host specificity and approved by the U.S. Department of Agriculture (USDA) Animal and Plant Health Inspection Service (APHIS), prior to release in the United States. Biocontrols suspected of being capable of adversely affecting non-target organisms are not approved for release. In some instances, approved biocontrols have attacked closely related non-target plant species; however, none of the invasive plants targeted for biocontrol treatments on the Coos Bay District are in the same genus as any documented or suspected Special Status plants. All available biological control agents are widespread on the District and noxious weed populations in Special Status plant habitats are not abundant enough to support agents. New agents are anticipated to be approved by the ODA for gorse and Japanese knotweed; however, no native species in the same genus as these noxious weeds occur on the District. Consequently, there would be no effects from the use of biological control agents on Special Status plants.

Coos Bay BLM has a limited amount of Special Status plants in habitats that would be suitable for targeted grazing. One unique plant community that would benefit is the coastal sand dune habitat. In areas where coastal sand dune communities have become overgrown with invasive grasses, targeted cattle grazing would remove primarily grasses through consumption and trampling, reducing vigor and reproduction. Regrowth would be treated with glyphosate and or imazapyr to further control the grasses, reducing competition for Special Status species or creating habitat for reintroduction. Similarly, sheep grazing would affect forbs and grasses, while goats would preferentially remove shrubby invasive plants. In areas where existing Special Status plants are already present, livestock would be carefully managed with fencing or herding to avoid damaging existing Special Status plants. Because targeted grazing would avoid Special Status plant populations or create conditions for Special Status plant reintroduction, short-term effects would be negligible and long-term effects would be beneficial.

Prescribed fire is non-selective and has the potential to harm Special Status plant populations if the Special Status species is not fire adapted. Following Standard Operating Procedures as well as Fire and Fuels Management Best Management Practices described in the *Northwestern and Coastal Oregon Resource Management Plan* (USDI 2016d:162-167) minimizes this risk. One of the risks of using prescribed fire is that many invasive plants are adapted to fire and can rapidly establish themselves post fire. Prescribed fire would not be used to treat invasive plants in or near most Special Status plant sites, unless those Special Status plants are adapted to periodic burning, such as Gasquet manzanita. Proposed treatment at Dean Creek would exclude habitat for Henderson's checkermallow. Prescribed fire in plover habitat restoration areas would be followed with seeding pink sand verbena seed that was collected prior to treatment or other appropriate native species if necessary.

Under all alternatives, 2,4-D, glyphosate, and dicamba would be available to treat noxious weeds near Special Status plant habitat, though dicamba has been used infrequently, some years not being used at all (see Table 2-8, *Annual Treatment Summary (2012-2016)*). Picloram could be used in the Jeffrey pine savannah community where no Special Status species are present, but where Canada thistle threatens the native grasslands. The U.S. Forest Service Risk Assessment ratings and discussions for susceptible plants (Appendix C, *Herbicide Risk Assessment Summaries*) are assumed to represent Special Status plants. 2,4-D, glyphosate, dicamba, and picloram present a high risk of damage to susceptible plants under direct spray scenarios. 2,4-D, glyphosate, and dicamba present no risk under surface runoff scenarios. Picloram is high risk in direct runoff scenarios, but is not registered for use in areas where Special Status plants occur on the District (e.g., riparian areas, areas with sandy soil, or areas with shallow water tables). Hence, there would be no effects to plants from these four herbicides in runoff scenarios. 2,4-D presents low risk with low boom applications and zero risk with backpack direct foliar application for off-site drift scenarios[57]. Risk of off-site drift from low booms is low for dicamba and moderate for glyphosate at typical rates. Risk of off-site drift from backpack direct foliar applications is low for glyphosate at typical rates, but was not

[57] Additional information about the 0 (or no), low, moderate, and high risk ratings and how they are derived can be found in Appendix C, *Herbicide Risk Assessment Summaries*.

evaluated for dicamba (although the risk can be reasonably assumed to be lower than for drift from low booms). The BLM would use spot treatments on 95 percent (action alternatives) to 100 percent (No Action Alternative) of herbicide treatments. However, in Special Status plant habitat, only spot treatments would be used under all alternatives. Hence, the overall effects to Special Status plants from drift would be negligible to minor.

No Action Alternative

Under the No Action Alternative, only noxious weeds are treated and no other invasive plants would be treated. As described in *Invasive Plants* Issue 1, treatment effectiveness would be approximately 60 percent district-wide for noxious weeds and 0 percent for other invasive plants. For some infestations near Special Status plant species, effectiveness would be less than 60 percent; for example, treatments of European beachgrass (in the coastal sand dune communities and estuarine habitats) and Canada thistle (in most unique plant communities that are threatened by invasive plants) are only 10 percent effective. As described below, this could lead to major adverse long-term effects on the Special Status plants and these communities, including loss of individual plants, degradation of habitat, competition and exclusion of entire populations in areas where invasive plants would totally displace Special Status plants. In addition, treating only noxious weeds (and not other invasive plant species) results in an increase of invasive plants that are not listed as noxious weeds. The subsequent increase in untreated invasive plants reduces the quality of the habitat for Special Status species.

In western snowy plover habitat restoration areas where pink sand verbena populations occur, the entire 172 acres is retreated biannually to prevent a major adverse effect from regrowth of European beachgrass. Most treatments in this area would be mechanical with some hand-pulling and limited treatments with glyphosate on the North Spit. Mechanical treatments and reseeding allow persistence of the pink sand verbena; however, plant size and seed production have decreased under this regime and persistence depends on seed collection and reseeding (Jennie Sperling, Umpqua Field Office Botanist, 2018 personal communication). Closure of the area during snowy plover nesting from March 15 to September 15 precludes treatments of noxious weeds (European beachgrass, Scotch broom, and field bindweed) during the most effective treatment period, perpetuating the need to use mechanical treatments twice a year to control European beachgrass.

Outside of the western snowy plover habitat restoration areas, the BLM would treat noxious weeds in most Special Status plant sites by manual techniques. Effects of pulling, digging, and grubbing would be localized and negligible; however, manual treatments are more costly and time consuming and repeated treatments are necessary within each year.

Canada thistle can be effectively controlled with dicamba or picloram, but these herbicides are not registered for use in riparian areas or sandy soil where this species is the most problematic. Hence, major adverse long-term effects would occur to unique plant communities (e.g., Dean Creek and New River), as Canada thistle continues to spread. Canada thistle cannot be effectively treated using manual techniques and would continue to degrade habitat for Henderson's checkermallow, Oregon bensoniella, and several Special Status coastal sand dune species.

Additionally, the District would treat new invaders (Category III) that are noxious weeds; however, invasive plants that are not noxious weeds would not be treated and would also result in long-term adverse effects to Special Status plants and their habitat.

Proposed Action

Under the Proposed Action, all invasive plants could be treated and additional herbicides and treatment methods are available for use. As described in *Invasive Plants* Issue 1, treatment effectiveness would be approximately 80 percent district-wide.

Similar to the No Action Alternative, for some infestations near Special Status plant species, effectiveness would be less than 80 percent; for example, treatments of European beachgrass (in the coastal sand dune communities and in estuarine habitat) remain only 10 percent effective. As described in the No Action Alternative, the entire 172 acres in the western snowy plover habitat restoration areas is retreated biannually to prevent a major adverse effect from the regrowth of European beachgrass. Outside of western snowy plover habitat restoration areas in coastal sand dune communities, imazapyr and glyphosate would be used to control European beachgrass. Glyphosate alone is less effective on beachgrass; better control is found when glyphosate is tank mixed with imazapyr. The tank mix has improved efficacy and fewer adverse effects to the native plant community than using imazapyr alone. Imazapyr and glyphosate are both non-selective; however imazapyr has longer soil activity and tank mixing the two reduces the rate of each herbicide and thus the risk associated with longer persistence (DiTomaso et al. 2013). Other invasive plants have also begun to invade coastal sand dune communities where Special Status species occur; including the invasive annual grasses big quakinggrass, ripgut brome, and rat-tail fescue, as well as sweet vernal grass (perennial), sheep sorrel, false dandelions, and English plantain.

Manual treatments of invasive annual grasses are effective, but must be done repeatedly as seed germinates under favorable conditions, typically multiple times annually on the District. Effective manual treatments are difficult to achieve on perennial and deep rooted species because the roots are difficult to remove and these plants will often survive manual treatments. In addition, removing these plants manually results in minor to moderately adverse effects to adjacent Special Status plants from trampling, soil turnover, and accidental uprooting. Treatment of all invasive plants in coastal sand dune communities is necessary for Special Status plants to persist and to avoid competition from invasive plants' major adverse effects on one or more of the Special Status plants at these sites. Spot treatments of imazapyr (with or without glyphosate), imazapic, or sulfometuron methyl would be used to effectively treat invasive grasses and plantain in open sand dune habitats. Spot treatments with herbicides can target invasive plants while avoiding avoid Special Status plants. This results in less trampling and soil disturbance than manual or mechanical treatments.

In Coast Range meadows and Jeffrey pine savannahs where Canada thistle threatens Special Status plants and native grasslands, aminopyralid, aminopyralid + metsulfuron methyl, or 2,4-D mixed with clopyralid are effective treatments for Canada thistle. Wicks or backpack sprayers would be used to apply herbicide directly to target plants, and spray shields would be used, which would minimize inadvertent application to Special Status plants. These treatments would have negligible to minor effects to Special Status plants and the native grassland in these unique plant communities.

Conservation Measures (see Appendix A) specify herbicide buffers for all Special Status species on the District; however, as described in Project Design Feature and Figure 3-2, *Bureau Sensitive Species Treatment Conditions,* these buffers may be modified if treatments are not expected to harm individual plants, sites, or populations. Hence, short term adverse effects from herbicides are expected to be negligible to minor. Table 3-5 shows treatment considerations that indicate when buffers would be modified.

Table 3-5. *Effects of Herbicides on Native Vegetation and Special Status Plants*

Herbicide	***Considerations***
ALS-inhibitors: chlorsulfuron, imazapic, imazapyr, metsulfuron methyl, sulfometuron methyl	Highly active as both pre- and post-emergents and can injure or kill Special Status plants at low application rates. Off-site movement of small concentrations of these herbicides can result in damage to non-target plants, even at concentrations lower than those reportedly required to kill target invasive plants (Fletcher et al. 1996). Hence, chlorsulfuron, metsulfuron methyl, and sulfometuron methyl would not be a preferred treatment method in Special Status plant habitat. Metsulfuron methyl (formulated with or without aminopyralid) would not be a preferred treatment for Canada thistle infestations near Special Status plants. However, it would be used in Jeffrey pine savannah where Canada thistle threatens native grasslands and no Special Status plants are present. Imazapyr is non-selective and would be a preferred treatment method on European beachgrass and other invasive perennial grasses when combined with glyphosate. The mix has improved efficacy and fewer

	adverse effects to the native plant community than using imazapyr alone. Imazapyr and glyphosate are both non-selective; however imazapyr has longer soil activity. Tank mixing imazypyr and glyphosate reduces the rate of each herbicide and thus the risk associated with longer persistence (DiTomaso et al. 2013). The risk to Special Status plants would be further reduced to minor or less by limiting treatment areas, spot applications, monitoring treatment effects, and adaptive management. Imazapic, a selective herbicide, would be preferred for treating invasive annual grasses in Special Status plant habitat. However, the risk to Special Status plants from direct imazapic spray is low at typical application rates and moderate at high rates. Imazapic labels indicate that annual dicots may be harmed by imazapic (particularly at high rates), but perennial dicots would not. This is consistent with studies that have observed tolerance in perennial forbs (e.g., Bahm and Barnes 2011), but more variable responses have occurred in annual forbs, depending on rate and site conditions (e.g., Sheley et al. 2007). Many of the habitats infested by invasive annual grasses where imazapic would be a preferred treatment are also occupied by annual Special Status forbs, such as seaside gilia and coastal cryptantha. Because the effects of imazapic on these species are unknown, the BLM would implement protective measures and conduct treatments on less than five percent of a Special Status plant population to clarify effects prior to operational-scale treatments in these sites.
Synthetic auxins: aminopyralid, clopyralid, triclopyr	Present a high risk of damage to Special Status plants under direct spray scenarios. For clopyralid and triclopyr, the risk of plant damage from off-site drift ranges from low to moderate (depending on rate) for low boom applications and zero risk for backpack foliar spraying. Aminopyralid has a low risk from off-site drift under all scenarios. Aminopyralid and clopyralid have zero risk of damage from surface runoff, but the risk is low to moderate for triclopyr, depending on rate. Aminopyralid is selective for broadleaf forbs and would be a preferred treatment for thistle and knapweed. It would be applied with hand-directed spot treatments. Triclopyr would be a preferred treatment for woody invasive plants such as Scotch broom, French broom, blackberry, and gorse. These are uncommon in Special Status sites. When using triclopyr within 300 feet of Special Status plants (such as on blackberry), all treatments would be hand-directed spot applications so that any effect to Special Status plants would be negligible to minor.
Auxin transport inhibitor: diflufenzopyr	Selective for annual broadleaf plants. It is a weak herbicide by itself, but is formulated with dicamba for use on the District, which reduces the amount of dicamba needed.

Weed barrier mats would be used at Dean Creek and Spruce Reach Island Special Management Areas to deprive perennial grasses (such as reed canarygrass, sweet vernal grass, orchard grass and tall fescue) and yellow flag iris of sunlight. This treatment would be used to prepare sites for seeding and planting native species. This technique could be used adjacent to native plants. For example, a tarp or mat could be pinned over vegetation next to Henderson's checkermallow to control invasive grasses or yellow flag iris and there would be no effect to the checkermallow. Propane torches would be used to selectively spot treat invasive plants within Special Status plant habitat. For example, when invasive annual grasses go to seed within silvery phacelia habitat at Floras Lake in the New River ACEC, torches could be used to remove the seed heads and prevent viable seed from being added to the site. The heat is directed at the seed heads, approximately 8 to 12 inches above silvery phacelia plants. Because the heat would be directed away from the Special Status plants, there would be negligible effects from this treatment.

Seeding and planting prescriptions for Special Status plant habitats would use only locally sourced (genetically appropriate) native plant materials from species that are typical components of the Special Status species' habitat, and those materials would be planted at rates and patterns that reflect typical relative abundance and distribution for that habitat. The adverse effects of seeding and planting would be temporary and minor or negligible with positive long-term effects.

Treatment of invasive plants would improve habitat conditions and provide long-term benefits to unique plant communities and Special Status plant populations. Treating invasive plants with more selective herbicides would reduce competition with Special Status plants with less adverse effects on non-target species. However, in the pink

sand verbena habitat, limited glyphosate use for control of noxious weeds and other invasive plants would result in continued reliance on semi-annual mechanical treatments supplemented with manual treatments. Annual invasive plants that germinate after March 15 and produce seed before September 15 (the closure season for western snowy plover) would continue to survive.

Alternative 3

This alternative allows all treatments under the Proposed Alternative, and adds three additional herbicides that may be used in these unique plant communities: fluroxypyr, rimsulfuron, and fluazifop-P-butyl and allows the use of other herbicides besides glyphosate in western snowy plover habitat restoration areas.

The effects of fluroxypyr on Special Status plants would be negligible. This herbicide would not be a preferred treatment for any invasive plant treatment group and it would be used on less than 4 acres district-wide over the life of the plan. Fluroxypyr presents a low risk of damage from off-site drift to susceptible plants and a zero risk of damage from surface runoff. Rimsulfuron is highly active on both pre- and post-emergent plants and can injure or kill Special Status plants at low application rates. Off-site movement of small concentrations of this herbicide can result in damage to non-target plants, even at concentrations lower than those reportedly required to kill target invasive plants (Fletcher et al. 1996). Rimsulfuron would be one of the preferred treatments for invasive annual grasses in coastal sand dunes and Jeffrey pine savannahs; however, the BLM would not use this herbicide in sites that are occupied by Special Status plants unless Protection Measures could be implemented to reduce effects to minor or below. Fluazifop-P-butyl inhibits fatty acid synthesis by blocking activity of the ACCase enzyme. The ACCase enzyme of many, but not all, grass species is more sensitive than in broadleaf plants, which are tolerant of fluazifop-P-butyl. Thus, fluazifop-P-butyl could be used to treat invasive grasses with negligible effects to Special Status forbs. The scale of adverse or beneficial effects would be limited because experimental use of this herbicide would not exceed 15 acres per Field Office, for a total of 30 acres across the District.

In the plover habitat restoration areas where populations of pink sand verbena exist, the ability to use a chemical treatment method that is more selective than discing would reduce the need to rely on semi-annual manual and mechanical treatments to control European beachgrass. Although pink sand verbena is often classified as a short-lived perennial, many individuals act as annuals, flowering and dying in their first year of growth. Discing/plowing does not allow the longer-lived perennials a chance to overwinter. These short-lived perennial plants, when left undisturbed, would have an additional season to grow larger and produce more seed than smaller annual plants. Although these effects have been observed, there have not been empirical studies to quantify the amount of additional seed that would be produced. The additional seed would increase the seed in the soil which would provide both short- and long-term benefits by helping ensure there are viable seeds in the following season as well as in future years. This reduction in discing would benefit the existing pink sand verbena population by allowing pink sand verbena plants to produce seed later in the fall and preserve the short-term perennials in the population, thus providing short- and long-term benefits to the survival and persistence of the pink sand verbena populations at these sites.

Other coastal sand dune communities contain a mix of annual and perennial Special Status species and European beachgrass has historically been the primary threat to these species. Glyphosate applied in late fall or winter would not affect annual plants, but could injure or kill short-lived perennials. Imazapyr has soil activity and could kill emerging seedlings or established plants; however, a study done by the Oregon Department of Agriculture found that a mix of 1 percent imazapyr and 3.6 percent glyphosate sprayed on soil pots planted with pink sand verbena seed did not affect emergence rates compared to those that were not treated (Amsberry et al. 2016). However, in this study, above ground or partially buried fruits of pink sand verbena were not sprayed and so the effects on germination or survival of unburied seed is unknown. Field documentation of the effects of imazapyr treatment on pink sand verbena germination and seedling survival is needed (Amsberry et al. 2016) and additional monitoring included with the Proposed Action and Alternative 3 would help to refine these prescriptions by determining effective control measures.

As European beachgrass is controlled, other invasive perennial grasses (sweet vernal grass, velvetgrass, and tall fescue) and winter annual grasses (big quaking grass, ripgut brome, and rat-tail fescue) increase in abundance. All of these species can be controlled with imazapic or rimsulfuron treatments conducted in fall or winter when the annual Special Status plant species are dormant and no negative effects to Special Status plants from over-spray would occur. (Annual Special Status plants do not germinate until later in the spring or have deep roots protecting them.) As described in the *Monitoring for the Proposed Action and Alternative 3* section, above, since there is uncertainty about the residual effects of rimsulfuron or imazapic in coastal sand dunes, only five percent or less of known sites would be treated until monitoring identifies effects.

All other effects remain as described under the Proposed Action. Treatment of invasive plants would improve habitat conditions and provide long-term benefits to unique plant communities and Special Status plant populations.

Summary of Effects

Table 3-6. *Summary of Effects (Native Vegetation Issue 1)*

Alternative	Direct Effects	Indirect Effects
Common to all Alternatives	Individual Special Status plants could be injured or killed by invasive plant treatments, but adverse effects to populations from treatments would be negligible to minor because implementation of Protection Measures (Appendix A) would reduce effects to below levels that could adversely affect populations or trend species toward listing. Annual Treatment Plan reviews would provide additional opportunities to develop site-specific treatment prescriptions and prescribe Protection Measures that would further reduce adverse effects to Special Status plants.	Treatment would improve habitat conditions and provide long-term benefits to unique plant communities and Special Status plant populations.
No Action		In coastal sand dune communities, biannual treatments of European beachgrass and seeding and planting prevent major adverse effects to pink sand verbena from beachgrass, however no effective treatment for other invasive plants results in their populations increasing. Canada thistle infestations that cannot be effectively treated in estuarine areas, coastal sand dunes, Jeffrey pine savannah, and Coast Range meadows could lead to the loss of individual plants, degradation of habitat, competition and exclusion of entire Special Status species populations.
Proposed Action		Treatment of invasive plants would improve habitat conditions and provide long-term benefits to unique plant communities and Special Status plant populations. As described in the No Action Alternative, in coastal sand dune communities, annual treatments of European beachgrass and seeding and planting prevent major adverse effects to pink sand verbena; however, annual invasive plants that germinate after March 15 and produce seed before September 15 (the closure season for western snowy plover) would continue to survive. Effective treatments of Canada thistle infestations would reduce adverse effects to unique plant communities and Special Status plant populations to negligible.
Alternative 3		Treatment of invasive plants would improve habitat conditions and provide long-term benefits to unique plant communities and Special Status plant populations. In western snowy plover habitat restoration areas, European beachgrass treatments using discing and bulldozers would occur less frequently, allowing pink sand verbena to remain undisturbed and have an additional season to grow larger and produce more seed. Other effects would remain as described under the Proposed Action/Common to all Alternatives

Cumulative Effects

On BLM-managed land, when any habitat-disturbing projects are proposed, the BLM reviews projects and surveys all potential habitat for Special Status plants and incorporate Protection Measures to ensure that projects would

not adversely affect populations. Similar to invasive plant management, in the short term, restoration project activities could damage or kill a few plants, but the overall long-term effects would be beneficial because of habitat improvements.

Off of BLM-managed land, other Federal, state, and local agencies and organizations have invasive plant management programs that, when combined with the effects of Coos Bay BLM's actions under each alternative, would have cumulative benefits to the unique plant communities that host Special Status plants. The magnitude of these benefits would be greater under the Proposed Action and greatest under Alternative 3 (compared to the No Action Alternative) where more acres can be effectively treated and BLM has more available tools to use for treatment.

For example, the BLM works with Oregon State Parks to treat biddy-biddy at Cape Blanco State Park and the adjacent BLM-managed Cape Blanco lighthouse. In addition to controlling noxious weeds, these treatments protect large-flowered goldfields (*Lasthenia ornduffii*) that occurs in the state park. Oregon State Parks manages land bordering the New River ACEC where both agencies are controlling gorse; however, the dense infestation on the state-managed side continues to threaten unique habitats and five Special Status plants in the coastal sand dune community at the New River ACEC.

The Oregon Department of Agriculture Noxious Weed Control Program coordinates, releases, and monitors populations of traditional biological control agents used to help control noxious weeds. Several of the noxious weeds targeted are also species present in the unique plant communities where Special Status plants are threatened by invasive plants and include Canada thistle, French broom, gorse, purple loosestrife, and Scotch broom. In addition, Coos Bay BLM and ODA have worked together to control new invaders such as matgrass; one site was eradicated at the New River ACEC where several Special Status plants could be adversely affected if this invasive plant species were to spread.

Known populations of pink sand verbena are actively managed on Federal and state lands in Oregon and California, including adjacent lands on the Siuslaw National Forest and lands managed by the U.S. Army Corps of Engineers and Oregon Parks and Recreation Department. Manual, mechanical, and herbicide treatments to control European beachgrass and other invasive plants improve habitat conditions for pink sand verbena. While agencies seek to maintain and foster surviving wild populations, new populations have increased known populations from 6 to 23. In 1999, the North Spit habitat restoration area was seeded with 50,000 pink sand verbena seeds following mechanical treatments to control European beachgrass (USDI et al. 2006) and since then, the population has become well established and grown steadily in size. Currently, the North Spit population is the largest in Oregon and the seed source for augmentations and reintroductions at other sites. Ongoing activities to improve pink sand verbena habitat and populations across its range add cumulative long-term positive effects for pink sand verbena populations, as agencies share information about the effects of treatments, so that other land managers can capitalize on lessons learned and improve treatments to benefit populations.

When combined with the overall beneficial effects of invasive plant management across the Coos Bay District, projects on adjacent lands would not contribute to adverse cumulative effects and, instead, are anticipated to cumulatively maintain or improve population viability of Special Status plants.

Native Vegetation Issue 2 (Not Analyzed in Detail)

How would invasive plant treatments, especially herbicides, affect Special Status and edible fungi?

This issue is not analyzed in detail because there would be no potential for significant effects beyond those already analyzed in the Oregon FEIS, to which this analysis is tiered. This was previously described in the Oregon FEIS (USDI 2010a:145) and there are no new circumstances or information at the site-specific level that would change the effects anticipated for this EA.

There are 11 species of Special Status fungi that are documented or suspected of occurring on the Coos Bay District. All of these were former Survey and Manage species suspected to primarily occur in late successional forest habitat (see Table 3-7). Almost all the edible fungi found on District occur in forested habitats. This includes common edibles such as chanterelles, hedgehogs, oysters, king boletes, and matsutakes.

Table 3-7. *Special Status Fungi Known or Suspected to Occur on Coos Bay BLM*

Special Status Fungus	Documented or Suspected	Habitat[1]
Albatrellus avellaneus	Suspected	Ectomycorrhizal. Found under conifers, primarily associated with large western hemlock/Douglas fir and spruce. Occurs principally in coastal Sitka spruce, Western hemlock and in Pacific silver fir old growth forest.
Chamonixia caespitosa	Suspected	Ectomycorrhizal. It has been found in association with the roots of hemlock species and Pacific silver fir in high elevation forests and western hemlock, Douglas-fir and, Sitka spruce in coastal forests.
Cortinarius barlowensis	Suspected	Ectomycorrhizal. Populations have been located in Pacific silver fir (46%), western hemlock (27%), mountain hemlock (15%), and Sitka spruce (12%) plant associations.
Cortinarius pavelekii	Suspected	Ectomycorrhizal. Endemic to mature old growth coastal forests or forests with an old growth legacy of coarse woody debris, usually mossy places, from sea level (17 ft.) to around 588 ft. in Oregon.
Dermocybe humboldtensis	Suspected	Ectomycorrhizal. Occurs in White Fir-Grand Fir vegetation zones at elevations of 1,337-1,781 ft. Associated species include Douglas fir and ponderosa pine.
Gastrolactarius camphoratus	Documented	Ectomycorrhizal. Occurs principally in soil and litter in western hemlock, tan oak, live oak, sugar pine, Douglas fir, Pacific madrone, California black oak, Port Orford cedar and Sitka spruce series at elevations of 3-3,385 (1,847) ft. of primarily moist forest types.
Phaeocollybia californica	Documented	Ectomycorrhizal. Associated with the roots of Pacific silver fir, Sitka spruce, Douglas-fir, and western hemlock with huckleberry.
Phaeocollybia gregaria	Suspected	Ectomycorrhizal. Associated with the roots of western hemlock, Sitka spruce and Douglas-fir in coastal rainforests.
Phaeocollybia oregonensis	Documented	Ectomycorrhizal. Associated with the roots of pacific silver fir, noble fir, Douglas-fir, and western hemlock.
Ramaria rubella var. *blanda*	Documented	Ectomycorrhizal. Associated with western hemlock rainforest.
Rhizopogon exiguus	Suspected	Ectomycorrhizal. Documented in the Douglas-fir series/wet Douglas-fir habitat association, white fir/grand fir series/moist white fir/grand fir habitat association, western red cedar series/wet western red cedar association, and western hemlock series/western hemlock wetlands.

As described in the Oregon FEIS, the risk of herbicide contamination on wild edible mushrooms is expected to be limited because proposed invasive plant management would be focused primarily on invasive plant infestations which are currently located in non-forest habitats and rights-of-way (primarily roads), rather than healthy forests where edible species are dependent on the roots (ectomycorrhizae) of conifer trees (USDI 2010a:145).

The type of actions and the amount of treatments under all alternatives would be consistent with the actions analyzed in the 2010 Oregon FEIS and the 2016 PEIS. All Standard Operating Procedures and Mitigation Measures analyzed in those documents would be applied to all alternatives. The wet forests (western hemlock, Sitka spruce) and westside moist forest (white/grand fir, tanoak) that are the majority of the forested habitat on Coos Bay BLM-managed lands have a low susceptibility to invasion by invasive plants because the cover type is too shady for most invasive plant species. Hence, it is unlikely that invasive plant treatments would have any negative effects under any of the alternatives to Special Status or edible fungi. In addition, invasive plant treatments are typically completed during the drier months of the year, from late spring through summer. Most fungi on the Coos Bay District come up after the rains begin later in the fall and are done fruiting by early winter, so the edible mushroom

picking season and the invasive plant treatment windows do not generally overlap. Invasive plant treatments in forest habitat would be primarily accomplished along rights-of-way through the forest habitat where spot spraying would target invasive plants, leaving the nearby vegetation unharmed. Due to the lack of potential for adverse effects, this issue was not analyzed in detail.

Native Vegetation Issue 3 (Not Analyzed in Detail)

Even though herbicides would not be used for timber production, would more effective invasive plant treatments indirectly decrease or increase timber harvest volume or quality?

This issue was not analyzed in detail because effects were previously described in the analysis for the Oregon FEIS (USDI 2010a:280) to which this analysis is tiered and there are no new circumstances or information at the site-specific level that would change the effects anticipated for this EA.

The Oregon FEIS showed that it is likely that the effects of invasive plant treatments on timberlands themselves, whether accomplished with herbicide or non-herbicide methods, are expected to be negligible. If there are effects to timber production, they would likely be positive as invasive plants competing 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 are more efficient than native plants at populating recently harvested sites and being competitive with desired conifers. While this results in decreased 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). Though the Oregon FEIS did not discuss the effects of aminopyralid, fluroxypyr, or rimsulfuron, the analysis would lead to the same conclusions since these herbicides are not ones that the BLM is likely to use on timber sale units in forests and woodlands. The primary targets in timber sale units are gorse and brooms that are most effectively treated with triclopyr. Other invasive plant species documented in timber sale areas include blackberries, Canada thistle, jubata grass, false brome, knotweeds, pampas grass, old man's beard, biddy-biddy, ivy, and fennel, though infestations are less than 1/10th acre per site and would be treated with spot applications.

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

There are approximately 304,000 acres of forest land on the Coos Bay District (or 93 percent of the District). In 2016, just under 1,700 acres was partial cut or regeneration harvested (USDI 2017b). Invasive plant treatments could occur in recently harvested timber sale units because any area is susceptible to invasion, and because site disturbances and increased sunlight to the ground increase the likelihood of infestation. Under all alternatives, the BLM would treat approximately 1,000 gross acres a year throughout the District. Treatments on average may account for 50 gross acres or less of treatments annually in timber sale units, primarily along roadsides to treat infestations before they spread. These treatments are estimated to be 80 percent effective under the Proposed Action and Alternative 3 and 60 percent effective under the No Action Alternative, which means that there are potentially 40 additional acres annually of improved forest land under the Proposed Action and Alternative 3, depending on the species treated. However, treatments are generally small (71 percent of known invasive plant sites are smaller than 0.5 acres; see Table 2-2, *Summary of Invasive Plants Documented in NISIMS by Infestation Size*), and these areas would be scattered across the District. BLM would not use herbicides for the production of timber.

Fish and Aquatic Organisms Issue 1

Fish and Aquatic Organisms Issue 1 (Not Analyzed in Detail)

How would invasive plant treatments in riparian areas affect aquatic organisms or their habitat, including riparian vegetation?

This issue was not analyzed in detail because effects are unlikely to differ between the alternatives and because effects are expected to be negligible. In addition, effects of herbicides were described in the 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:208-240, USDI 2007a:4-36 to 4-4-96, USDI 2016a:4-41 to 4-51). The nature of the disturbance associated with invasive plant treatments would have little potential to cause measurable effects to fish and other aquatic organisms and their habitat on the Coos Bay District. In addition, if there are site conditions in which adverse effects may result, the BLM would apply Protection Measures that minimize the potential for effects; for example, the risk of adverse effects is further minimized as a result of Project Design Features adopted for the Proposed Action and Alternative 3.

There are 17 Special Status aquatic species on the District, including four documented federally listed species: the green sturgeon, two populations segments of coho salmon, and the Pacific euchalon (see Table 3-8).

Table 3-8. *Aquatic Special Status Species within the Coos Bay District*

Common Name	Scientific Name	Category	Taxon
Green sturgeon (Southern DPS[1])	*Acipenser medirostris*	Threatened	Anadromous Fish
Coho salmon (Southern Oregon Northern California Coast ESU[2])	*Oncorhynchus kisutch*	Threatened	Anadromous Fish
Coho salmon (Oregon Coast ESU)	*Oncorhynchus kisutch*	Threatened	Anadromous Fish
Pacific eulachon	*Thaleichthys pacificus*	Threatened	Anadromous Fish
Pacific lamprey	*Entosphenus tridentatus*	Sensitive	Anadromous Fish
Chum salmon	*Oncorhynchus keta*	Sensitive	Anadromous Fish
Steelhead (Klamath Mountain Province Steelhead/Oregon Coast DPSs)	*Oncorhynchus mykiss*	Sensitive	Anadromous Fish
Chinook salmon (Southern Oregon Northern California Coast ESU)	*Oncorhynchus tshawytscha*	Sensitive	Anadromous Fish
Millicoma Dace	*Rhinichthys cataractae*	Sensitive	Non-anadromous Fish
Western ridged mussel	*Gonidea angulata*	Sensitive	Class Bivalvia (clams, oysters, and mussels)
Rotund lanx	*Lanx subrotunda*	Sensitive	Class Gastropoda (snails and slugs)
Robust walker	*Pomatiopsis binneyi*	Sensitive	
Pacific walker	*Pomatiopsis californica*	Sensitive	
Newcomb's littorine snail	*Littorina subrotundata*	Sensitive	
Caddisfly	*Rhyacophila chandleri*	Sensitive	Order Trichoptera (caddisflies and water moths)
Haddock's caddisfly	*Rhyacophila haddocki*	Sensitive	

1. Distinct population segment 2. Evolutionarily significant unit

Given the large geographic area covered by the District, and the many miles of streams contained within, there exists a wide range of aquatic habitat conditions, from relatively pristine to highly degraded. In general, due to the locations of larger urban and industrialized areas, the large fish-bearing streams and mainstem rivers have been the most altered by non-natural disturbances and are the portion of the aquatic ecosystem most likely to be impacted by chemicals, including herbicides. The smaller streams located further up in the analysis area generally have steeper gradients, are located in narrower valleys, and have been much less impacted by urban and

agricultural development. Timber management (past and ongoing) is the dominant land use in most of these areas. The majority of the Coos Bay District lands include these types of smaller streams.

Riparian Reserves on the Coos Bay District range in width from 50 feet on either side of the stream up to a full site potential tree height, depending on the particular class of sub-watershed and if the stream is fish bearing, perennial, or intermittent, as described in the *Northwestern and Coastal Oregon Record of Decision and Resource Management Plan* (USDI 2016a). The majority of the Riparian Reserves on the Coos Bay District are a full site potential tree height, which ranges from 140 to 240 feet. There are approximately 85,381 acres of Riparian Reserves on BLM-managed lands within the Coos Bay District. The majority of Riparian Reserves adjacent to large fish bearing streams are paralleled by roads and have had some past disturbances within them, including but not limited to timber harvests, stream cleaning, and splash damming. Roads are a known route of dispersal for invasive plants, so it stands to reason that watersheds with higher road densities would have a higher likelihood of infestations by invasive plants. Infestations by invasive plants are a common problem in disturbed areas, and in some cases, this has reduced riparian function.

Treatments targeting invasive plants in Riparian Reserves would not result in any negative effects to the health and function of the Riparian Reserves or fish habitat. Under the Proposed Action and Alternative 3, 95 percent of herbicide treatments on the Coos Bay District would be spot treatments to target specific plants, so that effects to non-target species can be kept to a minimum. Protection Measures would limit the potential for terrestrial applications of herbicides or sediment from areas of bare soil from entering the water directly. The magnitude of sediment potentially contributed to aquatic habitat in any given stream from treatments would be very small and undetectable in aquatic habitat. Any sediment would occur during the first freshet (elevated stream flow caused by heavy rain) following treatments, and would quickly dissipate downstream as a small turbidity pulse which would be undetectable in relation to the background levels expected to occur during a freshet. None of the proposed treatments would target large overstory trees, so shade and sources of future large woody debris inputs would be maintained in treatment areas. In streamside areas where no native vegetation exists, there could be a loss of cover associated with treatments, for example if a blackberry thicket around a small narrow stream was removed. Where this occurs, bare areas would be replanted with native shrubs, hardwoods, or conifers or seeded with native grasses so that increased sediment input into streams would be avoided or minimized.

Applications of herbicides to terrestrial invasive plants are unlikely to adversely affect aquatic organisms. Several Protection Measures would limit the potential for terrestrial applications of herbicides from entering the water directly. As further described in *Water* Issue 1, indirect contributions of herbicide to aquatic habitat from runoff or leaching has the potential to occur but is unlikely due to Protection Measures and depth to groundwater on the District.

Of the additional herbicides proposed to treat vegetation, only aminopyralid and aquatic formulations of imazapyr and triclopyr would be spot sprayed up to the water line of aquatic habitats. Risk Assessments prepared for aminopyralid and aquatic imazapyr showed no risk to any tested aquatic organisms under any of the tested application rates and delivery scenarios as shown in Appendix C, *Herbicide Risk Assessment Summaries*. Based on the toxicity data reviewed for the Risk Assessment, aminopyralid exposure to fish and aquatic invertebrates did not result in any observable mortality or sub-lethal effects and would not likely accumulate in fish tissue (USDI 2016a:4-45). Aquatic formulations of triclopyr were found to have only a low risk for susceptible fish, amphibians, and susceptible insects at maximum application rates under the accidental spill scenario, with no risks under any other scenarios (see Appendix C). The *Treatment Key* (Table 2-10) specifies triclopyr would only be used at or above typical rates, but below maximum application rates.

Improvements to fish habitat and Riparian Reserves from treatments would only be achieved in dispersed areas across the District in any given year. Most treatment areas would be small and benefits accrued by these treatments would only be measurable at local levels. In the long term (one year to decades, depending on the riparian area and length of time required for native vegetation to become re-established), treating invasive plants

in riparian areas would have a beneficial effect to Riparian Reserves as it would allow for the establishment of native vegetation in previously infested areas. Depending on the site, this could be a conversion from a blackberry thicket to a wooded riparian corridor, which would (at the site level) yield positive benefits to riparian and aquatic habitats through increased shade, cover, nutrient inputs, bank stability, and source of future wood recruitment to stream channels. The 2010 Oregon FEIS states:

> "In riparian areas, invasive plants (e.g. Himalayan blackberries, Japanese knotweed […]) often support fewer native insects than native plant species, which could affect food availability for insectivorous fish species, such as salmonids. The replacement of native riparian plant species with invasive plants may adversely affect stream morphology (including shading and instream habitat characteristics), bank erosion, and flow levels. Invasive plants break down the complex natural vegetative physical structure and interfere with natural processes" (USDI 2010a:230).

The removal of European beachgrass by mechanical methods at New River occurs adjacent to fish habitat. Prior to the 2009 *New River Foredune Management EA*, the BLM did not leave foredune buffers and an excessive amount of sand entered New River from wave overwash and wind. This increased amount of sand caused a decline in fish habitat in New River as the channel filled with sand. This impact was alleviated when foredune buffers from the 2009 EA were implemented. Because of the foredune buffers designed in the New River Foredune Management EA (USDI 2009a), the creation of bare sand associated with invasive plant removal would not result in changes to fish habitat in New River.

The following Project Design Features included with the Proposed Action and Alternative 3 further minimize the potential for effects to fish and other aquatic species:

Project Design Features for the Proposed Action and Alternative 3

- 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 or Strategic fish and other aquatic species (see Appendix A).

Project Design Features for Alternative 3

- All applicable Project Design Criteria identified in potential future consultations with the National Marine Fisheries Service will be incorporated into all treatments in listed anadromous fish habitat.
- The use of fluazifop-P-butyl will be confined to flat dry ground located greater than 1,500 feet from any aquatic features to prevent runoff to surface water or leaching to groundwater.
- Use only ARBO II (NMFS 2013) approved herbicides, adjuvants, and buffer distances in the New River western snowy plover habitat restoration areas (see Appendix A).

Wildlife

Wildlife Issue 1

How would mechanical and herbicide treatment methods affect the western snowy plover?

Analytical Methods

The analysis area includes 453 acres of designated western snowy plover critical habitat on the Coos Bay District in the New River Area of Environmental of Concern and the North Spit (see Figure 2-2, *Western Snowy Plover Habitat Restoration Areas (North Spit and New River)* in Chapter 2), of which 172 acres is included in habitat restoration areas and is treated to control European beachgrass. For the purpose of this analysis, short-term effects are

defined as those taking place during the invasive plant treatment. Long-term effects are those greater than a day or less than a year. Effects to western snowy plovers could be both short term and long term.

Numerical projections of treatment efficacy vary across the three alternatives and are based on the methodology and assumptions in the 2010 Oregon FEIS (USDI 2010a:135-139, 594-603). District-wide, treatments under the Proposed Action and Alternative 3 are expected to be 80 percent effective and treatments under the No Action Alternative are expected to be 60 percent effective on invasive plants. However, as described in *Invasive Plant* Issue 1, current treatments of European beachgrass are only 10 percent effective. In addition, noxious weed populations are estimated to spread 10 percent a year, damaging native plant communities and wildlife habitat and inhibiting ecosystem functions associated with those communities.

Herbicide Risk Assessments, done with the 2007 and 2016 PEISs are the basis for the effects discussion of herbicide use. Additional information about the effects of specific herbicides to birds, including the western snowy plover, can be found in Table 3-11, *Effects of Herbicides (Wildlife)*, in *Wildlife* Issue 3.

Prescribed fire would be used under all alternatives, either for habitat restoration (No Action Alternative) or as an invasive plant treatment method (under the action alternatives). Manual treatment methods would remain the same between the alternatives. There would be no measurable difference in the effects between the alternatives for the use of prescribed fire or manual methods. Thus, these treatment methods are not analyzed in detail.

Affected Environment

Western snowy plover habitat located in New River Area of Critical Environment of Concern and on the Coos Bay North Spit is 80 percent covered by European beachgrass. Prior to the introduction of European beachgrass in the 1930s to stabilize open sand near roads and campgrounds, the dunes and beach were largely open sand, pocketed by native plants such as American dunegrass (*Leymus mollis*), and yellow sand verbena (*Abronia latifolia*) (Pickart 2008). Species that lived in these open sand conditions evolved with a high degree of disturbance from wind and tides. The establishment of European beachgrass dramatically altered the original biota by outcompeting native vegetation and stabilizing foredunes (ODFW 2016). While European beachgrass is the primary threat, other invasive plants that are present in New River and the North Spit include Scotch broom, field bindweed, sea-rocket, false dandelions, wild radish, annual grasses, and sheep sorrel.

On March 5, 1993, the western snowy plover was listed as threatened under the *Endangered Species Act* (USDI 2007g). Critical habitat was designated in 1995 and updated in 2004. The Coos Bay BLM began management of European beachgrass in the 1990s, and continues to target beachgrass removal along with other snowy plover habitat improvements. Currently, 172 acres out of 453 acres of designated critical habitat on BLM are habitat restoration areas that function as nesting habitat. (See Figure 2-2, *Western Snowy Plover Habitat Restoration Areas (North Spit and New River)* in Chapter 2.)

Western snowy plover numbers have steadily increased on District since their listing date. A combination of actions including habitat work, predator control, public education, roping and signing habitat, and invasive plant removal have led the numbers to increase in Oregon from 33 in 1993, to 518 in 2016 (Lauten et al. 2015).

Treatments Planned Related to the Issue

Under the No Action Alternative, treatment proposed for western snowy plover habitat would be restricted to mechanical, and hand pulling of noxious weeds, with the exception of 24 acres on the North Spit of Coos Bay, where spot treatments of glyphosate would be used. No herbicides would be allowed at New River Area of Critical Environmental. Here up to 100 acres of bulldozing would take place annually. On the North Spit of Coos Bay, up to 72 acres of tractor, disc, and bulldozers work would be conducted annually, along with the use of glyphosate on 24

acres. Prescribed fire has also been used in snowy plover habitat, as habitat restoration and not as part of the invasive plant program. European beachgrass stabilizing the foredunes would not be treated, with the exception of plover access cuts. Standard Operating Procedures and Mitigating Measures identified in the in three NEPA analyses to which this EA tiers - the 2007 and 2016 PEISs (done at the national level) and the 2010 Oregon FEIS (USDI 2010a:241-257, USDI 2007a:4-96 to 4-13, USDI 2016a:4-51 to 4-64) - would be implemented.

Under the Proposed Action, western snowy plover habitat would be treated the same as the No Action Alternative, with some additional treatment of invasive plants on land adjacent to western snowy plover critical habitat. Prescribed fire would be done as part of the invasive plant program. Under this alternative, the additional herbicide use on non-critical habitat would allow BLM greater flexibility in designing treatment projects.

Under Alternative 3, additional herbicides would be available to treat invasive plants in western snowy plover habitat. The preferred treatment method for European beachgrass would be a combination of imazapyr and glyphosate. As imazapyr and glyphosate are both non-selective, they would be applied as spot treatments. Mechanical treatment would take place every 2 to 3 years to remove thick clumps of beachgrass and to contour the habitat. A total of 172 acres of western snowy plover habitat would be treated. There are approximately 25 acres of invasive plants (3 acres of noxious weeds) in western snowy plover habitat restoration areas other than European beachgrass and additional herbicides could be used on these invasive plants. Similar to the No Action Alternative and the Proposed Action, prescribed fire would be used. All Standard Operating Procedures and Mitigating Measures identified in the in three NEPA analyses to which this EA tiers; the 2007 and 2016 PEISs (done at the national level) and the 2010 Oregon FEIS (USDI 2010a:241-257, USDI 2007a:4-96 to 4-13, USDI 2016a:4-51 to 4-64) would be implemented.

Protection Measures

Standard Operating Procedures and Mitigation Measures Relevant to Effects

There are numerous Conservation Measures adopted with U.S. Fish and Wildlife Service consultation on the 2007 and 2016 PEISs that protect federally listed sand nesting birds such as the snowy plover. These are listed in full in Appendix A. Some of the ones most relevant to the issue include:

- Do not treat vegetation in nesting areas during the breeding season (as determined by a qualified biologist).
- Do not use 2,4-D in western snowy plover, piping plover, or interior least tern[58] habitats; do not broadcast spray 2,4-D within ¼ mile of western snowy plover, piping plover, or interior least tern habitat.
- Where feasible, avoid use of the following herbicides[59] in western snowy plover and piping plover habitat: clopyralid, glyphosate, hexazinone, imazapyr, metsulfuron methyl, picloram, and triclopyr.
- If broadcast spraying imazapyr or metsulfuron methyl in or adjacent to western snowy plover, piping plover, or interior least tern habitat, apply at the typical, rather than the maximum, application rate.
- If conducting manual spot applications of glyphosate, hexazinone, or triclopyr to vegetation in western snowy plover, piping plover, or interior least tern habitat, utilize the typical, rather than the maximum, application rate.

[58] Piping plover and interior least tern do not occur on the District. (Conservation Measures were adopted at the national level with the 2007 and 2016 PEISs.)

[59] This Conservation Measure was adopted as part of consultation on the 2007 PEIS, which used Risk Assessments prepared in 2003 (glyphosate) and 2004 (imazapyr). These 2003 and 2004 Risk Assessments indicated that there was a low or moderate risk to small birds from eating contaminated insects. These Risk Assessments were updated in 2011, which indicates that aquatic formulations of imazapyr have 0 risk to any fish or wildlife species (SERA 2011b) and aquatic glyphosate has a 0 risk to birds under every scenario (SERA 2011a).

In addition, the New River Foredune Management EA specifies the following protection measures at New River:

- Manual and mechanical treatments would occur between September 16th and March 14th, which is outside of the plover nesting season.
- Mechanical treatments would include the use of a bulldozer. The bulldozer would be used to treat the beachgrass layer only and not cut the established elevation down in the open sand area any further then necessary to remove European beachgrass.

Project Design Features for Alternative 3

The following Project Design Features would further reduce effects on western snowy plover under Alternative 3:

- Do not use dicamba, triclopyr, or fluazifop-P-butyl (herbicides with a low or moderate risk to birds) in areas that are currently capable of supporting western snowy plovers. (Dicamba in formulation with diflufenzopyr has no risk to birds and can be used in these areas.)
- Implement all current (see Appendix A) and future reasonable and prudent measures and terms and conditions identified by the U.S. Fish and Wildlife Service through consultation on western snowy plovers.

Environmental Consequences

Direct and Indirect Effects

Common to All Alternatives

Treating European beachgrass would have beneficial effects to the western snowy plover and plover habitat. These effects would vary by alternative. The potential for western snowy plovers to be disturbed by invasive plant treatments also varies by alternative. All treatments would be conducted during the non-nesting season, when birds are mobile and move away from disturbances. Mechanical treatment is a slow process, allowing for time for birds to flush away from equipment, but then return to the site once the equipment is gone. The potential for direct exposure from herbicides is negligible, as all herbicide application would be done by spot spraying, in which the specific invasive plant is treated. Conservation Measures and other Protection Measures adopted as part of consultation with the U.S. Fish and Wildlife Service further protect the western snowy plover from any adverse effects that may occur because of invasive plant treatments.

No Action Alternative

Under the No Action Alternative, 85 percent of the western snowy plover habitat would be maintained by mechanical methods using heavy equipment (bulldozers and tractors) with 1 acre per year of non-mechanical treatments in the plover access cuts. Beachgrass control with heavy equipment is temporary, as the grass immediately starts to resprout after the disturbance. Since treatments of European beachgrass have only been about 10 percent effective and the beachgrass spreads at approximately 10 percent a year, retreating the entire area annually is necessary. An estimated 172 acres would be treated using heavy equipment on the North Spit and New River Area of Critical Environmental Concern each year. These treatments would cause long-term effects to snowy plovers; birds flush from the treatment area until the operation is complete, which is estimated to be six weeks annually. This would not occur during nesting season; during non-nesting season, plovers use these areas to shelter and rest from storms.

On the North Spit, there would be some additional short-term disturbance associated with spot spraying up to 24 acres of glyphosate on new European beachgrass shoots that appear after mechanical treatment. The Risk Assessments (Appendix C) indicate that at the maximum application rate (7 lbs./acre), glyphosate has a low risk to a small bird associated with the consumption of contaminated insects, and no risk at the typical rate (2 lbs./acre). However, there is no risk at the maximum application rate when aquatic formulations of glyphosate are used. The

BLM would treat beachgrass at 3 lbs./acre with the aquatic formulation; therefore, there is a no risk of adverse effects to snowy plovers from herbicide treatments (see Table 3-11, *Effects of Herbicides (Wildlife)*).

The reliance on mechanized equipment and limited herbicide use would make progress towards meeting treatment goals of improved western snowy plover habitat; however, this alternative would be the most expensive method (see *Implementation* Costs Issue 1) with the greatest amount of disturbance to the western snowy plover. The literature suggests that the effectiveness of glyphosate on European beachgrass is marginal because it has no soil activity[60] (DiTomaso et al. 2013:31). In addition, under this alternative, invasive plants that are not listed as noxious weeds that negatively affect western snowy plover habitat would not be treated. Species such as American/European sea-rocket currently occupy approximately 10 percent of the area. If left untreated, they would continue to expand, further degrading plover habitat.

Proposed Action

The Proposed Action treatments would be the same as under the No Action Alternative and effects would be similar. There would be no additional use of herbicides in western snowy plover habitat restoration areas than what is described in the No Action Alternative. However, there would be a greater variety of treatments methods used outside of, but adjacent to, habitat restoration areas. This would lead to a reduction of seed source on adjacent land, and reduction of other invasive plants spreading into western snowy plover habitat. Invasive plants would continue to degrade plover habitat and make it less suitable to meet snowy plover life requirements (e.g. sparsely vegetated, flat, open sandy beaches).

Alternative 3

Alternative 3 would allow the District to treat all invasive plants using a more targeted, integrated, and effective management approach, resulting in a greater magnitude of beneficial effects to the western snowy plover and its habitat. This alternative would best meet the goals of treating invasive plants to maintain western snowy plover habitat. It is anticipated that treatments would be 80 percent effective under this alternative, which is anticipated to result in a 75 percent reduction in heavy equipment use, and hence less re-entry and disturbance. It is estimated that the frequency of treatment with bulldozers or tractors with discs and plows would be reduced to once every two years (a total of three weeks of disturbance). Herbicides would provide the most effective, least expensive (see *Implementation Costs* Issue 1), and least disturbing method for restoring suitable habitat.

The Oregon FEIS concluded the likelihood of significant adverse effects to wildlife from contact with the herbicides analyzed in that document was negligible at the population scale. The herbicides are formulated to affect plants and have been selected to have some of the lowest (or no) demonstrable wildlife toxicity of EPA-registered herbicides, do not bioaccumulate, and are quickly degraded in wildland settings (USDI 2010a:245, *Wildlife* Issue 3). An occasional individual could be exposed to doses above the level of concern, but risks would not be expected to be significant at the population level (USDI 2010a:245). Imazapyr and glyphosate would be the most widely used in the western snowy plover habitat restoration areas. The terrestrial formulation of glyphosate has low risk to small birds under the maximum application rate, but the BLM would not use the terrestrial formulation of glyphosate in western snowy plover habitat restoration areas and the District does not plan to treat European beachgrass at the maximum rate. The risk of imazapyr is lower than glyphosate; imazapyr has no risk at any application rate under any wildlife scenario and the EPA classifies it as practically non-toxic to birds. While imazapyr and glyphosate would be the most commonly used in these areas to treat European beachgrass, other herbicides may occasionally be used in western snowy plover habitat. However, a Project Design Feature included with Alternative 3 prohibits the use of herbicides with any risk to birds. Therefore, there is no risk of adverse effects to snowy plovers from herbicide treatments (see Table 3-11, *Effects of Herbicides (Wildlife)*).

[60] Glyphosate binds to soil particles and is rapidly degraded by microbes, making it inactive in soil. See *Soil* Issues 2 and 3.

Zarnetske et al. (2010) suggest that use of herbicides instead of mechanical treatments allows for a more holistic dune community approach, maintaining native plants while producing suitable plover habitat. This alternative would have the least disturbance effects to western snowy plover, since long-term disturbance associated with mechanical treatment would decrease in frequency (once every other year, instead of twice a year). This alternative would require *Endangered Species Act* consultation with U.S. Fish and Wildlife Service prior to implementation.

Summary of Effects

Table 3-9. *Summary of Effects (Wildlife)*

<table>
<tr><th>Indicator</th><th>No Action Alternative</th><th>Proposed Action</th><th>Alternative 3</th></tr>
<tr><td rowspan="2">Disturbance</td><td colspan="2">Greatest amount of long-term disturbance; up to six weeks annually of mechanical treatments using bulldozers, and tractors.</td><td>Least amount of long-term disturbance; three weeks every other year of mechanical treatments using bulldozers, and tractors.</td></tr>
<tr><td colspan="3">Treatments would not happen during nesting season.</td></tr>
<tr><td rowspan="3">Herbicides</td><td colspan="2">Herbicides limited to 24 acres with glyphosate (with only marginal effectiveness on beachgrass).</td><td rowspan="2">Greatest selection of herbicides, treatment effectiveness is expected to be 80%. Can treat invasive plants.</td></tr>
<tr><td>Can only treat noxious weeds.</td><td>Some additional benefit associated with herbicide treatment on invasive plants near habitat restoration areas, by reducing seed source.</td></tr>
<tr><td colspan="2">Aquatic glyphosate has 0 risk to western snowy plovers.</td><td>Imazapyr and aquatic glyphosate have 0 risk to western snowy plovers.</td></tr>
<tr><td>Habitat</td><td colspan="2">Invasive plants will continue to spread and degrade plover habitat.</td><td>Best snowy plover habitat in long term at the least cost (see Implementation Costs Issue 2).</td></tr>
</table>

Cumulative Effects

In addition to the Coos Bay District, other agencies and organizations have ongoing and foreseeable invasive plant management programs, that when combined with the effects of BLM's actions under each alternative would have cumulative benefits to western snowy plover. The magnitude of these cumulative effects would be greater for Alternative 3 than under the No Action Alternative and Proposed Action. Since the Federal listing of the western snowy plovers in 1993, the BLM, Oregon State Parks, U.S. Army Corps of Engineers, and Siuslaw National Forest have worked together to control European beachgrass and improve habitat capability along the Oregon Coast for plovers. Because of their restricted range and specialized habitat, maintaining multiple population centers across the Oregon Coast allows for pioneering into new unoccupied habitat and the potential of repopulation after a stochastic event. For example, in 1999, the freighter New Carissa ran aground on the North Spit of Coos Bay, on a beach supporting plovers, spilling 70,000 gallons of fuel oil. A total of 3,000 sea and shore birds were estimated to have been killed, including snowy plovers (USDI 2018). Suitable habitat and populations on the Siuslaw National Forest, near the North Spit (Tenmile Creek), provided for plover refugia and subsequent repopulation. In other words, the damage to habitat at one population center is mitigated by having suitable habitat nearby. On the other hand, habitat degradation due to ineffective European beachgrass control could be detrimental to other nearby populations. Thus, the direct and indirect benefits of the BLM's European beachgrass control, when added to the benefits of similar treatments on adjacent lands, has beneficial cumulative effects by providing greater amount of habitat, refugia during inclement events, and individuals for repopulating unoccupied habitat. However, because there is a possibility that, under the No Action Alternative and Proposed Action, European beachgrass control on BLM would be limited, these cumulative beneficial effects would not occur as quickly as under Alternative 3 or would not occur at all under the No Action Alternative and Proposed Action.

As described in the analysis of direct and indirect effects, the District's invasive plant treatments could create disturbances to snowy plovers. However, like the BLM, invasive plant treatments implemented by adjacent Oregon State Parks, U.S. Army Corps of Engineers, and Siuslaw National Forest would also apply protection measures to prevent adverse effects to snowy plovers. Most private landowners would not conduct invasive plant management treatments or implement measures to conserve snowy plovers, because they are not legally required to do so. Hence, cumulative adverse effects from invasive plant management for snowy plover habitat would not differ among the alternatives. The overall beneficial effects of invasive plant management on snowy plover habitat are anticipated to cumulatively improve population viability. Alternative 3 would have greater beneficial cumulative effects than the Proposed Action and the No Action Alternative.

Wildlife Issue 2 (Not Analyzed in Detail)

How do invasive plants affect wildlife?

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

The Coos Bay District manages 329,700 acres of land with a wide variety of habitats including forest, meadows, dunes, oak woodlands, pine savannas, marsh, and streams. This habitat supports a rich diversity of wildlife species. In general, the BLM is responsible for managing wildlife habitat, while the State of Oregon is responsible for managing wildlife species, with the exception of federally listed species.

While some wildlife may benefit from or are tolerant of invasive plants (e.g. American black bear and its consumption of Himalayan blackberry fruit), they seldom provide wildlife the same food and cover quality of native species (USDI 2010a:251). 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 herbicide treatment on invasive plants as adverse habitat changes can result from invasive plants (USDI 2010a:252).

The International Union for the Conservation of Nature (IUCN) notes that a substantial portion of species now considered extinct, were driven to extinction by invasive species, and generally ranks invasive species as one of the top 10 threats to currently threatened species (IUCN 2008 as cited in USDI 2010a:251). As described in *Wildlife* Issue 1, one of the most significant causes of habitat loss for the western snowy plover, a federally threatened species, has been the encroachment of invasive European beachgrass (*Ammophila arenaria*) (USDI 2008d). 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).

Noxious weed populations are estimated to spread 10 percent a year, damaging native plant communities and wildlife habitat and inhibiting ecosystem function associated with those communities. The type of actions and the amount of treatments under all alternatives would be consistent with the actions analyzed in the 2010 Oregon FEIS and the 2016 PEIS.

District-wide, treatments under the Proposed Action and Alternative 3 are expected to be 80 percent effective and treatments under the No Action Alternative are expected to be 60 percent effective on invasive plants (see Chapter 2 and USDI 2010a:136-138). Therefore, the Proposed Action and Alternative 3 will provide greater benefit to the habitat of native birds and small animal species than the No Action Alternative. As described in *Wildlife* Issue 1, Alternative 3 would treat invasive plants in western snowy plover habitat restoration areas, and hence would be more beneficial to the western snowy plover than the No Action Alternative or the Proposed Action.

Wildlife Issue 3 (Not Analyzed in Detail)

How would contact with or ingestion of herbicides affect wildlife species, especially Special Status wildlife species?

This issue is not analyzed in detail because the effects of the herbicides on wildlife were analyzed in three NEPA analyses to which this EA tiers: the 2007 and 2016 PEISs (done at the national level) and the 2010 Oregon FEIS (USDI 2010a:241-257, USDI 2007a:4-96 to 4-13, USDI 2016a:4-51 to 4-64). There are no new circumstances or information at the site-specific level that would change the effects anticipated for this EA. The herbicides analyzed in this EA were chosen in part because they were unlikely to have adverse effects to wildlife (Appendix C and USDI 2010a:245) and Mitigation Measures adopted with the Records of Decision for these three EISs mitigated all potentially significant effects at the national and state level. The risk of adverse effects is further minimized as a result of Project Design Features included with the Proposed Action and Alternative 3.

There are 17 documented and seven suspected Special Status wildlife species on the District, including three documented federally listed species: the northern spotted owl, marbled murrelet, and the western snowy plover (see Table 3-10). Table 3-10 also includes additional Birds of Conservation Concern (BCC) and Game Birds Below Desired Conditions (GBBDC). Western snowy plover is further discussed in *Wildlife* Issue 1.

Table 3-10. *Wildlife Special Status Species, Birds of Conservation Concern, and Game Birds Below Desired Conditions*

Common Name	Scientific Name	2017 Status[1]	Coos Bay Presence[2]	General Habitat
Birds				
Allen's hummingbird	*Selasphorus sasin*	BCC	Documented	Found in narrow, moist coastal fog zones in open areas of coastal scrub. Nest in nearby wooded areas.
American peregrine falcon	*Falco peregrinus anatum*	Bureau Sensitive, BCC	Documented	Wide range of habitats, nests on cliff ledges.
Bald eagle	*Haliaeetus leucocephalus*	Bureau Sensitive, BCC	Documented	Nests in large older trees in forested areas near large bodies of water, along rivers, lakes, and reservoirs.
Band-tailed pigeon	*Patagioenas fasciata*	GBBDC	Documented	Coniferous and mixed forests and woodlands.
Marbled murrelet	*Brachyramphus marmoratus*	Federally Threatened	Documented	Nests inland in old growth forest stands within 35-50 miles of the coast.
Mourning dove	*Zenaida macroura*	GBBDC	Documented	Breed in variety of open habitats, including agricultural areas, open woods, and forest edges.
Northern goshawk	*Accipiter gentilis*	BCC	Documented	Mature forests with large trees on moderate slopes with open understories.
Northern spotted owl	*Strix occidentalis caurina*	Federally Threatened	Documented	Older mixed conifer forests with high canopy cover.
Olive-sided flycatcher	*Contopus cooperi*	BCC	Documented	Open conifer forests (< 40% canopy cover) and edge habitats where standing snags and scattered tall trees remain after a disturbance.
Oregon vesper sparrow	*Pooecetes gramineus affinis*	Bureau Sensitive and BCC	Suspected	Grassland and savannah habitat types in lowland valleys and foothills, except for the Klamath Mountains ecoregion in the South/southeast portion of District where it occurs in montane meadows.

Common Name	Scientific Name	2017 Status[1]	Coos Bay Presence[2]	General Habitat
Purple finch	*Carpodacus purpureus*	BCC	Documented	Breed in moderately moist, open conifer forests, and edge habitat at low-to-mid elevations. Use a variety of habitats including deciduous woodlands, riparian corridors, and edge habitat. In winter, they are more widespread, using forests, shrubby areas, weedy fields, hedgerows, and backyards.
Purple martin	*Progne subis*	Bureau Sensitive	Documented	Open habitat near forest edges and clearings. Snags with cavities.
Rufous hummingbird	*Selasphorus rufus*	BCC	Documented	Found in a variety of habitats, most likely in brushy areas with flowers and forests with a well-developed understory.
Western snowy plover	*Charadrius nivosus nivosus*	Federally Threatened	Documented	Open sand habitat along the ocean and bays.
White-tailed kite	*Elanus leucurus*	Bureau Sensitive	Documented	Open fields and agricultural lands.
Willow flycatcher	*Empidonax traillii*	BCC	Documented	Riparian and shrub habitat.
Amphibians				
Foothill yellow-legged frog	*Rana boylii*	Bureau Sensitive	Documented	Permanent streams with gravel bottoms.
Reptiles				
Northwestern pond turtle	*Actinemys marmorata*	Bureau Sensitive	Documented	Spends the majority of their life cycle in aquatic environments, but leave the water to adjacent meadows to dig terrestrial nests and lay their eggs. Often over-winter in the uplands.
Mammals				
Fisher	*Pekania pennantia*	Bureau Sensitive	Documented	Mature older forests with higher canopy cover, snags, and down logs.
Fringed myotis bat	*Myotis thysanodes*	Bureau Sensitive	Documented	Roosts in caves, abandoned buildings, rock crevices, and trees. They are found in chaparral to ponderosa pine habitat, but preferred habitats are oak woodlands, mixed conifers, and mature Douglas firs and snags.
Pacific marten	*Martes caurina*	Bureau Sensitive	Documented	Older/mature conifer dominated forests with dense understory shrub layers and down wood and snags.
Pallid bat	*Antrozous pallidus*	Bureau Sensitive	Suspected	Found in brushy, rocky terrain, but have been observed at edges of coniferous and deciduous woods and open farmland. Roosts in buildings, bridges, large decadent snags, and rock outcrops.
Townsend's big-eared bat	*Corynorhinus townsendii*	Bureau Sensitive	Documented	Roost and hibernate in mines and caves, but have been found roosting in hollow trees.
Invertebrates				
Coastal greenish blue butterfly	*Plebejus saepiolus littoralis*	Bureau Sensitive	Suspected	Coastal grasslands, bogs, roadsides with clover. Eggs are laid in clover flowers, where the species overwinters as an instar.
Hoary elfin	*Callophrys polios maritima*	Bureau Sensitive	Suspected	All life stages of the elfin are closely associated with the kinnikinnick hostplant. Oregon and California populations occupy sites on coastal bluffs and ancient sand dunes.

Common Name	Scientific Name	2017 Status[1]	Coos Bay Presence[2]	General Habitat
Johnson's hairstreak butterfly	*Callophrys johnsoni*	Bureau Sensitive	Documented	Spends lifespan in and near the tops of conifer trees, although it descends to ground level for nectaring (including Oregon grape, Pacific dogwood, ceanothus, pussy paws, and Rubus species) and to visit moist muddy areas as a source of water. Dependent on conifer mistletoe for egg laying and for food in its larval stage.
Mardon skipper butterfly	*Polites mardon*	Bureau Sensitive	Documented	Populations in the southern Oregon Coast occupy small (0.5 to 10 ac), grasslands within mixed conifer forests. They are usually associated with a water source, usually a small perennial or intermittent stream running through the grassland, but also with areas with shallow subsurface water.
Siuslaw sand tiger beetle	*Cicindela hirticollis siuslawensis*	Bureau Sensitive	Documented	Immediate sandy edge of river mouths on beaches along the Pacific Ocean, near New River ACEC.
Oregon shoulderband snail	*Helminthoglypta hertleini*	Bureau Sensitive	Suspected	Associated with shrublands or rocky inclusions in forested habitat with substantial grass and subsurface water sources.
Green sideband snail	*Monadenia fidelis flava*	Bureau Sensitive	Documented	Oregon endemic, limited to the western slope of the Coast Range and the immediate adjacent Coast, found in mesic forest habitats or near springs or other water sources in forest situations.
Western bumblebee	*Bombus occidentalis*	Bureau Sensitive	Suspected	Require plants that bloom and provide adequate nectar and pollen throughout the colony's life cycle. Flower-rich meadows of forests and subalpine zones. Nests are primarily in underground cavities such as old squirrel or other animal nests and in open west-southwest slopes bordered by trees.

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

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

The Oregon FEIS described that the risk of adverse effects to wildlife from dermal contact or ingestion would vary by the amount of herbicide applied to vegetation that is used as forage, the toxicity of the herbicide, physical features of the terrain, weather conditions, and the time of year. The likelihood of most larger and mobile wildlife species being directly sprayed is very low since human activity associated with herbicide treatments generally would cause wild animals to temporarily leave the immediate area.

Table 3-11 is a summary of the potential risks to wildlife from each of the herbicides considered in this analysis. This summary was adapted from the 2007 PEIS, the Oregon FEIS, the 2016 PEIS, and the Risk Assessments that were created or adopted as part of those analyses.

Table 3-11. *Effects of Herbicides (Wildlife)*[1]

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

Available under all Alternatives	
2,4-D	2,4-D is one of the more toxic herbicides for wildlife of the foliar-use herbicides considered in this EA. The ester form is more toxic to wildlife than the salt form. Ingestion of treated vegetation is a concern for mammals, particularly since 2,4-D can increase palatability of treated plants (USDA 2006) for up to a month following treatment (Farm Service Genetics 2008). Mammals are more susceptible to toxic effects from 2,4-D, and the sub-lethal effects to pregnant mammals were noted at acute rates below LD_{50}. However, bats were not specifically included in these mammal groups; only small and large mammalian herbivores were included. Bats are generally wide-ranging and forage in multiple locations two miles or more from their roost sites. It is unlikely they would only forage on insects that have been sprayed due to the small treatment areas, so the potential effects are minimal. Birds are less susceptible to 2,4-D than mammals, and the greatest risk is ingestion of contaminated insects or plants. There is little information on reptile toxicity, although one study noted no sexual development abnormalities. Honeybees would not be adversely affected by 2,4-D use, even at the highest application rate (SERA 2006). Studies that quantify exposure for other terrestrial invertebrates suggest that adverse effects occur at application rates of 4 lbs./acre but this rate is greater than that used by the District. The salt form is practically non-toxic to amphibians, but the ester form is highly toxic. It can be neurotoxic to amphibians; although not all amphibians respond the same (e.g., toads were more susceptible than leopard frogs) (SERA 2006).
Dicamba	No adverse effects on mammals are plausible for either acute or chronic exposures to dicamba at the typical rate. At the highest tested rate, there are adverse reproductive effects possible for acute scenarios consuming contaminated vegetation. Dicamba has no adverse effects on birds for acute or chronic exposures at the typical rate, although highest tested application rates had possible adverse reproductive concerns for acute scenarios involving birds consuming contaminated vegetation or contaminated insects (SERA 2004g). Dicamba is practically non-toxic to amphibians and honeybees. Amphibians are as tolerant as fish to the acute toxicity of dicamba, and aquatic invertebrates appear to be somewhat more susceptible to dicamba than fish or amphibians.
Glyphosate	Glyphosate formulations vary in toxicity, but studies support the conclusion that the toxic effect of POEA-containing glyphosate herbicides is due to POEA rather than to the active glyphosate ingredient and BLM no longer uses formulations that include POEA. The glyphosate Risk Assessment (SERA 2011a) found that toxicity to wildlife under most of the Risk Assessment scenarios is very low, so much so that No Observed Adverse Effects Levels are used because the LD_{50} were not found. Observed effects in mammals had to do with reduced feeding efficiency and reduced weight gain. Glyphosate does not bioaccumulate. Larval amphibians were more susceptible in some studies (Relyea 2005b), but less so in other studies (Thompson et al. 2004). However, glyphosate without POEA has not been tested on a wide range of amphibians. The Risk Assessment found that glyphosate is low risk to honeybees, but little information is available for other terrestrial invertebrates. Most field studies suggest that effects on terrestrial invertebrates would be minimal (SERA 2011a). However, more recent research indicates that glyphosate used in agricultural settings has been shown to affect honeybee appetite, foraging behavior, and navigation (Balbuena et al. 2015 and Herbert et al. 2014). A recent study found that chronic exposure (over the course of 75 days) to very low doses of glyphosate resulted in kidney and liver damage to laboratory animals (Mesnage et al. 2015).
Picloram	Studies on birds, bees, and snails generally support picloram as relatively nontoxic to terrestrial animals. The few field studies indicated no change to mammalian or avian diversity following picloram treatment. Variations in different exposure assessments have little effect on risk through ingestion, grooming, or direct contact. Maximum rates have higher risk to mammals due to ingestion of contaminated grass or insects. No information was found in the literature about picloram's effect on reptiles (SERA 2011c). No conclusive studies on invertebrates were found. No sublethal effects were noted on honeybee activity patterns.
Available under both the Proposed Action and Alternative 3	

Aminopyralid	The Risk Assessment for aminopyralid predicted that exposure to this active ingredient would not pose a risk to terrestrial wildlife (including pollinators) under any of the modeled exposure scenarios. Risk quotients were all below the level of concern of 0.5 (acute high risk). Therefore, exposure of wildlife to this active ingredient by direct spray, contact with sprayed vegetation, or ingestion of plant materials or prey items that have been exposed to this active ingredient is not a concern from a toxicological perspective.
Chlorsulfuron	Chlorsulfuron is an ALS-inhibitor; a group of herbicides that has the lowest risk to all groups of wildlife of the herbicides evaluated. All likely application scenarios are below the level of concern for wildlife groups under tested scenarios, even under spill or off-site drift scenarios. There is very little information on the effects of chlorsulfuron on terrestrial invertebrates, amphibians, or reptiles (SERA 2004a). The literature includes two toxicity studies involving leaf beetles exposed to chlorsulfuron that reported there were no substantial effects on survival or growth for insects from host plants treated with chlorsulfuron. Toxicity studies in honeybees were not identified for chlorsulfuron.
Clopyralid	Clopyralid is unlikely to pose risk to terrestrial mammals. All of the estimated mammalian acute exposures are no or low risk; mammalian chronic exposures are below the no observed adverse effects level at the typical rate. At the maximum rate, all but one risk scenario has no risk. Large and small birds have some risk of ingestion of contaminated food but hazard quotients are below the level of concern for all exposure scenarios under the typical rate. There is no risk to honeybees from direct spray at typical application rates. No studies on reptiles, amphibians, or invertebrates were found (SERA 2004b).
Dicamba + Diflufenzopyr	Diflufenzopyr has slightly more toxic effects to wildlife than dicamba based on evaluations in the ecological Risk Assessment. The mixture has a moderate residual effect that could affect insects and mammals through ingestion but insect lethal effects are unlikely. Risk quotients for terrestrial wildlife were all below the most conservative level of concern of 0.1, indicating that accidental direct spray effects are not likely to pose a risk to terrestrial animals. The mixture is practically non-toxic to birds, but there are some concerns for ingestion of contaminated thistle or knapweed manifesting in reproductive effects at the maximum application rates. There are chronic and acute ingestion concerns for mammals as well (see Appendix C, *Herbicide Risk Assessment Summaries*). It has low toxicity to honeybees. It is practically non-toxic to aquatic invertebrates, although they are more susceptible to dicamba than fish. One study on dicamba indicates it is practically non-toxic to amphibians (ENSR 2005d, i).
Imazapic	Imazapic is an ALS-inhibitor that rapidly metabolizes and does not bioaccumulate. Mammals are more susceptible during pregnancy and larger mammals are more susceptible than small mammals. No adverse short-term exposure risks to birds were noted for imazapic, but some chronic growth reduction was noted. None of the risk ratings for susceptible or non-susceptible mammals or birds shows any ratings that exceed the level of concern. Imazapic has one of the lowest toxic risks to wildlife of herbicides evaluated in this EA along with other ALS-inhibitors (SERA 2004c). Very little information on toxicity to terrestrial invertebrates is available. Even at exposure associated with direct spray, there is no basis for expecting mortality in honeybees (SERA 2004c).
Imazapyr	There is a lack of information on dose levels that demonstrate harm to mammals, amphibians, or birds. Effects of field studies (Brooks et al. 1995) suggest observed changes to birds and mammals following treatment are habitat related, and not due to toxic effects. Imazapyr is one of the least toxic aquatic herbicides evaluated. Imazapyr is only slightly more toxic than the other ALS-inhibitors, all of which are the least toxic of any of the herbicides evaluated (SERA 2011d). No studies on invertebrates were found.
Metsulfuron methyl	Metsulfuron methyl is an ALS-inhibitor that does not appear to bioaccumulate. Metsulfuron methyl can be effective for invasive plants that are unsusceptible to other herbicides. None of the acute or chronic exposure scenarios exceeded the level of concern at the typical rate, and few exceeded the level of concern at maximum rate. Metsulfuron methyl has very low toxicity to birds for direct spray and consumption and no mortality of acute spray on honeybees. Aquatic invertebrates do not appear to be susceptible. One study on rove beetles indicated reduced egg hatching. Like other ALS-inhibitors, it is one of the least toxic of the herbicides evaluated (SERA 2004e).
Sulfometuron methyl	Sulfometuron methyl has the lowest risk to all groups of wildlife of the herbicides evaluated (with other ALS-inhibitors). All scenarios indicate no risk rating that exceeded the level of concern, although it may be moderately toxic to amphibians; Sulfometuron methyl can cause malformations in amphibians

	(SERA 2004f), but whether the malformations are caused by endocrine disruption, cellular toxicity, or other pathways has not been reported.
Triclopyr	Triclopyr is available as triethylamine (TEA) salt and butoxyethyl ester (BEE). Some formulations of the TEA salt of triclopyr have been labeled for aquatic invasive plant control. Triclopyr TEA is less toxic to wildlife than triclopyr BEE. The major metabolite of triclopyr, 3,5,6-trichloro-2-pyridinol (TCP) is more toxic than triclopyr to mammals. At the upper range of exposures, hazard quotients for triclopyr exceed the level of concern for mammals, but average hazard quotients do not exceed the level of concern for any exposure scenario. Triclopyr is practically non-toxic to slightly toxic to birds at the typical rate. Consumption of treated vegetation (and insects) is the greatest concern for birds or mammals. Using less toxic formulas reduces risk (SERA 2011d). No studies on invertebrates were found.
Available under Alternative 3 only	
Fluroxypyr	The Risk Assessment for fluroxypyr predicted that exposure to fluroxypyr would not pose a risk to most terrestrial wildlife (including pollinators) under any of the modeled exposure scenarios; the Risk Assessments indicate that there is a low risk under typical and maximum rates to susceptible pollinators under the 100 percent absorption scenario (direct spray). All other risk quotients were below the level of concern of 0.5 (acute high risk); Therefore, exposure of wildlife to this active ingredient by direct spray, contact with sprayed vegetation, or ingestion of plant materials or prey items that have been exposed to this active ingredient is not a concern from a toxicological perspective.
Hexazinone	Hexazinone inhibits photosynthesis and, at higher levels inhibits the synthesis of RNA, proteins, and lipids in plants. Hexazinone poses zero to moderate risk to mammals for ingestion under both acute and chronic scenarios. Birds are more tolerant than mammals (SERA 2005c). Studies of the effects on amphibians are not well documented.
Rimsulfuron	Data from the literature indicate that rimsulfuron has low toxicity to birds (AECOM 2014b). Based on a review of available ecotoxicological literature, rimsulfuron is characterized as not acutely toxic via dermal or oral routes of exposure to mammals. No toxicity studies for amphibians were found in the published literature.
Available for Research and Demonstration (Alternative 3)	
Fluazifop-P-butyl	The risk characterization of mammals and birds is constrained by the lack of field studies and is based solely on laboratory studies and modeled estimates of exposure. There are no data to suggest that levels of long-term exposure cause adverse effects in birds. For acute non-accidental exposures, hazard quotients are below the level of concern except for mammals and large birds consuming contaminated grass. This scenario is unlikely because fluazifop-P-butyl kills most treated grasses before wildlife has an opportunity to consume it. Based on the available toxicity data on the honeybee, fluazifop-P-butyl would not cause adverse effects following direct spray or surface contamination of the insect due to spray drift. Risks to reptiles and terrestrial phase amphibians cannot be characterized directly because of the lack of data.

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

Under the Proposed Action and Alternative 3, 95 percent of herbicide treatments on the Coos Bay District would be spot treatments to target specific plants, so that effects to non-target species would be minimized. Pre-project surveys would identify the presence of Special Status species and inform the Conservation Measures that would be applied (see Figure 3-2), including herbicide-free buffers. Risk ratings (the high/moderate/low/none, described in Table 3-11 above) are based on various exposure scenarios. Standard Operating Procedures and Mitigation Measures including limitation on the herbicide types and doses, handling procedures, application methods, drift minimization, and timing of application are designed to greatly reduce the likelihood that the modeled exposure scenarios described would actually occur, and thus reduce the described adverse effects to wildlife species, including Special Status species.

The District prepares an Annual Treatment Plan containing the invasive plant treatments planned for each year. These plans are subject to an interdisciplinary team review, which helps the District ensure that treatments conform to design and mitigation standards, and that the required Pesticide Use Proposals, Biological Control Agent Release Proposals, and other authorizations, obligations, and commitments are completed prior to

implementation. Projects that have the potential to disturb Special Status wildlife habitat require pre-project clearances, including review for potential habitat or pre-project site surveys (USDI 2008b).

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

As described earlier in this issue, the Oregon FEIS found that the likelihood of significant adverse effects to wildlife from contact with herbicides is negligible at the population scale; where there is potential for effects at the District level, those species are discussed further in subsequent sections. The conclusions presented regarding wildlife and Special Status species above apply to the species discussed in the following sections.

The following Project Design Feature included in the Proposed Action and Alternative 3 further minimizes the potential for effects to federally listed species:

- In listed species habitat, follow all Project Design Criteria outlined in the *Coos Bay BLM District Bureau of Indian Affairs/Coquille Indian Tribe FY2014 – 2018 Land Management Activities That May Affect Northern Spotted Owls or Marbled Murrelets* (USDI 2014a) (see Appendix A, *Protection Measures*) or future updates.

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

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

The Oregon FEIS determined that birds would generally avoid the treatment area during treatment because of noise and activity (USDI 2010a:253-254). As described in the Oregon FEIS, disturbance may disrupt normal behavior to the extent survival of adults is impaired or reproduction compromised depending 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); the herbicides proposed in this EA have a very short active period where wildlife toxicity could occur. Some pre-fledgling birds could be restricted to the treatment area and could be adversely affected by broad scale treatments using herbicides with moderate toxicity[61] (USDI 2010a:246-250). However, herbicide treatments on the Coos Bay District have usually been 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 and maximum rates.

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

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

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

How would herbicide treatments affect insects such as the Mardon skipper?

The Mardon skipper (*Polites mardon*) is a rare butterfly found only in grassland and open meadows, endemic to the states of Washington, Oregon, and California. On the Coos Bay District, the Mardon skipper is only known to occur in three meadows in the North Fork Hunter Creek ACEC, south east of Gold Beach, Oregon. (See *Native Vegetation* Issue 1 for further information about the North Fork Hunter Creek ACEC.) They are weak fliers and usually unable to disperse more than a few hundred yards (Black et al. 2010). They are strongly averse to Scotch broom and because they do not fly well, are particularly dependent on habitat quality, making them more susceptible to adverse effects from invasive plant infestations (Black and Vaughan 2005).

The Risk Assessments indicate that, for fluroxypyr, there is 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 Coos Bay District and would minimize the potential for adverse effects:

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

Conservation Measures were identified in the 2007 and 2016 Biological Assessments for Special Status wildlife to eliminate the potential for all significant effects, including the following for Special Status butterflies[62].

- To protect host and nectar plants from herbicide treatments, follow recommended buffer zones and other Conservation Measures for TEP[63] 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 or triclopyr to vegetation in TEP butterfly or moth habitat, utilize the typical, rather than the maximum, application rate.

A full list of Special Status insects on the District is included in Table 3-10. While no Conservation Measures were identified for other insect species, the following Project Design Feature included with the Proposed Action and Alternative 3 would minimize the potential for effects to other Special Status insects:

- Conservation Measures (see Appendix A) applicable to butterflies and moths[64] will be applied, as appropriate, for other Special Status insects.

In addition, the following Project Design Feature included with Alternative 3 would minimize the potential for effects to Mardon skipper:

- Do not use fluroxypyr at known Mardon skipper sites.

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

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

Pollinators include bees, bats, birds, and insects. They play an important role in flowering plant reproduction and the production of most fruits and vegetables. Habitat loss, disease, parasites, and environmental contaminants have all contributed to the decline of many species of pollinators. Effects from herbicides to pollinators would generally be related to habitat loss, not to the pollinators themselves; herbicides are formulated to work specifically on plants by disrupting the metabolic processes inherent in plants and not in other organisms. Several Special Status wildlife species may serve as pollinators on the Coos Bay District (See Table 3-10).

As described above, this issue is not analyzed in detail because, as described in the Oregon FEIS, effects would be minimal, and there is no meaningful difference between the alternatives. In addition, 95 percent (Proposed Action and Alternative 3) to 100 percent (No Action Alternative) of herbicide treatments would be spot treatments to target specific plants, so that effects to non-target species can be kept to a minimum. The herbicides analyzed in this EA were chosen in part because they were unlikely to have adverse effects to wildlife, including pollinators (USDI 2010a:245). The Oregon FEIS describes that adult honeybees are used as a surrogate for all invertebrates in Risk Assessments. Honeybees are nonnative and have been shown to favor non-native plant species and can differentially allow the non-native vegetation to compete against native plants (Goulson 2003 in USDI 2010a). The Risk Assessments (see Appendix C) indicate that there is low risk to bees or other insects in certain direct spray or vegetation consumption scenarios involving clopyralid, fluroxypyr, glyphosate, and triclopyr at typical (fluroxypyr and glyphosate) or maximum (clopyralid and triclopyr) rates and no risk from all other herbicides evaluated in this EA (the effects of 2,4-D and dicamba to insects were not evaluated as part of the Risk Assessment process). Additional information summarized from the Oregon FEIS is provided in Table 3-11.

The 2016 PEIS states that treatments that remove non-native plant species that: 1) inhibit the growth of native plant species used by pollinators, or 2) 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).

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

- Do not use 2,4-D in TEP butterfly/moth habitat.
- When conducting herbicide treatments in or near habitat used by TEP butterflies or moths, avoid use of the following herbicides, where feasible: clopyralid, glyphosate, imazapyr, picloram, and triclopyr.
- If conducting manual spot applications of glyphosate, or triclopyr to vegetation in TEP butterfly or moth habitat, utilize the typical, rather than the maximum, application rate.
- When conducting herbicide treatments in or near habitats used by Special Status and listed terrestrial arthropods, design treatments to avoid the use of fluroxypyr, where feasible. If pre-treatment surveys determine the presence of listed terrestrial arthropods, do not use fluroxypyr to treat vegetation.

Therefore, effects from the use of herbicides to Special Status insect pollinators would be minimal.

Human Health

Human Health Issue 1 (Not Analyzed in Detail)

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

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

As described in the *Recreation* Issue 1 later in this chapter, over 700,000 recreators visit the Coos Bay District's recreation sites annually. Local Tribes have treaty rights on BLM-managed 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. People live and work on or near the Coos Bay District or drive on roads or hike on trails across the District.

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

Tables 3-12 and 3-13 display a summary of information presented in the 2007, 2010, and 2016 EISs, showing the herbicides that have some level of risk (greater than 0) to the public in one or more Risk Assessment-modeled scenario. All other herbicides had no risk for any of the modeled scenarios of public exposure, including incidental handling, consumption, and contact with the skin.

Table 3-12. *Human Health Herbicide Risk Summary, Public*

Herbicides	Risk Category (worst-case scenario, one or more scenarios)				Treatment Acres (over life of plan)		
	Typical rate	Maximum rate			No Action	Proposed Action	Alternative 3
		Direct Spray	*Dermal Exposure*	*Consumption of Contaminated Substance*[2]			
Herbicides available under all alternatives							
2,4-D[3,5]	0	L[1]	0[1]	0[1,2]	149	361	361
Dicamba	0	0	0	L (water)	129	60	60
Glyphosate[3]	0	0	0	L (water)	7,690	1,808	1,808
Herbicides available under the Proposed Action and Alternative 3							
Clopyralid	0	0	0	L (water)	0	331	331
Diflufenzopyr[4]	0	0	0	0[2]	0	136	136
Triclopyr[3]	0	L[1]	L[1]	L[1,2] (water and fruit)	0	5,572	5,572
Herbicides available under Alternative 3							
Fluazifop-P-butyl	0	0	0	L (fish)	0	0	30

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. When applied on BLM-managed lands, diflufenzopyr is formulated with dicamba. Diflufenzopyr by itself poses no risk to human health under any scenario.
5. The use of 2,4-D increases by 142 percent under the action alternatives when compared to the No Action Alternative. Approximately half of this increase is due to the addition of invasive plants that are not listed as noxious weeds (e.g., burdock, iceplant, and sweetclover) to the plants that can be treated under the action alternatives and the other half is because under the action alternatives, 2,4-D can be tank mixed with herbicides that were not available under the No Action Alternative (i.e., clopyralid, chlorsulfuron, and metsulfuron methyl). Under the action alternatives, the use of 2,4-D on noxious weeds by itself or in combination with picloram, dicamba, or glyphosate decreases by 67 percent compared with the No Action Alternative. It should be noted that very little 2,4-D is currently used on the district (7.5 acres / year), which would increase to 18 acres / year.

Table 3-13. Effects of Herbicides[1] (Human Health)
Additional information about the risk ratings discussed below can be found in Appendix C, *Herbicide Risk Assessment Summaries*.

Herbicides available under all alternatives	
2,4-D	The public faces zero risk from all modeled scenarios except one; there is low risk to a child being sprayed over their entire body at maximum application rate. In the human health Risk Assessment conducted to support the reregistration of 2,4-D (USEPA 2004), the EPA concluded that there is not sufficient evidence that 2,4-D is an endocrine disrupting chemical.
Dicamba	The public faces zero risk from all modeled scenarios except one; there is low risk to the public from the consumption of water from a pond contaminated with a spill.
Glyphosate	For both workers and members of the public, there are no risks associated with nearly all exposures to glyphosate at the typical or maximum application rate (SERA 2011a). The Risk Assessment calculated no risk for all but one of the tested scenarios. There is low risk to children associated with accidental exposure to glyphosate through consumption of contaminated water after an herbicide spill at the maximum rate into a small pond. See also *Human Health* Issue 4.
Herbicides available under the Proposed Action and Alternative 3	
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 + Diflufenzopyr	(See dicamba, above. Diflufenzopyr poses no risk to human health under any scenario.)
Triclopyr	There is low risk to the public from triclopyr BEE applications at the maximum rate under four acute or accidental scenarios: 1) direct spray to the lower legs; 2) dermal contact with contaminated vegetation; 3) acute consumption of contaminated fruit; and 4) acute consumption by a child of pond water contaminated by a spill. There is low risk to the public from triclopyr acid (TEA) applications at the maximum rate for acute consumption by a child of pond water contaminated by a spill, and for chronic consumption of contaminated fruit.
Herbicides available under Alternative 3	
Fluazifop-P-butyl	There is low risk to subsistence population from fluazifop-P-butyl applications at the maximum rate after an accidental spill.

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 below would actually occur, and thus reduce the described adverse effects. As shown in Table 2-10 (*Treatment Key*), 2,4-D, dicamba, and fluazifop-P-butyl would be used at the maximum rate in some instances (see Table D-3, *Estimated Total Treatment Acres, 20-Year Analysis Period*):

- 2,4-D on 7.3 acres over the life of the plan (an average of 0.4 acres per year) under the Proposed Action and Alternative 3 or 3.5 acres under the No Action Alternative (approximately 0.2 acres annually);
- Dicamba on 4 acres over the life of the plan under the No Action Alternative and 1.5 under the action alternatives; and
- Fluazifop-P-butyl on 30 acres under Alternative 3.

Therefore the only scenarios with risk that are theoretically possible under the alternatives are associated with accidental applications:

- a low risk associated with a child being sprayed over their entire body with 2,4-D at the maximum rate;

- a low risk to the public from consuming dicamba contaminated water after an accidental spill; or
- a low risk to a subsistence population from eating contaminated fish after an accidental spill of fluazifop-P-butyl.

As described in *Water* Issue 1, accidental spills directly into water are not expected to occur. Targeted application methods and Protection Measures would prevent these scenarios from happening. Under the Proposed Action and Alternative 3, 95 percent of herbicide treatments on the Coos Bay District would be spot treatments, generally done with a hand-directed sprayer, to target specific plants so that effects to non-target species can be kept to a minimum. Effects from broadcast treatments on non-target plants would be minimized by the application of Protection Measures (see below).

Standard Operating Procedures, PEIS Mitigation Measures, and Oregon FEIS Mitigation Measures designed to reduce potential unintended effects to human health are listed in Appendix A. Specific Standard Operating Procedures and Mitigation Measures pertinent to this analysis include:

- 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[65].
- Use the typical application rate, where feasible, when applying 2,4-D and triclopyr to reduce risk to workers and the public.
- Consideration should be given to herbicides other than 2,4-D; use of 2,4-D should be limited to situations where other herbicides are ineffective or in situations in which the risks posed by 2,4-D can be mitigated.
- Proposals to boom spray herbicides within 200 feet of streams that are within 1,000 feet upstream from a public water supply intake, or spot apply herbicides within 100 feet of streams that are within 500 feet upstream from a public water supply intake, will include coordination with the Oregon Department of Environmental Quality and the municipality to whom the intake belongs.
- Establish a buffer between treatment areas and human residences based on guidance given in the Human Health Risk Assessment, with a minimum buffer of 100 feet for ground applications, unless a written waiver is granted.
- Consider the potential for treatments to affect communities from herbicide-contaminated resources originating from the BLM, such as subsistence resources or water used downstream for human or agricultural uses.

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

[65] 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 the *Traditional and Cultural Uses* Issue 1).

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

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

Treatments in this EA are targeted towards invasive plants, which – with some exceptions – are generally not plant species being collected or ingested. Triclopyr 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 would generally only occur in areas where they threaten Special Status plants, along roadsides where they are limiting access, or where forest management projects have recently contributed to the spread of invasive plants. These areas are generally not collection areas. In addition, treatments typically happen before fruit is present and signs are posted at treatment areas to inform the public of the application of herbicides.

With the exception of triclopyr (described above), the herbicides that are low risk (under maximum rates) in contaminated water scenarios (see Table 3-12) are unlikely to contaminate water, as they are not registered for aquatic use and hence, would not be used in riparian areas where they could contaminate water.

No herbicides present moderate or high risks to human health under any scenario. The consumption of contaminated wildlife by humans was not evaluated, but large mammalian carnivores only had risks greater than zero in scenarios that involved 2,4-D (low risk at typical and maximum rates), triclopyr (low risk at maximum rates), and dicamba + diflufenzopyr (low risk at typical rate and moderate risk at maximum rate, under chronic exposure scenarios). However, the potential for actual effects is negligible. As described in the *Wildlife* Issue 3, larger animals (such as deer, rabbits, or birds) are unlikely to remain in a treatment area while treatments are occurring. These animals may return to the treatment site and consume treated vegetation, but since 95 percent of herbicide treatments would be spot treatments, it would be unlikely that an animal could consume enough treated vegetation to reach the levels analyzed in the Risk Assessment scenarios. Triclopyr and dicamba + diflufenzopyr would not be applied at maximum rates (see Table 2-10 *Treatment Key*).

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

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

The Oregon FEIS describes that the Risk Assessments apply uncertainty factors (multiplying the lowest observable effects by a factor of 10, 100, or even 1,000 to get a level of concern), which are included to account for hypersensitive individuals and otherwise accommodate uncertainties into the measurements. Thus, herbicide exposure to a healthy (not susceptible) individual to a dose identified as having a risk would likely have no effect. Nevertheless, the low rating indicates that the potential for risk starts at that level of concern (USDI 2010a:91). Therefore, the general assessment of the possible effects to humans in the *Human Health* sections of those documents includes those with chemical sensitivities. Risk Assessments scenarios include scenarios with children and women (see Appendix C, *Herbicide Risk Assessment Summaries*).

At the maximum rate, only 2,4-D and triclopyr pose risk to the public from direct spray or dermal exposure. Triclopyr would not be applied at the maximum rate. Of the 360 acres on which 2,4-D would be used over the life of the plan under the Proposed Action or Alternative 3, only 7.3 acres (or 2 percent) would be at the maximum rate. Protection Measures, such as herbicide application buffers and restricting application methods to spot spraying (triclopyr), would further reduce risk to susceptible populations (see Appendix A – *Protection Measures*).

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). As described in the *Neighboring Lands Pesticide Use* section in Chapter 2, BLM use of herbicides is a small fraction (0.03-0.04 percent) of the pounds of pesticides used in the water basins containing Coos Bay District-managed lands. Herbicides would not be sprayed aerially and drift reduction strategies would be applied to spot and broadcast treatments.

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

This was not analyzed in detail because effects were previously described in the analysis for the Oregon FEIS and 2007 and 2016 PEISs and there are no new circumstances or information at the site-specific level that would change the effects anticipated for this EA. Tables 3-12 and 3-13 show that four herbicides (dicamba, glyphosate, triclopyr BEE, and clopyralid) have some level of risk (greater than 0) at maximum application rates to the public in one or more Risk Assessment-modeled scenarios involving contaminated water. All of the scenarios with some amount of risk involved accidental spills. Specific to spills, the following Standard Operating Procedures minimize the potential for spills:

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

In addition, a variety of Standard Operating Procedures and Mitigation Measures reduce the potential for herbicides to contaminate water that may be consumed by humans. These measures are listed in full in Appendix A, *Protection Measures*. They include, but are not limited to:

- To protect domestic water sources, no herbicide treatments should occur within 100 feet of a well or 200 feet of a spring or known diversion used as a domestic water source unless a written waiver is granted by the user or owner (Oregon FEIS Mitigation Measure).
- Proposals to boom spray herbicides within 200 feet of streams that are within 1,000 feet upstream from a public water supply intake, or spot apply herbicides within 100 feet of streams that are within 500 feet upstream from a public water supply intake, will include coordination with the Oregon Department of Environmental Quality and the municipality to whom the intake belongs (Oregon FEIS Mitigation Measure).
- Use appropriate herbicide-free buffer zones for herbicides not labeled for aquatic use based on Risk Assessment guidance, with minimum widths from water of 25 feet for vehicle, and 10 feet for hand spray applications.

Human Health Issue 2 (Not Analyzed in Detail)

What are the hazards to workers treating invasive plants?

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

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 (especially when cutting trees[66]), tripping or slipping on hazards on the ground, protruding objects such as branches and twigs, poisonous plants and insects, and dangerous wildlife. Workers are subject to heat-related illness (potentially exacerbated by safety equipment such as chainsaw chaps or face guards) or hypothermia when working in extreme weather conditions, and may incur musculoskeletal injuries related to improper body mechanics (USDI 2010a:343-345). Table 3-14 shows herbicides that have some level of risk (greater than 0) to applicators in one or more Risk Assessment-modeled scenario.

Table 3-14. *Human Health Herbicide Risk Summary, Workers*

Herbicides	Risk Category (worst-case scenario, one or more scenarios)			Treatment Acres over life of plan (Acres applied at the maximum rate)		
	Typical rate	Maximum rate	Accidental Exposure	No Action Alternative	Proposed Action	Alternative 3
2,4-D	L	L[1]	M	149 (3.5)	361 (7)	361 (7)
Chlorsulfuron	0	L	0	0	188 (0)	188 (0)
Dicamba	0	L	0	129 (4)	60 (2)	60 (2)
Hexazinone	0	L[1]	0	0	0	90 (0)
Rimsulfuron	0	0	M-H	0	0	138 (138)
Triclopyr	0	L[1]	L	0	5,572 (0)	5,572 (0)

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

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

- For 2,4-D and triclopyr, workers face moderate risk from wearing contaminated gloves for an hour (USDI 2010a:349-350).
- Chlorsulfuron and dicamba at the maximum rate can cause temporary skin or eye irritation to applicators (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 2010a:348, USDI 2017a:4-102).

Further information about these modeled scenarios can be found in each herbicide's human health Risk Assessment (See Appendix C, *Herbicide Risk Assessment Summaries*).

No injuries to herbicide applicators from herbicide exposure have been recorded for at least the past 20 years on BLM-managed lands in Oregon (Erin McConnell, Oregon BLM State Weed Coordinator, 2018 personal communication).

The potential for an injury (from manual, mechanical, or chemical treatments) is exacerbated if workers are fatigued, poorly trained, poorly supervised, or do not follow established safety practices. Appropriate training, together with monitoring and intervention to correct unsafe practices, minimizes potential for worker injury and illness. 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-managed 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 and completing a one-week training course is required.

[66] Treatments for woody species, such as tree-of-heaven and locust, are included in Woody Species treatment group (see Table 2-10).

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

Human Health Issue 3 (Not Analyzed in Detail)

What are effects to human health of mixing two or more herbicides? Are these combinations more toxic than herbicides used individually?

This is not analyzed in detail because the effects discussed in *Human Health* Issue 1 (incidental/public exposure) and *Human Health* Issue 2 (worker exposure) reflect the potential effects of using two or more herbicides in combination. Some formulations (brands) approved for use on BLM-managed lands contain more than one herbicide active ingredient (see Table B-2, *Herbicide Formulations Approved for use on BLM-managed Lands*). Others can be mixed in the field (tank mix). Herbicides can only be used 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 BLM's nationally approved herbicide formulations list is based on the herbicide Risk Assessments, which considered evaluations of common tank mixes and current research on synergistic effects (with other pollutants found in water, for example). Uncertainty is acknowledged in the analysis, and accommodated in part by requiring the use of conservative risk ratings and mitigation. 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. It is understood that 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 increase effectiveness and decrease the likelihood of missing otherwise resistant plants (USDI 2010a:62).

Human Health Issue 4 (Not Analyzed in Detail)

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

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

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[67]. The Risk Assessment for glyphosate states, "Three specific tests on the potential effects of glyphosate on the endocrine system have been conducted and all of these tests reported no effects. The conclusion that glyphosate is not an endocrine disruptor is reinforced by epidemiological studies that have examined relationships between occupational farm exposures to glyphosate formulations and risk of spontaneous miscarriage, fecundity, sperm quality, and serum reproductive hormone concentrations… the approach taken in the Risk Assessment is highly conservative and no recent information has been encountered suggesting that this Risk Assessment is not adequately protective of any reproductive effects that might be associated with glyphosate exposure." However, a recent study by Benachour and Seralini (2008) shows potential endocrine disruption, DNA damage, and toxicity of

[67] The Oregon FEIS discusses results from a 2002 Risk Assessment. The 2011 Risk Assessment, also done by SERA, include similar results (SERA 2011a).

POEA and possibly alpha-amino-3-hydroxy-5-methyl-4- isoxazolepropionic acid (AMPA, the major glyphosate degradate) in human cell cultures. This is a single study and scientists rely on the weight of evidence of multiple studies, which have not identified these adverse effects. These new findings need to be confirmed by other studies." (USDI 2010a:350)

In March 2015, the IARC, the specialized cancer agency of the World Health Organization (WHO), added glyphosate to Group 2A, *probably carcinogenic to humans*. In May 2016, the Food and Agriculture Committee of the WHO held their regular Joint Meeting on Pesticide Residues (JMPR), where they found that glyphosate was "unlikely to pose carcinogenic risk from exposure through diet." The WHO also stated that the conclusions arrived at by the JMPR and the IARC were "different, yet complementary" noting that "the IARC reviews published studies to identify potential cancer hazards, it does not estimate the level of risk to the population associated with the hazard." The IARC defines a cancer *hazard* as an agent that is capable of causing cancer under some circumstances, while a cancer *risk* is an estimate of the carcinogenic effects expected from exposure to that substance. The distinction between 'hazard' and 'risk' is important. The IARC identifies cancer hazards even when risks are very low at current exposure levels. Their list of carcinogens describes the level of evidence that something can cause cancer, not how likely it is that something will cause cancer in any particular person. Other agents listed in Group 2A include drinking hot beverages (over 149° F), eating red meat, and indoor emissions of burning wood (IARC 2015, JMPR 2016).

However, in June 2016, Reuters reported that court documents from an ongoing legal case against Monsanto (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 Dezell 2016).

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

Soil

Soil Issue 1 (Not Analyzed in Detail)

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

This issue was not analyzed in detail because effects are unlikely to differ between the alternatives and because effects are expected to be negligible. The nature of the disturbance associated with invasive plant treatments would have little potential to cause measurable soil compaction or erosion due to the low intensity and limited scale of treatments on the Coos Bay District. In addition, if there are site conditions in which adverse effects may result, the BLM would apply Protection Measures that minimize the potential for effects; the risk of adverse effects would be further minimized as a result of Project Design Features adopted for the Proposed Action and Alternative 3.

More than 90 percent of Coos Bay soils have a low clay content (less than 25 percent) and a high organic matter, which make the soils less susceptible to compaction. There are exceptions; for example, the Dean Creek Elk Viewing Area is compacted by elk herds, as well as previous and ongoing management activities. Levels of organic matter and clay can vary widely within a small area; however, they are generally described below, using the four soils order on the Coos Bay District. Inceptisols are the most widely distributed soils, present on 88 percent of the District. They have high infiltration rates, low amounts of clay, and are typical of forested areas. Ultisol soils (11 percent of the District) have high amounts of organic matter, and good drainage and are typical of forested areas. The remaining soils types make up 1 percent or less of the District. The Coos Bay District soils are not prone to water erosion, with low to medium average water erosion risk ratings for all soil types. (Soils that do not compact easily allow for the water to infiltrate subsurface, which reduces the risk for water erosion. See Range K-Factor, Table 3-15.) Less than 1 percent of the District soils have a high risk for water erosion.

Table 3-15. *Soil Order Properties and Extent*

Soil Order	Average % Organic Matter[1]	Average % Clay	Range K-Factor [Water Erosion] (Risk Rating[2])	Approximate Acres/Percent of BLM-Administered Lands[3]
Inceptisols	29	19	0.05 to 0.37 (Low - Medium)	281,300 acres/88%
Ultisols	28	24	0.17 to 0.37 (Low - Medium)	33,600 acres/11%
Entisols	4	8	0.02 to 0.37 (Low - Medium)	2,600 acres/0.8%
Alfisols	3	22	0.28 to 0.43 (Medium - High)	2,200 acres/0.7%

1. Average organic material and clay contents derived from A horizon for all soils within the order, not the entire profile
2. K Factor Erosion Risk Rating: Low = 0.05 to 0.2, Medium = 0.21 to 0.40, High = 0.41+. Erosion factor K appears in the Universal Soil Loss Equation (Wischmeier and Smith 1978) as a relative index of susceptibility of bare cultivated soil to particle detachment and transport by rainfall.
3. Only represents soil orders that are greater than 0.5% of total acres on District. Therefore, Andisols (940 acres), Histosols (95 acres), Millisols (101 acres), and Spodosols (194 acres) are not included in this table.

Seventy-one percent of invasive plant infestations on the District are on sites less than 0.5 acres. Under the No Action Alternative, all herbicide treatments would be done as spot treatments with a hand-directed sprayer and under the action alternatives, 95 percent of herbicide treatments would be similar spot treatments. These treatments would not be expected to create large unvegetated areas that would be prone to compaction or erosion. Invasive plants on the District tend to occur in previously disturbed areas; hence, herbicide applications are generally made from roads and other previously disturbed surfaces, where compaction or erosion may have already occurred. Competitive seeding and planting would be used under all alternatives on larger sites to aid in revegetation and to help prevent soil erosion and compaction that could occur in large unvegetated areas. This would typically happen on treatment sites larger than 0.5 acres, and the extent of it would not change between the alternatives. Competitive seeding and planting may be preceded by tilling to decompact the soil and increase the success of the seeding. Targeted grazing with sheep or goats (for forbs and woody vegetation) and cattle

(grasses) would not be a preferred treatment method for any treatment group, and are proposed for less than one percent of treatments. Given its extremely limited use as well as the application of Protection Measures that would prevent effects that result from intensive grazing, any erosion or compaction would be negligible and short-term. Treatment of some small invasive plant sites may be done utilizing a hand held propane torch. Treatments would be limited to individual plants, and used primarily in parking lots and other areas where the substrate is non-flammable, like sand or paved areas. Because of the limited use and site conditions, propane torches would not contribute to erosion or compaction. With the exception of treatments done with tractors, discs, or bulldozers (discussed below), mechanical methods such as string trimmers or mowers tend to disturb little or no soil, removing the plant at the base and leaving the roots intact. Prescribed fire would be used on approximately 100 acres annually[68]. This could lead to compaction if heavy machinery is used to pile vegetation or erosion if large amounts of vegetation are removed. However, all prescribed fire treatments would follow Standard Operating Procedures (see Appendix A) as well as Fire and Fuels Management Best Management Practices described in the *Northwestern and Coastal Oregon Resource Management Plan* (USDI 2016d:162-167). These Protection Measures would minimize the potential for adverse effects.

Sandy soils (in the Entisol soil order) are present in the North Spit and New River area of the District. These soils are not prone to compaction due to their uniform grain size. Widespread European beachgrass in these sandy areas is removed with tractors, discs, or bulldozers. The exposure of bare sand can lead to increased wind erosion, but the movement of sand is natural to that environment. This sand movement will not affect any water bodies or existing infrastructure (e.g. Sand Road). The foredunes are a sand ridge that forms parallel to the coast and acts as stability feature (like a sea wall) from ocean and wind processes. Under the No Action Alternative and the Proposed Action, the stability of the foredune would be protected as described in existing management plans and interagency agreements. (See the description of the alternatives in Chapter 2 for further information.) Under the Alternative 3, the following Project Design Feature would be adopted to reduce effects:

- All guidelines established in potential future North Spit western snowy plover NEPA would be done in conjunction with the U.S. Army Corps of Engineers.

As a result, erosion is not a concern in sandy environments following invasive plant treatments.

Due to the nature of the treatments, the soils present on the District, and the application of Protection Measures, invasive plant treatments would not lead to soil compaction or erosion. By removing invasive plants, the normal soil protection processes and vegetation and soil armoring are returned over the long term. Improved effectiveness in treating invasive plants and retention of larger amounts of non-target vegetation will inhibit further invasive plant establishment.

Soil Issues 2 and 3 (Not Analyzed in Detail)

How do herbicides break down and move through soils?
Do herbicides affect soils?

Because both issues discuss how soil characteristics influence the way in which they interact with herbicides, these issues are discussed together. These issues were not analyzed in detail because effects were previously described in the analysis for the Oregon FEIS and the 2007 and 2016 PEISs (USDI 2010a:178-187, USDI 2007a:4-16, USDI 2016a:4-10 to 4-13) and there are no new circumstances or information at the site-specific level that would change the effects anticipated for this EA. Additional analysis at this site-specific level would not change the conclusions from the Oregon FEIS and the 2007 and 2016 PEISs. The type of actions and the amount of treatments under all alternatives would be consistent with the actions analyzed in the 2010 Oregon FEIS and the 2007 and 2016 PEISs. The same Standard Operating Procedures and Mitigation Measures analyzed in those documents would be applied to all alternatives in this EA.

[68] Under the No Action Alternative, this has occurred as a habitat restoration activity. Under the action alternatives, this would occur as an invasive plant treatment.

As described in the Oregon FEIS, soil consists of varying levels of sand, silt and clay particles, organic matter, and soil organisms. Soil filters, buffers, degrades, immobilizes, and detoxifies organic and inorganic materials, including herbicides (USDA 1997 as cited in USDI 2010a:174). The ability of soils to hold and break down herbicides is affected by biological processes (organisms and plant uptake), physical parameters (adsorption, volatilization, hydrolysis, and leaching), and other parameters (climate and vegetative cover)(see Table 3-16, *Fate of Herbicides in Soils*). Soils in the Coos Bay District weather from a variety of parent materials like sedimentary rock, volcanic deposits, and metamorphic rocks. The Coos Bay District also has beach and dune (sand) deposits.

Information about soils and its characteristics on the Coos Bay District comes from the Natural Resources Conservation Service's (NRCS) Soil Web Survey (USDA 2016a). In general, soils on the Coos Bay District are porous and have a moderately high to very high[69] hydraulic conductivity class. This means that even if the soil is saturated, the soil has a high ability to transmit water. Organic matter content is considered the most important soil property affecting herbicide adsorption. Pesticides are very strongly attached to the surface of organic matter and less likely to leach in soils high in organic matter (USDI 2007a:4-11). Most of the soils on the District (98.5 percent) have a high (greater than 4 percent) percentage of organic matter (see Table 3-15, *Soil Order Properties and Extent*). The adsorption affinity of these two conditions (high hydraulic conductivity and high organic matter) are in contrast to one another. Therefore, it can be assumed that the adsorption affinity across the District varies, but in general is moderate to high. However, some herbicide adsorption rates, like imazapyr, imazapic, and picloram, depend on chemical characteristics of the soil. Picloram degrades slower in soils with a pH greater than 7 (1 percent of soils on the District), whereas imazapyr and imazapic degrade slower in soils with a pH greater than 5 (42 percent of soils on the District) (USDA 2016a, USDA 2000b as cited in USDI 2010a:184 and Tu et al. 2004 as cited in USDI 2015a). Table 3-16 shows the fate of herbicides in soils; that is, how long these herbicides would be expected to remain in the soil (USDI 2010a:59-61, 181, USDI 2007a:4-15 to 4-21, USDI 2016a:4-10 to 4-13). While herbicides are generally not expected to affect the attributes of soil except as described below, this information is presented as context for other resources (e.g., water, vegetation, and fish) which could be exposed to herbicides attached to or persisting in soil. In the cases where herbicide could move down through the soil, the main concern is groundwater contamination (discussed further in *Water* Issue 1).

The Oregon FEIS describes that herbicides probably affect few soil organisms directly (USDI 2010a:178). While there are varying amounts of information available for each herbicide, three (chlorsulfuron, picloram, and metsulfuron methyl) may reduce the presence of soil biota for a period of up to three weeks, and the remaining have no or slight adverse effect (USDI 2010a:182-185, USDI 2007a:4-16, USDI 2016a:4-11 to 4-13). When adverse effects were noted (diflufenzopyr, imazapic, or imazapyr), it was at application rates many times higher than those used by the BLM (USDI 2010a:178).

Fluazifop-P-butyl, proposed for use in limited areas for research and demonstration under Alternative 3, was not analyzed in the EISs to which this document tiers. The Risk Assessment for fluazifop-P-butyl says it could have adverse effects on terrestrial arthropods at the treated site, but functional recovery (i.e., repopulation) within one year would be expected and no effects would be expected at a distance of 100 feet from the treated site, indicating highly localized, temporary effects (SERA 2014).

Herbicides can affect biological soil crusts. Although soils of the Coos Bay District contain concentrations of microorganisms, they rarely, if ever, develop biological soil crusts; winter storms are too wet.

Except for applications of imazapic and rimsulfuron on grasses, treatments would be applied to foliage. Vegetation would absorb the herbicide and the quantity that might come in contact with the soils would be minimal.

[69] See also Table 3-17, *Median Saturated Hydraulic Conductivity (Ksat) values for BLM land within the Analysis Area*. Measured in feet per day across BLM-administered land within the Coos Bay District: 69 percent very high (Ksat values above 28), 24 percent high (Ksat between 2.8 and 28), and 8 percent moderately high (Ksat values between 0.28 and 2.8).

Chlorsulfuron and metsulfuron methyl may reduce populations of microorganisms for a few days to a few weeks. The combined treatment areas of these herbicides is 653 acres over the life of the plan. These herbicides would have a negligible effect on soil as treatments would be dispersed and organisms would easily recolonize within several weeks.

Under Alternative 3, up to 172 acres annually of glyphosate and imazapyr would be used in western snowy plover habitat restoration areas. Glyphosate rapidly degrades in soils through microbial degradation. Imazapyr will take longer to break down (see Table 3-16, *Fate of Herbicides in Soils*); however, the pH of the local sand environments is between pH 5.3 and pH 6.2, which are below the pH 7 threshold where adsorption is lower.

Only five percent of herbicide treatments of the Proposed Action and Alternative 3 would be broadcast applications where contact with the soil could be expected. However, these treatments would occur on dense infestations of blackberry. Because the canopy of these infestations is continuous, herbicides are not expected to drift onto soil.

The herbicides that would be most used under the Proposed Action are triclopyr (40 percent), aminopyralid (15 percent), glyphosate (15 percent), and imazapyr (10 percent). All other herbicides would be used on 5 percent or less of treatments (25 acres or less a year, on sites distributed throughout the District) and would cumulatively make up 20 percent. The fate of the herbicides in soils is summarized in Table 3-16. Triclopyr is rated as moderately persistent in soils. Degradation occurs primarily through microbial metabolism, but degradation by water (hydrolysis) and light (photolysis) can be important. As plants die, release of triclopyr to the soil can occur and it can then be taken up by other plants. Aminopyralid is rated as non-persistent to persistent depending on soil type with low to intermediate potential for leaching or runoff. As described above, imazapyr (15 percent) would degrade slowly because of the soil pH. Glyphosate (10 percent) is tightly adsorbed to soil and is rapidly degraded by microbes (thus, has no soil activity). The use of glyphosate would drop by 75 percent when compared to the No Action Alternative. Given the small quantity of the remaining herbicides used and the distribution across the District, localized effects to soil function from all other herbicides would be negligible.

Table 3-16. *Fate of Herbicides in Soils*

Herbicide	Soil Half-life[1] *Aerobic (Anaerobic)*	Soil Adsorption (K_{oc})[2]	Fate in Environment (Persistence Rating[3])	SPISP II[4] Ratings (potential)		
				Leaching (PLP)[5]	*Solution Runoff (PSRP)[6]*	*Adsorbed Particle Runoff (PARP)[7]*
Herbicides available under all Alternatives						
2,4-D	10 *(333)*	Acid/Salt: 20 mL/g Ester: 100 mL/g	Rapid microbial degradation within 1-4 weeks. (Non-Persistent)	Inter-mediate	Inter-mediate	Inter-mediate
Dicamba	14 *(141)[8]*	2 mL/g	Mobile in soil but is easily degraded by microbes. (Non-Persistent)	High	Inter-mediate	Low
Glyphosate	47 *(12 to 70)*	24,000 mL/g	Tightly adsorbed to soil and rapidly degraded by microbes, thus no soil activity. Adsorption is governed mainly by binding to the mineral components (PRI 2008 as cited in USDI 2015a). The sorption is not dependent on the pH level (PRI 2008 as cited in USDI 2015a). Penetration into soils depends on soil type, with this herbicide reaching depths of 4 to 12 inches in clay or loam soils and 8 to 18 inches in sandy soils depending on rainfall events (SERA 2011a). (Moderately Persistent)	Very Low	Inter-mediate	Low
Picloram	20-300 *(> 500)*	16 mL/g	Very slow microbial degradation and some photo-decomposition. Picloram is persistent for a year or more. Persistence is dependent on soil moisture and temperature; warm and moist soils degrade this herbicide rapidly. Picloram dissipates most slowly when soils are alkaline (> pH 7), fine textured (clay) and low in organic matter (USDA 2000b as cited in USDI 2010a:184). (Moderate to Persistent)	High	High	Inter-mediate
Herbicides available under the Proposed Action and Alternative 3						
Aminopyralid	32 to 533 *(462 to 990)*	1.05 to 24.3 mL/g	Broken down in the soil by microbes and sunlight. Main mode of degradation is microbial metabolism in soils, which can be slow in some soils, especially at lower soil depths and very slow in aquatic systems. Weakly sorbed to soil, so unlikely to be transported off-site by wind-blown soil. High potential for surface water runoff. Leaching has not been documented at levels below 30 centimeters. (Non-Persistent to Persistent, depending on soil type)	Low	Inter-mediate	Inter-mediate
Chlorsulfuron	40 *(109 to 263)*	40 mL/g	Relatively rapid degradation by microbial and chemical actions, trace amounts have extreme bioactivity (works well at low doses). (Moderately Persistent)	High	High	Inter-mediate
Clopyralid	40 *(> 1000)*	6 mL/g, ranges to 60 mL/g	Biodegradation is rapid in soil, reducing the potential for leaching or runoff. Degraded primarily by microbial metabolism. Resistant to degradation by sunlight, hydrolysis, or other chemical degradation. Water-soluble, does not bind strongly with soils, and has the potential to be highly mobile in soils, especially sandy soil. Not highly volatile. Possible release of herbicide from decaying plants with uptake by other plants. (Moderately Persistent)	High	Inter-mediate	Low
Diflufenzopyr	2 to 14 *(20)*	18 to 156 mL/g (avg. 87)	Biodegradation, photolysis, and hydrolysis are the primary mechanisms that remove diflufenzopyr from soil. (Non-Persistent)	Low	Inter-mediate	Low
Imazapic	120 to 140 *(> 1000)*	137 mL/g	Most imazapic is lost through bio-degradation. Sorption to soil increases with decreasing pH and increasing organic matter and clay content. (Persistent)	Inter-mediate	Inter-mediate	Low

Herbicide	**Soil Half-life**[1] *Aerobic (Anaerobic)*	**Soil Adsorption (K_{oc})**[2]	**Fate in Environment (Persistence Rating**[3]**)**	**SPISP II**[4] **Ratings (potential)**		
				Leaching (PLP)[5]	*Solution Runoff (PSRP)*[6]	*Adsorbed Particle Runoff (PARP)*[7]
Imazapyr	25 to 141 *(> 500)*	100 mL/g	Adsorption is affected by aluminum and iron in soil more than by clay and organic matter, subject to microbial degradation except in cool temperatures. Adsorption is lower not only in soils with higher pH (> 5), but those with wetter conditions, lower organic matter, and sandier substrates (Tu et al. 2004 as cited in USDI 2015a). (Moderate to Persistent)	High	High	Inter-mediate
Metsulfuron methyl	30 *(338)*	35 mL/g	Degradation by hydrolysis. (Non-Persistent)	High	High	Inter-mediate
Sulfometuron methyl	20 *(60)*	78 mL/g	Relatively rapid microbial and chemical degradation. However, trace amounts can be have an impact due to extreme bioactivity (works well at low doses). (Non-Persistent)	Inter-mediate	High	Low
Triclopyr	46 *(< 1)*	20 mL/g (salt) 780 mL/g (ester)	Degradation occurs primarily through microbial metabolism, but photolysis and hydrolysis can be important. As plants die, release of triclopyr to the soil can occur and it can then be taken up by other plants. (Moderately Persistent)	High	High	Inter-mediate
Herbicides available under Alternative 3						
Fluroxypyr	7 to 23 *(3.5 to 14)*	50 to 136 mL/g	Mobile to very mobile in soil, but its movement is reduced by its quick initial microbial degradation. Degrades first to the pyridine and then to the methoxypyridine, which is persistent and has a high tendency to adsorb to soil, and is slowly degraded by microbial degradation and volatilization. Generally not found below a soil depth of 6 inches; varies depending on soil type (may be found deeper in coarser (sandy) soils) and rainfall. (Not Persistent)	Inter-mediate	High	Low
Hexazinone	90	54 mL/g	Soil organic matter content does not affect adsorption. Relatively low affinity for soil particles and dissolves in soil water. Biodegradation occurs as the plant uptakes it, and ties it up or degrades it. (Moderate to Persistent)	High	High	Inter-mediate
Rimsulfuron	5 to 40 *(18)*	19 to 74 mL/g	Breaks down rapidly in soil, with aerobic metabolism the primary route of degradation. Its mobility in soil ranges from moderate in clay and silt loams to very mobile in sandy loams. Its tendency to adsorb to soil varies by soil type, and is greatest in soils with high organic matter or clay content. Rimsulfuron has a low risk of leaching to groundwater. (Not Persistent to Moderately Persistent)	Inter-mediate	Inter-mediate	Low
Allowed in limited areas as part of Research and Demonstration under Alternative 3						
Fluazifop-P-butyl	15 *(> 2)*	5700 mL/g	Degraded primarily through microbial metabolism and hydrolysis, but not degraded readily by sunlight. Binds strongly with soils, so it is not highly mobile (Non-Persistent)	Low	Inter-mediate	Inter-mediate

1. Half-life in days. Aerobic soils are drier and anaerobic soils are wetter (e.g., in riparian areas).
2. K_{oc}: Soil organic carbon sorption coefficient of an active ingredient in mL/g. For a given chemical, the greater the K_{oc} value, the less soluble the chemical is in water and the higher affinity the chemical has for soil organic carbon. For most chemicals, a higher affinity for soil organic carbon (greater K_{oc}) results in less mobility in soil.
3. Persistence based on aerobic half-life. Non Persistent: less than 30 days; Moderately Persistent: 30 to 100 days; and Persistent: greater than 100 days (defined by Extoxnet Pesticides)
4. The source for this data is SPISP II = Soil Pesticide Interaction Screening Procedure version II
5. PLP: Pesticide Leaching Potential indicates the tendency of a pesticide to move in solution with water and leach below the root zone. A low rating indicates minimal movement and no need for mitigation.
6. PSRP: Pesticide Solution Runoff Potential indicates the tendency of a pesticide to move in surface runoff in the solution phase. A high rating indicates the greatest potential for pesticide loss in solution runoff.
7. PARP: Pesticide Adsorbed Runoff Potential indicates the tendency of a pesticide to move in surface runoff attached to soil particles. A low rating indicates minimal potential for pesticide movement adsorbed to sediment, and no mitigation is required.
8. Source: USEPA (2006)

Water Quality

Water Quality Issue 1

How would herbicide use affect the quality of surface water and groundwater used for domestic water supply?

Analytical Methods

The BLM bases the following conclusions regarding the risk of herbicide use to water quality on a review of GIS spatial data, State and Federal information, professional literature, and herbicide use expertise, both internal and external. The BLM uses Natural Resources Conservation Service (NRCS) median depth to highest water table[70] (Map 3-1, *Depth of Ground Water*) and median saturated hydraulic conductivity[71] data (Map 3-2, *Saturated Hydraulic Conductivity* and Table 3-17), Oregon Water Resources Department (OWRD) and consultant depth to water table data, herbicide movement values and ratings (Table 3-18), and United States Geological Survey aquifer descriptions to evaluate the potential for herbicide movement to groundwater. In addition, the BLM uses Oregon Department of Environmental Quality (ODEQ) and Oregon Health Authority information on water quality and drinking water protection, and OWRD information on water rights to provide a proximity context for herbicide treatments on BLM land and the location of source water areas for public water systems and known private points of diversion. The BLM then uses Risk Assessments (Appendix C) to evaluate how herbicides affect water quality and domestic water supply.

Table 3-17. *Median Saturated Hydraulic Conductivity (Ksat) Values for BLM land within the Analysis Area*[1]

Ksat *(ft./day)*[2]	***10^5***	***10^4***	***1000***	***100***	***10***	***1***	***0.1***	***0.01***	***0.001***	***0.0001***	***10^{-5}***	***10^{-6}***	***10^{-7}***
Ksat class	Very High				High	Mod. High	Mod. Low	Low		Very Low			
Percentage of Acres on District[3]	0	0	0	0	86.1%	11.8%	2.1%	0	0	0	0	0	0
Relative Permeability	Pervious				Semi-Pervious				Impervious				
Aquifer	Good					Poor				None			
Soil Texture													
Unconsolidated Clay & Organic Material					Peat		Layered Clay			Unweathered Clay			
Unconsolidated Sand & Gravel	Well Sorted Gravel		Well Sorted Sand or Sand and Gravel			Very Fine Sand, Silt, Loess, Loam							
Consolidated Rocks	Highly Fractured Rocks				Oil Reservoir Rock			Sandstone		Limestone, Dolomite		Granite	

1. Table modified from Bear (1972).
2. Map 3-2 shows median saturated hydraulic conductivity values in micrometers per second. The BLM converted the values to feet per day for comparison with the other categories in the table.
3. Acres where Ksat value is greater than or equal to the Ksat value listed in header, but less than the next greatest value (e.g., 86.1 percent of acres on BLM land has a Ksat greater than or equal to 10 but less than 100.)

The spatial scale of this analysis (i.e., the analysis area) is all land within the Coos Bay District BLM boundary. Use of the term "the analysis area" refers to all ownerships, whereas mention of "BLM-managed land" refers only to Coos Bay District BLM-managed land.

The BLM bases the temporal scale for this analysis on herbicide persistence (Tables 3-15, *Soil Order Properties and Extent* and 3-18, *Selected Characteristics that Affect the Fate of Herbicides*), the depth to water table, saturated hydraulic conductivity, and proximity of treatment locations to domestic water supplies. Triclopyr, for example, has moderate persistence in aerobic soils (half-life 46 days), is non-persistent in anaerobic soils (half-life < 1 day), and is low risk for leaching. Given triclopyr's relatively short half-life and its other characteristics, short-term (days to weeks) and long-term (months to years) water quality effects would not be expected at a domestic water source several miles distant from a dry season treatment area with a relatively deep water table.

[70] Water table refers to the saturated zone in the soil (NRCS 2017a).
[71] Saturated hydraulic conductivity (Ksat) is a quantitative measure of a saturated soil's ability to transmit water when subjected to a hydraulic gradient, or the ease with which pores of a saturated soil permit water movement (NRCS 2017b).

Table 3-18. *Selected Characteristics that Affect the Fate of Herbicides*

Herbicide	Persistence in Water[1]	Persistence in Soils[2]	Half-life in Soils[3] days (aerobic)	Soil Adsorption (K_{oc}) ml/g[4]	Pesticide Movement Rating[5]	Solubility mg/L[6]	Groundwater Leaching[6]	Surface Water Runoff[6]
Herbicides available under all alternatives								
2,4-D	Moderate	Non-persistent	10	20 to 100	Moderate	33,900	Moderate	Low
Dicamba	Moderate	Non-persistent	14	2	Very High	400,000	High	Low
Glyphosate	Moderate	Moderate	47	24,000	Extremely Low	900,000	Low	High
Picloram	Moderate	Moderate to Persistent	20 to 300	16	High to Very High	200,000	High	Low
Herbicides available under the Proposed Action and Alternative 3								
Aminopyralid	Moderate	Moderate to Persistent	32 to 533	1 to 24	High to Very High	2,480	High	High
Chlorsulfuron	Moderate	Moderate	40	40	High	7,000	High	Low
Clopyralid	Moderate	Moderate	40	6 to 60	High to Very High	300,000	High	Low
Diflufenzopyr	Low	Non-persistent	2-14	18 to 156	Very Low to Moderate	5,850	Low	Moderate
Imazapic	High	Persistent	120 to 140	206	High	2,200	Low	Low
Imazapyr	Moderate	Moderate to Persistent	25 to 141	100	Moderate to Very High	>11,000	High	High
Metsulfuron methyl	Moderate	Non-persistent	30	35	High	9,500	High	Moderate
Sulfometuron methyl	Low	Non-persistent	20	78	Moderate	70	Moderate	Moderate
Triclopyr	Moderate	Moderate	46	20 to 780	Low to Very High	435	Low	High
Herbicides available under Alternative 3								
Fluazifop-P-butyl[7]	High	Non-persistent	Hours	2,010-5,700	Extremely Low to Very Low	1-2	Low	-
Fluroxypyr	Low	Non-persistent	7 to 23	50 to 136	Low to Moderate	7,300	Low	Low
Hexazinone	High	Moderate to Persistent	90	54	Very High	33,000	High	Moderate
Rimsulfuron	Low	Non-persistent to Moderate	5 to 40	19 to 74	Low to High	7	Low	Low

1. From USDI (2010a:199) and USDI (2016a:4-17).
2. From USDI (2010a:181). Persistence based on half-life in soils: non-persistent less than 30 days, moderately persistent 30 to 100 days, and persistent greater than 100 days.
3. In days. From USDI (2010a:181). See Table 3-15 for half-life in anaerobic soils.
4. K_{oc}: Soil organic carbon sorption coefficient of an active ingredient in mL/g. For a given chemical, the greater the K_{oc} value, the less soluble the chemical is in water and the higher affinity the chemical has for soil organic carbon. For most chemicals, a higher affinity for soil organic carbon (greater K_{oc}) results in less mobility in soil. From USDI (2010a:59-61), USDI (2007a:4-15), and USDI (2016a:4-17).
5. Pesticide movement rating based on the Groundwater Ubiquity Score (GUS) = log10 (half-life) x [4 – log10 (K_{oc})] (Gustafson 1989). Pesticide movement rating extremely low (GUS < 0.1), very low (GUS 0.1 to 1.0), low (GUS 1.0 to 2.0), moderate (GUS 2.0 to 3.0), high (GUS 3.0 to 4.0), and very high (GUS > 4.0) (Vogue et al. 1994).
6. From USDI (2007a:4-28), and USDI (2016a:4-17).
7. Fluazifop-P-butyl information from SERA (2014).

Three physical properties determine the runoff and leaching potential of an herbicide: persistence (the time a chemical stays active), soil adsorption (the tendency of a chemical to bind to soil particles), and solubility (the tendency of a chemical to dissolve in water) (BPA 2000). Table 3-18 lists these properties for the proposed herbicides and provides a ranking for surface water runoff and leaching to groundwater potentials. Herbicides must be relatively persistent to have the potential to run off or leach. Herbicides with low solubility or that adsorb strongly to soil particles tend to run off with soil movement. Soils high in organic content or clay tend to be the most adsorptive, while sandy soils low in organic content are typically the least adsorptive (USDI 1991a as cited in USDI 2007a). Herbicides with low soil adsorption tend to leach down through the soil as do herbicides that are highly soluble.

Affected Environment

The Coos Bay District BLM manages a relatively small percentage of the analysis area. There are 32 fifth field watersheds within the analysis area and the BLM manages less than 10 percent of the total acres. Two of the watersheds have no BLM-managed land, 20 watersheds have less than 5 percent BLM land, 7 watersheds have less than one-third BLM-managed land (8 to 28 percent), and 3 watersheds have between 35 and 52 percent BLM-managed land.

Surface Water

Almost all precipitation in the analysis area occurs as rainfall from October to May and is due to frontal storms originating over the Pacific Ocean. Annual stream flow closely correlates with annual precipitation. Fall rains recharge soil moisture depleted by summertime evapotranspiration[72] and stream flow. In winter, the rapid conversion of rainfall to runoff occurs because soils remain wet between frequent storms and evapotranspiration diminishes. During the spring, runoff decreases due to less rainfall, increasing transpiration by plants, and increasing canopy interception and evaporation of precipitation. Both rainfall and discharge drop to seasonally low levels in the summer.

Relatively few streams cross BLM-managed land compared to total stream miles in the analysis area. There are roughly 5,135 perennial stream miles and 14,233 intermittent stream miles in the analysis area. Approximately 14 percent or 738 miles of the perennial streams and 17 percent or 2,442 miles of the intermittent streams cross BLM-managed land.

Section 303(d) of the *Clean Water Act* requires that the ODEQ develop a list of water bodies that do not meet water quality standards that protect the beneficial uses of rivers, streams, lakes, and estuaries. For streams crossing BLM-managed land, fish and aquatic life is the most common beneficial use, although water originating on BLM-managed land also supports public water systems and private residences. Oregon has narrative and numeric standards for toxic substances to protect aquatic life and human health (ODEQ 2014). Although there are 4,426 miles of water quality limited streams and lakes within the analysis area according to the most recent (2012) 303(d) list (ODEQ 2015), there are no listings for toxic substances, including herbicides.

The ODEQ and the Oregon Health Authority completed source water assessments between 1999 and 2005 for all Oregon public water systems that have at least 15 hookups or serve more than 25 people year-round (ODEQ 2017a). The ODEQ and Oregon Health Authority defined surface water source areas that supply public water systems. The BLM manages just under 10 percent of the land, within 8 of the 19 surface water source area public water systems (ODEQ 2017b). BLM acreage as a percentage of total acreage is greatest in the North Fork Coquille River watershed serving the City of Myrtle Point (44 percent) and the Coquille River watershed serving the City of Coquille (14 percent).

The ODEQ recommends that the BLM establish direct communication with public water system operators downstream of BLM planned projects with potential to affect water quality. To protect public water systems, the ODEQ also generally recommends 100 or 200-foot stream buffers within 500 to 1,000 feet of a public water system intake, and suggests that BLM's management in municipal watersheds/aquifers should support the overall goal of providing the highest quality water possible downstream at intakes and wells (USDI 2010a:192).

In addition to public water systems, private residences sometimes use springs and streams on adjacent BLM land for domestic water supplies. The BLM requires a valid water right to grant a right-of-way to pipe water from a

[72] The water lost to the atmosphere from the ground surface, evaporation from the surface of vegetation, and the transpiration of groundwater by plants.

point of diversion on BLM-managed land to a place of use on private land. Point of diversion information for the analysis area is readily available via a 2016 OWRD GIS layer and the searchable OWRD Water Rights Information System (OWRD 2016, OWRD 2017a). Coos Bay District hydrologists consult these resources when working with herbicide applicators to make sure that water right holders are aware of proposed herbicide treatments in their area, and to eliminate or minimize the risk of surface water contamination. As described in *Socioeconomics* Issue 4, BLM also protects points of diversion on federal land without water rights by notifying adjacent landowners prior to herbicide application to give the public the opportunity to disclose the location of water systems that should be buffered from herbicide applications.

Groundwater

Shallow wells and unconsolidated aquifer materials increase the likelihood of herbicide detection in groundwater (USDI 2016a:4-16). Unconsolidated-deposit aquifers underlie approximately 13 percent of all land and just 6 percent of BLM-managed land in the analysis area (Whitehead 1994). Groundwater is commonly available from shallow wells in unconsolidated-deposit aquifers that primarily consist of sand and gravel with variable quantities of clay and silt. Unconsolidated-deposit aquifers are prevalent along present and ancestral stream valleys and in lowlands; areas that are generally thousands of feet to miles distant from BLM-managed land and road rights-of-way where herbicides would be applied. Unconsolidated-deposit aquifers are concentrated along the coast, west of the Coast Range, primarily between Port Orford to south of Florence. This aquifer type is also associated with Coos Bay and the surrounding sloughs as well as the river valleys of the Umpqua and the Smith. In the analysis area, greater than 90 percent of the 182 wells mapped by the OWRD occur in unconsolidated-deposit aquifers (OWRD 2017b). Only 15 wells are mapped in pre-Miocene (23 to 5.3 million years before present) rock aquifers that underlie approximately 87 percent of all land and 94 percent of BLM-managed land in the analysis area (Whitehead 1994, OWRD 2017b). These aquifers are in the mountainous areas and they consist on undifferentiated volcanic rocks, undifferentiated consolidated sedimentary rocks, and undifferentiated igneous and metamorphic rocks.

Groundwater data (i.e., depth to the water table) is relatively limited in the analysis area and based on soil surveys and well logs. Generalized estimates of the median depth to highest water table are available from the NRCS (Map 3-1, NRCS 2016). Map 3-1 displays median depth to highest water table in six different categories ranging from shallow (0 to 25 centimeters) to deep (> 200 centimeters). Nearly 82 percent of BLM-managed land falls into the deep category, and deeper water tables are less susceptible to herbicide contamination (USDI 2016a:4-16). The highest water tables (0 to 25 centimeters) occupy 4 percent of BLM-managed land and are concentrated at the Dean Creek Elk Viewing Area, North Spit, and New River. Dean Creek is a diked, tide-gated pasture next to the Umpqua River and seasonally high rainfall and river levels retard drainage, leading to higher water tables. The North Spit and New River areas are sandy and highly permeable, and their water tables rise relatively quickly in response to rainfall.

Wells not on BLM-managed land offer site-specific water table information. Three of the 15 pre-Miocene rock aquifer wells and 30 of the 167 unconsolidated-deposit aquifer wells mapped by the OWRD have hydrographs showing yearly water table fluctuations (OWRD 2017b). The three pre-Miocene rock aquifer wells are located along the Highway 101 corridor and they have water table depths from 55 to 135 feet, 25 to 29 feet, and 29 to 31 feet. The minimum water table depth ranges from 0 to 75 feet (median 15 feet) and the maximum water table depth ranges from 6 to 112 feet (median 34.5 feet) for the 30 unconsolidated-deposit aquifer wells also located along the Highway 101 corridor.

Site-specific water table information is also available for North Spit monitoring wells in unconsolidated-deposit aquifers both on and off BLM land. A consulting firm measured water depth below the ground surface in 29 wells during the wet season between October 4, 2004 and January 25, 2005. Water depths in the 20 wells on BLM land ranged from 5.5 to 23.4 feet (median 8.5 feet) and water depths in the 9 wells on private land ranged from 7.1 to 35.1 feet (median 8.9 feet) (PES Environmental 2005).

The BLM Umpqua Field Office hydrologist measured summertime water depths with continuous data loggers in three hand-augured wells in an unconsolidated-deposit aquifer in the field south of the main parking lot at the Dean Creek Elk Viewing Area in 2004 and found that maximum depths were 4.3, 4.5, and 4.7 feet below the ground surface.

The ODEQ and Oregon Health Authority completed source water assessments between 1999 and 2005 and defined groundwater source areas that supply public water systems. The BLM manages land in only 8 of the 95 groundwater source areas in the analysis area (ODEQ 2017c). Four of the source areas serve BLM recreation sites: Loon Lake, Dean Creek Elk Viewing Area, Edson Creek Campground, and the Sixes River Campground. Although there are groundwater source areas associated with the Dean Creek Elk Viewing Area and the Sixes River Campground, groundwater is no longer used at either site. Dean Creek receives water from the City of Reedsport system and the BLM no longer provides water to campers at Sixes. The BLM manages less than 65 acres in 7 of the source areas, and manages 3,132 acres or 3 percent of the City of Gold Beach source area.

The ODEQ and Oregon Health Authority inventoried each of the groundwater source areas to determine potential sources of contamination. The ODEQ did not specifically identify herbicide use in their GIS layer that shows potential contaminants as of October 2005 (ODEQ 2005), but they did assign a higher risk for well contamination in one groundwater source area with no BLM land due to industrial pesticide, fertilizer, and petroleum storage, handling, and mixing.

Private residences use springs and streams on adjacent BLM land for drinking water, irrigation, and livestock watering among other uses, but there are no water rights connected to private wells as points of diversion on BLM-managed land (OWRD 2016). 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 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.

Treatments Planned Related to the Issues

No Action Alternative

The BLM would treat approximately 800 gross acres annually with herbicides (80 percent of all noxious weed treatments). The BLM would use glyphosate for approximately 95 percent of the herbicide treatments and 2,4-D, dicamba, picloram, or a tank mix of two or more of these for 5 percent of the herbicide treatments. The BLM would not use herbicides in the New River western snowy plover habitat restoration area and would only use limited amounts of glyphosate in the North Spit western snowy plover habitat restoration area.

Proposed Action

The BLM would treat approximately 900 gross acres annually with herbicides (90 percent of all terrestrial invasive plant treatments). Nine additional herbicides would be available for use under the Proposed Action compared to the No Action Alternative. The BLM would use triclopyr for approximately 40 percent of the herbicide treatments, aminopyralid for 15 percent of the treatments, and glyphosate for 15 percent of the treatments. Spot treatments would account for 95 percent of herbicide treatments and broadcast treatments would account for 5 percent. Similar to the No Action Alternative, the BLM would not use herbicides in the New River western snowy plover habitat restoration area and would only use limited amounts of glyphosate in the North Spit western snowy plover habitat restoration area.

Alternative 3

Alternative 3 is the same as the Proposed Action, except that it also allows the BLM to use the herbicides hexazinone, rimsulfuron, fluroxypyr, fluazifop-P-butyl, and allows the BLM to use herbicides other than glyphosate in western snowy plover habitat at the North Spit and New River. The BLM would use hexazinone and rimsulfuron approximately one percent of the time when herbicides are used, and the BLM would very rarely use fluazifop-P-butyl and fluroxypyr. In western snowy plover habitat restoration areas, the BLM would use imazapyr + glyphosate to treat approximately 100 acres of European beachgrass annually.

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

The BLM would implement Standard Operating Procedures and Mitigation Measures (see Appendix A) to minimize the potential for adverse herbicide-related effects to water resources. These include, but are not limited to:

- Review hydrogeologic maps of proposed treatment areas. Note depths to groundwater and areas of shallow groundwater and areas of surface water and groundwater interaction. Minimize treating areas with high risk for groundwater contamination.
- Buffer intermittent stream channels when there is a prediction of rain (including thunderstorms) within 48 hours.
- Use drift reduction agents, as appropriate, to reduce the drift hazard.
- 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.
- 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.
- 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.
- 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.
- 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.

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.

Environmental Consequences

Direct and Indirect Effects

Common to All Alternatives

Herbicide treatments under all alternatives have the potential to affect the quality of surface water and groundwater on or near BLM land used for domestic purposes. The routes for this potential water contamination are drift into streams from spraying, runoff (e.g., from a rainstorm soon after application), and leaching through soil into groundwater. The proportion of herbicide that is on or in the plant, soil, and water after application influences whether an herbicide will runoff, drift, or leach; 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).

Herbicide contamination can also occur because of direct application to water. However, this is not expected under any alternative; the BLM is not proposing direct application of herbicides to surface water and accidental spills into water are both unlikely due to Protection Measures (see Appendix A), and have not occurred since the BLM has implemented its integrated invasive plant program (Jeanne Standley, Coos Bay Weed Coordinator, 2018 personal communication).

The BLM's application methods decrease the chance that herbicides would redistribute within the application site or move off site where they may contaminate surface water or groundwater. The BLM would primarily use hand-directed sprayers for herbicide applications because the applicator can target specific plants and minimize herbicide contact with the soil or water. Under the No Action Alternative, all applications would be spot treatments, whereas under the action alternatives, 95 percent would be spot treatments and 5 percent would be broadcast treatments. No aerial application would occur, and drift reduction agents are used when appropriate. A Standard Operating Procedure specifies no-herbicide buffer distances from water bodies, which are based on herbicide properties and site-specific conditions.

Drift into streams from the proposed invasive plants treatments is of minimal concern under all alternatives. Aerial herbicide application is the method most likely to result in herbicides getting onto non-target areas such as stream channels (USDI 2010a:65, 200). While this is done on neighboring lands by timber companies, the BLM is not proposing aerial applications, but is instead almost exclusively using hand-directed sprayers for targeted spot applications. The herbicides that BLM uses have very low vapor pressures and BLM spray mixtures do not produce much vapor (see Appendix C, *Herbicide Risk Assessment Summaries,* for more information). In addition, the BLM would apply herbicide between weather fronts and at the time of day when winds are calm. Movement of herbicides from wind erosion of soil would be minimal due to the dense groundcover in the analysis area (USDI 2010a:200) and smaller infestations sizes (see Table 2-2, *Summary of Invasive Plants Documented in NISIMS by Infestation Size*). Drift reduction agents would be used if needed (for example, with sulfonylureas herbicides, which can be more prone to drift or in windy areas) to reduce drift.

Application timing also decreases the chance that herbicides would contaminate surface water or groundwater. Berg (2004) reported that herbicides applied in or along dry intermittent stream channels may enter streams through runoff if a higher intensity or longer duration rainstorm occurs soon after treatment. The BLM would buffer dry intermittent stream channels when there is a prediction of rain within 48 hours to reduce the risk that herbicide adsorbed to sediment would move within or toward streams. The BLM would apply herbicides primarily during the dry season (May through September with some applications outside this period if rainfall is not expected) allowing time for microbial, chemical, and photo degradation prior to rainfall. Therefore, the probability of a higher intensity or longer duration rainstorm soon after application of herbicides would be low. The rate of microbial degradation would be greater during the dry season when the weather is warmer, and herbicides

applied to foliage during the dry season would be less likely over time to wash off as they incorporate into (leaf) surface waxes (Kerle et al. 2007). Hence, it is unlikely that herbicides would run off into surface water. However, if rain were to occur following herbicide application, herbicide runoff to surface water is possible, and the potential for it to occur varies by herbicide (and hence, varies by alternative).

Herbicide leaching to groundwater is possible, and varies by alternative. However, maximizing the amount of herbicide that gets on the plant (and not the soil), using the minimum amount of herbicide necessary, and applying herbicide during the dry season when depth to groundwater is greatest, reduces the likelihood of herbicides with low soil adsorption or high solubility reaching groundwater. Although the median saturated hydraulic conductivity is high or very high for 87 percent of BLM land (see Table 3-17, *Median Saturated Hydraulic Conductivity (Ksat) Values for BLM land within the Analysis Area*), herbicides may not make it to the water table for transport off-site or its movement within the saturated zone may be slowed by confining layers of clay and silt. Nearly 82 percent of BLM managed-land in the analysis area has a greater than 200 centimeter median depth to highest water table, and the summertime water table is deeper. If herbicides make it to the groundwater and move offsite, the potentially long distances between treatment sites and public water system and private points of diversion together with dilution and chemical degradation make contamination less likely. Most water rights (surface and well), cluster in river and stream valleys and lowlands toward the coast where BLM manages relatively little land. Most BLM land and road rights-of-way are in headwater areas or higher in watersheds where there are far fewer points of diversion. BLM manages just 6 percent of the area with unconsolidated-deposit aquifers where groundwater is commonly available from shallow wells. Only 4 percent of the records in the 2016 OWRD points of diversion GIS layer overlap BLM land.

Table 3-19 is a summary of the potential risks to water for herbicides considered under all alternatives in this analysis.

Table 3-19. *Effects of herbicides available under all alternatives[1] (Water)*

2,4-D	Some forms of 2.4-D are registered for use in aquatic systems. 2,4-D is a known groundwater contaminant meaning that it has been detected in groundwater, but not necessarily at levels exceeding any established health standard. The pesticide movement rating for 2,4-D is moderate due in part to its relatively short half-life in soils. In terrestrial applications, most formulations of 2,4-D do not bind tightly with soils, and therefore have a moderate potential to leach into the soil column and to move off site in surface or subsurface water flows (Johnson et al. 1995, cited in Tu et al. 2001). 2,4-D amine (aquatic formulation) is the preferred form and it is not persistent under most environmental conditions (Jervais et al. 2008).
Dicamba	Because dicamba is mobile in soil, application of this herbicide can result in groundwater and surface water contamination. Biodegradation is the major mechanism for dicamba degradation in water. Dicamba is a known groundwater contaminant, and has a high potential to leach into groundwater. The EPA has set health advisory concentration levels for dicamba (e.g., 300 µg/L for 1-day exposures), but has not set maximum concentration limits for potable water. A regional study of pesticides in shallow groundwater in Delaware, Maryland, and Virginia detected dicamba in groundwater at low concentrations, generally less than 3 µg/L (ppb) (Koterba et al. 1993).
Glyphosate	While glyphosate is very water soluble, it is unlikely to enter water through surface runoff or subsurface flow because it binds strongly to soil particles, except when the soil itself washes away by runoff. Even then, it remains bound to soil particles and is generally unavailable (Rueppel et al. 1977, Malik et al. 1989, all cited in Tu et al. 2001). The pesticide movement rating for glyphosate is extremely low.
Picloram	Picloram has a high to very high pesticide movement rating because it is persistent in soils and does not bind strongly with soil particles. Woodburn et al. (1989, cited in Tu et al. 2001) found that the half-life of picloram in water was 2 to 3 days but the EPA reported it stable to hydrolysis (the chemical breakdown of a compound due to reaction with water) and unlikely to degrade in groundwater, even over several years (USEPA 1995).

1. Adapted from the Oregon FEIS (USDI 2010a: 194-198) and the herbicide Risk Assessments.

No Action Alternative

The BLM would use glyphosate for approximately 95 percent of the herbicide treatments and 2,4-D, dicamba, picloram, or a tank mix of two or more of these for 5 percent of the herbicide treatments. 2,4-D, dicamba, and picloram are known groundwater contaminants, although potentially in different soils or scenarios than found in the analysis area. As shown in Table 3-19, glyphosate would tightly bind to soil particles and is hence unlikely to leach into groundwater. If it were to run off, it would remain tightly bound to soil particles.

The BLM would use aquatic formulations of herbicides when near water. The aquatic formulations of 2,4-D and glyphosate are 0 risk to aquatic organisms under all scenarios, and dicamba (not an aquatic herbicide) is 0 risk except in accidental spill scenarios involving aquatic invertebrates. Picloram and ester forms of 2,4-D are not labeled for use in riparian areas and in Special Status species habitat. ARBO II requires a 50-foot no-treatment spot spray buffer for these herbicides along dry intermittent streams and dry roadside ditches to protect water quality. According to Table 2–10, *Treatment Key*, the BLM would apply 2,4-D, dicamba, picloram, or a combination of two of these three herbicides at typical rates or below maximum rates in almost all scenarios. Maximum rate applications are proposed for 2,4-D (3.5 gross acres over the life of the plan) and dicamba + 2,4-D (only dicamba at maximum rate on 4 gross acres over the life of the plan). Using less of the herbicides known to contaminate groundwater, and implementing Protection Measures to prevent application near points of diversion used for water supplies minimize risk. If herbicides available under this alternative did reach domestic-use groundwater 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 dicamba and glyphosate applied at the maximum rate (see *Human Health* Issue 1 for additional detail). Dicamba would be applied at the maximum rate to few acres, and glyphosate would be applied at typical and below maximum application rates.

The BLM would not use herbicides in the New River western snowy plover habitat restoration area and would only use glyphosate in the North Spit western snowy plover habitat restoration area on up to 24 acres. Use of glyphosate on the North Spit would not affect the municipal wells to the north. Glyphosate would be applied to minimize contact with the sand/soil. Should it contact the ground, it has a low leaching potential and it would be applied after September 15th inside the western snowy plover habitat restoration areas or in late summer outside the habitat restoration areas when the water table is at or near maximum depth. The summer water table in the plover area is likely relatively deep (10 to 15 or more feet) based on the 2005 North Spit water table data and the site topography. The plover area is down gradient from the Coos Bay-North Bend Water Board sand dune wellfield, so even if herbicide were to reach the water table, it would not affect the quality of water withdrawn for municipal and industrial uses. The southernmost Water Board well, Well 46, is located approximately 4 miles to the northeast of the plover area and groundwater flow in the vicinity of this well is south towards Coos Bay (CH2M Hill 1995:6-14).

The use of glyphosate at the Dean Creek Elk Viewing Area would not affect potable water used on-site or affect downriver points of diversion. The water for the Elk Viewing Area comes from the City of Reedsport and not surface or groundwater sources at the recreation area. Although the summertime water table is relatively shallow in the pastures of the Elk Viewing Area (less than 5 feet), glyphosate contacting the soil would bind to the organic rich material and be prevented from leaching to groundwater.

Water quality effects from glyphosate use at Loon Lake and the Edson Creek campground are not anticipated. Glyphosate would be applied to minimize contact with the soil, and should it contact the soil, it would not be expected to leach to the groundwater. Limited treatment areas at each site (approximately ¼ acre (Jeanne Standley, Coos Bay Weed Coordinator, 2018 personal communication)) would be greater than 100 feet from the professionally drilled and cased wells that serve these recreation sites.

Short term (days to weeks) and long term (months to years) water quality effects are not expected with herbicide applications under the No Action Alternative because BLM would apply herbicides in such a manner to prevent

water contact during initial application and prevent water contact during herbicide degradation. Glyphosate is moderately persistent in soils, but it would be applied to minimize contact with soil and it would not likely move off site should it contact soil. 2,4-D and dicamba are non-persistent in soils, would be used over a limited area, and, like glyphosate, would be applied to minimize soil contact. Picloram is moderate to persistent in soils, but would also be applied over a limited area, applied to minimize soil contact, and applied with appropriate Protection Measures in place to protect domestic water supplies. Repeated applications with longer half-life herbicides can lead to herbicide persistence in the environment (Hanson et al. 2015). In contrast, several months to one year or more would elapse between treatments at any one site under the No Action Alternative, so herbicides would have time to break down.

Proposed Action

Nine additional herbicides would be available for use under the Proposed Action. The BLM would use triclopyr for approximately 40 percent of the herbicide treatments, aminopyralid for 15 percent, glyphosate for 15 percent, and imazapyr for 10 percent. Aquatic formulations of triclopyr, glyphosate, and imazapyr are available and they require no buffer when spot spraying near dry intermittent streams, dry intermittent wetlands, and dry roadside ditches because they present no risk to aquatic organisms. The non-aquatic form of triclopyr is not registered for use in riparian areas or Special Status species habitat, and ARBO II requires a 150-foot spot spray buffer on dry intermittent streams and wetlands, and dry roadside ditches to protect aquatic organisms. Aquatic triclopyr, glyphosate, and imazapyr would be used at the Dean Creek Elk Viewing Area, Loon Lake, and the Edson Creek campground. An acre or less would be treated at each of these recreation sites (Jeanne Standley, Coos Bay Weed Coordinator, 2018 personal communication) and Protection Measures would be used to minimize herbicide contact with soil and appropriately buffer the wells serving Loon Lake and Edson Creek. Aminopyralid would also be used at Dean Creek. Aminopyralid has a high risk for leaching (Table 3-18, *Selected Characteristics that Affect the Fate of Herbicides*). The Dean Creek summertime water table is lower than one foot, but given aminopyralid's moderate to persistent half-life in soil, herbicide residues could come in contact with the wintertime water table; however, past studies have not documented leaching of aminopyralid at levels below one foot (Table 3-20) and aminopyralid presents no risks to animals or humans (See *Fish and Aquatic Organisms* Issue 1, *Wildlife* Issue 1, *Human Health* Issue 1 and *Recreation* Issue 1). Appropriate Protection Measures (See Appendix A) to protect water quality would be identified during review of the Annual Treatment Plan.

Triclopyr and glyphosate have a low risk for leaching (Table 3-18), so applications in headwater areas or higher in watersheds would not affect domestic water supplies that are generally thousands of feet to miles distant. Treatments would happen during the dry season (May through September) in areas where the water table is feet below the surface, and applicators would minimize the amount of herbicide delivered to the soil surface. Treatment methods that prevent water contact during herbicide application and the rate of degradation would prevent short- and long-term water quality impacts. Aminopyralid and imazapyr can be more persistent in soil than triclopyr and glyphosate, and they have a high risk for leaching. Imazapyr, however, is not known to be a groundwater contaminant (Table 3-20). The lack of proximity to the summertime water table at the time of application and the lack of proximity to domestic water sources would allow time for degradation of these moderate to persistent herbicides (Table 3-18).

Chlorsulfuron and clopyralid have a high risk for leaching (Table 3-18), but chlorsulfuron is not known to be a groundwater contaminant and clopyralid leaching and subsequent contamination of groundwater appear to be minimal (Table 3-20). Both diflufenzopyr and imazapic are low risk for leaching (Table 3-18). Metsulfuron methyl and sulfometuron methyl are not known to be groundwater contaminants (Table 3-20) despite having increased risk for leaching (Table 3-18). The BLM may use aminopyralid, chlorsulfuron, imazapyr, and metsulfuron methyl (4 of the 5 Proposed Action herbicides in Table 3-18 with a high risk of leaching) up to the maximum application rate on approximately 3,460 gross acres over the life of the plan (see Table D-4, *Estimated Treatment Acres, 20-Year Analysis Period*). The risk of adverse effects to water supplies from these four herbicides or any of the nine herbicides available under the Proposed Action would be reduced by using spot treatments to minimize herbicide

contact with the soil, avoiding areas with points of diversion or increased risk of groundwater contamination, and working with adjacent landowners if there are concerns. If herbicides available under the Proposed Action did 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 and triclopyr applied at the maximum rate (see *Human Health* Issue 1 for additional detail). Mitigation Measures limit triclopyr application to the typical rate where feasible, and BLM would apply clopyralid at typical to below maximum application rates, thereby reducing the already low risk associated with these herbicides.

As described under the No Action Alternative, the BLM would not use herbicides in the New River habitat restoration area and would only use glyphosate in the North Spit habitat restoration area. As described above, use of glyphosate on the North Spit would not affect the municipal wells to the north.

Table 3-20. *Effects of herbicides available under the Proposed Action and Alternative 3[1] (Water)*

Aminopyralid	Aminopyralid is moderately persistent and has high mobility in most soils because of its low soil adsorption values (USEPA 2005a). Therefore, it is transported to surface water and groundwater. Breakdown by microbes in soil is the primary form of dissipation. Aminopyralid's mobility and high water solubility suggest that the herbicide is prone to leaching (Lindenmeyer 2012). However, in past studies, leaching of aminopyralid has not been documented at levels below one foot (USEPA 2005b).
Chlorsulfuron	Chlorsulfuron is not known to be a groundwater contaminant, but has a high potential to leach.
Clopyralid	Clopyralid does not appear to bind tightly to soil and will leach under favorable conditions. However, leaching and subsequent contamination of groundwater appear to be minimal (SERA 2004b), which is consistent with a short-term monitoring study of clopyralid in surface water after an aerial application (Rice et al. 1997a, cited in SERA 2004b). Clopyralid is not known to be a common groundwater contaminant, and no major off-site movement has been documented.
Diflufenzopyr	Diflufenzopyr is not a known groundwater contaminant. Biodegradation, photolysis, and hydrolysis are important mechanisms in removing diflufenzopyr from aquatic systems. Its half-life is less than 1 month, with hydrolysis and photolysis rates higher in acidic environments. The aquatic dissipation half-life for diflufenzopyr is 25 to 26 days in aerobic and 20 days in anaerobic conditions. The expected half-life of diflufenzopyr in small ponds is estimated at 24 days. These factors suggest that diflufenzopyr would be removed from an aquatic environment relatively rapidly if contamination occurred (USEPA 1999).
Imazapic	Little is known about the occurrence, fate, or transport of imazapic in surface water or groundwater (Battaglin et al. 2000). However, according to the herbicide label for Plateau, in which imazapic is the active ingredient, it is believed to be a groundwater contaminant (BASF 2008).
Imazapyr	In their literature review of imazapyr, Tu et al. (2001) found no reports of imazapyr contamination in water, despite its potential for mobility. It is not known to be a groundwater contaminant. Battaglin et al. (2000) stated that little is known about its occurrence, fate, or transport in surface water or groundwater. In one study, imazapyr (from terrestrial applications) was detected in 4 percent of the 133 samples taken from streams, but was not detected in reservoirs or groundwater.
Metsulfuron methyl	Metsulfuron methyl is not known to be a groundwater contaminant, although it has a high potential to leach.
Sulfometuron methyl	Degrades quickly by hydrolysis in acidic water but is stable in neutral water. Aquatic dissipation half-lives are estimated at 1 to 3 days to 2 months in aerobic systems and several months in anaerobic sediments (Extoxnet 1996). It is not known to be a groundwater contaminant. In one surface water study, sulfometuron methyl was detected in 2 percent of 133 samples taken from streams.
Triclopyr	The salt form of triclopyr (TEA) is soluble in water and photodegrades in several hours with adequate sunlight. The terrestrial form of triclopyr (BEE) is not water-soluble and can partition into organic materials and be transported to sediments, where it is persistent. Alternatively, bound ester forms can degrade through hydrolysis or photolysis to triclopyr acid (Smith 1976 cited in Tu et al. 2001), which will diffuse into the water column and continue to degrade (Tu et al. 2001).

1. Adapted from the 2007 PEIS (USDI 2007a:4-30 to 4–34), the Oregon FEIS (USDI 2010a:195-198), the 2016 PEIS (USDI 2016a:4-17 to 4-18), and the herbicide Risk Assessments.

Alternative 3

Four additional herbicides would be available under Alternative 3, but their use would be limited. BLM would use hexazinone and rimsulfuron approximately one percent of the time when herbicides are used, and fluazifop-P-butyl and fluroxypyr very rarely. The BLM would generally not use fluroxypyr, hexazinone, or rimsulfuron in sandy environments due to the potential for groundwater contamination, and the BLM would not use these herbicides in other environments where groundwater contamination and source water contamination are concerns.

Use of imazapyr + glyphosate on the North Spit would not affect the municipal wells to the north. Glyphosate has a low leaching potential, and imazapyr has a high potential for leaching (Table 3-18), but it is not known to be a groundwater contaminant (Table 3-20). Herbicides would be applied to minimize contact with the sand/soil, and herbicides would be applied after September 15th when the water table is at or near maximum depth. The western snowy plover habitat restoration area is down gradient from the Coos Bay-North Bend Water Board sand dune wellfield so even if herbicide were to reach the water table it would not affect the quality of water withdrawn for municipal and industrial uses. The southernmost Water Board well, Well 46, is located approximately 4 miles to the northeast of the habitat restoration area and groundwater flow in the vicinity of this well is south towards Coos Bay (CH2M Hill 1995:6–14).

Use of imazapyr + glyphosate on the foredune west of New River would not affect two water rights to the east of New River. There is an irrigation water right with a point of diversion on a tributary approximately 800 feet upstream from the confluence with New River, and a recreation water right for an impoundment on a different tributary approximately 1,800 feet upstream from the confluence with New River. Spot treatments on calm days west of New River would not produce drift that would reach either point of diversion east of New River, and spot treatments would minimize the amount of herbicide on the sand/soil surface after application. If herbicide moves subsurface or makes it to the water table, it would be downgradient from the points of diversion and therefore would have no effect on the quality of surface water used for irrigation and recreation. Even with no threat to water quality, the BLM would notify adjacent landowners prior to the use of herbicides and address their concerns.

All other effects remain as described under the Proposed Action.

Table 3-21. *Effects of herbicides available only under Alternative 3[1] (Water)*

Fluazifop-P-butyl	Fluazifop-P-butyl is non-persistent in soil, has an extremely low to very low pesticide movement rating, and a low risk of leaching (See Table 3-18, *Selected Characteristics that Affect the Fate of Herbicides*).
Fluroxypyr	Based on soil adsorption characteristics, fluroxypyr is expected to have a high mobility in soil. However, it has a low potential for movement to groundwater because it is rapidly broken down by microbes in the soil (soil half-life is 1 to 3 weeks (California Department of Pesticide Regulation 2005, National Library of Medicine 2011). In field studies submitted to the EPA, fluroxypyr was generally not found below a soil depth of 6 inches (USEPA 1998), although this may vary depending on soil type and amount of rainfall. In sandy soils, the potential to leach to groundwater is much higher, and has been identified as a concern (NYSDEC 2006). Factors that influence the rate of fluroxypyr degradation in soils include soil microbes, organic matter, temperature, and soil moisture (Tao and Yang 2011).
Hexazinone	Hexazinone and its degradates persist, are highly mobile, and are readily washed into surface waters. Hexazinone has been identified as a groundwater contaminant in seven states. The EPA requires a groundwater advisory on all product labels stating that hexazinone must not be used on permeable soils.
Rimsulfuron	Rimsulfuron is unstable in soil, and therefore likely has a low risk of leaching to groundwater. The pH of the site conditions is likely a factor, with rimsulfuron less mobile in acidic conditions. Its metabolites may have a greater likelihood of contaminating groundwater, particularly the second metabolite, which is not readily degraded (Metzger et al. 1998). There is little available information about rimsulfuron and its metabolites in terms of groundwater and surface water contamination. One study in sandy soils found no rimsulfuron in groundwater following an herbicide application, but did find the first metabolite in the soil water at a depth of 3.3 feet, for as long as 3 years, in concentrations unsafe for drinking water. Concentrations of the second metabolite were much lower

	(Rosenbom et al. 2010). However, neither rimsulfuron nor its two metabolites are included on the EPA's list of drinking water contaminants (USEPA 2013).

1. Adapted from the Oregon FEIS (USDI 2010a:197), the 2016 PEIS (USDI 2016a:4-18 to 4-19), SERA 2014, and the herbicide Risk Assessments.

Summary of Effects

Table 3-22. *Summary of Effects (Water)*

Alternative	Direct Effects	Indirect Effects
No Action Alternative	Proposed herbicide treatments can potentially affect surface water and groundwater quality on or near BLM land. However, contamination of domestic water supply is unlikely given BLM's application methods, rates, and timing. Surface runoff risk is low, given high soil infiltration capacities, spot treatments with no-treatment buffers, and implementation of Protection Measures. BLM would mitigate the potential for leaching by selecting appropriate herbicides based on proximity to domestic water sources, shallow groundwater areas, and groundwater-surface water interaction areas.	This alternative uses herbicides that are known groundwater contaminants, but on far fewer acres than glyphosate. Glyphosate binds tightly to soil and has an extremely low pesticide movement rating. District soils generally have high or very high saturated hydraulic conductivity, but saturated zones are relatively deep, and points of diversion are generally distant. Risk Assessments for human consumption of contaminated water show no risk at typical rates of application for all herbicides and low risk for dicamba and glyphosate applied at the maximum rate. BLM proposes maximum rate dicamba application on less than 4 gross acres (see Table 2-10, *Treatment Key* (Perennial Parsley)), and typical to below maximum rate application of glyphosate.
Proposed Action		The Proposed Action and Alternative 3 use some herbicides with potential to leach to groundwater. District soils generally have high or very high saturated hydraulic conductivity, but saturated zones are relatively deep, and points of diversion are generally distant. Risk Assessments for human consumption of contaminated water show no risk at typical rates of application for all herbicides and low risk for clopyralid and triclopyr applied at the maximum rate. Mitigation Measures limit triclopyr application to the typical rate where feasible, and BLM would apply clopyralid at typical to below maximum application rates.
Alternative 3		

Cumulative Effects

As described in the *Ongoing and Reasonably Foreseeable Actions* section in Chapter 2, outside of the invasive plant program analyzed in this EA, the BLM injects tanoak with glyphosate or imazapyr on 50 to 100 acres annually to prevent the spread of Sudden Oak Death. Potential effects to groundwater from tanoak treatment would only occur in the case of an accidental spill, but like the invasive plant management program, precautions and restrictions are in place to prevent spills from occurring and minimize spills that may occur.

The Coos Bay BLM proposes to use approximately 0.04 percent (No Action) and 0.03 percent (Proposed Action and Alternative 3) of the pounds of pesticide used in the Southern Oregon Coast basin (see *Ongoing and Reasonably Foreseeable Actions* in Chapter 2). Considering the proposed safeguards, this relatively small use is not likely to trigger an herbicide related 303(d) stream listing in an analysis area with no current herbicide listings, or to contaminate groundwater to the detriment of human health.

Air Quality

Air Quality Issue 1 (Not Analyzed in Detail)

How would the alternatives affect air quality?

This issue was not analyzed in detail because effects were previously described in the analysis for the Oregon FEIS and the 2016 PEIS (USDI 2010a:166-172, USDI 2016a:4-9) and there are no new circumstances or information at the site-specific level that would change the effects anticipated for this EA.

Air quality on the Oregon Coast generally has an Air Quality Index of "good" due to coastal winds and topography (areas with air quality problems tend to be inland, concentrated around valleys). There are no non-attainment or maintenance areas (areas with a history of nonattainment, but now consistently meeting the National Ambient Air Quality Standard) as defined by the Oregon Department of Environmental Quality within the District. The Oregon Smoke Management Plan Annual Report (ODF 2016) identifies the population center of Coos Bay and North Bend as Smoke Sensitive Receptor Areas, and provides the highest level of protection against smoke intrusion in these areas.

The Oregon FEIS showed that emissions from invasive plant treatments on *all* Oregon BLM-administered lands would be less than 0.1 percent of statewide emissions of carbon monoxide (CO), nitrogen oxides (NOx), sulfur dioxide (SO_2), and Volatile Organic Compound (VOCs) and 0.2 percent of particulate matter (PM) (USDI 2010a:167). As described in the Oregon FEIS, emissions from prescribed fire were the primary air quality concern in an integrated invasive plant management program (USDI 2010a:165, USDI 2007d); the herbicides analyzed in the 2010 Oregon FEIS contribute less than 1 percent of the aforementioned SO_2, less than 0.1 percent of the CO, and less than 0.2 percent of the NOx, VOCs, and PM (USDI 2010a:167). The 2016 PEIS states that annual emissions nationwide from a program that included the three additional herbicides would be similar to the program without those three herbicides (USDI 2016a:4-9).

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

On the Coos Bay District, effects from invasive plant treatments on local and regional air quality would be undetectable. The amount of herbicides and prescribed fire used would be within the amount analyzed in the Oregon FEIS. Standard Operating Procedures such as 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 would minimize adverse effects. All alternatives would be relatively benign to air quality. In general, control of invasive plants can reduce the effects of wildfire, thereby slowing or preventing the degradation of air quality; however, wildfires caused by invasive plants or their treatments are not expected on the Coos Bay District (see *Fire* Issue 1).

Air Quality Issue 2 (Not Analyzed in Detail)

How would the alternatives affect climate change, including greenhouse gas emissions and carbon storage?

This issue was not analyzed in detail because effects were previously described in the analysis for the Oregon FEIS and the 2007 and 2016 PEISs (USDI 2010a:166-172, USDI 2007a:4-9 and 4-10, USDI 2016a:4-9) and there are no new circumstances or information at the site-specific level that would change the effects anticipated for this EA.

Along with the general lack of detailed information concerning existing carbon storage and storage capacity, climate responses to changes in greenhouse gas emissions and carbon storage rates are non-linear, making any assessment of potential effects of the alternatives on climate largely speculative (USDI 2010a:172-173).

The Oregon FEIS discusses that emissions from biocontrols, targeted livestock grazing, and seeding or planting are considered to have a negligible effect on climate change (USDI 2010a:166). Acres of mechanical treatments are expected to increase from 468 acres [No Action Alternative] to 687 acres [Proposed Action], or remain about the same at 460 acres [Alternative 3] over the 20-year analysis period; and associated fugitive dust and exhaust emissions would remain the same [Alternative 3] or increase proportionate to the increase in acres of treatments [Proposed Action]. 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 (USDI 2016a:4-9). Effects did not differ because of the herbicide used; rather, levels of effects were related to the acres treated and associated trip distance, vehicle exhaust, and fugitive dust. A quantitative analysis of carbon sequestration was not completed, as there is no appropriate protocol for evaluating impacts (USDI 2016a:4-6).

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

Alternatives that control or reduce invasive plants maintain or enhance net carbon storage capacity and alternatives that allow invasive plants to spread reduce net carbon storage capacity (USDI 2010a:173). Since the annual acres treated would remain the same under all alternatives (1,000 gross acres), there would be no difference in carbon storage between the alternatives. The Proposed Action and Alternative 3 would reduce invasive plant spread, so there would be a net carbon storage capacity increase associated with those alternatives (USDI 2010a:173-174).

Emissions are also discussed above, in *Air Quality* Issue 1.

Fire

Fire Issue 1 (Not Analyzed in Detail)

How would the treatment of invasive plants affect fuel loading?

This issue was not analyzed in detail because effects were previously described in the analysis for the Oregon FEIS (USDI 2010a:273-278) and there are no new circumstances or information at the site-specific level that would change the effects anticipated for this EA. Adverse and beneficial effects are expected to be negligible.

As shown in Table 3-23, 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, on the Coos Bay District, 44 percent of the BLM-administered lands fall into fire regime group 5, where fires are infrequent (greater than 200 years) (USDI 2016e:225). Although the Coos Bay District has a large portion (39 percent) of lands classified as fire regime I within the District boundary, 99.9 percent of the BLM-administered lands in the Coos Bay District are classified as moist forest (USDI 2016e:232). Historically, fire was not an important frequent change agent acting to influence stand structure distribution of these forested ecosystems. Natural ignitions, weather, and fuel conditions to support fires in these areas rarely aligned, and fires that burned were large and of high severity (Morrison and

Swanson 1990 cited USDI 2016e:224). While lightning ignitions are infrequent in the coastal area, human ignitions are prevalent and account for greater than 90 percent of all ignitions. From 1984 to 2013, on the Coos Bay District there were 66 human caused ignitions and only 6 lightning caused ignitions (USDI 2016e:227).

Table 3-23. *Coos Bay-Administered Lands by Historic Fire Regime Group*

Fire Regime Group	1	2	3	4	5
Fire Return Interval (in years)	0-35	0-35	35-200	25-200	> 200
Severity	Low and Mixed	Replacement	Low and Mixed	Replacement	Varies
Percent of Coos Bay District	39%	0%	16%	0%	44%

The Oregon FEIS describes that invasive plants in the Western Forest Biome (BLM-administered lands on the Coos Bay District fall primarily within this biome) are generally neither flammable nor continuous enough to constitute a major fuel hazard or to have significantly altered the fire regime. Gorse is an exception; gorse has contributed to wildfires in the area, notably in or near the city of Bandon. Reducing fire risk may occasionally be an invasive plant treatment objective in this biome, but these exceptions do not produce measurable differences between the alternatives (USDI 2010a:274).

Invasive plant infestations and thus treatment areas on the District are small (71 percent of sites are less than ½ acre (gross)) and do not have an effect on fuel loading. Of the sites larger than ½ acre (see Table D-1 in Appendix D, *Invasive Plant Infestations*), none are species that are likely to increase fire risk (Jeanne Standley, Coos Bay District Weed Coordinator, 2018 personal communication). While gorse is widespread on the south coast of Oregon, there is very little gorse on BLM-administered lands because the threshold for treatment is a single plant, and it is treated in the same year as it is detected. The BLM coordinates with the Coos Forest Protective Association through the Western Oregon Fire Protection Services to respond to all wildfires, regardless of the source of their ignition, to minimize the damage to the forest and watershed environment (CFPA 2017); hence, if a fire were to start in an area with invasive plants, fire damage would be minimized.

Archaeological and Cultural Resources

Archaeological and Cultural Resources Issue 1 (Not Analyzed in Detail)

How would treatment of invasive plants affect historic and prehistoric cultural sites?

This issue was not analyzed in detail because effects were previously described in the analysis for the Oregon FEIS and the 2016 PEIS (USDI 2010a:286-289, USDI 2016a:4-71 and 4-72) and there are no new circumstances or information at the site-specific level that would change the effects anticipated for this EA. The risk of adverse effects is further minimized as a result of Project Design Features included with the Proposed Action and Alternative 3.

Prehistoric occupation of coastal Oregon dates back at least the last 12,000 years, based on archaeological research (Aikens et al. 1993). Published research illustrating what is actually known about the human prehistory of the Oregon coast consists of very little hard data and limited analysis of a complex archaeological record (Lyman 1991). Research analysis indicates that the Northwest Coast culture pattern, in which western Oregon participated, extended from northern California up the coast through British Columbia to Alaska (Aikens et al. 1992). 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, archaeological data in western Oregon shows that past human activity most often took place on level ground and near freshwater sources, as revealed by the location of archaeological sites across the landscape (USDI 2016e), though other sites such as rock shelters, trails,

mines, traditional cultural properties, and sacred sites may fall outside these areas. Seasonal places in the uplands and interior valleys away from the estuaries and coast were often hunting and food gathering areas used by many different Native groups. Exploration into the North Pacific by Europeans began in the early part of the 16th century, but increased into the late 18th century with maritime exploration along the southwest Oregon coast. Logging, shipbuilding, ranching, and agriculture were the mainstay of the local 19th century economy (Douthit 1999:18). Coastal interior rivers were harnessed to transport lumber to Coos Bay, where it was used to build ships and fill the demand brought on by population growth during the California gold rush. Coastal farming and agriculture was supported by local industry. Only 1 percent of the Coos Bay District has been inventoried for archaeological resources, with 30 prehistoric and 24 historic sites recorded (USDI 2016e:216, 218).

Proposed invasive plant treatments can be divided into two groups: ground disturbing and non-ground disturbing actions (see Table 3-24). Non-ground disturbing actions are considered "exempt" under the 2015 State Protocol between the Oregon-Washington BLM and the State Historic Preservation Office (Protocol) which governs the way cultural resource compliance work is conducted on BLM-managed lands in Oregon. Appendix E of the Protocol lists specific projects or activities that are conditionally exempt from field survey and consultation with the State Historic Preservation Office, and includes herbicide application/treatment by spraying "where it is unlikely to affect rock art or traditional Native American gathering areas" (Oregon SHPO and USDI 2015).

Table 3-24. *Ground Disturbing/Non-Ground Disturbing Actions*

Ground Disturbing Actions	Non-Ground Disturbing Actions
Manual (pulling and grubbing) Competitive seeding (when soil preparation required) and planting Biological (targeted grazing) Prescribed fire	Mechanical (mowing and string trimmers) Biological control agents (insects) Herbicide application Competitive seeding (when soil preparation not required)

A Standard Operating Procedure applicable to all alternatives states:

- Follow standard procedures for compliance with Section 106 of the *National Historic Preservation Act* as implemented through the National Programmatic Agreement and State protocols or 36 CFR Part 800, including necessary consultations with the State Historic Preservation Officers and interested Tribes.

The *National Historic Preservation Act* requires agencies to take into consideration the effects of their actions on properties listed or eligible for listing on the National Register of Historic Places (NRHP). As described in Chapter 2, Annual Treatment Plans are reviewed by an interdisciplinary team. This happens, in part, to confirm that required authorizations, obligations, and commitments (such as archaeological reviews and surveys) are completed prior to implementation. Potential effects from ground disturbing treatments under the Proposed Action and Alternative 3 will be assessed and adverse effects will be resolved or minimized through avoidance of discovered sites and the use of Project Design Features prior to project implementation.

Both the Oregon FEIS and 2016 PEIS describe that herbicide applications can increase soil acidity and advance artifact deterioration or the surfaces of masonry structure, pictographs, or petroglyphs (USDI 2010a:286, USDI 2016a:4-72). In addition, cultural resources often occur on or near the ground surface and can be damaged by ground disturbing activities such as mechanical invasive plant treatments (USDI 2010a:288-289). Standard Operating Procedures have been established to address these potential effects.

The type of actions and the amount of treatments under all alternatives would be consistent with the actions analyzed in the 2010 Oregon FEIS and the 2016 PEIS. All Standard Operating Procedures and Mitigation Measures analyzed in those documents would be applied to all alternatives. An additional ***Project Design Feature*** included in the analysis of the Proposed Action and Alternative 3 would further minimize potential effects:

- Avoid getting herbicides (through drift or accidental direct spray) on rock art or wooden/metal structures or artifacts at National Register of Historic Places (NRHP) listed or eligible sites.

- Avoid repeated use of livestock (more than one grazing episode annually) at National Register of Historic Places (NRHP) listed or eligible sites.

Traditional and Cultural Uses (Native American Interests)[73]

Traditional and Cultural Uses Issue 1 (Not Analyzed in Detail)

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

This issue was not analyzed in detail because effects were previously described in the analysis for the Oregon FEIS and the 2016 PEIS (USDI 2010a:286-289, USDI 2016a:4-71 and 4-72) and there are no new circumstances or information at the site-specific level that would change the effects anticipated for this EA. The risk of adverse effects is further minimized as a result of Project Design Features included with the Proposed Action and Alternative 3.

Historically, southwest Oregon Indians maintained a detailed ecological knowledge of a tremendous variety of plant resources and resource management techniques required to tend and harvest them, such as landscape burning (Gray 1987). The Tribes 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 all the sacred sites and places of traditional and cultural importance located within or near the District. The BLM manages those sites of which the BLM is aware in consultation with Tribes. In preparation of the *Resource Management Plans of Western Oregon*, 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). The Coos Bay District has agreements with the Coquille Indian Tribe and the Confederated Tribes of the Coos, Lower Umpqua, and Siuslaw Indians that allow collection of specific plants on designated BLM-administered lands.

Traditionally gathered plants may occur near invasive plant treatments areas. These traditionally gathered plants might be exposed to incidental contamination from drift when herbicides are used on invasive plants. The Oregon FEIS concluded that having the broader mix of herbicides would increase the options for appropriately managing invasive plants while minimizing the risk to humans, including Native Americans gathering traditional resources near the treatment areas (USDI 2010a:289). The *Human Health* Issues address the potential risk to human health associated with exposure to herbicide treatments; while there is a measurable risk under Risk Assessment modeled scenarios involving some of the herbicides analyzed in this EA (see *Human Health* Issue 1 and Table 3-13, *Effects of Herbicides (Human Health)*), the actual effects would be minimal because of how the herbicides are applied under all alternatives (generally spot sprayed at lower rates than analyzed in the Risk Assessments) and because of Protection Measures described in Appendix A 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 *Human Health* Issues for more information). It is expected that the treatment of

[73] Consultation with the Tribes on this program is ongoing. Additional issues affecting Tribes may be developed through the consultation process, as well as additional information about potential effects.

invasive plants would improve the habitat for traditionally gathered plants, as treatments would reduce habitat competition.

The type of actions and the amount of treatments under all alternatives would be consistent with the actions analyzed in the 2010 Oregon FEIS and the 2016 PEIS. All Standard Operating Procedures and Mitigation Measures analyzed in those documents would be applied to all alternatives. Additional ***Project Design Features*** included in the analysis of the Proposed Action and Alternative 3 would minimize the potential for invasive plant treatments affecting plants that may be important to Native Americans:

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

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 the *Native Vegetation* Issues and effects from the consumption of treated vegetation can be found in *Human Health* Issue 1. *Socioeconomics* Issue 4 discusses how the public and Tribes will be notified of proposed herbicide treatments.

Environmental Justice

Environmental Justice Issue 1 (Not Analyzed in Detail)

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

This issue was not analyzed in detail because this issue was addressed in the 2010 Oregon FEIS (USDI 2010a: 251-253). There are no new circumstances or information at the site-specific level that would change the effects anticipated for this EA.

Coos, Curry, and Douglas counties contain lower proportions of Hispanic/Latino residents and higher proportions of white residents than are present statewide. Between 89-93 percent of the population in each county is white, compared to 85 percent statewide, and between 5 and 6 percent of the residents were of Hispanic or Latino ethnicity, compared to 12 percent statewide. However, both Coos and Curry counties have a higher proportion of Native American residents (2.3 percent and 2 percent) than the statewide level of 1.1 percent, which is about the same in Douglas County (1.2 percent). The Coquille Indian Tribe and the Confederated Tribes of Coos, Lower Umpqua, and Siuslaw Indians both have a presence in the District. Coos and Douglas Counties each have a higher poverty rate than that for Oregon, and Curry County's rate is just below, so all three counties could be considered as environmental justice populations because of their low-income status. The 2016 per capita income in each county ($24,000 in Coos and Douglas, and $25,000 in Curry) is lower than the $29,000 average income for Oregon residents. The percentage of people below the poverty level was higher in Coos County (18 percent) and Douglas County (19 percent) than the statewide proportion of about 16 percent, but Curry County's poverty level was slightly lower, at about 15 percent.

The type of actions and the amount of treatments under all alternatives would be consistent with the actions analyzed in the 2010 Oregon FEIS and 2016 PEIS. All Standard Operating Procedures and Mitigation Measures analyzed in those documents would be applied to all alternatives. The FEIS analysis found a potential for contract and other crews to include a small disproportionate number or 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 treatment designs that attempt to minimize exposure of non-target food and water sources, and Standard Operating Procedures requiring consultation with tribes to locate any areas of vegetation that are significant to the tribes and that might be affected by herbicide treatments. *Human Health* Issues 1 and 2 address the potential for worker and public exposure to herbicide and non-herbicide treatments and finds, that while there is a measurable risk to workers under some scenarios, that risk is lower under the Proposed Action and Alternative 3 than under the No Action Alternative. The FEIS analysis also noted that the natural resources used for cultural or subsistence purposes would be adversely affected by the spread of invasive plants, which would be greater under the No Action Alternative (USDI 2010a:333).

Socioeconomics

Socioeconomics Issue 1 (Not Analyzed in Detail)

What are the economic impacts of invasive plants on the Coos Bay District on local area timber production, agriculture, and recreation?

This issue is not analyzed in detail because effects were previously described in the analysis for the Oregon FEIS and 2016 PEIS (USDI 2010a:309, USDI 2016a:4-82) and there are no new circumstances or information at the site-specific level that would change the effects anticipated for this EA.

The Coos Bay District manages approximately 322,700 acres of public lands located primarily in Curry, Coos, and Douglas Counties with smaller portions in Josephine and Lane Counties[74] (see Map 1-1). 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, Curry County has the highest percentage of Federal lands (61.9 percent, including BLM) but the lowest percentage of Coos Bay District-managed lands (3.4 percent). Douglas County (22.8 percent) and Coos County (15.5 percent) have more BLM-management, but a lower percentage of other Federal lands (11.8 and 8.2 percent respectively). Employment and earnings in timber and recreation related industries are important components of the Coos Bay economy. Timber production accounts for 6.7 percent of jobs and 10.1 percent of total earnings, while recreation accounts for 11 percent of employment and 5.5 percent of earnings on the Coos Bay District (USDI 2016e:667).

The Oregon FEIS and 2016 PEIS describe how management activities on BLM-managed lands have the potential to affect local economies (USDI 2010a:318, USDI 2016a:4-82). Invasive plants can result in direct economic losses and control costs. On agriculture and timber lands, invasive plants provide competition to the crop species, which leads to lost harvest and land value, as well as costs associated with invasive plant control. Invasive plants can limit recreation access and degrade the resource that the recreation relies on (e.g., water, wildlife, etc.). The 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:323). While there are differences in effectiveness

[74] Approximately 3,740.5 acres of the Coos Bay District are administered by the Medford District. These acres are analyzed in the Medford District's 2017 Integrated Plant Management EA (USDI 2017a).

between the alternatives, these differences would not reflect quantifiable changes in socioeconomic impacts (USDI 2010a:324, USDI 2016a:4-86).

A recent report described the direct negative economic impacts associated with noxious weeds in the state of Oregon, the additional costs associated if noxious weeds expand to new areas, and the positive return on investment associated with control (The Research Group, LLC 2014). That study estimated annual losses of $83.5 million to the State's economy from 25 noxious weed species. If left uncontrolled, potential annual losses could reach $1.8 billion in personal income and 40,800 jobs (The Research Group, LLC 2014). Two of the 25 selected noxious weeds, Himalayan blackberry and Scotch broom (the latter being a particular problem in forests), are widespread (state-wide and on the Coos Bay District) and contribute $79.6 million to the current overall economic impact. The remaining 23 species are limited in distribution and are under intensive management thus contributing to less than five percent of total current impacts. A similar analysis found that in Washington State, invasive species created losses of $239.5 million on crops, $120 million in the livestock industry, $125 million in the timber industry, and $20 million in recreation. Scotch broom was found to be one of the most costly plant species (Community Attributes Inc. 2017). While neither of these studies is specific to the Coos Bay District, they demonstrate that invasive species can have an economic effect on valued resources, lands, and opportunities.

The type of actions and the amount of treatments under all alternatives would be consistent with the actions analyzed in the 2010 Oregon FEIS and 2016 PEIS. All Standard Operating Procedures and Mitigation Measures analyzed in those documents would be applied to all alternatives. For example, as descried in the *Recreation* Issue, most treatments would be scheduled to avoid peak recreational use times and when treatments with herbicides occur in developed recreation sites, they would generally be spot treatments on small sites, 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. This helps to protect local area timber production, crops, livestock, and recreation resource values, while also reducing the level of risk of invasive plant infestations negatively affecting these resources. Adjacent landowners, county, State, and other Federal lands benefit from the BLM having a broader range of herbicides available for consideration. Having more herbicides available would enhance the BLM's ability to prevent the spread of invasive plants from BLM lands to private, county, State, and other Federal lands. The BLM's ability to more closely match existing private land treatments on adjacent areas under the action alternatives would be more effective than the No Action Alternative at cooperatively controlling plants so they do not infest or re-infest adjacent lands.

Socioeconomics Issue 2 (Not Analyzed in Detail)

Given the checkerboard land ownership pattern, what is the potential for herbicide contamination of yards, gardens, organic farms, vineyards, and bee hives on private lands?

This issue is not analyzed in detail because effects were previously described in the analysis for the Oregon FEIS and the 2016 PEIS (USDI 2010a:309, USDI 2016a:4-81) and there are no new circumstances or information at the site-specific level that would change the effects anticipated for this EA. The type of actions and the amount of treatments under all alternatives would be consistent with the actions analyzed in the 2010 Oregon FEIS and 2016 PEIS. The same Standard Operating Procedures and Mitigation Measures analyzed in those documents would be applied to all alternatives in this EA.

In general, BLM and their contractors would not apply herbicides on private lands. (BLM may fund treatments on private lands through cooperative management agreements.) The Oregon FEIS stated that residential lands and agricultural lands, where crops (including orchards, vineyards, and pastures) are grown are protected from drift of BLM applied herbicides by Standard Operating Procedures that include no-spray buffers, drift reduction measures, and other practices that minimize or eliminate herbicide drift or off site movement (USDI 2010a:145). Those same Standard Operating Procedures were also included in the 2007 and 2016 PEISs and are common to all alternatives.

County residents can obtain a "No Spray" permit issued by the State or County if they do not wish to have herbicides sprayed next to their property. These permits are not binding on the BLM; they are most commonly used to prevent State or County road maintenance spraying noxious weeds immediately adjacent to private properties, and these crews know where these permits have been issued. BLM spray crews would generally respect signs they see; some are intended to protect high-value crops or other things not always apparent at the site. Standard Operating Procedures preclude ground spraying within 100 feet of a residence without written permission from the owner or occupant.

The herbicides that the BLM uses have very low vapor pressures and would not be found at a distance of 9 to 27 meters downwind of the application site (Vencill et al. 2002). Further, herbicide application methods used on the District are not those that are prone to drift. Under the No Action Alternative, the Coos Bay District has done all of their treatments with hand-directed applications, primarily backpack sprayers. Under the Proposed Action and Alternative 3, 95 percent of herbicide treatments would be hand-directed, and 5 percent would be broadcast primarily along existing roads. Aerial applications have not and would not be used. Drift and methods for control are discussed further in Appendix C, *Herbicide Risk Assessment Summaries*.

Bees are unlikely to be affected by the BLM's herbicide use; the effects from herbicides to pollinators would generally be related to habitat (vegetation) loss and treatments proposed under the alternatives are generally small (see Table 2-2, *Summary of Invasive Plants Documented in NISIMS by Infestation Size*: 71 percent of known sites are less than 0.5 acres). The effects of herbicides on pollinators are addressed in *Wildlife* Issue 3 and the effects of herbicides on vegetation are described in the *Native Vegetation* Issues.

Socioeconomics Issue 3 (Not Analyzed in Detail)

How would the alternatives affect permitted land uses, including rights-of-way and administrative site grant and leaseholders?

This is not analyzed in detail because there is no effect to permitted land uses. As described in the Purpose and Need, the alternatives are solely intended to evaluate options for improving invasive plant control, thereby assisting the BLM in meeting its obligation to manage public lands for multiple uses consistent with the *Federal Land Policy and Management Act*. The alternatives do not propose changes to land uses.

All three alternatives apply to all invasive plant control activities conducted on BLM-managed lands within the Coos Bay District, including those undertaken by grant holders and lessees. Grant and leaseholder responsibility for control of noxious weeds (not all invasive plants) would continue, but additional herbicides could be used. The addition of invasive plants to the species that can be controlled would enable grant and leaseholders to more effectively manage the right-of-way and conduct maintenance. In cases where grants or leases specify or limit the herbicides to be used, there may be some delay in approving additional herbicides until grants or leases are renewed. Holders of long, linear rights-of-way crossing multiple jurisdictions would benefit by being able to use the same herbicides over long expanses rather than changing each time they enter BLM-managed lands.

Socioeconomics Issue 4 (Not Analyzed in Detail)

How and when will the public and Tribes be notified of herbicide application?

This issue is not analyzed in detail because there is no difference between the alternatives. There are several Standard Operating Procedures and Mitigation Measures that ensure the public will be notified prior to herbicide applications and these measures apply equally to all of the alternatives. Changes to these procedures are not proposed in this analysis. These Protection Measures include:

- Notify adjacent landowners, grazing permittees, the public, and emergency personnel of treatments.

- Coordinate with and/or notify neighboring landowners who may want to treat, or are already treating, adjacent lands.
- Notify other public land users within or adjacent to the right-of-way proposed for treatment.
- Provide public notification in newspapers or other media where the potential exists for public exposure.

The Coos Bay District sends news releases to local newspapers and signs all treatment areas prior to the treatment. A district-wide Annual Treatment Plan will be prepared prior to the beginning of control treatments each year and the resulting Determination of NEPA Adequacy, or additional NEPA analysis if warranted, will be made available to the public on ePlanning and shared with the Tribes as part of ongoing consultation (see also *Traditional and Cultural Uses (Native American Interests)* Issue 1). 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.

Implementation Cost

Implementation Cost Issue 1

How would the increased availability of herbicides to treat European beachgrass in western snowy plover habitat restoration areas under Alternative 3 affect treatment costs at the North Spit and New River?

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 2005f:34).

This issue examines the direct costs of invasive plant treatments at the North Spit and New River. Costs presented in this section are in 2018 dollars not adjusting for inflation, and include equipment, materials (including herbicides), wages, and contract costs; they do not include program planning (e.g., NEPA or the creation of Annual Treatment Plans). As shown in Table 3-25, the direct cost of treating an acre of invasive plants varies by density of infestation. Manual treatments on the Coos Bay District range from $68/acre (low density, pull and scatter invasive plants) to $370 (high density pull and bag invasive plants).

Table 3-25. *Direct Costs of Invasive Plant Treatments, by Gross Acre*[1]

Activity[1]	Density	Cost
Herbicide Spot Spray	Low	$68.00
Herbicide Spot Spray	Medium	$96.00
Herbicide Spot Spray	High	$204.00
Herbicide Wicking/Wiping Application	Low	$98.00
Herbicide Wicking/Wiping Application	Medium	$160.00
Herbicide Wicking/Wiping Application	High	$280.00
Bulldozers or tractors with discs or plows[2]	Any	$963.00

1. Herbicides costs based on recent District contracts for invasive plant control projects. Per acre costs do not include a supplemental fee for walk-ins more than ¼ mile of $38 per person
2. Costs for mechanical removal are based on past project implementation costs at North Spit and New River by the BLM from Fiscal Year 2017.

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.

European beachgrass is a fast-growing species that forms dense rhizomes that crowds out other plant species. As much as 80 percent of the North Spit is covered with European beachgrass and would be considered high density infestations.

Under all alternatives, plover access cuts through European beachgrass on ocean foredunes would be treated with methods that would avoid the removal of the root system. This has been accomplished with youth crews, manually pulling the beachgrass, at a cost $7,700 to $8,500 per week (Kip Wright, Coos Bay Wildlife Biologist / ACEC Coordinator, 2018 personal communication). This would not change between alternatives and is not analyzed further.

Treatments Planned Related to the Issue

No Action Alternative and Proposed Action

In habitat restoration areas at New River and the North Spit, approximately 100 acres of European beachgrass would primarily be treated mechanically twice a year, with non-selective heavy equipment such as discs or bulldozers. At New River, no herbicides would be used in the plover habitat restoration area. At the North Spit, the BLM would treat up to 24 acres annually with glyphosate.

Alternative 3

In these habitat restoration areas, imazapyr, glyphosate, or imazapyr mixed with glyphosate would be used to treat European beachgrass. While this could occur on all 172 acres in one year, it would generally happen on approximately 100 acres annually. The use of these more effective herbicides on European beachgrass would reduce the treatments done by heavy equipment. In the next five years, this is anticipated to result in greater than 75 percent reduction in the use of bulldozers or tractors with discs or plows (or approximately once every two years).

Environmental Consequences

Table 3-26 shows the average direct cost of invasive plant treatments as it varies by alternative over a 20-year analysis period.

Table 3-26. *Average Direct Cost of Treatments*

Alternative	Herbicide		Mechanical		Total Cost	Cost/Acre
	Cost/Acre	Acres Treated	Cost/Acre	Acres treated		
No Action Alternative and Proposed Action						
Year 1 to 5	$204	24	$963	200	$197,496	$1,975
Year 6 to 10	$204	24	$963	200	$197,496	$1,975
Year 11 to 20	$204	24	$963	200	$197,496	$1,975
Alternative 3[1]						
Year 1 to 5	$204	100	$963	50	$68,550	$686
Year 6 to 10	$98	100	$963	50	$57,950	$580
Year 11 to 20	$68	100	$963	50	$54,950	$550

1. Costs conservatively assume mechanical treatments in western snowy plover habitat restoration areas will occur once every two years. As described below, mechanical treatments may occur every two to three years.

No Action Alternative and Proposed Action

Existing *Endangered Species Act* consultation limits the treatment methods that can be used under the No Action Alternative and Proposed Action to mechanical and manual methods at both sites, and 24 acres of glyphosate use at the North Spit. This restriction means that bulldozers have been the primary method of treatment. Due to the deep rhizomes and rapid regrowth of European beachgrass, this has meant two treatments are needed each year to reduce the beachgrass cover to maintain nesting habitat for the western snowy plover. The treatments are time consuming and expensive since large equipment must be mobilized and operated, causing 6 weeks of disturbance annually (see *Wildlife* Issue 1) at a cost of $963 per acre. Treating 100 acres twice a year mechanically costs $192,600. Herbicide use is limited to 24 acres annually at the North Spit, at a cost of $4,896 assuming spot spraying on a high density infestation. These treatment methods have been estimated to be only 10 percent effective at treating beachgrass, therefore the infestation density would remain high even with annual treatment. Implementation costs would remain the same over time (no reduction in infestations with treatment). The total implementation costs to treat European beachgrass at the North Spit and New River would be $197,496, or $1,975 per acre.

Alternative 3

The availability of herbicides (imazapyr and glyphosate) would reduce the need for mechanical treatments from twice a year to once every 2 to 3 years. Herbicide treatments are less than one quarter of the cost per acre of mechanical treatments since much less equipment and people are required to implement the treatment. The herbicide cost per acre would remain the same, but the total acres treated would increase, thus the total cost of herbicide use would increase to $20,400. However, mechanical treatments would decrease in frequency from twice a year to once every two years, reducing the average annual treatment cost for that treatment method by 75 percent. Total implementation costs would decrease to $68,555 ($686/acre), 65 percent less compared to the No Action Alternative and Proposed Action.

Over time, it is reasonable to assume that European beachgrass density would decrease with annual herbicide treatments, and thus treatment costs would decrease (USDI 2015a). After 5 years, it is assumed that effective treatment with imazapyr and glyphosate would reduce densities to medium, and eventually to low density by year 20. This would further reduce treatment costs for a total of a 71 percent reduction (compared to the No Action Alternative and Proposed Action) by year 5, and a 72 percent reduction (compared to the No Action Alternative and Proposed Action) by year 20.

Summary of Effects

Table 3-27. *Summary of Effects (Implementation Cost Issue 1)*

Alternative	Cost/Acre Year 1-5	Cost/Acre Year 6-10	Cost/Acre Year 11-20	Comments
No Action Alternative/ Proposed Action	$1,975	$1,975	$1,975	Mechanical treatments of European beachgrass are needed twice a year. Infestations remain at high densities, leaving treatment costs unchanged over time.
Alternative 3	$686	$580	$550	Treatment of European beachgrass with herbicides, reduces need for mechanical treatments to once every 2 years and lowers costs. Effective treatment methods decreases invasive plant densities, further reducing costs over time.

Recreation

Recreation Issue 1 (Not Analyzed in Detail)

How would herbicide treatments at recreation sites affect visitor access and recreational experiences?

This issue is not analyzed in detail because effects were previously described in the analysis for the Oregon FEIS and the 2016 PEIS (USDI 2010a:309, USDI 2016a:4-81) and there are no new circumstances or information at the site-specific level that would change the effects anticipated for this EA.

As described in the Oregon FEIS, manual methods would 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 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:308-309). The Oregon FEIS did not discuss the effects of aminopyralid, fluroxypyr, or rimsulfuron. The effects of these three herbicides were discussed in the 2016 PEIS, where it states that impacts to recreation nationwide from a program that included these three herbicides would be similar to the program without those three herbicides (USDI 2016a:4-81).

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

Popular recreation sites on the District include Loon Lake Campground, Dean Creek Elk Viewing Area, Edson Campground, Sixes Campground, New River, Smith River Falls Campground, Vincent Creek Campground, Park Creek Campground, Bastendorff Beach, North Spit Boat Ramp, North Spit Trails, and Blue Ridge Trails. Invasive plant species of concern in these areas include brooms, blackberry, knotweeds, and ivy. The District has over 700,000 visitors a year (USDI 2016d). 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. As stated in a Standard Operating Procedure, most treatments would be scheduled to avoid peak recreational use times. When treatments with herbicides occur in developed recreation sites, they would generally be spot treatments (95 percent in the action alternatives and 100 percent in the No Action Alternative) on small sites, which would limit potential exposure to visitors.

The effects of herbicides on human health in situations that are applicable to visitors are discussed in the *Human Health* Issue 1 earlier in this EA and the effects of recreation to the spread of invasive plants is described in *Invasive Plants* Issue 1. Recreation is also discussed in *Socioeconomic* Issue 2 and *Water* Issue 1.

Recreation Issue 2 (Not Analyzed in Detail)

What are the effects of herbicides on horses, dogs, and other pets that accompany recreationists?

This issue is not analyzed in detail because treatments under all alternatives would have no potential to adversely affect pets and other animals that accompany recreationists (e.g., horses, dogs, llamas). As described in *Recreation* Issue 1, existing Protection Measures (Appendix A) would limit the exposure of recreationists to herbicides.

Although animals that accompany recreationists could potentially be exposed, BLM assumes that pets would be controlled by their owners. When feasible, treatments would be scheduled to avoid peak use and most treatments are spot treatments targeting individual plants in small areas (71 percent of sites are less than ½ gross acre) minimizing the likelihood that people and animals would be exposed. As required by existing Protection Measures (see Appendix A), treatment areas are posted to alert people to avoid areas and further minimize exposure potential.

Risk Assessments (summarized in Appendix C) 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 dicamba or triclopyr, but dicamba and triclopyr would not be used to treat invasive grasses (see Table 2-10, *Treatment Key*) and the scenario assumed that the large mammal would feed on contaminated grass for an entire day (see Appendix C). Scenarios that involve small or large mammals consuming contaminated insects or smaller mammals are all 0 or low risk (see Appendix C). 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.

As described in Chapter 2's *Category II, Spread from Existing Invasive Plant Sites* section, like the recreationists that they accompany, pets and other animals can also spread invasive plants. As described in the *Prevention, Education, and Awareness* section in Chapter 2, the District requires weed-free forage for any livestock fed on BLM-managed lands.

Consultation and Coordination

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

List of Preparers

Core Team	
Team Lead and Coos Bay District Invasive Plant Coordinator	Jeanne Standley
Planning and Environmental Coordinator (Coos Bay)	Aimee Hoefs
Management Representative and Umpqua Resource Area Field Manager	Glenn Harkleroad
Project Manager and Oregon State Office Invasive Plant Coordinator	Erin McConnell
Planner (Oregon State Office)	Richard Hardt
GIS Specialist (Oregon State Office)	Maria Fiorella
Denton and Denton Environmental (Contractor)	Christi Denton
Denton and Denton Environmental (Contractor)	Carolyn Sharp

Other Specialists (all Coos Bay District unless otherwise specified)	
Socioeconomic Specialist (Oregon State Office)	Stewart Allen
Hydrologist	John Colby
Geographic Information Specialist	Tristan Holland
Outdoor Recreation Planner	John Harper
Archaeologist	William Kerwin
Geologist and Soil Scientist	Greta Krost
Fire Management Officer	Jamie Lilienthal
Fish Biologist	Stephanie Messerle
Botanist	Tim Rodenkirk
Cartographer (Oregon State Office)	Gabriel Rousseau
ACEC Coordinator/Wildlife Biologist	Kip Wright

Reviewers

Thanks to Carol Aron, Tom Beaucage, Megan Harper, Scott Hoefs, Jim Kirkpatrick, Teresa Stutesman, and Kathy Westenskow in the Coos Bay District Office and Lee Folliard, Mike Kinsey, Mark Mousseaux, Scott Lightcap, Bruce Hollen, Angel Dawson, Robert Hopper, Mike Brown, Jerry Magee, Leanne Mruzik, Dave Johnson, and Kristin Martine in the Oregon State Office.

Review Opportunity

The EA and Finding of No Significant Impact (FONSI) were made available for a 30-day review period (July 2018) on BLM's ePlanning website. A legal notice was also published in the Coos Bay World announcing the availability of the documents for review and the comment period end date. Agencies, Native American Tribes, and interested members of the public were notified of the availability of the EA and FONSI for review. The mailing list is contained in the project record file.

Glossary

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.

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-managed lands in Oregon, this may include seasonal fire stations, wild horse corrals, rock quarries, bulk material and equipment storage areas, seed orchards, BLM-managed airstrips and helipads, BLM range improvements and water source developments, sanitary systems, BLM communication sites, remote automated weather stations, etc.

Adsorption: 1) The adhesion of substances to the surface of solids or liquids. 2) The attraction of ions of compounds to the surface of solids or liquids.

Aerobic: Life or processes that require, or are not destroyed by, the presence of oxygen (Also see anaerobic).

Affected environment: Existing biological, physical, social, and economic conditions of an area subject to change, both directly and indirectly, as the result of a proposed human action.

Air quality: The composition of air with respect to quantities of pollution therein. Used most frequently in connection with “standards” of maximum acceptable pollutant concentrations.

Ambient air: Any unconfined portion of the atmosphere; open air, surrounding air, or “outdoor air.”

Anadromous fish: Fish that mature in the sea and swim up freshwater rivers and streams to spawn. Examples include salmon, steelhead, and sea-run cutthroat trout.

Anaerobic: Life or processes, such as the breakdown of organic contaminants by microorganisms, which take place without oxygen. Anaerobic soils are generally found in riparian areas.

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

Area of Critical Environmental Concern (ACEC): Type of special land use designation specified within the *Federal Land Policy and Management Act*. Used to protect areas with important resource values in need of special management.

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 nonnative agents including invertebrate parasites and predators (usually insects, mites, and nematodes), and plant pathogens to reduce populations of invasive plants.

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 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.

Candidate species: Plants and animals for which the U.S. Fish and Wildlife Service or National Marine Fisheries Service has sufficient information on their biological status and threats to propose them as endangered or threatened under the *Endangered Species Act*, but for which development of a proposed listing regulation is precluded by other higher priority listing activities.

Chronic exposure: Exposures that extend over a long period. Chronic exposure studies are used to evaluate the carcinogenic potential of chemicals and other long-term health effects.

Chronic toxicity: The ability of a substance or mixture of substances to cause harmful effects over an extended period, usually upon repeated or continuous exposure sometimes lasting for the entire life of the exposed organism.

Clay: In soil, particles smaller than 0.002 mm in diameter. Fine textured sediment, with particles smaller than silt.

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

Endemic: Being unique to a defined geographic location, such as an island, nation, country or other defined zone, or habitat type.

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

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.

Ephemeral stream: A stream that contains running water only sporadically, such as during and following storm events.

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

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.

Integrated vegetation (or) weed management (IVM or IWM): A long-standing, science-based, decision-making process that identifies and reduces risks from vegetation and vegetation management related strategies. It coordinates the use of vegetation biology, environmental information, and available technology to prevent unacceptable levels of damage by the most economical means, while posing the least possible risk to people, property, resources, and the environment. IVM provides an effective strategy for managing vegetation in all arenas from developed agricultural, residential, and public areas to wild lands. IVM serves as an umbrella to provide an effective, all encompassing, low-risk approach to manage problem vegetation. A sustainable approach to managing vegetation by combining biological, cultural, physical, and chemical tools in a way that minimizes economic, health, and environmental risks.

Interagency Special Status/Sensitive Species Program (ISSSSP): The BLM and Forest Service collaboration to coordinate record keeping and other management of the Bureau Special Status and Forest Service Sensitive species programs. See also *Special Status species*.

Intermittent stream: Any non-permanent flowing drainage feature having a definable channel and evidence of annual scour or deposition. This includes what are sometimes referred to as ephemeral streams if they meet these two criteria.

Invasive plants: Nonnative, aggressive plants with the potential to cause significant damage to native ecosystems, cause significant economic losses, or both. *This Oregon FEIS definition differs from the 2007 PEIS definition by not including species native to the ecosystem under consideration.*

Issue: A matter of controversy, dispute, or general concern over resource management activities or land uses.

K_{oc}: Organic carbon-water partition coefficient. A measure of a material's tendency to adsorb to soil particles. High K_{oc} values indicate a tendency for the material to be adsorbed by soil particles rather than remain dissolved in the soil solution. Strongly adsorbed molecules will not leach or move unless the soil particle to which they are adsorbed moves (as in erosion).

Label: All printed material attached to or part of the pesticide container, and which contains instructions for the legal application of the pesticide.

LC_{50} (median lethal concentration): A concentration of a chemical in air or water to which exposure for a specific length of time is expected to cause death in 50 percent of a defined experimental animal population.

LD_{50} (median lethal dose): The dose of a chemical calculated to cause death in 50 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. For example, herbicide products that include 2,4-D list 4 lbs./acre as the maximum rate on the label, but Risk Assessments analyze a maximum application rate of 2 lbs./acre. Therefore, the maximum allowable rate of application on BLM-administered lands is 2 lbs./acre.

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 A.

Monoculture: A population dominated by a single species; a prevailing culture marked by homogeneity.

Monitoring: The orderly collection, analysis, and interpretation of resource data to evaluate progress toward meeting management objectives.

Nematode: Any of a phylum (*Nematoda* or *Nemata*) of elongated cylindrical worms parasitic in animals or plants or free-living in soil or water —also called roundworm.

No Action Alternative: The most likely condition to exist in the future if current management direction were to continue unchanged.

No observed adverse effect level (NOAEL): The exposure level at which there are no statistically or biologically significant differences in the frequency or severity of any adverse effect between the exposed and control populations.

No observed effect level (NOEL): Exposure level at which there are no statistically or biologically significant differences in the frequency or severity of any effect between the exposed and control populations.

Non-selective herbicide: An herbicide that is generally toxic to plants without regard to species or group.

Non-target: Any organism that is not the objective of a control treatment.

Noxious weed: A subset of invasive plants that are County, State, or federally listed as injurious to public health, agriculture, recreation, wildlife, or any public or private property.

Parent material: The unconsolidated and more or less chemically weathered mineral or organic matter from which the soil has developed.

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

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

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.

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

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

Prescribed fire: A wildland fire that burns under specified conditions and in 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 as part of this analysis to prevent adverse effects from invasive plant treatments.

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

Proposed threatened or endangered species: Plant or animal species proposed by the U.S. Fish and Wildlife Service or National Marine Fisheries Service to be biologically appropriate for listing as threatened or endangered and that is published in the Federal Register. It is not a final designation. Proposed species are, at minimum, managed as Bureau Sensitive until a decision is made about Federal listing.

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

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.

Research Natural Areas (RNAs): Parts of a national network of reserved areas under various ownerships, containing important ecological and scientific values that are managed for minimum human disturbance. They are established and managed to protect ecological processes, conserve biological diversity, and provide opportunities for observation for research and education.

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. They are not available to the general public.

Resource Management Plan: Current generation of land use plans developed by BLM under the FLPMA; replaces the older generation management framework plans; provides long-term (up to 20 years) direction for the management of a particular area of land, usually corresponding to a BLM field office, and its resources.

Revegetation: Establishing or re-establishing desirable plants where desirable plants are absent or of inadequate density, either by controlling site conditions (including the suppression of unwanted competition) so existing vegetation can reseed and spread, or by direct seeding or transplanting.

Right-of-way: 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 buffer: A strip of vegetation along the bank of a body of water that slows the rate of flow of runoff from adjoining uplands, causing sediment and other materials to deposit onto the land before the runoff enters and pollutes the body of water.

Riparian habitat: Areas adjacent to rivers and streams with a high density, diversity, and productivity of plant and animal species relative to nearby uplands.

Risk: The likelihood that a given exposure to an item or substance (e.g., herbicide dose) will produce illness or injury.

Risk Assessment: The process of gathering data and making assumptions to estimate short- and long-term harmful effects to human health or elements of the environment from particular products or activities. See Appendix C, *Herbicide Risk Assessment Summaries*.

Risk quotient: The Estimated Environmental Concentration (EEC), as calculated through computer modeling, divided by the LD_{50} (lethal dose where 50 percent of test population dies) or LC_{50} (lethal concentration for aquatic forms, where 50 percent of the test population dies). RQs were developed to provide a more realistic scenario of herbicide exposure. Even so, results assume 100 percent exposure and animals confined to the treatment area. For species that are at all mobile, such exposures are unlikely from the applications proposed by the action alternatives. Analogous to Hazard Quotient. An RQ less than or equal to 1 is presumed to indicate an acceptably low level of risk for a specific application.

Runoff: Overland flow; the part of precipitation, as well as any other flow contributions that does not soak into soil or stay held on the site for evaporation or transpiration, but runs into streams.

Safety data sheet (SDS): A compilation of information required under the Occupational Safety and Health Administration Communication Standard on the identity of hazardous chemicals, health and physical hazards, exposure limits, and precautions.

Salmonids: Fishes of the family *Salmonidae*, including salmon, trout, chars, whitefish, ciscoes, and grayling.

Sand: Individual rock or mineral fragments that range in diameter from 0.05 to 2 mm in diameter.

Scoping: A process at the beginning of a NEPA analysis whereby the public is asked to provide oral or written comments about the scope of the analysis and the range of alternatives, to help ensure the analysis appropriately addresses potential effects on individuals, communities, and the environment.

Secondary invasion: An increase in abundance of non-target invasive plants following treatment of targeted invasive plants.

Sediments: Unweathered geologic materials generally laid down by or within water bodies; the rocks, sand, mud, silt, and clay at the bottom and along the edge of lakes, streams, and oceans.

Selective herbicide: A chemical designed to affect only certain groups or types of plants, leaving other tolerant plants unharmed.

Sensitive species (Bureau Sensitive): Native species designated by the BLM State Director as sensitive because they are found on BLM-managed 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-managed lands, and there is evidence that such areas are threatened with alteration such that the continued viability of the species in that area would be at risk.

Serpentine soil or substrate: Serpentine soils are unique for their low amounts of calcium and high amounts of magnesium, high concentrations of metals, and low levels of nitrogen.

Significant: The description of an impact that exceeds a certain threshold level. Requires consideration of both context and intensity. The significance of an action must be analyzed in several contexts, such as society as a whole, and the affected region, interests, and locality. Intensity refers to the severity of effects, which should be weighed along with the likelihood of its occurrence. Determination of significance for effects is a management decision considering multiple factors, and not one made by technical specialists to indicate the quantity of effects are above or below some level.

Silt: Individual mineral particles that range in diameter from between 0.002 and 0.05 mm in diameter.

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

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

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

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

Standard Operating Procedures: Procedures that would be followed by the BLM to ensure that risk to human health and the environment from treatment actions were kept to a minimum. See Appendix A. Since they originate from Manual and other direction, they may appear in resource management and other plans under other titles.

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-managed lands. Under some situations, this value may be higher or lower than what is going to be applied for a specific job. The rate of application of any pesticide is based upon several factors, including, but not limited to, the species to be controlled, the environment for which the application is to be made, the timing of the application, and other factors. For example, a typical rate of application for imazapic is about 2.0 fluid ounces of Plateau, which, when taking into the concentration of the formulated product (2.0 pounds acid equivalent/per gallon) equates to 0.0313 lb. a.e./acre. It is known that 2.0 fluid ounces of Plateau will achieve a specific level of control under a specific set of conditions. Rates around 4.0 to 6.0 fluid ounces of imazapic appear to be the more common range for activity, based on the experience of researchers, for cheatgrass. The rate is based upon what is identified as what is normally considered for application under a normal condition.

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

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

Weed: When not preceded by "noxious," this term generally means invasive plants (including noxious weeds) in this EA. Its use in this EA is avoided except when it is used in citations and paraphrases of other documents, or is part of titles or common phrases. Within such documents, the intent is usually noxious weeds and other invasive plants.

Wetlands: An area that is saturated by surface or ground water with vegetation adapted for life under those soil conditions, as swamps, bogs, fens, marshes, and estuaries.

Wild and Scenic Rivers: Rivers designated in the National Wild and Scenic Rivers System that are classified in one of three categories (wild, scenic, or recreational), depending on the extent of development and accessibility along each section. In addition to being free flowing, these rivers and their immediate environments must possess at least one outstandingly remarkable value: scenic, recreational, geologic, fish and wildlife, historical, cultural, or other similar values.

Wilderness: Land designated by Congress as a component of the National Wilderness Preservation System.

Wildfire: Unplanned ignitions or prescribed fires that are declared wildfires. Wildfires may be managed to meet one or more objectives as specified in Resource Management Plans and the objectives can change as the fire spreads across the landscape.

Wildland fires: Fires occurring on wildlands, regardless of ignition source, damages, or benefits, and including wildfire and prescribed fire.

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. Prepared for USDI BLM. Manchester, New Hampshire.
AECOM 2014d	AECOM. 2014. Clopyralid Ecological Risk Assessment Final Report. Prepared for USDI BLM. Manchester, New Hampshire.
AECOM 2014e	AECOM. 2014. 2,4-D Ecological Risk Assessment Final Report. Prepared for USDI BLM. Manchester, New Hampshire.
AECOM 2015	AECOM. 2015. Aminopyralid Ecological Risk Assessment Final Report. Prepared for USDI BLM. Manchester, New Hampshire.
Aikens et al. 1992	Aikens et al. 1993. Archaeology of Oregon. USDI-BLM Publication, Oregon State Office Publication. Pp. iii. Preface by Richard Hanes. Pp. iii. Cited in Archaeology of Oregon.
Aikens et al. 1993	Aikens et al. 1993. Archaeology of Oregon. USDI-BLM Publication, Oregon State Office Publication. Pp. iii. Preface by Richard Hanes. Pp. iii. Cited in Archaeology of Oregon.
Amsberry et al. 2016	Amsberry, K., Brown J. and R. J. Meinke. 2016. The effect of the herbicide imazapyr on seedling emergence and survival of Abronia umbellata var. breviflora (pink sand verbena). Oregon Department of Agriculture, Native Plant Conservation Program, 14p.
ASI 2006	American Sheep Industry. 2006. Targeted Grazing: A Natural Approach to Vegetation Management and Landscape Enhancement. Karen Launchbaugh (ed.). American Sheep Industry Assoc. Available at http://www.fs.fed.us/rm/pubs/rmrs_gtr292/2006_launchbaugh_k002.pdf
Bahm and Barnes 2011	Bahm, M.A. and T.G. Barnes. 2011. Native grass and forb response to pre-emergent treatment of imazapic and imazapyr. Natural Areas Journal 31:75-79.
Balbuena et al. 2015	Balbuena M.S., Tison L., Hahn M.L., Greggers U., Menzel R., Farina W.M. 2015. Effects of sublethal doses of glyphosate on honeybee navigation. Journal of Experimental Biology. 218:2799-2805. Available at http://jeb.biologists.org/content/218/17/2799
BASF 2008	BASF. 2008. Plateau Herbicide Label. Research Triangle Park, North Carolina.
Battaglin et al. 2000	Battaglin, W.A., E.T. Furlong, M.R. Burkhardt, and C.J. Peter. 2000. Occurrence of Sulfonylurea, Sulfonamide, Imidazolinone, and Other Herbicides in Rivers, Reservoirs and Ground Water in the Midwestern United States, 1998. Science of the Total Environment 248:123-133.
Bear 1972	Bear, J. 1972. Dynamics of fluids in porous media. Dover Publications. ISBN 0-486-65675-6.
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.
Benachour and Seralini 2008	Benachour, N. and Seralini, G-E. 2008. Glyphosate formulations induce apoptosis and necrosis in human umbilical, embryonic, and placental cells. Chemical Research in Toxicology, DOI: 10.1021/tx800218n. December 23, 2008. Available at http://pubs.acs.org/doi/abs/10.1021/tx800218n
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. Available at http://apps.who.int/iris/bitstream/10665/78102/1/WHO_HSE_PHE_IHE_2013.1_eng.pdf?ua=1
Black and Vaughan 2005	Black, S. H., and D. M. Vaughan. 2005. Species Profile: *Polites mardon*. In Shepherd, M. D., D. M. Vaughan, and S. H. Black (Eds). Red List of Pollinator Insects of North America. CD-ROM Version 1 (May 2005). Portland, OR: The Xerces Society for Invertebrate Conservation.
Black et al. 2010	Black, S.H., L. Beyer, S. Jepsen, C. Mazzacano, M. Shepherd, A. Minnerath. 2010. Management plans for all Southern Oregon Cascade mardon skipper (*Polites mardon klamathensis*) sites on BLM lands. Final Report to the Forest Service and BLM from The Xerces Society. Portland, OR: The Xerces Society.
BPA 2000	Bonneville Power Administration. 2000. Transmission System Vegetation Management Program Environmental Impact Statement. Portland, OR.

Cited As	Reference
Brooks et al. 1995	Brooks, J.J., J.L. Rodrigues, M.A. Cone, KV Miller, B.R. Chapman and others. 1995. Small mammal and avian communities on chemically-prepared sites in the Georgia Sandhills. Gen. Tech. Rpt. Southern Research Station USDA Forest Service; pp 21-23.
California Department of Pesticide Regulation 2005	California Department of Pesticide Regulation. 2005. Public Report 2005-01. Fluroxypyr. Tracking ID 197141 N. Available at http://www.cdpr.ca.gov/docs/registration/ais/publicreports/5768.pdf
CFPA 2017	Coos Forest Protective Association. (website) 2017 Available at http://www.coosfpa.net/aboutcfpa.asp. Accessed February 12, 2018.
CH2M Hill 1995	CH2M Hill. 1995. Sand dune aquifer groundwater availability study. Prepared for the Coos Bay-North Bend Water Board.
Chang and Dezell 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. Available at 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. Available at http://www.invasivespecies.wa.gov/council_projects/economic_impact/Invasive%20Species%20Economic%20Impacts%20Report%20Jan2017.pdf
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.
Douthit 1999	Douthit, Nathan. 1999. A Guide to the Oregon South Coast History: Traveling the Jedediah Smith Trail. Canada: Oregon State University Press. Corvallis, OR.
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. Available at https://echa.europa.eu/documents/10162/23294236/portier_echa_efsa_response.pdf/9e199eca-af2f-96bb-9e61-d6bae2588f4b
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 2005c	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 2005d	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 2005g	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 2005h	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 2005i	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 2005j	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 2005l	ENSR. 2005. Vegetation Treatment Programmatic Environmental Impact Statement Human Health Risk Assessment Final Report. Prepared for BLM Nevada State Office, Reno, NV.
Extoxnet 1996	Extension Toxicology Network (Extoxnet). 1996. Sulfometuron methyl. Pesticide Information Profiles. Extension Technology Network. Available at http://extoxnet.orst.edu/pips/sulfomet.htm

Cited As	Reference
Farm Service Genetics 2008	Farm Service Genetics. 2008. SS 200 BMR Sorghum Sudangrass.
Fletcher et al. 1996	Fletcher, J.S., T.G. Pfleeger, H.C. Ratsch, and R. Hayes. 1996. Potential impact of low levels of chlorsulfuron and other herbicides on growth and yield of nontarget plants. Environmental Toxicology and Chemistry 15:1189-1196.
Gordon 1998	Gordon, D. 1998. Effects on invasive, non-indigenous plant species on ecosystem processes: lessons from Florida. Ecological Society of America. 8(4):975-989.
Gray 1987	Gray, D.J. The Takelma and Their Athapaskan Neighbors: A New Ethnograophic Synthesis for the Upper Rogue River Area of Southwestern Oregon. University of Oregon Anthropological Papers:37.
Gustafson 1989	Gustafson, D.I. 1989. Groundwater Ubiquity Score: A Simple Method for Assessing Pesticide Leachability. Enviromental Toxicology and Chemistry, 8, 339-357. Available at http://dx.doi.org/10.1002/etc.5620080411
Halofsky and Peterson 2016	Halofsky, J.E. and D. L. Peterson. 2016. Climate Change Vulnerabilities and Adaptation Options for Forest Vegetation Management in the Northwestern USA. Atmosphere 7(3), 46. Available at doi:10.3390/atmos7030046.
Hanson et al. 2015	Hanson, B., C. Bond, K. Buhl, D. Stone. 2015. Pesticide half-life fact sheet. National Pesticide Information Center, Oregon State University Extension Service. http://npic.orst.edu/factsheets/half-life.html
Herbert et al. 2014	Herbert LT, Vázquez DE, Arenas A, Farina WM. 2014. Effects of field-realistic doses of glyphosate on honeybee appetitive behavior. Journal of Experimental Biology 217:3457-3464. Available at http://jeb.biologists.org/content/217/19/3457
IARC 2015	International Agency for Research on Cancer. 2016. IARC Monographs Volume 112: evaluation of five organophosphate insecticides and herbicides. March 2015. Lyon, France. Available at http://www.iarc.fr/en/media-centre/iarcnews/pdf/MonographVolume112.pdf
Jervais et al. 2008	Jervais, G.; Luukinen, B.; Buhl, K.; Stone, D. 2008. 2,4-D Technical Fact Sheet; National Pesticide Information Center, Oregon State University Extension Services. Available at http://npic.orst.edu/factsheets/archive/2,4-DTech.html
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. Available at 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. Available at 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.
Koterba et al. 1993	Koterba, M.T., W.S.L. Banks, and R.J. Shedlock. 1993. Pesticides in Shallow Groundwater in the Delmarva Peninsula. Journal of Environmental Quality. 22:500-518.
Lauten et al 2015	Lauten D.J., K.A. Castelein, J.D. Farrar, A.A. Kotaich, E. Krygsman, and E.P.Gaines. 2015. The Distribution and Reproductive Success of the Western Snowy Plover along the Oregon Coast – 2015. Oregon Biodiversity Information Center Institute for Natural Resources Portland State University. Portland State University. 56 pp.
Lindenmeyer 2012	Lindenmayer, R.B. 2012. Understanding aminocyclopyrachlor behavior in soil and plants. Ph.D. thesis, Colorado State University, Fort Collins, CO. 82 pp.
Lyman 1991	Lyman R.L. 1991. Prehistory of the Oregon Coast. The effects of Excavation Strategies and Assemblage Size on Archaeological Inquiry. Academic Press, San Diego, CA. Ch.2. pp.16.
Mesnage et al. 2015	Mesnage, R., M. Arno, M. Costanzo, M. Malatesta, G.E. Séralini, and M.N. Antoniou. Transcriptome profile analysis reflects rat liver and kidney damage following chronic ultra-low dose Roundup exposure. Environmental Health. 2015;14:70. doi:10.1186/s12940-015-0056-1.
Metzger et al. 1998	Metzger, L.O.Y., C. Munier-Lamy, T. Choné, F. Andreux, M.J. Belgy, J.M.F. Martins, and A. Mermoud. 1998. Fate of the Sulfonylurea Herbicide Rimsulfuron in Soil: Mobility and Interactions with Soil Constituents (Poster). Proceedings of the 16th World Congress of Soil Science.
National Library of Medicine 2011	National Library of Medicine. 2011. Fluroxypyr. Toxicology Data Network HSDB Database. Available at http://toxnet.nlm.nih.gov/cgi-bin/sis/search/a?dbs+hsdb:@term+@DOCNO+6655
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.

Cited As	Reference
NRCS 2016	Natural Resources Conservation Service (NRCS). 2016. Soil data viewer. Available at https://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/soils/home/?cid=nrcs142p2_053620.
NRCS 2017a	Natural Resources Conservation Service (NRCS). 2017. TSSH Part 617 Water table determinations. Available at https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/ref/?cid=nrcs142p2_053385. (14 January).
NRCS 2017b	Natural Resources Conservation Service (NRCS). 2017. Soil Survey Technical Note 6. Available at https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/ref/?cid=nrcs142p2_053573. (14 January).
NYSDEC 2006	New York State Department of Environmental Conservation (NYSDEC). 2006. Registration of Vista and Spotlight Herbicide (EPA Reg. No. 62719-308) Which Contain the New Active Ingredient: Fluroxypyr (Chemical Code: 128968). Letter to Jim Baxter, Dow AgroSciences, LLC Dated May 2, 2006. Albany, New York.
OCCRI 2017	Oregon Climate Change Research Institute. 2017 Third Oregon Climate Assessment Report. Oreson State University. Corvallis, OR. Available at http://www.occri.net/publications-and-reports/third-oregon-climate-assessment-report-2017/
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. Available at https://www.oregon.gov/ODA/shared/Documents/Publications/Weeds/ORNoxiousWeedEconomicImpact.pdf
ODA 2017	Oregon Department of Agriculture. 2017. Oregon Noxious Weed Policy and Classification. Salem, OR.Available at http://www.oregon.gov/ODA/shared/Documents/Publications/Weeds/NoxiousWeedPolicyClassification.pdf
ODEQ 2005	Oregon Department of Environmental Quality (ODEQ). 2005. Potential contaminant sources as of October 2005. Available at http://www.oregon.gov/deq/wq/programs/Pages/DWP-Maps.aspx.
ODEQ 2014	Oregon Department of Environmental Quality (ODEQ). 2014. Methodology for Oregon's 2012 water quality report and list of water quality limited waters. Available at http://www.oregon.gov/deq/FilterDocs/AssessmentMethodologyRep.pdf.
ODEQ 2015	Oregon Department of Environmental Quality (ODEQ). 2015. 2012 Integrated Report Assessment Geodatabase. Available at http://www.oregon.gov/deq/Data-and-Reports/Pages/GIS.aspx
ODEQ 2017a	Oregon Department of Environmental Quality (ODEQ). 2017. Introduction to Oregon's Drinking Water Protection Program. Available at https://services.oregon.gov/deq/FilterDocs/dwpIntro.pdf
ODEQ 2017b	Oregon Department of Environmental (ODEQ). 2017. Surface water drinking water source areas in Oregon Version 5. Available at http://www.oregon.gov/deq/wq/programs/Pages/DWP-Maps.aspx
ODEQ 2017c	Oregon Department of Environmental Quality (ODEQ). 2017. Groundwater drinking water source areas in Oregon Version 5. Available at http://www.oregon.gov/deq/wq/programs/Pages/DWP-Maps.aspx
ODF 2011	Oregon Department of Forestry. 2011. Elliot State Forest Management Plan.
ODF 2014	Oregon Department of Forestry. 2017. Data provided to the Oregonian for article: In Oregon, helicopters spray weed killers near people under West Coast's weakest protections. Rob Davis, October 23, 2014. Available at http://www.oregonlive.com/environment/index.ssf/2014/10/in_oregon_helicopters_spray_we.html
ODF 2016	Oregon Department of Forestry. 2016. Oregon Smoke Management Annual Report. Salem, OR. Available at http://www.oregon.gov/ODF/Board/Documents/SMAC/2016AnnualReport.pdf
ODFW 2016	Oregon Department of Fish and Wildlife. 2016. Oregon Conservation Strategy. Available at http://oregonconservationstrategy.org
ODOT 2016	Oregon Department of Transportation. 2016. ODOT Herbicide Reduction Final Report. Maintenance and Operations Branch. Available at http://www.oregon.gov/ODOT/Maintenance/Documents/Herbicide%20Reduction%20Final%20Report%20April%202016.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.

Cited As	Reference
OSU 2017	Oregon State University. 2017. Pacific Northwest Weed Management Handbook. Editor: Ed Peachey. Available at http://weeds.ippc.orst.edu/pnw/weeds?01W_INTR06.dat
OWRD 2013	Oregon Water Resources Department (OWRD). 2013. Water Rights in Oregon An introduction to Oregon's water laws. Available at http://www.oregon.gov/owrd/PUBS/docs/aquabook.pdf
OWRD 2016	Oregon Water Resources Department (OWRD). 2016. Water Right Data/GIS Themes. Available at http://www.oregon.gov/owrd/pages/maps/index.aspx#Water_Right_Data_GIS_Themes
OWRD 2017a	Oregon Water Resources Department (OWRD). 2017. Water Right Information Search. Available at http://www.oregon.gov/owrd/pages/wr/wris.aspx. (14 January).
Pacific Coast Seed 2010	Pacific Coast Seed. 2010. Native Perennial Grasses: Planning, Seeding, Establishing, and Maintaining. Available at http://www.pcseed.com/docs/NATIVE%20PERENNIAL%20GRASSES-1.pdf
PES Environmental 2005	PES Environmental, Inc. 2005. Monitoring well decommissioning and repair Weyerhaeuser containerboard mill North Bend, Oregon.
Pickart 2008	Pickart, A.J., 2008. Restoring the Grasslands of Northern California's Coastal Dunes. California Native Grassland Association. Available at http://www.fws.gov/uploadedFiles/Region_8/NWRS/Zone_1/Humboldt_Bay_Complex/Humbolt_Bay/Sections/Documents/grasslandsarticle.pdf
Plum 2017	Plum, K. June 27 2017. California to list herbicide as cancer-causing; Monsanto vows fight. Reuters. Available at http://www.reuters.com/article/us-usa-glyphosate-california-idUSKBN19H2K1
Radtke and Davis 2000	Radtke, Hans D. and Shannon 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.
Relyea 2005b	Relyea, R.A. 2005. The lethal impact of Roundup® on aquatic and terrestrial amphibians. Ecological Applications 15:1118-1124. Available at https://www.nrc.gov/docs/ML1434/ML14345A564.pdf
Rosenbom et al. 2010	Rosenbom, A.E., J.K. Jaer, and P. Olsen. 2010. Long-term leaching of rimsulfuron degradation products through sandy agricultural soils. Chemosphere 79(2010):830-838
SERA 1997	Syracuse Environmental Research Associates, Inc. (SERA). 1997. Selected Commercial Formulations of Hexazinone – Human Health and Ecological Risk Assessment Final Draft. SERA TR 95-21-04-01b. March 4, 1997.
SERA 2003a	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 2003b	Syracuse Environmental Research Associates, Inc. (SERA). 2003. Picloram – Revised Human Health and Ecological Risk Assessment Final Report. SERA TR 03-43-16-01b. Prepared for the U.S. Department of Agriculture Forest Service, Arlington, Virginia. Fayetteville, New York.
SERA 2003c	Syracuse Environmental Research Associates, Inc. (SERA). 2003. Triclopyr – Revised Human Health and Ecological Risk Assessment Final Report. SERA TR 02-43-13-03b. 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.
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. Imazapyr – Human Health and Ecological Risk Assessment Final Report. SERA TR 04-43-17-05b. Prepared for the U.S. Department of Agriculture Forest Service, Arlington, Virginia. Fayetteville, New York.
SERA 2004e	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 2004f	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.

Cited As	Reference
SERA 2004g	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 2005c	Syracuse Environmental Research Associates, Inc. (SERA). 2005c. Hexazinone – Human Health and Ecological Risk Assessment Final Report. SERA TR 05-43-20-03d. 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 2007	Syracuse Environmental Research Associates, Inc. (SERA). 2007. Aminopyralid Human Health and Ecological Risk Assessment. Final Report. Prepared for USDA Forest Service and National Park Service. Syracuse, 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 2009	Syracuse Environmental Research Associates, Inc. (SERA). 2009. Fluroxypyr Human Health and Ecological Risk Assessment. Final Report. Prepared for USDA Forest Service, Southern Region. 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.
Sheley et al. 2007	Sheley, R.L., M.F. Carpinelli, and K.J. Reever Morghan. 2007. Effects of imazapic on target and nontarget vegetation during revegetation. Weed Technology 21:1071-1081.
Tao and Yang 2011	Tao, L., and H Yang. 2011. Fluroxypyr Biodegradation in Soils by Multiple Factors. Environmental Monitoring and Assessment (2011) 175:227-238.
The Research Group, LLC 2014	The Research Group, LLC. 2014. Economic Impact From Selected Noxious Weeds in Oregon. Prepared for Oregon Department of Agriculture Noxious Weed Control Program. http://www.oregon.gov/ODA/shared/Documents/Publications/Weeds/ORNoxiousWeedEconomicImpact.pdf
Thompson et al. 2004	Thompson, D.G., B.F. Wojtaszek, B. Staznik, D.T. Chartrand, and G.R. Stephenson. 2004. Chemical and biomonitoring to assess potential acute effects of Vision herbicide on native amphibian larvae in forest wetlands. Environmental Contamination and Toxicology 23:843–849.
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. Available at 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. Available at http://www.cals.uidaho.edu/edComm/pdf/pnw/pnw0437.pdf
USDA 1995	USDA Forest Service. 1995b. Interim strategies for managing fish-producing watersheds in eastern Oregon and Washington, Idaho, western Montana, and portions of Nevada (INFISH).
USDA 2005	USDA Forest Service. 2005. Pacific Northwest Region Invasive Plant Program: Preventing and Managing Invasive Plants. Environmental Impact Statement. Available at http://www.fs.fed.us/r6/invasiveplant-eis/

Cited As	Reference
USDA 2006	USDA Agricultural Research Service. 2006. Poisonous Plant Research. Larkspur: Available at http://www.ars.usda.gov/Services/docshtm?docid=9943
USDA 2016a	USDA Natural Resources Conservation Service. 2016. Soil Web Survey, online database. Available at https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx
USDA and USDI 1994b	USDA Forest Service and USDI Bureau of Land Management. 1994. Northwest Forest Plan and Record of Decision.
USDA and USDI 1995	USDA Forest Service and USDI Bureau of Land Management. 1995. Decision Notice/Decision Record, Finding of No Significant Impact, Environmental Assessment for the Interim Strategies for Managing Anadromous Fish Producing Watersheds in Eastern Oregon and Washington, Idaho, and Portions of California (PACFISH). February. Washington, DC.
USDA and USDI 2015a	USDA Forest Service and USDI Bureau of Land Management. 2015. Pollinator-Friendly Best Management Practices for Federal Lands (Draft). Available at http://www.fs.fed.us/wildflowers/pollinators/BMPs/documents/PollinatorFriendlyBMPsFederalLandsDRAFT05152015.pdf
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 Environmental Impact Statement. BLM Oregon State Office. Portland, OR.
USDI 1987	USDI Bureau of Land Management. 1987. Supplemental Record of Decision Northwest Area Noxious Weed Control Program. Washington, D. C.
USDI 1989	USDI Bureau of Land Management. 1989. Coos Bay Shorelands Draft Management Plan. Coos Bay, OR.
USDI 1992a	USDI Bureau of Land Management. 1992. Manual 9011. Chemical Pest Control Handbook. Available at http://www.blm.gov/ca/st/en/prog/weeds/9011.html
USDI 1992b	USDI Bureau of Land Management. 1992. Manual 9015. Integrated Weed Management. Release 9-321. Available at http://www.blm.gov/ca/st/en/prog/weeds/9015.html
USDI 1994	USDI Bureau of Land Management. 1994. Coos Bay Shorelands Draft Management Plan and Environmental Assessment. Coos Bay, OR.
USDI 1996	USDI Bureau of Land Management. 1996. Partners Against Weeds: An Action Plan for the Bureau of Land Management. Washington, D.C.
USDI 1997	USDI Bureau of Land Management. 1997. Integrated Noxious Weed Program on the Coos Bay District Environmental Assessment. Coos Bay, OR.
USDI 2005	USDI Bureau of Land Management. 2005. North Spit Plan. Coos Bay, OR.
USDI 2006	USDI Bureau of Land Management. 2006. Integrated Pest Management Provolt Seed Orchard, Grants Pass (Jackson & Josephine Counties), OR, Charles A. Sprague Seed Orchard, Merlin (Josephine County), OR Record of Decision. Available at https://www.blm.gov/or/districts/medford/plans/files/Provolt-Sprague_eis_ROD_acc.pdf
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. Available at http://www.blm.gov/wo/st/en/prog/more/veg_eis.html
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. Available at http://www.blm.gov/wo/st/en/prog/more/veg_eis.html
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.
USDI 2007e	USDI. Office of Environmental Policy and Compliance. 2007. Departmental Manual. Part 517. Pesticides Chapter 1 Integrated Pest Management Policy. Available at https://elips.doi.gov/ELIPS/DocView.aspx?id=1744
USDI 2007f	USDI Bureau of Land Management. 2007. Biological Assessment of the BLM's North Spit Plan as it may affect the Threatened Western Snowy Plover and its Critical Habitat. Coos Bay, OR.

Cited As	Reference
USDI 2007g	USDI Fish and Wildlife Service. 2007. Recovery Plan for the Pacific Coast Population of the Western Snowy Plover. Volume 1: Recovery Plan. Sacramento, CA. Available at: https://www.fws.gov/carlsbad/SpeciesStatusList/RP/20070813_RP_WSP.pdf
USDI 2008a	USDI Bureau of Land Management. 2008. BLM Manual H1740-2 Integrated Vegetation Management. Washington D.C. Available at https://www.blm.gov/style/medialib/blm/wo/Information_Resources_Management/policy/blm_handbook.Par.59510.File.dat/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 Fish and Wildlife Service. 2008. Migratory Bird Program Strategic Plan.
USDI 2008d	USDI Fish and Wildlife Service. 2007. Biological Opinion on the Management of the North Spit of Coos Bay for Effects on Western Snowy Plovers and Their Critical Habtiat on Bureau of Land Management Lands. Newport, OR.
USDI 2009a	USDI Bureau of Land Management. 2009. New River Foredune Management Environmental Assessment, Finding of No Significant Impact, and Decision Record. OR128-06-01. Coos Bay District Office, North Bend, OR.
USDI 2009b	USDI Bureau of Land Management. 2009. Biological Assessment for the New River Foredune Management Environmental Assessment. Coos Bay District Office, North Bend, OR.
USDI 2010a	USDI Bureau of Land Management. 2010. Vegetation Treatments Using Herbicides on BLM Lands in Oregon Final Environmental Impact Statement. Available at http://www.blm.gov/or/plans/vegtreatmentseis/
USDI 2010b	USDI Bureau of Land Management. 2010. Vegetation Treatments Using Herbicides on BLM Lands in Oregon Record of Decision. Available at http://www.blm.gov/or/plans/vegtreatmentseis/
USDI 2011	USDI Bureau of Land Management. 2011. Management of the Western Snowy Plover on Federal Lands Within the New River Area of Critical Environmental Concern during the 2011-2021 Nesting and Wintering Seasons Biological Opinion.
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. Bandon Marsh National Wildlife Refuge Comprehensive Conservation Plan.
USDI 2014a	USDI Bureau of Land Management and Bureau of Indian Affairs. 2014. Biological Assessment for the FY 2014-2018 Programmatic Activities for Coos Bay BLM and Coquille Indian Tribe, May 2014.
USDI 2014b	USDI Fish and Wildlife. 2014. Biological Opinion titled Fiscal Years 2014-2018 Programmatic Suite of Activities that May Affect Spotted Owls, Murrelets and their designated Critical Habitats (FWS Reference Number 01EOFW00-2014-F-0163). June 2014.
USDI 2015a	USDI National Park Service. 2015. Coastal Dune Restoration EA. Point Reyes National Seashore, Marin County CA. Available at https://www.nps.gov/pore/learn/management/upload/planning_dunerestoration_project_ea_150109.pdf
USDI 2015b	USDI Bureau of Land Management. 2016. Final Oregon/Washington State Director Special Status Species List - July 13, 2015. Portland, OR.
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 and Final Environmental Impact Statement for Resource Management Plans for Western Oregon.
USDI 2016f	USDI Fish and Wildlife Service. 2016. Programmatic Suite of Activities that May Affect Spotted Owls, Murrelets and their designated Critical Habitats Proposed by The Coos Bay District BLM and the Coquille Indian Tribe Biological Opinion.

Cited As	Reference
USDI 2017a	USDI Bureau of Land Management. 2017. Integrated Invasive Plant Management for the Medford District Environmental Assessment.
USDI 2017b	USDI Bureau of Land Management. 2017. BLM Facts Oregon and Washington 2016.
USDI et al. 2006	USDI Bureau of Land Management, UDSA Forest Service, and Oregon Parks and Recreation District. 2006. Conservation strategy for pink sand-verbena (abronia umbellata ssp. Breviflora). Available at: https://appliedeco.org/wp-content/uploads/ABUM_CS-Final7-28-06.pdf
USEPA 1995	US Environmental Protection Agency. 1995. Reregistration Eligibility Decision Facts: Picloram. 11pp.
USEPA 1998	US Environmental Protection Agency 1998. Fluroxypyr Pesticide Fact Sheet. Available at https://www3.epa.gov/pesticides/chem_search/reg_actions/registration/fs_PC-128959_30-Sep-98.pdf
USEPA 1999	US Environmental Protection Agency. 1999. Pesticide Fact Sheet: Diflufenzopyr United States Environmental Protection Agency. Office of Prevention, Pesticides and Toxic Substances. Washington, D.C.
USEPA 2001b	Environmental Protection Agency. 2001b. 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 2005a	US Environmental Protection Agency 2005. Environmental Fate and Ecological Risk Assessment for the Registration of Aminopyralid. Available at https://archive.epa.gov/pesticides/chemicalsearch/chemical/foia/web/pdf/005100/005100-2005-05-10a.pdf
USEPA 2005b	US Environmental Protection Agency 2005. Office of Prevention, Pesticides and Toxic Substances: Pesticide Fact Sheet – Aminopyralid. Available at https://www3.epa.gov/pesticides/chem_search/reg_actions/registration/fs_PC-005100_10-Aug-05.pdf
USEPA 2006	US Environmental Protection Agency. 2006. Reregistration Eligibility Decision for Dicamba and associated Salts.
USEPA 2007	Environmental Protection Agency. 2007b. Inert (other) Pesticide Ingredients in Pesticide Products - Categorized List of Inert (other) Pesticide Ingredients (outdated). Available at http://www.epa.gov/opprd001/inerts/oldlists.html
USEPA 2013	US Environmental Protection Agency 2013. Drinking Water Contaminants. Available at https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations
USFWS 2018	USDI Fish and Wildlife Service. 2018/Oregon Fish & Wildlife Office website - New Carissa Oil Spill. Accessed March 6, 2018. Available at https://www.fws.gov/oregonfwo/Contaminants/Spills/NewCarissa/
Vencill et al. 2002	Vencill, W.K. (ed). 2002. Herbicide Handbook, 8th ed. Weed Science Society of America, Lawrence, KS. 155-157.
Vogue et al. 1994	Vogue P.A., Kerle E.A., Jenkins J. 1994. Oregon State University Extension Pesticide Properties Database, Corvallis, Oregon. Available at http://npic.orst.edu/ppdmove.htm
Whitehead 1994	Whitehead, R.L. 1994. Ground Water Atlas of the United States Idaho, Oregon, Washington. United States Geological Survey. HA 730-H. Available at https://pubs.usgs.gov/ha/ha730/ch_h/
Wilcove et al. 1998	Wilcove, D.S., D. Rothstein, J. Dubow, A. Phillips and E. Losos. 1998. Quantifying threats to imperiled species in the United States. BioScience 48(8):607(9).
Wischmeier and Smith 1978	Wischmeier, W.H. and D.D. Smith. 1978. Predicting rainfall erosion losses: guide to conservation planning. USDA, Agriculture Handbook 537. U.S. Government Printing Office, Washington, DC.
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.
Zarnetske et al. 2010	Zarnetske, P.L., E.W. Seabloom, S.D. Hacker. 2010. Non-target effects of invasive species management: beachgrass, birds, and bulldozers in coastal dunes. Ecosphere, An ESA Open Access Journal. Available at http://onlinelibrary.wiley.com/doi/10.1890/ES10-00101.1/full

Appendix A – Protection Measures

Information included in this Appendix is a compilation of information originally presented in:

- Chapters 2 and 3 of this EA;
- the 2007 *Vegetation Treatments Using Herbicides on BLM Lands in 17 Western States PEIS* (USDI 2007a), *Record of Decision* (USDI 2007b), and *Biological Assessment* (USDI 2007c);
- the *Vegetation Treatments on BLM Lands in 17 Western States Programmatic Environmental Report* (USDI 2007d);
- the 2010 *Vegetation Treatments on BLM Lands in Oregon FEIS* (USDI 2010a) and *Record of Decision* (USDI 2010b); and,
- the 2016 *Vegetation Treatments Using Aminopyralid, Fluroxypyr, and Rimsulfuron PEIS* (USDI 2016a), *Record of Decision* (USDI 2016b), and *Biological Assessment* (USDI 2016c); and,
- the 2013 National Marine Fisheries Service's *Aquatic Restoration Biological Opinion II* (ARBO II, NMFS 2013)
- the 2013 U.S. Fish and Wildlife Service's *Aquatic Restoration Biological Opinion II* (ARBO II, USDI 2013a)

Project Design Features

Project Design Features of the Proposed Action

The following Project Design Features are included to reduce effects of the Proposed Action:

Bureau Sensitive Species (Plants, Fish, and Wildlife)

- Follow the Bureau Sensitive Species Treatment Conditions flowchart (Figure 3-2, *Bureau Sensitive Species Treatment Conditions*) when working in potential habitat for Bureau Sensitive species.

Special Status Plants

- When using prescribed fire in western snowy plover habitat restoration areas, reseed with pink sand verbena or other appropriate native species in areas where revegetation will not occur through natural processes.

Fish and Aquatic Organisms

- 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 or Strategic fish and other aquatic species (see Appendix A).

Wildlife

- In listed species habitat, follow all Project Design Criteria outlined in the *Coos Bay BLM District Bureau of Indian Affairs/Coquille Indian Tribe FY2014 – 2018 Land Management Activities That May Affect Northern Spotted Owls or Marbled Murrelets* (USDI 2014a) or future updates.
- Conservation Measures applicable to butterflies and moths will be applied, as appropriate, for other Special Status insects.

Archaeological and Cultural Resources

- Avoid getting herbicides (through drift or accidental direct spray) on rock art or wooden/metal structures or artifacts at National Register of Historic Places (NRHP) listed or eligible sites.

- Avoid repeated use of livestock (more than one grazing episode annually) at National Register of Historic Places (NRHP) listed or eligible sites.

Traditional and Cultural Uses (Native American Interests)

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

Project Design Features of Alternative 3

In addition to Project Design Features included with the Proposed Action, the following Project Design Features are included to reduce effects of Alternative 3:

Fish and Aquatic Organisms

- All applicable Project Design Criteria identified in potential future consultations with the National Marine Fisheries Service will be incorporated into all treatments in listed anadromous fish habitat.
- The use of fluazifop-P-butyl will be confined to flat dry ground located greater than 1,500 feet from any aquatic features to prevent runoff to surface water or leaching to groundwater.
- Use only ARBO II (NMFS 2013) approved herbicides, adjuvants, and buffer distances in the New River western snowy plover habitat restoration areas (see Appendix A).

Wildlife

- Do not use dicamba, triclopyr, or fluazifop-P-butyl (herbicides with a low or moderate risk to birds) in areas that are currently capable of supporting western snowy plovers. (Dicamba in formulation with diflufenzopyr has no risk to birds and can be used in these areas.)
- Implement all current and future reasonable and prudent measures and terms and conditions identified by the U.S. Fish and Wildlife Service through consultation on western snowy plovers.
- Do not use fluroxypyr at known Mardon skipper sites.

Soil

- All guidelines established in potential future North Spit western snowy plover NEPA would be done in conjunction with the U.S. Army Corps of Engineers.

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.

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* (Oregon Final EIS; BLM 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 Coos Bay 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 Coos Bay 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 or a serious rainfall event is imminent.

In addition, Standard Operating Procedures and Mitigation Measures for wild horse and burro herds, livestock, Designated Wilderness, Wilderness Study Areas, and Wild and Scenic Rivers are not included in this Appendix, as they are not present on the Coos Bay District.

Guidance Documents

Fire Use

BLM handbooks H-9211-1 (*Fire Management Activity Planning Procedures*) and H-9214-1 (*Prescribed Fire Management*), and manuals 1112 (*Safety*), 9210 (*Fire Management*), 9211 (*Fire Planning*), 9214 (*Prescribed Fire*), and 9215 (*Fire Training and Qualifications*).

Mechanical

BLM Handbook H-5000-1 (*Public Domain Forest Management*), and manuals 1112 (*Safety*) and 9015 (*Integrated Weed Management*).

Manual

BLM Domain Forest Management, and manuals 1112 (*Safety*), and 9015 (*Integrated Weed Management*).

Biological

BLM manuals 1112 (*Safety*), 4100 (*Grazing Administration*), 9014 (*Use of Biological Control Agents on Public Lands*), and 9015 (*Integrated Weed Management)* and Handbook H-4400-1 (*Rangeland Health Standards*).

Chemical

BLM Handbook H-9011-1 (*Chemical Pest Control*), and manuals 1112 (*Safety*), 9011 (*Chemical Pest Control*), 9015 (*Integrated Weed Management*), and 9220 (*Integrated Pest Management*).

General

Fire Use

- Prepare fire management plan.
- Use trained personnel with adequate equipment.
- Minimize frequent burning in arid environments.
- Avoid burning herbicide-treated vegetation for at least 6 months.

Mechanical

- Ensure that power cutting tools have approved spark arresters.
- Ensure that crews have proper fire-suppression tools during the fire season.
- Wash vehicles and equipment before leaving weed infested areas to avoid infecting weed-free areas.
- Keep equipment in good operating condition.

Manual

- Ensure that crews have proper fire-suppression tools during fire season.
- Minimize soil disturbance, which may encourage new weeds to develop.

Biological

- Use only biological control agents that have been tested and approved to ensure they are host specific.
- If using domestic animals, select sites with weeds that are palatable and non-toxic to the animals.
- Manage the intensity and duration of containment by domestic animals to minimize overutilization of desirable plant species.
- Utilize domestic animals to contain the target species in the treatment areas prior to weed seed set. Or if seed set has occurred, do not move the domestic animals to uninfested areas for a period of 7 days.

Chemical

- Prepare an operational and spill contingency plan in advance of treatment.
- Conduct a pretreatment survey before applying herbicides.
- Select the herbicide that is least damaging to the environment while providing the desired results.
- Select herbicide products carefully to minimize additional impacts from degradates, adjuvants, other ingredients, and tank mixtures.
- Apply the least amount of herbicide needed to achieve the desired result.
- Follow herbicide product label for use and storage.
- Have licensed or certified applicators or State-licensed “trainees” apply herbicides, or they can be applied by BLM employees under the direct supervision of a BLM-certified applicator.

- Use only USEPA-approved herbicides and follow product label directions and "advisory" statements.
- Review, understand, and conform to the "Environmental Hazards" section on the herbicide product label. This section warns of known herbicide risks to the environment and provides practical ways to avoid harm to organisms or to the environment.
- Minimize the size of application area, when feasible.
- Comply with herbicide-free buffer zones to ensure that drift will not affect crops or nearby residents/landowners.
- Post treated areas and specify reentry or rest times, if appropriate.
- Notify adjacent landowners prior to treatment, if appropriate.
- Keep a copy of Material Safety Data Sheets (MSDSs) at work sites. MSDSs are available for review at http://www.cdms.net.
- Keep records of each application, including the active ingredient, formulation, application rate, date, time, and location.
- Avoid accidental direct spray and spill conditions to minimize risks to resources.
- Take precautions to minimize drift by not applying herbicides when winds exceed >10 mph or a serious rainfall event is imminent.
- Use drift control agents and low volatile formulations.
- Conduct pre-treatment surveys for sensitive habitat and Special Status species within or adjacent to proposed treatment areas.
- Consider site characteristics, environmental conditions, and application equipment in order to minimize damage to non-target vegetation.
- Use drift reduction agents, as appropriate, to reduce the drift hazard to non-target species.
- Turn off application equipment at the completion of spray runs and during turns to start another spray run.
- Refer to the herbicide product label when planning revegetation to ensure that subsequent vegetation would not be injured following application of the herbicide.
- Clean OHVs to remove plant material.

The BLM has suspended the use of the adjuvant R-11.

Land Use

Fire Use

- Carefully plan fires in the WUI to avoid or minimize loss of structures and property.
- Notify nearby residents and landowners who could be affected by smoke intrusions or other fire effects.

Mechanical

- Collaborate on project development with nearby landowners and agencies.

Manual

- Collaborate on project development with nearby landowners and agencies.

Biological

- Notify nearby residents and landowners who could be affected by biological control agents.

Chemical

- Comply with herbicide-free buffer zones to ensure that drift will not affect crops or nearby residents and landowners.
- Post treated areas and specify reentry times, if appropriate

Air Quality

Standard Operating Procedures for air quality are taken from BLM's *Soil, Water, and Air Management Manual* (7000).

Fire Use

- Have clear smoke management objectives.
- Evaluate weather conditions, including wind speed and atmospheric stability, to predict effects of burn and impacts from smoke.
- Burn when weather conditions favor rapid combustion and dispersion.
- Burn under favorable moisture conditions.
- Use backfires, when applicable.
- Burn small vegetation blocks, when appropriate.
- Manage smoke to prevent air quality violations and minimize impacts to smoke-sensitive areas.
- Coordinate with air pollution and fire control officials, and obtain all applicable smoke management permits, to ensure that burn plans comply with federal, state, and local regulations.

Mechanical

- Maintain equipment in optimal working order.
- Conduct treatment activities during the wetter seasons.
- Use heavy equipment under adequate soil moisture conditions to minimize soil erosion.
- Minimize vehicle speeds on unpaved roads.
- Minimize dust impacts to the extent practicable.

Manual

- Maintain equipment in optimal working order.
- Conduct treatment activities during the wetter seasons.
- Minimize vehicle speeds on unpaved roads.
- Minimize dust impacts to the extent practicable.

Chemical

- Consider the effects of wind, humidity, temperature inversions, and heavy rainfall on herbicide effectiveness and risks.
- Apply herbicides in favorable weather conditions to minimize drift. For example, do not treat when winds exceed 10 mph or rainfall is imminent.
- Use drift reduction agents, as appropriate, to reduce the drift hazard.
- Select proper application equipment (e.g., spray equipment that produces 200- to 800-micron diameter droplets [spray droplets of 100 microns and less are most prone to drift]).
- Select proper application methods (e.g., set maximum spray heights, use appropriate buffer distances between spray sites and non-target resources).

Soil Resources

Standard Operating Procedures for soil resources are taken from BLM's *Soil, Water, and Air Management Manual* (7000).

General

- Assess the susceptibility of the treatment site to soil damage and erosion prior to treatment.

Fire Use

- Prescribe broadcast and other burns that are consistent with soil management activities.
- Plan burns so as to minimize damage to soil resources.
- Conduct burns when moisture content of large fuels, surface organic matter, and soil is high to limit the amount of heat penetration into lower soil surfaces and protect surface organic matter.
- Time treatments to encourage rapid recovery of vegetation.

- Further facilitate revegetation by seeding or planting following treatment.
- When appropriate, reseed following burning to re- introduce species, or to convert a site to a less flammable plant association, rather than to specifically minimize erosion.

Mechanical

- Time treatments to avoid intense rainstorms.
- Time treatments to encourage rapid recovery of vegetation.
- Further facilitate revegetation by seeding or planting following treatment.
- Use equipment that minimizes soil disturbance and compaction.
- Minimize use of heavy equipment on slopes >20%.
- Conduct treatments when the ground is sufficiently dry to support heavy equipment.
- Implement erosion control measures in areas where heavy equipment use occurs.
- Conduct mechanical treatments along topographic contours to minimize runoff and erosion.
- When appropriate, leave plant debris on site to retain moisture, supply nutrients, and reduce erosion.
- Prevent oil and gas spills to minimize damage to soil.

Manual

- Time treatments to avoid intense rainstorms.
- Time treatments to encourage rapid recovery of vegetation.
- Further facilitate revegetation by seeding or planting following treatment.
- Minimize soil disturbance and compaction.

Biological

- Minimize use of domestic animals if removal of vegetation may cause significant soil erosion or impact biological soil crusts.
- Closely monitor timing and intensity of biological control with domestic animals.
- Avoid grazing on wet soil to minimize compaction and shearing.

Chemical

- Minimize treatments in areas where herbicide runoff is likely, such as steep slopes when heavy rainfall is expected.
- Minimize use of herbicides that have high soil mobility, particularly in areas where soil properties increase the potential for mobility.
- Do not apply granular herbicides on slopes of more than 15% where there is the possibility of runoff carrying the granules into non-target areas.

Water Resources

Standard Operating Procedures for water resources are taken from BLM's *Soil, Water, and Air Management Manual* (7000).

Fire Use

- Prescribe burns that are consistent with water management objectives.
- Plan burns to minimize negative impacts to water resources.
- Minimize burning on hillslopes, or revegetate hillslopes shortly after burning.
- Maintain a vegetated buffer between treatment areas and water bodies.

Mechanical

- Minimize removal of desirable vegetation near residential and domestic water sources.
- Do not wash equipment or vehicles in water bodies.
- Maintain minimum 25 foot wide vegetated buffer near streams and wetlands.

Manual

- Maintain vegetated buffer near residential and domestic water sources.
- Minimize removal of desirable vegetation near residential and domestic water sources.
- Minimize removal of desirable vegetation near water bodies.
- Minimize use of domestic animals near residential or domestic water sources.

- Minimize use of domestic animals adjacent to water bodies if trampling or other activities are likely to cause soil erosion or impact water quality.

Chemical

- Consider climate, soil type, slope, and vegetation type when developing herbicide treatment programs.
- Select herbicide products to minimize impacts to water. This is especially important for application scenarios that involve risk from active ingredients in a particular herbicide, as predicted by Risk Assessments.
- Use local historical weather data to choose the month of treatment.
- Considering the phenology of target aquatic species, schedule treatments based on the condition of the water body and existing water quality conditions.
- Plan to treat between weather fronts (calms) and at appropriate time of day to avoid high winds that increase water movements, and to avoid potential stormwater runoff and water turbidity.
- Review hydrogeologic maps of proposed treatment areas. Note depths to groundwater and areas of shallow groundwater and areas of surface water and groundwater interaction. Minimize treating areas with high risk for groundwater contamination.
- Conduct mixing and loading operations in an area where an accidental spill would not contaminate an aquatic body.
- Do not rinse spray tanks in or near water bodies.
- Do not broadcast pellets where there is danger of contaminating water supplies.
- Minimize the potential effects to surface water quality and quantity by stabilizing terrestrial areas as quickly as possible following treatment.
- Establish appropriate (herbicide-specific) buffer zones for species/populations (Tables A-1 and A-2). (MM)
- Areas with potential for groundwater for domestic or municipal use shall be evaluated through the appropriate, validated model(s) to estimate vulnerability to potential groundwater contamination, and appropriate Mitigation Measures shall be developed if such an area requires the application of herbicides and cannot otherwise be treated with non-herbicide methods. (MM)
- Use appropriate herbicide-free buffer zones for herbicides not labeled for aquatic use based on Risk Assessment guidance, with minimum widths from water of 25 feet for vehicle, and 10 feet for hand spray applications.
- Maintain buffers between treatment areas and water bodies. Buffer widths should be developed based on herbicide and site-specific conditions to minimize impacts to water bodies.
- To protect domestic water sources, no herbicide treatments should occur within 100 feet of a well or 200 feet of a spring or known diversion used as a domestic water source unless a written waiver is granted by the user or owner. (Oregon FEIS MM)
- Site-specific analyses for roadside treatments should specifically consider that drainage ditches and structures lead to streams and that normal buffer distances, herbicide selection, and treatment method selection may need to be changed accordingly, particularly where those ditches are connected to streams with Federally Listed or other Special Status species. (Oregon FEIS MM)
- Buffer intermittent stream channels when there is a prediction of rain (including thunderstorms) within 48 hours. (Oregon FEIS MM)
- Proposals to boom spray herbicides within 200 feet of streams that are within 1,000 feet upstream from a public water supply intake, or spot apply herbicides within 100 feet of streams that are within 500 feet upstream from a public water supply intake, will include coordination with the Oregon Department of Environmental Quality and the municipality to whom the intake belongs. (Oregon FEIS MM)

Wetlands and Riparian Areas

Fire Use

- Following treatment, reseed or replant with native vegetation if the native plant community cannot recover and occupy the site sufficiently.

Mechanical

- Manage riparian areas to provide adequate shade, sediment control, bank stability, and recruitment of wood into stream channels.
- Following treatment, reseed or replant with native vegetation if the native plant community cannot recover and occupy the site sufficiently.

Manual

- Following treatment, reseed or replant with native vegetation if the native plant community cannot recover and occupy the site sufficiently.

Biological

- Manage animals to prevent overgrazing and minimize damage to wetlands.
- Following treatment, reseed or replant with native vegetation if the native plant community cannot recover and occupy the site sufficiently.

Chemical

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

Vegetation

Standard Operating Procedures for vegetation are taken from Handbook H-4410-1 (*National Range Handbook*), and manuals 5000 (*Forest Management*) and 9015 (*Integrated Weed Management*).

General

- Use weed-free feed for horses and pack animals. Use weed-free straw and mulch for revegetation and other activities.

Fire Use

- Keep fires as small as possible to meet the treatment objectives.
- Conduct low intensity burns to minimize adverse impacts to large vegetation.
- Limit area cleared for fire breaks and clearings to reduce potential for weed infestations.
- Where appropriate, use mechanical treatments to prepare forests for the reintroduction of fire.
- Use plant stock or seed from the same seed zone and from sites of similar elevation when conducting revegetation activities.

Mechanical

- Power wash vehicles and equipment to prevent the introduction and spread of weed and exotic species.
- Remove damaged trees and treat woody residue to limit subsequent mortality by bark beetles.
- Use plant stock or seed from the same seed zone and from sites of similar elevation when conducting revegetation activities.
- Identify and implement any temporary domestic livestock grazing and/or supplemental feeding restrictions needed to enhance desirable vegetation recovery following treatment.

Manual

- Remove damaged trees and treat woody residue to limit subsequent mortality by bark beetles.
- Use plant stock or seed from the same seed zone and from sites of similar elevation when conducting revegetation activities.

Biological

- Use domestic animals at the time they are most likely to damage invasive species.
- Manage animals to prevent overgrazing and minimize damage to sensitive areas.
- Identify and implement any temporary domestic livestock grazing and/or supplemental feeding restrictions needed to enhance desirable vegetation recovery following treatment.
- Consider adjustments in the existing grazing permit, including the application of state or regional grazing administration guidelines, needed to maintain desirable vegetation on the treatment site.
- Use plant stock or seed from the same seed zone and from sites of similar elevation when conducting revegetation activities.

Chemical

- Refer to the herbicide label when planning revegetation to ensure that subsequent vegetation would not be injured following application of the herbicide.
- Use native or sterile plants for revegetation and restoration projects to compete with invasive plants until desired vegetation establishes.
- Minimize the use of terrestrial herbicides (especially sulfometuron methyl) in watersheds with downgradient ponds and streams if potential impacts to aquatic plants are identified. (MM)
- When necessary to protect Special Status plant species, implement all Conservation Measures for plants presented in the 2007 Vegetation Treatments on Bureau of Land Management Lands in 17 Western States and 2016 Vegetation Treatments Using Aminopyralid, Fluroxypyr, and Rimsulfuron Biological Assessments (see Conservation Measures later in this Appendix). (MM, 2016 MM)
- Establish appropriate (herbicide-specific) buffer zones (Tables A-1 and A-2) around downstream water bodies, habitats, and species/populations of interest. Consult the Risk Assessments prepared for the PEIS for more specific information on appropriate buffer distances under different soil, moisture, vegetation, and application scenarios. (MM)
- Use Table A-4 to establish herbicide-specific buffer zones around downstream water bodies, and associated habitats and non-target plant species/populations of interest for aminopyralid, fluroxypyr, and rimsulfuron. Consult the Risk Assessments for more specific information on appropriate buffer distances under different soil, moisture, vegetation, and application scenarios. (2016 MM)

Pollinators

Chemical

- Complete vegetation treatments seasonally before pollinator foraging plants bloom.
- Time vegetation treatments to take place when foraging pollinators are least active both seasonally and daily.
- Design vegetation treatment projects so that nectar and pollen sources for important pollinators and resources are treated in patches rather than in one single treatment.
- Minimize herbicide application rates. Use typical rather than maximum rates where there are important pollinator resources.
- Maintain herbicide free buffer zones around patches of important pollinator nectar and pollen sources.
- Maintain herbicide free buffer zones around patches of important pollinator nesting habitat and hibernacula.
- Make special note of pollinators that have single host plant species, and minimize herbicide spraying on those plants and in their habitats.

Fish and 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 6780 (*Habitat Management Plans*)

Fire Use

- Maintain vegetated buffers near fish-bearing streams to minimize soil erosion and soil runoff into streams.
- Minimize treatments near fish-bearing streams during periods when fish are in sensitive life stages (e.g., embryo).

Mechanical

- Minimize treatments adjacent to fish-bearing waters.
- Do not wash vehicles in streams or wetlands.
- Refuel and service equipment at least 100 feet from water bodies to reduce the chance for pollutants to enter water.
- Maintain adequate vegetated buffer between treatment area and water body to reduce the potential for sediments and other pollutants to enter the water body.

Manual

- Refuel and service equipment at least 100 feet from water bodies to reduce the chance for pollutants to enter water.
- Minimize removal of desirable vegetation near fish-bearing streams and wetlands.

Biological

- Limit access of domestic animals to streams and other water bodies to minimize sediments entering water and potential for damage to fish habitat.

Chemical

- Use appropriate buffer zones based on label and Risk Assessment guidance.
- Minimize treatments near fish-bearing water bodies during periods when fish are in life stages most sensitive to the herbicide(s) used, and use spot rather than broadcast treatments.
- Use appropriate application equipment/method near water bodies if the potential for off-site drift exists.
- For treatment of aquatic vegetation, 1) treat only that portion of the aquatic system necessary to meet vegetation management objectives, 2) use the appropriate application method to minimize the potential for injury to desirable vegetation and aquatic organisms, and 3) follow water use restrictions presented on the herbicide label.
- Limit the use of terrestrial herbicides in watersheds with characteristics suitable for potential surface runoff that have fish-bearing streams during periods when fish are in life stages most sensitive to the herbicide(s) used. (MM)
- To protect Special Status fish and other aquatic organisms, implement all Conservation Measures for aquatic animals presented in the *2007 Vegetation Treatments on Bureau of Land Management Lands in 17 Western States and* 2016 *Vegetation Treatments Using Aminopyralid, Fluroxypyr, and Rimsulfuron Biological Assessments* (see *Conservation Measures* later in this Appendix). (MM, 2016 MM)
- Establish appropriate herbicide-specific buffer zones for water bodies, habitats, or fish or other aquatic species of interest (Table A-3 and recommendations in individual Ecological Risk Assessments). (MM)
- Consider the proximity of application areas to salmonid habitat and the possible effects of herbicides on riparian and aquatic vegetation. Maintain appropriate buffer zones around salmonid-bearing streams. (MM)
- At the local level, consider effects to Special Status fish and other aquatic organisms when designing treatment programs. (MM)
- Use of adjuvants with limited toxicity and low volumes is recommended for applications near aquatic habitats. (Oregon FEIS MM)

Wildlife Resources

Standard Operating Procedures for wildlife resources are taken from BLM Manuals, including Manuals 6500 (*Wildlife and Fisheries Management*) and 6780 (*Habitat Management Plans*)

Fire Use

- Minimize treatments during nesting and other important periods for birds and other wildlife.
- Minimize treatments of important forage areas immediately prior to important use period(s), unless the burn is designed to stimulate forage growth.

Mechanical

- Minimize treatments during nesting and other important periods for birds and other wildlife.
- Retain wildlife trees and other unique habitat features where practical.

Manual

- Minimize treatments during nesting and other important periods for birds and other wildlife.
- Retain wildlife trees and other unique habitat features where practical.

Biological

- Minimize the use of livestock grazing as a vegetation control measure where and/or when it could impact nesting and/or other important periods for birds and other wildlife.
- Consider and minimize potential adverse impacts to wildlife habitat and minimize the use of livestock grazing as a vegetation control measure where it is likely to result in removal or physical damage to vegetation that provides a critical source of food or cover for wildlife.

Chemical

- Use herbicides of low toxicity to wildlife, where feasible.
- Use spot applications or low-boom broadcast operations where possible to limit the probability of contaminating non-target food and water sources, especially non-target vegetation over areas larger than the treatment area.
- Use timing restrictions (e.g., do not treat during critical wildlife breeding or staging periods) to minimize impacts to wildlife.
- To minimize risks to terrestrial wildlife, do not exceed the typical application rate for applications of dicamba, glyphosate, hexazinone or triclopyr, where feasible. (MM)
- Minimize the size of application areas, where practical, when applying 2,4-D and Overdrive® to limit impacts to wildlife, particularly through contamination of food items. (MM)
- Where practical, limit glyphosate and hexazinone to spot applications in grazing land and wildlife habitat areas to avoid contamination of wildlife food items. (MM)
- Do not use the adjuvant R-11 (MM)
- To protect Special Status wildlife species, implement Conservation Measures for terrestrial animals presented in the 2007 Vegetation Treatments on Bureau of Land Management Lands in 17 Western States and 2016 Vegetation Treatments Using Aminopyralid, Fluroxypyr, and Rimsulfuron Biological Assessments (see Conservation Measures later in this Appendix). (MM, 2016 MM)
- Impacts to wildlife from herbicide applications can be reduced by treating habitat during times when the animals are not present or are not breeding, migrating or confined to localized areas (such as crucial winter range). (Oregon FEIS MM)
- When treating native plants in areas where herbivores are likely to congregate, choose herbicides with lower risks due to ingestion. This Mitigation Measure is applicable if large areas of the herbivores' feeding range would be treated, either because the treatment areas are large or the feeding area for an individual animal is small. (Oregon FEIS MM)
- Where there is a potential for herbivore consumption of treated vegetation, apply dicamba, imazapyr, and metsulfuron methyl at the typical, rather than maximum, application rate to minimize risks. (Oregon FEIS MM)

- Where possible, design native vegetation treatment areas to mimic natural disturbance mosaics. Patchiness is usually beneficial to most wildlife, and patchiness is usually tolerated by species that prefer contiguous habitat. (Oregon FEIS MM)
- Use of adjuvants with limited toxicity and low volumes is recommended for applications near aquatic habitats. (Oregon FEIS MM)
- When conducting herbicide treatments in or near habitats used by special status and listed terrestrial arthropods, design treatments to avoid the use of fluroxypyr, where feasible. If pre-treatment surveys determine the presence of listed terrestrial arthropods, do not use fluroxypyr to treat vegetation. (2016 MM)

Threatened and Endangered Species

Standard Operating Procedures for threatened and endangered species are taken from BLM Manual 6840 (*Special Status Species*) and *Vegetation Treatments Using Herbicides on BLM Lands in 17 Western States Programmatic Biological Assessment*.

Fire Use

- Survey for Special Status species of concern if project may impact federally- and state-listed species.
- Minimize direct impacts to species of concern, unless studies show that species will benefit from fire.

Mechanical

- Minimize use of ground- disturbing equipment near Special Status species of concern.
- Survey for species of concern if project could impact these species.
- Use temporary roads when long-term access is not required.

Manual

- Survey for Special Status species of concern if project could impact these species.

Biological

- Survey for Special Status species of concern if project could impact these species.

Chemical

- Provide clearances for Special Status species before treating an area as required by Special Status Species Program policy. Consider effects to Special Status species when designing herbicide treatment programs.
- Use a selective herbicide and a wick or backpack sprayer to minimize risks to Special Status plants.
- Avoid treating vegetation during time-sensitive periods (e.g., nesting and migration, sensitive life stages) for Special Status species in area to be treated.

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*)[75]

See also:

- The 1997 Programmatic Agreement among the Bureau of Land Management, the Advisory Council on Historic Preservation, and the National Conference of State Historic Preservation Officers Regarding the Manner in Which BLM Will Meet Its Responsibilities Under the *National Historic Preservation Act*;
- 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,

[75] 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.

- 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.
- 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.

Mechanical

- Minimize dust drift, especially near recreational or other public use areas.
- Minimize loss of desirable vegetation near high public use areas.
- Minimize earthwork and locate away from prominent topographic features.
- Revegetate treated sites.
- Lessen visual effects in Class I and Class II visual resource areas.

Manual

- Minimize dust drift, especially near recreational or other public use areas.
- Minimize loss of desirable vegetation near high public use areas.
- Lessen visual effects in Class I and Class II visual resource areas.

Biological

- At areas such as visual overlooks, leave sufficient vegetation in place, where possible, to screen views of vegetation treatments.
- Lessen visual effects in Class I and Class II visual resource areas.

Chemical

- Minimize the use of broadcast foliar applications in sensitive watersheds to avoid creating large areas of browned vegetation.
- Minimize off-site drift and mobility of herbicides (e.g., do not treat when winds exceed 10 mph; minimize treatment in areas where herbicide runoff is likely; establish appropriate buffer widths between treatment areas and residences) to contain visual changes to the intended treatment area.
- If the area is a Class I or II visual resource, ensure that the change to the characteristic landscape is low and does not attract attention (Class I), or if seen, does not attract the attention of the casual viewer (Class II).
- Lessen visual impacts by: 1) designing projects to blend in with topographic forms; 2) leaving some low growing trees or planting some low-growing tree seedlings adjacent to the treatment area to screen short-term effects; and 3) revegetating the site following treatment.
- When restoring treated areas, design activities to repeat the form, line, color, and texture of the natural landscape character conditions to meet established Visual Resource Management (VRM) objectives.

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 grazing permittees of livestock feeding restrictions in treated areas, if necessary, as per herbicide product label instructions.
- Notify the public of the project to improve coordination and avoid potential conflicts and safety concerns during implementation of the treatment.
- Control public access until potential treatment hazards no longer exist, per herbicide product label instructions.
- Observe restricted entry intervals specified by the herbicide product label.
- Notify local emergency personnel of proposed treatments.
- Use spot applications or low-boom broadcast applications where possible to limit the probability of contaminating non-target food and water sources.
- Consult with Native American Tribes to locate any areas of vegetation that are of significance to the Tribes and Native groups and that might be affected by herbicide treatments.

- To the degree possible within the law, hire local contractors and workers to assist with herbicide application projects and purchase materials and supplies for herbicide treatment projects (including the herbicides) through local suppliers.
- To minimize fears based on lack of information, provide public educational information on the need for vegetation treatments and the use of herbicides in an integrated vegetation management program for projects proposing local use of herbicides.
- For herbicides with label-specified re-entry intervals, post information at access points to recreation sites or other designated public use or product collection areas notifying the public of planned herbicide treatments in languages known to be used by persons likely to be using the area to be treated. Posting should include the date(s) of treatment, the herbicide to be used, the date or time the posting expires, and a name and phone number of who to call for more information. (Oregon FEIS MM)
- Consider the potential for treatments to affect communities from herbicide-contaminated resources originating from the BLM, such as subsistence resources or water used downstream for human or agricultural uses. (Oregon FEIS MM)
- Coordinate with and/or notify neighboring landowners who may want to treat, or are already treating, adjacent lands. (Oregon FEIS MM)
- To the extent permitted by normal contracting authority, ensure materials safety data sheets and other informational or precautionary materials are available in languages spoken by the work crews implementing treatments. This includes but is not limited to material such as Occupational Safety and Health Administration standards along with agency, industry and manufacturers' recommendations and Human Health and Safety Standard Operating Procedures and Mitigation Measures or equivalent. (Oregon FEIS MM)

Rights-of-way

General

- Coordinate vegetation management activities where joint or multiple use of a ROW exists.
- Notify other public land users within or adjacent to the ROW proposed for treatment.

Fire Use

- Manage burns under powerlines so as to avoid negative impacts to the powerline.

Mechanical

- Apply appropriate safety measures when operating equipment within utility ROW corridors.
- Minimize exposed soil areas during treatment.
- Keep operations within prescribed ROW.

Manual

- Always use appropriate safety equipment and operating procedures.
- Utilize methods for disposal of vegetation that prevent spreading or reinfestation of unwanted vegetation.

Chemical

- Use only herbicides that are approved for use in ROW areas.

Human Health 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).
- Do not apply triclopyr by any broadcast method (Oregon FEIS MM).

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

Application Scenario	Chlorsulfuron	Imazapic	Diflufenzopyr + dicamba	Sulfometuron methyl
Buffer Distance (feet) from Non-target Aquatic Plants				
Typical Application Rate				
Low Boom[1]	0	0	100	900
High Boom[1]	0	0	900	900
Maximum Application Rate				
Low Boom[2]	0	0	900	900
High Boom[2]	0	0	900	900
Buffer Distance (feet) from Non-target Terrestrial Plants				
Typical Application Rate				
Low Boom[1]	900	0	0	0
High Boom[1]	900	0	100	0
Maximum Application Rate				
Low Boom[1]	1,000	0	100	0
High Boom[1]	1,000	0	100	0
Buffer Distance (feet) from Threatened, Endangered, and Sensitive Plants				
Typical Application Rate				
Low Boom[1]	1,000	0	100	1,100

Application Scenario	Chlorsulfuron	Imazapic	Diflufenzopyr + dicamba	Sulfometuron methyl
High Boom[1]	1,000	0	900	1,000
Maximum Application Rate				
Low Boom[1]	1,050	0	900	1,100
High Boom[1]	1,000	0	900	1,000

1 High boom is 50 inches above ground and low boom is 20 inches above ground.
NE =Not evaluated and NA =not applicable.
Buffer distances are the smallest modeled distance at which no risk was predicted. In some cases, buffer distances were extrapolated if the largest distance modeled still resulted in risk, or interpolated if greater precision was required.

Table A-2. Buffer Distances to Minimize Risk to Vegetation from Off-Site Drift of Forest Service-Evaluated Herbicides

Application Scenario	2,4-D	Dicamba	Clopyralid	Glyphosate	Hexazinone	Imazapyr	Metsulfuron methyl	Picloram	Triclopyr
Buffer Distance (feet) from Susceptible Plants[1]									
Typical Application Rate									
Low Boom	NE	300	900	50	NE	900	900	>900	300
Maximum Application Rate									
Low Boom	NE	900	1 000	300	NE	>900	>900	>900	>900
Buffer Distance (feet) from Tolerant Terrestrial Plants									
Typical Application Rate									
Low Boom	NE	0	0	25	0	25	25	25	NE
Maximum Application Rate									
Low Boom	NE	0	25	25	100	50	25	25	NE

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

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

Application Scenario	Chlorsulfuron	Imazapic	Overdrive	Sulfometuron methyl
Minimum Buffer Distance (feet) from Fish and Aquatic Invertebrates				
Typical Application Rate				
Low boom	0	0	0	0
High boom	0	0	0	0
Maximum Application Rate				
Low boom	0	0	0	0
High 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 A-4. Buffer Distances (in feet) to Minimize Risk to Non-target Vegetation from Off-site Drift

Application Scenario	Aminopyralid	Fluroxypyr	Rimsulfuron
Buffer Distance (feet) from Non-Target Terrestrial Plants			
Typical Application Rate			
High Boom[1]	200	400	400
Low Boom[1]	25	100	100
Maximum Application Rate			
High Boom	400	600	700
Low Boom	100	400	400
Buffer Distance (feet) from Terrestrial Threatened, Endangered, and Sensitive Plants			
Typical Application Rate			
High Boom	400	400	400
Low Boom	100	100	100
Maximum Application Rate			

Application Scenario	Aminopyralid	Fluroxypyr	Rimsulfuron
High Boom	600	700	700
Low Boom	400	600	400
Buffer Distance (feet) from Non-Target Aquatic Plants[3]			
Typical Application Rate			
High Boom	NA	NA	200
Low Boom	NA	NA	100
Maximum Application Rate			
High Boom	NA	NA	300
Low Boom	NA	NA	100

2 High boom is 50 inches above ground and low boom is 20 inches above ground.
3 Aquatic plants in ponds and streams were considered in the Ecological Risk Assessments. The largest buffer distances are presented in this table.
4 NA means that no buffers are required, since direct spray of plants was not predicted to result in adverse effects. However, a direct spray into an aquatic habitat is not an approved use of these herbicides.
Buffer distances are the smallest modeled distance at which no risk was predicted. In some cases, buffer distances were extrapolated if the largest distance modeled still resulted in risk, or interpolated if greater precision was required.

Protection Measures for Federally Listed Species

The Coos Bay District has seven federally listed species that are known to occur on the District (see Table A-5).

Table A-5*. Listed Species on the Coos Bay District*

Taxon	Common Name	Scientific Name	Population	Status
Plant	Western lily	*Lilium occidentale*		Endangered
Bird	Marbled murrelet	*Brachyramphus marmoratus*		Threatened
Bird	Western snowy plover	*Charadrius nivosus nivosus*	Pacific Coastal Population	Threatened
Bird	Northern spotted owl	*Strix occidentalis caurina*		Threatened
Anadromous Fish	Coho salmon	*Oncorhynchus kisutch*	S. Oregon/N. California Coast	Threatened
			Oregon Coast	
Anadromous Fish	Green sturgeon	*Acipenser medirostris*	Southern	Threatened
Anadromous Fish	Pacific eulachon	*Thaleichthys pacificus*	Southern DPS	Threatened

Formal and informal consultation that covers herbicides and other invasive plant treatments on the Coos Bay District has occurred with the U.S. Fish and Wildlife Service (FWS) and National Marine Fisheries Service (NMFS) on numerous occasions (see Table A-6).

Table A-6. *Endangered Species Act Consultation*

Program and Biological Assessment	Treatment Methods	Agency - Area	Year	Consultation
Vegetation Treatments Using Herbicides on BLM Lands in 17 Western States PEIS (USDI 2007a) *and Vegetation Treatments on BLM Lands in 17 Western States Programmatic Environmental Report (USDI 2007d) and Vegetation Treatments on BLM Lands in 17 Western States Biological Assessment* (USDI 2007c)	Integrated Invasive Plant Management. Includes all herbicides in this EA except aminopyralid, fluroxypyr, and rimsulfuron.	BLM - 17 Western States	2007	Letter of Concurrence (FWS) Biological Opinion (NMFS)
Biological Assessment of the Effects of the New River Foredune Management Project (USDI 2009b)	Heavy equipment, burning, and hand pulling to remove European beachgrass	BLM - Coos Bay District, New River ACEC	2009	Letter of Concurrence (NMFS)
Biological Assessment of the BLM's North Spit Plan	Integrated Vegetation Management, including glyphosate	BLM - Coos Bay District, North Spit	2008-2018, extended to 2022	Biological Opinion (FWS)

as it may affect the Threatened Western Snowy Plover and its Critical Habitat (USDI 2007e)				
Vegetation Treatments Using Herbicides on BLM Lands in Oregon (USDI 2010a) *and Vegetation Treatments on BLM Lands in 17 Western States Biological Assessment* (USDI 2007c)	Integrated Invasive Plant Management. Includes all herbicides in this EA except aminopyralid, fluroxypyr, and rimsulfuron.	BLM - Oregon	2010	Letter of Concurrence (FWS) Biological Opinion (NMFS)
Management of the Western Snowy Plover on Federal Lands Within the New River Area of Critical Environmental Concern during the 2011-2021 Nesting and Wintering Seasons (USDI 2011)	Heavy equipment, burning, and hand pulling to remove European beachgrass	BLM – Coos Bay District, New River ACEC	2011-2021	Biological Opinion (FWS)
Aquatic Restoration Biological Assessment II (USDA et al. 2013, NMFS 2013)	Integrated Invasive Plant Management. Includes all herbicides in this EA except fluridone, fluazifop-P-butyl, *Pseudomonas fluorescens*, fluroxypyr, and rimsulfuron	BLM and Forest Service - OR, WA, plus parts of CA, NV, and ID	2013	Aquatic Restoration Biological Opinion (ARBO II – FWS and NMFS)
Fiscal Years 2014-2018 Programmatic Suite of Activities that May Affect Spotted Owls, Murrelets and their designated Critical Habitats Proposed by The Coos Bay District BLM and the Bureau of Indian Affairs/Coquille Indian Tribe Biological Assessment (USDI 2014a)[1]	Integrated Vegetation Management	BLM - Coos Bay District	2014 - 2018	Biological Opinion (FWS)
Vegetation Treatments Using Aminopyralid, Fluroxypyr, and Rimsulfuron PEIS (USDI 2016a) *and Biological Assessment* (USDI 2016c)	Aminopyralid, fluroxypyr, and rimsulfuron.	BLM - 17 Western States	2016	Letter of Concurrence (FWS) Biological Opinion (NMFS)

1. Amended by the *2016 Programmatic Suite of Activities that May Affect Spotted Owls, Murrelets and their designated Critical Habitats Proposed by The Coos Bay District BLM and the Coquille Indian Tribe Biological Opinion* (USDI 2016f).

Endangered Species Act consultation with FWS 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 FWSNMFS 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 FWS 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 FWS. In addition, the FWS recognized that any future site-specific actions carried out under the PEIS would undergo additional consultation as appropriate (USDI 2007b). In 2010, the FWS reviewed the 2010 Oregon FEIS and 2007 Biological Assessment (USDI 2007c) and

issued a similar Letter of Concurrence (USDI 2010b). In 2016, after reviewing the 2016 PEIS and Biological Assessment, the FWS issued a similar Letter of Concurrence (USDI 2016b).

The Biological Opinion issued by the NMFS in 2007 concluded that the proposed action as described in the 2007 PEIS and Biological Assessment was not likely to jeopardize the continued existence of listed anadromous fish. There is no incidental take[76] identified or exempted by the Biological Opinion. If take is anticipated for site-specific treatments, then the amount or extent of take will be identified during subsequent consultation for those proposed treatments. Similarly, the Biological Opinion issued by the NMFS in 2010 – based on the 2010 Oregon FEIS and 2007 Biological Assessment – concluded that the proposed action was not likely to jeopardize the continued existence of listed anadromous fish in the State or result in the destruction or adverse modification of designated critical habitat. The Biological Assessment stated that incidental take is likely but not precisely quantifiable (USDI 2010b:143). Hence, the NMFS concluded that, "vegetation treatments within a 1,500 feet buffer will undergo a site-specific consultation. Vegetation treatments outside of the 1,500-foot buffer should not result in take if minimization measures are used" (USDI 2010b:143). Similar to the 2007 Biological Opinion, the 2016 Biological Opinion concluded that herbicide use was not likely to jeopardize the continued existence of endangered and threatened salmon and trout, threatened green sturgeon, and threatened southern resident killer whales and did not identify any incidental take.

The effects from terrestrial invasive plant control actions on the listed anadromous fish species present on the District were also analyzed in the *Aquatic Restoration Biological Assessment II* (ARBA II), with a determination of "may affect, likely to adversely affect" and were provided *Endangered Species Act* and *Magnuson-Stevens Fishery Conservation Act* coverage under the National Marine Fisheries Service's Aquatic Restoration Biological Opinion (ARBO II, NMFS 2013).

In ARBO II, NMFS determined that the proposed action was not likely to jeopardize the continued existence of the coho salmon (threatened, Oregon Coast and Southern Oregon/Northern California Coast Evolutionary Significant Units) or result in the destruction or adverse modification of designated critical habitat. Project design criteria for invasive plant control outlined in NMFS's ARBO II were fully incorporated into Project Design Features of this EA, 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, hexazinone, or rimsulfuron (four of the herbicides analyzed this analysis as part of Alternative 3). However, all herbicide treatments included in ARBO II are consistent with those included in the Proposed Action; therefore, ARBO II provides consultation coverage for the Proposed Action.

The BLM has engaged in multiple consultations with the FWS and NMFS over time addressing habitat restoration activities, including invasive plant treatments, for western snowy plover at North Spit and New River. The most recent consultations with the FWS are addressed in two biological assessments: the *Biological Assessment of the BLM's North Spit Plan as it may affect the Threatened Western Snowy Plover and its Critical Habitat* (USDI 2007e) and the Management of the Western Snowy Plover on Federal Lands Within the New River Area of Critical Environmental Concern during the 2011-2021 Nesting and Wintering Seasons (USDI 2011). The resulting biological opinions expect the condition of critical habitat in the project areas to stay the same or improve, relative to current conditions as a result of the management actions. The FWS determined the actions are not likely to jeopardize the continued existence of the western snowy plover and are not likely to adversely modify critical habitat. In 2009, the BLM consulted with NMFS on these same restoration activities with a determination of "may affect, not likely to adversely affect" for coho salmon and no effect for other listed species and received a letter of concurrence from NMFS.

[76] "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 2014, the BLM prepared a Biological Assessment (USDI 2014a) addressing effects to northern spotted owls and marbled murrelets from routinely occurring management activities on the Medford District, including invasive plant management. BLM determined that noxious weed management and native plant reestablishment would not effect habitat and the disturbance would "may affect, not likely to adversely affect" the northern spotted owl or marbled murrelet. The U.S. Fish and Wildlife Service concurred with this determination on June 30, 2014 in a Biological Opinion (USDI 2014b). The U.S. Fish and Wildlife Service issued an amendment to this opinion in May 2016 (USDI 2016f) associated with an increase in the planned quantity of acres of herbicide treatments. The Service found that the increase in treatment acres was consistent with the original determination with the inclusion of mitigation measures designed to avoid adverse effects to both species. Project Design Criteria identified to protect the northern spotted owl and marbled murrelet are included in the Proposed Action as a Project Design Feature to minimize potential effects.

Additional consultation with the National Marine Fisheries Service and the U.S. Fish and Wildlife Service would occur before the BLM could select Alternative 3. Specifically—

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

- The use of hexazinone, fluroxypyr, rimsulfuron, or fluazifop-P-butyl is proposed within 1,500 feet from listed fish habitat.

Additional consultation with the U.S. Fish and Wildlife Service would occur if:

- Any herbicide use is proposed in western snowy plover habitat, with the exception of 24 acres annually of glyphosate on the Coos Bay North Spit.
- The use of hexazinone, fluroxypyr, rimsulfuron, or fluazifop-P-butyl is proposed within the same watershed[77] as western snowy plover or western lily habitat.

Consultation resulted in Conservation Measures and Project Design Criteria identified to protect Coos Bay District listed species from treatments are listed below.

Conservation Measures from the 2007 and 2016 PEISs Biological Assessments

Mitigation Measures (above) include "when necessary to protect Special Status [plant/fish/wildlife species], implement all Conservation Measures for [plant/fish/wildlife species] presented in the *Vegetation Treatments on Bureau of Land Management Lands in 17 Western States Programmatic Biological Assessment*" (USDI 2007c). Those Conservation Measures are presented here for use with Special Status species as needed. Conservation Measures for mammals, birds, arthropods, and terrestrial mollusks are generally species specific. Special Status species with Conservation Measures are included below; not all Bureau Sensitive species have Conservation Measures. However, Conservation Measures for similar species can be found in the 2007 and 2016 PEIS Biological Assessments (for example, there are no Conservation Measures to protect the Bureau Sensitive American white pelican, but, when necessary, implementation of Conservation Measures for the brown pelican may be appropriate).

Given the low toxicity of aminopyralid, fluroxypyr, and rimsulfuron to fauna; likely uses of the herbicides; and, Standard Operating Procedures for minimizing the risk of spills, no new aquatic or terrestrial animal Conservation Measures have been developed for herbicide treatments using aminopyralid, fluroxypyr, or rimsulfuron. Additional plant Conservation Measures were adopted as part of the *Biological Assessment for Vegetation Treatments Using Aminopyralid, Fluroxypyr, and Rimsulfuron* (USDI 2016c) and are included below.

[77] Fifth field hydrological unit code (HUC)

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[78] plant species or their critical habitat that are present in the proposed treatment areas, and that list the measures that will be taken to protect them.

Many local BLM offices already have management plans in place that ensure the protection of these plant species during activities on public land. However, a discussion of these existing plans is outside the scope of this programmatic BA. The following general guidance applies to all management plans developed at the local level.

Required steps include the following:

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

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

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

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

- Herbicide treatments should not be conducted in areas where TEP plant species may be subject to direct spray by herbicides during treatments.

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

- Applicators should review, understand, and conform to the "Environmental Hazards" section on herbicide labels (this section warns of known pesticide risks and provides practical ways to avoid harm to organisms or the environment).
- To avoid negative effects to TEP plant species from off-site drift, surface runoff, and/or wind erosion, suitable buffer zones should be established between treatment sites and populations (confirmed or suspected) of TEP plant species, and site-specific precautions should be taken (refer to the guidance provided below).
- Follow all instructions and Standard Operating Procedures to avoid spill and direct spray scenarios into aquatic habitats that support TEP plant species.
- Follow all BLM operating procedures for avoiding herbicide treatments during climatic conditions that would increase the likelihood of spray drift or surface runoff.

The following Conservation Measures refer to sites where broadcast spraying of herbicides is desired. Manual spot treatment of undesirable vegetation can occur within the listed buffer zones if it is determined by local biologists that this method of herbicide application would not pose risks to TEP plant species in the vicinity. Additional precautions during spot treatments of vegetation within habitats where TEP plant species occur should be considered while planning local treatment programs, and should be included as Conservation Measures in local-level NEPA documentation.

The buffer distances provided below are conservative estimates, based on the information provided by Ecological Risk Assessments, and are designed to provide protection to TEP plants. Some Ecological Risk Assessments used regression analysis to predict the smallest buffer distance to ensure no risks to TEP plants. In most cases, where regression analyses were not performed, suggested buffers extend out to the first modeled distance from the application site for which no risks were predicted. In some instances, the jump between modeled distances was quite large (e.g., 100 feet to 900 feet). Regression analyses could be completed at the local level using the interactive spreadsheets developed for the Ecological Risk Assessments, using information in Ecological Risk Assessments and for local site conditions (e.g., soil type, annual precipitation, vegetation type, and treatment method), to calculate more precise, and possibly smaller buffers for some herbicides.

2,4-D

- Because the risks associated with this herbicide were not assessed, do not spray within ½ mile of terrestrial plant species or aquatic habitats where TEP aquatic plant species occur.
- Do not use aquatic formulations in aquatic habitats where TEP aquatic plant species occur.
- Assess local site conditions when evaluating the risks from surface water runoff to TEP plants located within ½-mile downgradient from the treatment area.
- In areas where wind erosion is likely, do not apply within ½ mile of TEP plant species.

Aminopyralid

- If using a low boom at the typical application rate, do not apply within 100 feet of TEP terrestrial plants[79].
- If using a low boom at the maximum application rate or a high boom at the typical application rate, do not apply within 400 feet of TEP terrestrial plants.
- If using a high boom at the maximum application rate, do not apply within 600 feet of TEP terrestrial plants.
- 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.

[79] Note that buffers for terrestrial plants may be appropriate for plant species that root in water but have foliage extending above the surface of the water.

- In areas where wind erosion is likely, do not apply within ½ mile of TEP plant species.

Clopyralid

- Since the risks associated with using a high boom are unknown, use only a low boom during ground applications of this herbicide within ½ mile of terrestrial TEP plant species or aquatic habitats in which TEP plant species occur.
- Do not apply by ground methods at the typical application rate within 900 feet of terrestrial TEP species.
- Do not apply by ground methods at the typical application rate within ½ mile of terrestrial TEP species.
- In areas where wind erosion is likely, do not apply within ½ mile of TEP plant species.

Dicamba

- If using a low boom at the typical application rate, do not apply within 1,050 feet of terrestrial TEP plant species.
- If using a low boom at the maximum application rate, do not apply within 1,050 feet of terrestrial TEP plant species.
- If using a high boom, do not apply within 1,050 feet of terrestrial TEP plant species.
- Do not apply within 25 feet of aquatic habitats where TEP plant species occur.
- In areas where wind erosion is likely, do not apply within ½ mile of TEP plant species.

Diflufenzopyr

- If using a low boom at the typical application rate, do not apply within 100 feet of terrestrial TEP plant species.
- If using a high boom, or a low boom at the maximum application rate, do not apply within 900 feet of terrestrial TEP plant species.
- If using a high boom, do not apply within 500 feet of terrestrial TEP plant species.
- Do not apply within 25 feet of aquatic habitats where TEP plant species occur.
- In areas where wind erosion is likely, do not apply within ½ mile of TEP plant species.

Fluroxypyr

- If using a low boom at the typical application rate, do not apply within 100 feet of TEP terrestrial plants.
- If using a low boom at the maximum application rate, do not apply within 600 feet of TEP terrestrial plants.
- If using a high boom at the typical application rate, do not apply within 400 feet of TEP terrestrial plants.
- If using a high boom at the maximum application rate, do not apply within 700 feet of TEP terrestrial plants.
- In areas where wind erosion is likely, do not apply within 1.2 miles of TEP plant species (an alternative suitable buffer may be developed at the local level based on an analysis of site conditions).

Glyphosate

- Since the risks associated with using a high boom are unknown, use only a low boom during ground applications of this herbicide within ½ mile of terrestrial TEP plant species.
- Do not apply by ground methods at the typical application rate within 50 feet of terrestrial TEP plant species.
- Do not apply by ground methods at the maximum application rate within 300 feet of terrestrial TEP plant species.
-

Hexazinone

- Since the risks associated with using a high boom are unknown, only apply this herbicide by ground methods using a low boom within ½ mile of terrestrial TEP plant species and aquatic habitats that support aquatic TEP species.

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

Imazapic

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

Imazapyr

- Since the risks associated with using a high boom are unknown, use only a low boom for ground applications of this herbicide within ½ mile of terrestrial TEP plant species or aquatic habitats in which TEP plant species occur.
- Do not apply at the typical application rate within 900 feet of terrestrial TEP plant species or aquatic habitats in which aquatic TEP species occur.
- Do not apply at the maximum application rate within ½ mile of terrestrial TEP plant species or aquatic habitats in which aquatic TEP species occur.
- Do not use aquatic formulations in aquatic habitats where TEP aquatic plant species occur.
- In areas where wind erosion is likely, do not apply within ½ mile of TEP plant species.

Metsulfuron Methyl

- Since the risks associated with using a high boom are unknown, use only a low boom for ground applications of this herbicide within ½ mile of terrestrial TEP plant species or aquatic habitats in which TEP plant species occur.
- Do not apply at the typical application rate within 900 feet of terrestrial TEP plant species or aquatic habitats in which aquatic TEP species occur.
- Do not apply at the maximum application rate within ½ mile of terrestrial TEP plant species or aquatic habitats in which aquatic TEP species occur.
- In areas where wind erosion is likely, do not apply within ½ mile of TEP plant species.

Overdrive®

- If using a low boom at the typical application rate, do not apply within 100 feet of terrestrial TEP plant species.
- If using a low boom at the maximum application rate, do not apply within 900 feet of terrestrial TEP plant species.
- If using a high boom, do not apply within 900 feet of terrestrial TEP plant species.
- Do not apply within 25 feet of aquatic habitats where TEP plant species occur.
- In areas where wind erosion is likely, do not apply within ½ mile of TEP plant species.

Picloram

- Do not apply by ground methods, at any application rate, within ½ mile of terrestrial TEP plant species.
- Assess local site conditions when evaluating the risks from surface water runoff to TEP plants located within ½-mile downgradient from the treatment area.
- In areas where wind erosion is likely, do not apply within ½ mile of TEP plant species.

Rimsulfuron

- If using a low boom at the typical application rate, do not apply within 200 feet of TEP terrestrial plants.
- If using a low boom at the maximum application rate or a high boom at the typical application rate, do not apply within 400 feet of TEP terrestrial plants.

- If using a high boom at the maximum application rate, do not apply within 700 feet of TEP terrestrial plants.
- In areas where wind erosion is likely, do not apply within 1.2 miles of TEP plant species (an alternative suitable buffer may be developed at the local level based on an analysis of site conditions).
- Do not use in watersheds where annual precipitation exceeds 50 inches.
- In watersheds where annual precipitation exceeds 10 inches, prior to use of rimsulfuron conduct a local-level analysis of site conditions and develop suitable conservation measures for protection of TEP plant species from surface runoff.

Sulfometuron Methyl

- Do not apply by ground methods within 1,500 feet of terrestrial TEP species.
- Do not apply by ground methods within 900 feet of aquatic habitats where TEP plant species occur.
- In areas where wind erosion is likely, do not apply within ½ mile of TEP plant species.

Triclopyr Acid

- Since the risks associated with using a high boom are unknown, use only a low boom during ground applications of this herbicide within ½ mile of terrestrial TEP plant species.
- Since the risks associated with using a high boom are unknown, use only a low boom during ground applications at the maximum application rate of this herbicide within ½ mile of aquatic habitats in which TEP plant species occur.
- Do not apply by ground methods at the typical application rate within 300 feet of terrestrial TEP plant species.
- Do not apply by ground methods at the maximum application rate within ½ mile of terrestrial TEP plant species or aquatic habitats in which TEP plant species occur.
- If applying to aquatic habitats in which aquatic TEP plant species occur, do not exceed the targeted water concentration on the product label.
- In areas where wind erosion is likely, do not apply within ½ mile of TEP plant species.

Triclopyr BEE

- Since the risks associated with using a high boom are unknown, use only a low boom for ground applications of this herbicide within ½ mile of terrestrial TEP plant species or aquatic habitats in which TEP plant species occur.
- Do not apply by ground methods at the typical application rate within 300 feet of terrestrial TEP plant species or aquatic habitats in which TEP plant species occur.
- Do not apply by at the maximum application rate within ½ mile of terrestrial TEP plant species or aquatic habitats in which TEP plant species occur.
- Do not use aquatic formulations in aquatic habitats where TEP aquatic plant species occur.
- In areas where wind erosion is likely, do not apply within ½ mile of TEP plant species.

If a tank mix of one of these chemicals with another approved herbicide is desired, an additional assessment of potential effects to non-target TEP species must be made with the assumption that effects of the herbicides are at a minimum additive. Larger buffers may be warranted. At the local level, the BLM must make determinations as to the suitability of herbicide treatments for the populations of TEP species that are managed by local offices. The following information should be considered: the timing of the treatment in relation to the phenology of the TEP plant species; the intensity of the treatment; the duration of the treatment; and the tolerance of the TEP species to the treatment. When information about species tolerance is unavailable or is inconclusive, local offices must assume an adverse effect to plant populations, and protect those populations from direct or indirect exposure to the treatment in question. Treatment plans must also address the presence of and expected impacts on noxious weeds on the project site. These plans must be coordinated with BLM weed experts and/or appropriate county weed supervisors to minimize the spread of weeds.

The information provided in Table 4-4 (of the 2007 PEIS Biological Assessment, USDI 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, nonnative species should not be used for revegetation.
- Certified noxious weed - 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 (Chapter 4 of this BA) and fish and aquatic invertebrates should be consulted as guidance. (Note: the Forest Service did not determine appropriate buffer distances for TEP fish and aquatic invertebrates when evaluating herbicides in Forest Service Ecological Risk Assessments; buffer distances were only determined for non-TEP species.)
- Do not use 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 USFWS).

Outside riparian areas in watersheds with TEP species or designated or undesignated critical habitat (i.e., unoccupied habitat critical to species recovery):

- Conduct soil-disturbing treatments only on slopes of 20% or less, where feasible.
- Do not conduct log hauling activities on native surface roads prone to erosion, where feasible.

Within riparian areas in these watersheds, more protective measures will be required to avoid negatively affecting TEP species or their habitat:

- Do not use vehicles or heavy equipment, except when crossing at established crossings.
- Do not remove large woody debris or snags during mechanical treatment activities.
- Do not conduct ground disturbing activities (e.g., disking, drilling, chaining, and plowing).
- Ensure that all mowing follows guidance to avoid negative effects to streambanks and riparian vegetation and major effects to streamside shade.
- Do not use equipment in perennial channels or in intermittent channels with water, except at crossings that already exist.
- Leave suitable quantities (to be determined at the local level) of excess vegetation and slash on site.
- Do not apply fertilizer within 25 feet of streams and supersaturated soils; apply fertilizer following labeling instructions.
- Do not apply fertilizer in desert habitats.
- Do not completely remove trees and shrubs.

Conservation Measures Related to Biological Control Treatments using Livestock

For treatments occurring in watersheds that support TEP species or in critical habitat:

- Where terrain permits, locate stock handling facilities, camp facilities, and improvements at least 300 feet from lakes, streams, and springs.
- Educate stock handlers about at-risk fish species and how to minimize negative effects to the species and their associated habitat.
- Employ appropriate dispersion techniques to range management, including judicial placement of saltblocks, troughs, and fencing, to prevent damage to riparian areas but increase weed control.
- Equip each watering trough with a float valve.

Within riparian areas of these watersheds, more protective measures are required.

- Do not conduct weed treatments involving domestic animals, except where it is determined that these treatments will not damage the riparian system, or will provide long-term benefits to riparian and adjacent aquatic habitats.
- Do not locate troughs, storage tanks, or guzzlers near streams with TEP species, unless their placement will enhance weed-control effectiveness without damaging the riparian system.

Terrestrial Animals

Butterfly or Moth Conservation Measures

Many local BLM offices already have management plans in place that ensure the protection of these species during activities on public lands. The following Conservation Measures are the minimum steps required of the BLM to ensure that treatment methods would be unlikely to negatively affect TEP species.

Each local BLM office is required to draw up management plans related to treatment activities that identify any TEP butterfly or moth species or their critical habitat that are present in the proposed treatment areas, as well as the measures that will be taken to protect these species.

Management plans should, at a minimum, follow this general guidance:

- Use an integrated pest management approach when designing programs for managing pest outbreaks.
- Survey treatment areas for TEP butterflies/moths and their host/nectar plants (suitable habitat) at the appropriate times of year.
- Minimize the disturbance area with a pre-treatment survey to determine the best access routes. Areas with butterfly/moth host plants and/or nectar plants should be avoided.
- Minimize mechanical treatments and OHV activities on sites that support host and/or nectar plants.
- Carry out vegetation removal in small areas, creating openings of 5 acres or less in size.
- Avoid burning all of a species' habitat in any 1 year. Limit area burned in butterfly/moth habitat in such a manner that the unburned units are of sufficient size to provide a refuge for the population until the burned unit is suitable for recolonization. Burn only a small portion of the habitat at any one time, and stagger timing so that there is a minimum 2-year recovery period before an adjacent parcel is burned.
- Where feasible, mow or wet around patches of larval host plants within the burn unit to reduce impacts to larvae.
- In TEP butterfly/moth habitat, burn while butterflies and/or moths of concern are in the larval stage, when the organisms would receive some thermal protection.
- Wash equipment before it is brought into the treatment area.
- Use a seed mix that contains host and/or nectar plant seeds for road/site reclamation.
- To protect host and nectar plants from herbicide treatments, follow recommended buffer zones and other Conservation Measures for TEP plants species when conducting herbicide treatments in areas where populations of host and nectar plants occur.
- Do not broadcast spray herbicides in habitats occupied by TEP butterflies or moths; do not broadcast spray herbicides in areas adjacent to TEP butterfly/moth habitat under conditions when spray drift onto the habitat is likely.
- Do not use 2,4-D in TEP butterfly/moth habitat.
- When conducting herbicide treatments in or near habitat used by TEP butterflies or moths, avoid use of the following herbicides, where feasible: clopyralid, glyphosate, hexazinone, imazapyr, picloram, and triclopyr.
- If conducting manual spot applications of glyphosate, hexazinone, or triclopyr to vegetation in TEP butterfly or moth habitat, utilize the typical, rather than the maximum, application rate.

Amphibians and Reptiles Conservation Measures

Many local BLM offices already have management plans in place that ensure the protection of these species during activities on public lands. In addition, the following Conservation Measures are the minimum steps required of the BLM to ensure that treatment methods would be unlikely to negatively affect TEP species.

- Survey all areas that may support TEP amphibians and/or reptiles prior to treatments.
- Conduct burns during periods when the animals are in aquatic habitats or are hibernating in burrows.
- For species with extremely limited habitat, such as the desert slender salamander, avoid prescribed burning in known habitat.
- Do not use water from aquatic habitats that support TEP amphibians and/or reptiles for fire abatement.
- Install sediment traps upstream of aquatic habitats to minimize the amount of ash and sediment entering aquatic habitats that support TEP species.
- Do not conduct prescribed burns in desert tortoise habitat.
- In habitats where aquatic herpetofauna occur, implement all Conservation Measures identified for aquatic organisms in Chapter 4.

- Within riparian areas, wetlands, and aquatic habitats, conduct herbicide treatments only with herbicides that are approved for use in those areas.
- Do not broadcast spray herbicides in riparian areas or wetlands that provide habitat for TEP herpetofauna.
- Do not use glyphosate, or triclopyr BEE to treat aquatic vegetation in habitats where TEP amphibians occur or may potentially occur.
- In desert tortoise habitat, conduct herbicide treatments during the period when desert tortoises are less active.
- To the greatest extent possible, avoid desert tortoise burrows during herbicide treatments.
- When conducting herbicide treatments in upland areas adjacent to aquatic or wetland habitats that support TEP herpetofauna, do not broadcast spray during conditions under which off-site drift is likely.
- In watersheds where TEP amphibians occur, do not apply triclopyr BEE in upland habitats upslope of aquatic habitats that support (or may potentially support) TEP amphibians under conditions that would likely result in surface runoff.
- Follow all instructions and Standard Operating Procedures to avoid spill and direct spray scenarios into aquatic habitats that support TEP herpetofauna.
- Do not use 2,4-D in terrestrial habitats occupied by TEP herpetofauna; do not broadcast spray 2,4-D within ¼ mile of terrestrial habitat occupied by TEP herpetofauna.
- When conducting herbicide treatments in or near terrestrial habitat occupied by TEP herpetofauna, avoid using the following herbicides, where feasible: clopyralid, glyphosate, hexazinone, imazapyr, metsulfuron methyl, picloram, and triclopyr.
- When conducting herbicide treatments in upland habitats occupied by TEP herpetofauna, do not broadcast spray 2,4-D, clopyralid, glyphosate, hexazinone, picloram or triclopyr; do not broadcast spray these herbicides in areas adjacent to habitats occupied by TEP herpetofauna under conditions when spray drift onto the habitat is likely.
- If conducting manual spot applications of glyphosate, hexazinone, or triclopyr to vegetation in upland habitats occupied by TEP herpetofauna, utilize the typical, rather than the maximum, application rate.
- If spraying imazapyr or metsulfuron methyl in or adjacent to upland habitats occupied by TEP herpetofauna, apply at the typical, rather than the maximum, application rate.
- If conducting herbicide treatments in or near upland habitats occupied by TEP herpetofauna, consult Table 6-3 on a species by species basis to determine additional Conservation Measures that should be enacted to avoid negative effects via ingestion of contaminated prey.

Bird Conservation Measures

Sand Nesters: Western Snowy Plover, Piping Plover, and Least Tern

- Survey for western snowy plovers, piping plovers, and interior least terns (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.
- Do not use 2,4-D in western snowy plover, piping plover, or interior least tern habitats; do not broadcast spray 2,4-D within ¼ mile of western snowy plover, piping plover, or interior least tern habitat.
- Where feasible, avoid use of the following herbicides in western snowy plover and piping plover habitat: clopyralid, glyphosate, hexazinone, imazapyr, metsulfuron methyl, picloram, and triclopyr; in interior least

tern habitat avoid the use of clopyralid, glyphosate, hexazinone, imazapyr, metsulfuron methyl, picloram, and triclopyr.

- Do not broadcast spray clopyralid, glyphosate, hexazinone, picloram, or triclopyr in western snowy plover or piping plover habitat; do not broadcast spray these herbicides in areas adjacent to western snowy plover or piping plover habitat under conditions when spray drift onto the habitat is likely.
- Do not broadcast spray clopyralid, glyphosate, hexazinone, picloram, or triclopyr in interior least tern habitat; do not broadcast spray these herbicides in areas adjacent least tern habitat under conditions when spray drift onto the habitat is likely.
- If broadcast spraying imazapyr or metsulfuron methyl in or adjacent to western snowy plover, piping plover, or interior least tern habitat, apply at the typical, rather than the maximum, application rate.
- If conducting manual spot applications of glyphosate, hexazinone, or triclopyr to vegetation in western snowy plover, piping plover, or interior least tern habitat, utilize the typical, rather than the maximum, application rate.

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

Bald Eagles

The following programmatic level conservation measures are the minimum steps required of the BLM to ensure that treatment methods would not negatively affect the bald eagle or its habitat. Additional, site-specific conservation measures would also be developed at the local level, as appropriate.

- Do not allow human disturbance within a suitable buffer distance of known bald eagle nest sites during the breeding season (as determined by a qualified wildlife biologist). For active bald eagle nests in open country, buffer distances should be 1 mile. In other habitats, with a shorter line-of-site distance, buffer distances may be reduced, based on consultation with the USFWS.
- Do not allow ground disturbing activities within ½ mile of active roost sites year round,
- Avoid human disturbance within 1 mile of a winter roost during the wintering period (as determined by a qualified wildlife biologist).
- Complete treatment activities that must occur within 1 mile of a winter roost within the hours of 9 a.m. to 3 p.m., during the winter roosting period.
- Conduct prescribed burn activities in a manner that ensures that nest and winter roost sites are greater than 1 mile from downwind smoke effects.
- Do not cut trees within ¼ mile of any known nest trees.
- Do not use 2,4-D in bald eagle habitats; do not broadcast spray 2,4-D within ¼ mile of bald eagle habitat.
- Where feasible, avoid use of the following herbicides in bald eagle habitat: clopyralid, glyphosate, hexazinone, imazapyr, metsulfuron methyl, picloram, and triclopyr.
- Do not broadcast spray clopyralid, glyphosate, hexazinone, picloram, or triclopyr in bald eagle habitat; do not broadcast spray these herbicides in areas adjacent to bald eagle habitat under conditions when spray drift onto the habitat is likely.
- If broadcast spraying imazapyr or metsulfuron methyl in or adjacent to bald eagle habitat, apply at the typical, rather than the maximum, application rate.
- If conducting manual spot applications of glyphosate, hexazinone or triclopyr to vegetation in bald eagle habitat, utilize the typical, rather than the maximum, application rate.

Riparian Birds

To minimize or avoid negative effects to riparian bird species (such as the yellow-billed cuckoo), the BLM would be required to implement the following programmatic-level conservation measures in habitats utilized by these three species.

- Conduct surveys prior to vegetation treatments within potential or suitable habitat.
- Where surveys detect birds, do not burn, broadcast spray herbicides, use domestic animals to control weeds, or conduct mechanical treatments.
- Do not conduct vegetation treatments within ½ mile (or further if deemed necessary to prevent smoke from inundating the nest area) of known nest sites or unsurveyed suitable habitat during the breeding season (as determined by a qualified wildlife biologist).
- Adjust spatial and temporal scales of treatments to that not all suitable habitat is affected in any given year.
- Following treatments, replant or reseed treated areas with native species, if needed.
- Closely follow all application instructions and use restrictions on herbicide labels; in wetland habitats use only those herbicides that are approved for use in wetlands.
- Do not use 2,4-D in least Bell's vireo, Inyo California towhee, or southwestern willow flycatcher habitats; do not broadcast spray 2,4-D within ¼ mile of least Bell's vireo, Inyo California towhee, or southwestern willow flycatcher habitat.
- Where feasible, avoid use of the following herbicides in least Bell's vireo, Inyo California towhee, and southwestern willow flycatcher habitat: clopyralid, glyphosate, hexazinone, imazapyr, metsulfuron methyl, picloram, and triclopyr.
- Do not broadcast spray clopyralid, glyphosate, hexazinone, picloram, or triclopyr in least Bell's vireo or southwestern willow flycatcher habitat; do not broadcast spray these herbicides in areas adjacent to least Bell's vireo or southwestern willow flycatcher habitat under conditions when spray drift onto the habitat is likely.

- Do not broadcast spray clopyralid, glyphosate, hexazinone, picloram, or triclopyr in Inyo California towhee habitat; do not broadcast spray these herbicides in areas adjacent to Inyo California towhee habitat under conditions when spray drift onto the habitat is likely.
- If broadcast spraying imazapyr or metsulfuron methyl in or adjacent to least Bell's vireo or southwestern willow flycatcher habitat, apply at the typical, rather than the maximum, application rate.
- If broadcast spraying imazapyr or metsulfuron methyl in or adjacent to Inyo California towhee habitat, apply at the typical, rather than the maximum, application rate.
- If conducting manual spot applications of glyphosate, hexazinone, or triclopyr to vegetation in least Bell's vireo, Inyo California towhee, or southwestern willow flycatcher habitat, utilize the typical, rather than the maximum, application rate.

Mammal Conservation Measures

Bats

In order to prevent or minimize the potential effects to bats from vegetation treatments, the following conservation measures should be followed:

- Prior to treatments, survey all potentially suitable habitat for the presence of bats or their nectar plants.
- At the local level, incorporate protection of lesser and Mexican long-nosed bats into management plans developed for proposed treatment programs.
- Instruct all field personnel on the identification of bat nectar plants and the importance of their protection.
- Protect nectar plants from modification by treatment activities to the greatest extent possible. Do not remove nectar plants during treatments. Avoid driving over plants, piling slash on top of plants, burning, and using domestic animals to control weeds.
- Do not burn within a mile upwind of known bat roosts.
- To protect nectar plants and roost trees from herbicide treatments, follow recommended buffer zones and other conservation measures for TEP plant species in areas where populations of nectar plants and roost trees occur.
- Do not use 2,4-D in lesser or Mexican long-nosed bat habitats; do not broadcast spray within ¼ mile of lesser or Mexican long-nosed bat habitat.
- Where feasible, avoid use of the following herbicides in lesser and Mexican long-nosed bat habitat: clopyralid, glyphosate, imazapyr, metsulfuron methyl, picloram, and triclopyr.
- Do not broadcast spray clopyralid, glyphosate, picloram, or triclopyr in lesser or Mexican long-nosed bat habitat; do not broadcast spray these herbicides in areas adjacent to lesser or Mexican long-nosed bat habitat under conditions when spray drift onto the habitat is likely.
- If broadcast spraying imazapyr or metsulfuron methyl in or near lesser or Mexican long-nosed bat habitat, apply at the typical, rather than the maximum, application rate.
- If conducting manual spot applications of glyphosate, or triclopyr to vegetation in lesser or Mexican long-nosed bat habitat, utilize the typical, rather than the maximum, application rate.
- If conducting spot treatments of herbicides in lesser or Mexican long-nosed bat habitats, avoid potential roost sites.

Essential Fish Habitat Conservation Measures

Conservation Measures have been incorporated into the Proposed Action and Alternative 3 to reduce negative effects to the point where they do not reduce the quantity or quality of essential fish habitat (EFH). For the purposes of developing Conservation Measures for salmon, riparian areas include traditional riparian corridors, wetlands, intermittent streams, and other areas that help maintain the integrity of aquatic ecosystems by 1)

influencing the delivery of coarse sediment, organic matter, and woody debris to streams, 2) providing root strength for channel stability, 3) shading the stream, and 4) protecting water quality.

Activities associated with the proposed vegetation treatments would have the potential to negatively affect salmonids, pelagic fish and groundfish, and Alaskan crabs and scallops and their habitat. Implementation of the measures listed below would minimize these potential impacts to a negligible level such that the quantity and quality of EFH is not reduced.

General Measures

- Establish riparian, estuarine, and coastal buffer strips adjacent to salmonid, groundfish and pelagic fish, and Alaskan crab and scallop habitats to reduce direct impacts to the various life stages of these species. Buffers widths should depend on the specific ecological function for which protection is desired (e.g., streambanks stabilization, control of sediment inputs from surface erosion, or maintenance of shade to stream channels). Local BLM field offices would consult BLM and Forest Service Ecological Risk Assessments prepared for the BA and PEIS to obtain programmatic guidance on appropriate buffer distances. Field offices can also input information on local site conditions (e.g., soil type, vegetation type, precipitation, treatment method) into interactive spreadsheets developed for the Ecological Risk Assessments to develop more site-specific, and in most cases less restrictive, buffers for individual projects.
- Implement Standard Operating Procedures to minimize sedimentation and disturbance of riparian, estuarine, and coastal vegetation.
- To avoid erosion and future recreational uses within close vicinity of aquatic areas, limit or exclude construction of new permanent or temporary roads within the boundary of treatment riparian areas.
- Where possible, to avoid increased instream sedimentation, choose low-intensity burns and manual treatment methods over mechanical treatment methods and use of domestic animals.

Prescribed Burning Treatments

- Where feasible, avoid ignition of fires within buffer strips.

Mechanical Treatments

- Minimize the use of mechanical treatment methods (including timber harvest and timber salvage) within buffer strips.
- To avoid damaging potential spawning areas, do not use mechanical equipment in perennial channels, or in intermittent channels with water, except at crossings that already exist. Do not use mechanical equipment in estuaries.
- Minimize log hauling during wet weather, and on non-paved roads.
- Minimize skidding or ground-based yarding within buffer strips.
- Do not remove large woody debris from buffer strips

Herbicide Treatments

- Where feasible, minimize spray operations around aquatic habitats to days when winds are > 10 miles per hour for ground applications, to avoid wind drift or direct application of herbicides into these habitats.
- Where feasible, minimize the use of terrestrial herbicides in watersheds with downgradient ponds and streams if potential impacts to salmonids are of concern.
- Time herbicide applications near salmonid-bearing streams, and estuaries and coastal/marine habitats used by salmon and FMP species so that they do not overlap with sensitive life-history stages of these fish (would vary at the local level).

Biological Treatments

- In watersheds that support salmonids or that flow into watersheds where salmonids occur, to minimize the cumulative effect of grazing in areas that have been burned, do not conduct weed control by

domestic animals in burned areas until they have recovered enough to control ash and sediment produced by the treatment.

- Prohibit livestock grazing in estuaries.

Project Design Criteria for Listed Anadromous Fish from ARBO II (NMFS 2013)

Project Design Criteria established through consultation with NMFS for ARBO II are adopted as a Project Design Feature for federally listed fish for the analysis in this EA. The Project Design Criteria are taken from:

- National Marine Fisheries Service. 2013. Endangered Species Act – Section 7 Programmatic Consultation Conference and Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for Reinitiation of Aquatic Restoration Activities in States of Oregon and Washington (ARBO II). NMFS Consultation Number: NWR-2013-9664 (NMFS 2013)

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

1.3 Proposed Action

1.3.1 Program Administration

33. Nonnative Invasive Plant Control includes manual, mechanical, biological, and chemical methods to remove invasive nonnative plants within Riparian Reserves, Riparian Habitat Conservation Areas, or equivalent and adjacent uplands. In monoculture areas (*e.g.*, areas dominated by blackberry or knotweed) heavy machinery can be used to help remove invasive plants. This activity is intended to improve the composition, structure, and abundance of native riparian plant communities important for bank stability, stream shading, 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 1995; 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. 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.
    4. Herbicide application rates will follow label direction, unless site- specific analysis determines a lower maximum rate is needed to reduce non-target impacts.
    5. 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.
    6. 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):[80]
    1. aminopyralid (e.g., terrestrial: Milestone VM)
    2. chlorsulfuron (e.g., terrestrial: Telar, Glean, Corsair) (c) clopyralid (e.g., terrestrial: Transline)
    3. clopyralid (e.g., terrestrial: Transline)
    4. dicamba (e.g., terrestrial: Vanquish, Banvel)
    5. diflufenzopyr + dicamba (e.g., terrestrial: Overdrive)
    6. glyphosate (e.g., aquatic: Aquamaster, AquaPro, Rodeo, Accord) (g) imazapic (e.g., terrestrial: Plateau)
    7. imazapic (e.g., terrestrial: Plateau)
    8. imazapyr (e.g., aquatic: Habitat; terrestrial: Arsenal, Chopper)
    9. metsulfuron methyl (e.g., terrestrial: Escort)
    10. picloram (e.g., terrestrial: Tordon, Outpost 22K)
    11. sethoxydim (e.g., terrestrial: Poast, Vantage)[81]
    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.

[80] 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.

[81] *Sethoxydim is not proposed for use in this analysis.*

iv. **Herbicide Carriers –** Herbicide carriers (solvents) are limited to water or specifically labeled vegetable oil.

v. **Herbicide Mixing –** Herbicides will be mixed more than 150 feet from any natural waterbody to minimize the risk of an accidental discharge. Impervious material will be placed beneath mixing areas in such a manner as to contain any spills associated with mixing/refilling. Spray tanks shall be washed further than 300 feet away from surface water. All hauling and application equipment shall be free from leaks and operating as intended.

vi. **Herbicide Application Methods** – Liquid forms of herbicides will be applied as follows:

1. Broadcast spraying using booms mounted on ground-based vehicles (this consultation does not include aerial applications).
2. Spot spraying with hand held nozzles attached to back pack tanks or vehicles and hand-pumped sprayers to apply herbicide directly onto small patches or individual plants.
3. Hand/selective through wicking and wiping, basal bark, frill ("hack and squirt"), stem injection, or cut-stump.
4. Dyes or colorants, (*e.g.*, Hi-Light, Dynamark) will be used to assist in treatment assurance and minimize over-spraying within 100 feet of live water.

vii. **Minimization of Herbicide Drift and Leaching –** Herbicide drift and leaching will be minimized as follows:

1. Do not spray when wind speeds exceed 10 miles per hour to reduce the likelihood of spray/dust drift. Winds of 2 mph or less are indicative of air inversions. The applicator must confirm the absence of an inversion before proceeding with the application whenever the wind speed is 2 mph or less.
2. Be aware of wind directions and potential for herbicides to affect aquatic habitat area downwind.
3. Keep boom or spray as low as possible to reduce wind effects. (d) Avoid or minimize drift by utilizing appropriate equipment and settings (*e.g.*, nozzle selection, adjusting pressure, drift reduction agents, *etc.*). Select proper application equipment (*e.g.*, spray equipment that produces 200-800 micron diameter droplets [Spray droplets of 100 microns or less are most prone to drift]).
4. Follow herbicide label directions for maximum daytime temperature permitted (some types of herbicides volatilize in hot temperatures).
5. Do not spray during periods of adverse weather conditions (snow or rain imminent, fog, *etc.*). Wind and other weather data will be monitored and reported for all pesticide applicator reports.
6. Herbicides shall not be applied when the soil is saturated or when a precipitation event likely to produce direct runoff to fish-bearing waters from a treated site is forecasted by NOAA National Weather Service or other similar forecasting service within 48 hours following application. Soil-activated herbicides can be applied as long as label is followed. Do not conduct any applications during periods of heavy rainfall.

viii. **Herbicide buffer distances –** The following no-application buffers— which are measured in feet and are based on herbicide formula, stream type, and application method—will be observed during herbicide applications (Table 4). Herbicide applications based on a combination of approved herbicides will use the most conservative buffer for any herbicide included. Buffer widths are measured as map distance perpendicular to the bankfull for streams, the upland boundary for wetlands, or the upper bank for roadside ditches.

Table 4. No-application buffer widths[1] in feet for herbicide application, by stream types and application methods.

Herbicide	Perennial Streams and Wetlands, and Intermittent Streams and Roadside Ditches with flowing or standing water present			Dry Intermittent Streams, Dry Intermittent Wetlands, Dry Roadside Ditches		
	Broadcast Spraying	Spot Spraying	Hand Selective	Broadcast Spraying	Spot Spraying	Hand Selective
Labeled for Aquatic Use						
Aquatic Glyphosate	100	waterline	waterline	50	0	0
Aquatic Imazapyr	100	waterline	waterline	50	0	0
Aquatic Triclopyr-TEA	***Not Allowed***	15	waterline	***Not Allowed***	0	0
Aquatic 2,4-D (amine)	100	waterline	waterline	50	0	0
Low Risk to Aquatic Organisms						
Aminopyralid	100	waterline	waterline	50	0	0
Dicamba	100	15	15	50	0	0
Dicamba + diflufenzopyr	100	15	15	50	0	0
Imazapic	100	15	bankfull elevation	50	0	0
Clopyralid	100	15	bankfull elevation	50	0	0
Metsulfuron methyl	100	15	bankfull elevation	50	0	0
Moderate Risk to Aquatic Organisms						
Imazapyr	100	50	bankfull elevation	50	15	bankfull elevation
Sulfometuron-methyl	100	50	5	50	15	bankfull elevation
Chlorsulfuron	100	50	bankfull elevation	50	15	bankfull elevation
High Risk to Aquatic Organisms						
Triclopyr-BEE	***Not Allowed***	150	150	***Not Allowed***	150	150
Picloram	100	50	50	100	50	50
Sethoxydim[1]	100	50	50	100	50	50
2,4-D (ester)	100	50	50	100	50	50

Project Design Criteria for Listed Plants from ARBO II (USDI 2013a)

Project Design Criteria established through consultation with U.S. Fish and Wildlife Service for ARBO II are adopted as a Project Design Feature for federally listed fish for the analysis in this EA. The Project Design Criteria are taken from:

- 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)

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

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

- **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 8).

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

Species	Optimal Survey Time Period[1]
western lily	June to July

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

Reasonable and Prudent Measures and Terms and Conditions for Western Snowy Plover at New River and North Spit

Taken from the Biological Opinions associated with the *Management of the Western Snowy Plover on Federal Lands Within the New River Area of Critical Environmental Concern during the 2011-2021 Nesting and Wintering Seasons* (USDI 2011) and the *Biological Assessment of the BLM's North Spit Plan as it may affect the Threatened Western Snowy Plover and its Critical Habitat* (USDI 2007e). Some terms and conditions are specific to either the North Spit or New River area and these are indicated by (North Spit) and (New River).

A. Reasonable and Prudent Measures

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize take of western snowy plovers:

1. Avoid disturbance and minimize potential loss of nests or nesting plovers.
2. Reduce impacts on foraging and resting plovers and broods.
3. Maintain productivity of at least 1 fledged chick per male over three consecutive years.

B. Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the BLM must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

1. Avoid disturbance and minimize potential loss of nests or nesting plovers:
    a. Ensure efforts to manage recreation are enforced and effective:
        i. Work with OPRD to reduce dog and vehicle violations on the New River ACEC (New River) / South Beach (North Spit) during the nesting season.
        ii. Ensure staff, including law enforcement officers and volunteers that patrol beaches, are trained in plover biology and required measures to reduce potential harm or disturbance to plovers. In addition, ensure plover monitors and law enforcement officers participate in coordinated law enforcement/plover training and coordination meetings when available (e.g., workshops, refresher courses, video training).
        iii. Compliance Monitors/Interpretive Specialists shall continue to inform law enforcement personnel about the location of plover nests and activities. Officers should focus their attention and time on areas where and periods when plovers may be particularly vulnerable.
        iv. Continue to work with the plover working group to improve signage and resolve law enforcement issues.
    b. Monitor and evaluate compliance of recreation:

   i. Monitor compliance with recreational restrictions and continue to collect data on standardized forms for comparison between years.
   ii. Reduce impacts to plovers by using visitor compliance data (i.e., number or percent of violations relative to number of people/dogs during the course of the breeding season) during the season to strategically target areas that are a concern for public education and enforcement; and
   iii. Ensure nests outside roped areas are protected. Either rope and sign the exposed nest, or contact the Service immediately to determine if any protection strategy is necessary.
2. Reduce impacts on foraging and resting plovers and broods:
   a. Disseminate information about the restrictions prior to 15 March of each year over the term of the proposed action.
   b. Continue to conduct public outreach during compliance patrols.
   c. Implement strategies for minimizing disturbance by targeting days and hours when disturbance and violations are most likely to occur, and by providing a Law Enforcement or Compliance Monitoring presence during those times. (North Spit)
3. Maintain productivity of at least 1.0 fledged chick per male over three consecutive years (New River):
   a. Based on the productivity data observed at New River (see pp. 33-35), the breeding population will maintain a mean hatch rate of at least 49 percent and a fledging success rate of at least 39 percent over three consecutive years at New River ACEC (i.e., the lower confidence interval calculated for the mean hatch and fledge rates over 2002-2010).
   b. Conduct or fund annual monitoring on BLM lands on the New River ACEC, that measures productivity in the following ways: hatch rate, fledging success rate, number of breeding adults, and number of fledged chicks per male. This project produces data essential to plover recovery efforts, management actions, and assessment of productivity and take of the western snowy plover.
   c. Participate in annual predator management action planning for plover areas.
   d. Manage predators of the western snowy plover on the New River ACEC.
   e. Continue to implement habitat restoration, maintenance, and breaching activities as described in Fish and Wildlife Service (2008) and the New River Health EA OR 128-03-11.

(New River): By December 31 of each year, provide an annual written report to the Service detailing the extent and effectiveness of habitat maintenance/restoration activities, the location and extent of habitat protection measures (i.e., ropes and signs), public education efforts conducted, and the results of compliance monitoring. In order to evaluate plover productivity, visitor use along the Oregon Coast Trail, and violations in plover and non-plover areas, please include the following in your report:

   1. The three-year mean rate for hatch success, fledging success, and number of fledged chicks per male at New River ACEC, along with an explanation of why goals were or were not met;
   2. 2. The location of compliance monitoring and law enforcement efforts (i.e., New River HRAs, CMA, Floras Lake to CMA, etc.) and associated statistics for each area; and
   3. 3. Continue to provide an estimate of the number of hikers/backpackers (registered and unregisters) using the Oregon Coast Trail within the New River ACEC

3. Maintain snowy plover productivity at nesting areas: (North Spit)
   a. Fund annual monitoring on BLM lands at CBNS, conducted by the Oregon Natural Heritage Information Center and cooperatively funded by State and Federal agencies. This project produces data essential to plover recovery efforts, management actions, and assessment of productivity and take of the western snowy plover.
   b. Participate in the development of predator action planning annually.
   c. Manage predators of the western snowy plover on BLM lands at CBNS.
   d. By December 31 of each year, provide an annual written report to the Service detailing the extent and effectiveness of habitat maintenance/restoration activities, the location and extent of habitat protection measures (i.e., ropes and signs), public education efforts conducted, and the results of compliance monitoring.

Appendix B – The Herbicides, Formulations, and Adjuvants

The Herbicides - The herbicides proposed for use in Oregon are a subset of the hundreds of herbicides registered for use in the U.S. They were chosen by the BLM nationally for maximum effectiveness against wildland weeds and least environmental and non-target species' risks. Table 2-5 in Chapter 2 shows the herbicides with some sample trade names, common plant targets, plant types it is selective for, how it is used, land types it is registered for, and typical and maximum rates. **Table B-1, *General Constraints from Herbicide Labels,*** supplements the Table 2-5 information by listing a summary of general label constraints.

Herbicides can be categorized as selective or non-selective (see Table 2-5). 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 2-5).

Herbicides are classified as either "general use" or "restricted use" by the EPA. Restricted use means that a product, or its uses, may have higher risks of adverse effects and thus can only be used by a certificated pesticide applicator with the appropriate training or under the direct supervision of a certified applicator (defined in 40 CFR 152.175). A license is required to purchase and apply the product and the label on the herbicide must clearly state that it is a "Restricted Use Pesticide." A general use pesticide, when applied in accordance with its directions for use, will generally not cause unreasonable adverse effects to humans or the environment, and thus is not restricted to certified applicators. They can be purchased and used by the public. Picloram is the only restricted use herbicide analyzed in this EA.

Table B-2, *Herbicide Formulations Approved for use on BLM-Administered Lands,* displays the BLM national list of approved herbicides, which is reviewed and updated at least annually. This list identifies herbicides that are known to be consistent with the formulations analyzed in the Risk Assessments (see Appendix C) and otherwise suitable for wildland use.

Table B-3, *Adjuvants Approved for Use on BLM Administered Lands*, displays the adjuvants approved for use on BLM-administered lands nationally. This list is also reviewed at least annually. This list identifies adjuvants that are known to be consistent with the formulations analyzed in the Risk Assessments (see Appendix C) and are known not to contain R-11, POEA, petroleum, and other products prohibited by Mitigation Measures (see Appendix A), or that are otherwise considered unsuitable for wildland use. Table B-3 also identifies those adjuvants identified by the 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 B-1. General Constraints from Herbicide Labels

Herbicides	***General Constraints from Labels (follow all label requirements)***
2,4-D	• Some formulations are toxic to aquatic invertebrates. • Only use approved formulations for streamside and aquatic applications. • Drift or runoff from terrestrial applications may adversely affect aquatic invertebrates and non-target plants. • For terrestrial uses, do not apply directly to water, or to areas where surface water is present or to intertidal areas below the mean high water mark. Do not contaminate water when disposing of equipment washwaters.
Aminopyralid	• After grazing aminopyralid-treated forage, livestock must graze for 3 days in an untreated pasture without desirable broadleaf plants before returning to an area where desirable broadleaf plants are present. • Do not apply directly to water, or to areas where surface water is present, or to intertidal areas below the mean high water mark. • Do not contaminate water when disposing of equipment wash-water or rinsate. • Do not treat inside banks or bottoms of irrigation ditches, either dry or containing water, or other channels that carry water that may be used for irrigation or domestic purposes.
Chlorsulfuron	• Do not apply more than 1.33 oz/acre per year in pasture, range, and Conservation Reserve Program treatments. • Do not treat frozen soil. • Applications to powdery, dry soil when there is low likelihood of rain soon may result in off-site damage by wind-borne soil particles.
Clopyralid	• Do not apply where soils have a rapid to very rapid permeability close to aquifers. • Do not contaminate irrigation ditches or water used for irrigation or domestic uses. • Do not apply directly to water, or to areas where surface water is present, or to intertidal areas below the mean high water mark. • Do not contaminate water when disposing of equipment wash-water. • Avoid spray drift. • After grazing clopyralid-treated forage, livestock must graze for 3 days in an untreated pasture without desirable broadleaf plants before returning to an area where desirable broadleaf plants are present. • Do not use plant residues, including hay or straw from treated areas, or manure or bedding straw from animals that have grazed or consumed forage from treated areas, for composting or mulching, where susceptible plants may be grown the following season. • Do not spread manure from animals that have grazed or consumed forage or hay from treated areas on land used for growing susceptible broadleaf crops, ornamentals, orchards, or other susceptible desirable plants.
Dicamba	• To prevent point source contamination, do not mix or load this pesticide within 50 feet of wells (including abandoned wells and drainage wells), sink holes, perennial or intermittent streams and rivers, and natural or impounded lakes and reservoirs. Do not apply this pesticide within 50 feet of wells. • Do not apply under conditions that favor runoff. Do not apply to impervious substrates such as paved or highly compacted surfaces in areas with high potential for ground water contamination. Ground water contamination may occur in areas where soils are permeable or coarse and ground water is near the surface.
Dicamba + Diflufenzopyr	• Do not load, mix, or apply within 50 feet of wells. • Do not apply directly to water, where surface water is present, or to intertidal areas. Do not contaminate water when disposing of equipment washwaters. • Do not apply to impervious substrates or under conditions that favor runoff. Do not apply to soils that classify as sand. • Be cognizant of leaching where soils are permeable or where water table is shallow.

Herbicides	***General Constraints from Labels (follow all label requirements)***
Fluroxypyr	• Do not apply directly to water, to areas where surface water is present or to intertidal areas below the mean high water mark. • Do not contaminate water when cleaning equipment or disposing of equipment washwaters. • Do not apply where drift may be a problem due to proximity to susceptible crops or other non-target broadleaf plants.
Glyphosate	• Only use approved aquatic formulations for aquatic applications. • Do not contaminate water when cleaning equipment or disposing of equipment washwaters. • Treatment of aquatic weeds can result in oxygen depletion or loss due to decomposition of plants that can cause fish suffocation. • This is a non-selective herbicide. • Avoid drift.
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 ground water where soils are permeable, particularly where water table is shallow. • Do not apply within the root zone of desirable trees unless such injury can be tolerated.
Rimsulfuron	• Do not graze treated sites or cut for forage or hay for a minimum of 1 year after application in order to allow newly emerged grasses sufficient time to become established. • Do not apply directly to water, or to areas where surface water is present, or to intertidal areas below the mean high water mark. • Do not contaminate water by cleaning of equipment or disposal of equipment washwaters or rinsate.

Herbicides	***General Constraints from Labels (follow all label requirements)***
	• 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.
Triclopyr	• Treatment of aquatic weeds can result in oxygen depletion or loss due to decomposition of plants in certain situations, which can cause fish suffocation. • Certain approved products can be used in and around standing water sites. Minimize overspray to open water (streams, lakes, etc.) when treating vegetation growing at water edge. Do not contaminate water when disposing of equipment wash-water.
Herbicides analyzed for Research and Demonstration	
Fluazifop-P-butyl	• This product is toxic to fish and aquatic invertebrates. Do not apply to areas where runoff into water bodies is expected. • Do not apply when weather conditions favor drift from target areas. • Do not apply directly to water, to areas where surface water is present, or to intertidal areas below the mean high water mark. • Fluazifop-P-butyl is known to leach through soil into ground water under certain conditions as a result of label use. This chemical may leach into ground water if used in areas where soils are permeable, particularly where the water table is shallow. • This product may impact surface water quality due to runoff of rain water. This is especially true for poorly draining soils and soils with shallow ground water. • This product is classified as having high potential for reaching surface water via runoff for several months or more after application. A level, well-maintained vegetative buffer strip between areas to which this product is applied and surface water features such as ponds, streams, and springs will reduce the potential loading of fluazifop-P-butyl from runoff water and sediment. Runoff of this product will be reduced by avoiding applications when rainfall is forecasted to occur within 48 hours. • Do not treat areas while unprotected humans or domestic animals are present in the treatment areas. Do not allow entry into treated areas without protective clothing until sprays have dried. • Do not apply if rainfall is expected within 1 hour. • Do not use flood type or other spray nozzle tips that deliver coarse, large droplet sprays.

Table B-2. Herbicide Formulations Approved for Use on BLM-Administered Lands[1]

Active Ingredient	Trade Name	Manufacturer	EPA Registration Number
2,4-D	2,4-D 4# Amine Weed Killer	UAP-Platte Chem. Co.	34704-120
2,4-D	2,4-D Amine	Helena Chemical Company	5905-72
2,4-D	2,4-D Amine	Setre (Helena)	5905-72
2,4-D	2,4-D Amine 4	Albaugh, Inc./Agri Star	42750-19
2,4-D	2,4-D Amine 4	Helena Chemical Company	42750-19-5905
2,4-D	2,4-D LV 4	Albaugh, Inc./Agri Star	42750-15
2,4-D	2,4-D LV4	Setre (Helena)	5905-90
2,4-D	2,4-D LV 6	Albaugh, Inc./Agri Star	42750-20
2,4-D	2,4-D LV6	Helena Chemical Company	4275-20-5905
2,4-D	2,4-D LV6	Setre (Helena)	5905-93
2,4-D	2,4-D LV 6 Ester	Nufarm Americas Inc.	228-95
2,4-D	Agrisolution 2,4-D Amine 4	Agriliance, LLC	1381-103
2,4-D	Agrisolution 2,4-D Amine 4	Winflied Solutions, LLC	1381-103
2,4-D	Agrisolution 2,4-D LV4	Agriliance, LLC	1381-102
2,4-D	Agrisolution 2,4-D LV4	Winflied Solutions, LLC	1381-102
2,4-D	Agrisolution 2,4-D LV6	Agriliance, LLC	1381-101
2,4-D	Agrisolution 2,4-D LV6	Winflied Solutions, LLC	1381-101
2,4-D	Alligare 2,4-D Amine	Alligare, LLC	81927-38
2,4-D	Alligare 2,4-D LV 6	Alligare, LLC	81927-39
2,4-D	Amine 4	Wilbur-Ellis Co.	2935-512
2,4-D	Aqua-Kleen	Nufarm Americas Inc.	228-378
2,4-D	Aqua-Kleen	Nufarm Americas Inc.	71368-4
2,4-D	Barrage HF	Helena Chemical Company	5905-529
2,4-D	Barrage LV Ester	Setre (Helena)	5905-504
2,4-D	Base Camp Amine 4	Wilbur-Ellis Co.	71368-1-2935
2,4-D	Base Camp LV6	Wilbur-Ellis Co.	2935-553
2,4-D	Broadrange 55	Wilbur-Ellis Co.	2217-813-2935
2,4-D	Clean Amine	Loveland Products, Inc.	34704-120
2,4-D	Clean Crop Amine 4	UAP-Platte Chem. Co.	34704-5 CA
2,4-D	Clean Crop Low Vol 6 Ester	UAP-Platte Chem. Co.	34704-125
2,4-D	Clean Crop LV-4 ES	UAP-Platte Chem. Co.	34704-124
2,4-D	Cornbelt 4 lb. Amine	Van Diest Supply Co.	11773-2
2,4-D	Cornbelt 4# LoVol Ester	Van Diest Supply Co.	11773-3
2,4-D	Cornbelt 6# LoVol Ester	Van Diest Supply Co.	11773-4
2,4-D	D-638	Albaugh, Inc./Agri Star	42750-36
2,4-D	De-Amine 4	Drexel Chemical Company	19713-650
2,4-D	De-Amine 6	Drexel Chemical Company	19713-651
2,4-D	De-Ester LV4	Drexel Chemical Company	19713-345
2,4-D	De-Ester LV6	Drexel Chemical Company	19713-655
2,4-D	Esteron 99C	Nufarm Americas Inc.	62719-9-71368
2,4-D	Five Star	Albaugh, Inc./Agri Star	42750-49
2,4-D	Formula 40	Nufarm Americas Inc.	228-357
2,4-D	HardBall	Helena Chemical Company	5905-549
2,4-D	Hi-Dep	PBI/Gordon Corporation	2217-703
2,4-D	Lo Vol-4	Wilbur-Ellis Co.	228-139-2935
2,4-D	Low Vol 4 Ester Weed Killer	Loveland Products, Inc.	34704-124
2,4-D	Lo Vol-6 Ester	Wilbur-Ellis Co.	228-95-2935
2,4-D	Low Vol 6 Ester Weed Killer	Loveland Products, Inc.	34704-125
2,4-D	Opti-Amine	Helena Chemical Company	5905-501
2,4-D	Phenoxy 088	Winfield Solutions, LLC	42750-36-9779
2,4-D	Platoon	Nufarm Americas Inc.	228-145
2,4-D	Rugged	Winfield Solutions, LLC	1381-247
2,4-D	Saber	Loveland Products, Inc.	34704-803

Active Ingredient	Trade Name	Manufacturer	EPA Registration Number
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
Dicamba	Vision	Albaugh, Inc.	42750-98
Dicamba	Vision	Helena Chemical Company	5905-576

Active Ingredient	Trade Name	Manufacturer	EPA Registration Number
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
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
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

Active Ingredient	Trade Name	Manufacturer	EPA Registration Number
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
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

Active Ingredient	Trade Name	Manufacturer	EPA Registration Number
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
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

Active Ingredient	Trade Name	Manufacturer	EPA Registration Number
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 B-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	
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.	

Adjuvant Type	Trade Name	Manufacturer	ARBO[2]
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	
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	

Adjuvant Type	Trade Name	Manufacturer	ARBO[2]
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.	
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	

Adjuvant Type	Trade Name	Manufacturer	ARBO[2]
Methylated Seed Oil	Kixyt	Precision Laboratories, LLC.	
Methylated Seed Oil	MES-100	Drexel Chemical Company	
Methylated Seed Oil	Methylated Spray Oil Conc.	Helena Chemical Company	
Methylated Seed Oil	Monterey M.S.O.	Monterey AgResources	
Methylated Seed Oil	MSO Concentrate	Alligare, LLC	
Methylated Seed Oil	MSO Concentrate	Loveland Products, Inc.	
Methylated Seed Oil	Premium MSO	Helena Chemical Company	
Methylated Seed Oil	Persist Ultra	Precision Laboratories, LLC.	
Methylated Seed Oil	Red River Supreme	Red River Specialties, Inc.	
Methylated Seed Oil	Renegade 2.0	Wilbur-Ellis Co.	
Methylated Seed Oil	Renegade-EA	Wilbur-Ellis Co.	
Methylated Seed Oil	Sunburn	Red River Specialties, Inc.	
Methylated Seed Oil	SunEnergy	Brewer International	
Methylated Seed Oil	Sunset	Red River Specialties, Inc.	
Methylated Seed Oil	Sun Wet	Brewer International	
Methylated Seed Oil	Super Kix	Wilbur-Ellis Co.	
Methylated Seed Oil	Super Spread MSO	Wilbur-Ellis Co.	
Methylated Seed Oil + Organosilicone	Alligare MVO Plus	Alligare, LLC	
Methylated Seed Oil + Organosilicone	Syl-Tac-EA	Wilbur-Ellis Co.	
Methylated Seed Oil + Organosilicone	Turbulence	Winfield Solutions, LLC	
Vegetable Oil	Amigo	Loveland Products, Inc.	
Vegetable Oil	BeanOil	Drexel Chemical Company	
Vegetable Oil	Competitor	Wilbur-Ellis Co.	✓
Vegetable Oil	Elite Natural	Red River Specialties, Inc.	
Vegetable Oil	Motion	Exacto, Inc.	
Vegetable Oil	Noble	Winfield Solutions, LLC	
Vegetable Oil	Vegetoil	Drexel Chemical Company	
Fertilizer-based			
Nitrogen-based	Actamaster Soluble Spray Adjuvant	Loveland Products, Inc.	
Nitrogen-based	Actamaster Spray Adjuvant	Loveland Products, Inc.	
Nitrogen-based	Alliance	Winfield Solutions, LLC	
Nitrogen-based	AMS-All	Drexel Chemical Company	
Nitrogen-based	AMS-Supreme	Drexel Chemical Company	
Nitrogen-based	AMS-Xtra	Drexel Chemical Company	
Nitrogen-based	Bronc	Wilbur-Ellis Co.	
Nitrogen-based	Bronc Max	Wilbur-Ellis Co.	✓
Nitrogen-based	Bronc Max EDT	Wilbur-Ellis Co.	
Nitrogen-based	Bronc Plus Dry	Wilbur-Ellis Co.	
Nitrogen-based	Bronc Plus Dry EDT	Wilbur-Ellis Co.	✓
Nitrogen-based	Bronc Total	Wilbur-Ellis Co.	
Nitrogen-based	Cayuse Plus	Wilbur-Ellis Co.	
Nitrogen-based	Class Act NG	Winfield Solutions, LLC	✓
Nitrogen-based	Cornbelt Gardian	Van Diest Supply Co.	
Nitrogen-based	Cornbelt Gardian Plus	Van Diest Supply Co.	
Nitrogen-based	Corral AMS Liquid	Winfield Solutions, LLC	
Nitrogen-based	Dispatch	Loveland Products, Inc.	
Nitrogen-based	Dispatch 111	Loveland Products, Inc.	
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			

Adjuvant Type	Trade Name	Manufacturer	ARBO[2]
Buffering Agent	Brimstone	Wilbur-Ellis Co.	
Buffering Agent	BS-500	Drexel Chemical Company	
Buffering Agent	Buffers P.S.	Helena Chemical Company	
Buffering Agent	Oblique	Red River Specialties, Inc.	
Buffering Agent	Spray-Aide	Miller Chem. & Fert. Corp.	
Buffering Agent	Tri-Fol	Wilbur-Ellis Co.	
Buffering Agent	Yardage	Exacto, Inc.	
Colorants/Dyes	Alligare Super Marking Dye	Alligare, LLC	
Colorants/Dyes	BullsEye	Milliken Chemical	
Colorants/Dyes	Elite Ruby	Red River Specialties, Inc.	
Colorants/Dyes	Elite Sapphire	Red River Specialties, Inc.	
Colorants/Dyes	Elite Sapphire WSB	Red River Specialties, Inc.	
Colorants/Dyes	Elite Splendor	Red River Specialties, Inc.	
Colorants/Dyes	Hash Mark Blue Liquid	Exacto, Inc.	
Colorants/Dyes	Hash Mark Blue Liquid HC	Exacto, Inc.	
Colorants/Dyes	Hash Mark Blue Powder	Exacto, Inc.	
Colorants/Dyes	Hash Mark Green Liquid	Exacto, Inc.	
Colorants/Dyes	Hash Mark Green Powder	Exacto, Inc.	
Colorants/Dyes	Hi-Light	Becker-Underwood	
Colorants/Dyes	Hi-Light WSP	Becker-Underwood	
Colorants/Dyes	Marker Dye	Loveland Products, Inc.	
Colorants/Dyes	Mark-It Blue	Monterey AgResources	
Colorants/Dyes	Mark-It Red	Monterey AgResources	
Colorants/Dyes	Mystic HC	Winfield Solutions, LLC	
Colorants/Dyes	Signal	Precision Laboratories, LLC	
Colorants/Dyes	SPI-Max Blue Spray Marker	PROKoZ	
Colorants/Dyes	Spray Indicator XL	Helena Chemical Company	
Colorants/Dyes	TurfTrax	Loveland Products, Inc.	
Colorants/Dyes	TurfTrax Blue Spray Indicator	Loveland Products, Inc.	
Compatibility/Suspension Agent	Blendex VHC	Setre (Helena)	
Compatibility/Suspension Agent	Convert	Precision Laboratories, LLC	
Compatibility/Suspension Agent	E Z MIX	Loveland Products, Inc.	
Compatibility/Suspension Agent	Mix	Drexel Chemical Company	
Compatibility/Suspension Agent	Support	Loveland Products, Inc.	
Defoaming Agent	Alligare Anti-Foamer	Alligare, LLC	
Defoaming Agent	Alligare Defoamer	Alligare, LLC	
Defoaming Agent	Cornbelt Defoamer	Van Diest Supply Co.	
Defoaming Agent	Defoamer	Brewer International	
Defoaming Agent	Fast Break	Winfield Solutions, LLC	
Defoaming Agent	Fighter-F 10	Loveland Products, Inc.	
Defoaming Agent	Fighter-F Dry	Loveland Products, Inc.	
Defoaming Agent	Foam Buster	Setre (Helena)	
Defoaming Agent	Foambuster Max	Helena Chemical Company	
Defoaming Agent	Foam Fighter	Miller Chem. & Fert. Corp.	
Defoaming Agent	Fome-Kil	Drexel Chemical Company	
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	

Adjuvant Type	Trade Name	Manufacturer	ARBO[2]
Deposition Aid	Alligare Pattern	Alligare, LLC	
Deposition Aid	Bivert	Wilbur-Ellis Co.	
Deposition Aid	Border AQ	Precision Laboratories, LLC	
Deposition Aid	Chem-Trol	Chemorse, Ltd	
Deposition Aid	Clasp	Helena Chemical Company	
Deposition Aid	Compadre	Loveland Products, Inc.	
Deposition Aid	Coverage G-20	Wilbur-Ellis Co.	
Deposition Aid	Crosshair	Wilbur-Ellis Co.	
Deposition Aid	CWC Sharpshooter	CWC Chemical, Inc.	
Deposition Aid	Cygnet Plus	Brewer International	✓
Deposition Aid	Direct	Precision Laboratories, LLC	
Deposition Aid	Droplex	Winfield Solutions, LLC	
Deposition Aid	EDT Concentrate	Wilbur-Ellis Co.	
Deposition Aid	Elite Secure Ultra	Red River Specialties, Inc.	
Deposition Aid	Exit	Miller Chem. & Fert. Corp.	
Deposition Aid	Grounded	Helena Chemical Company	
Deposition Aid	Grounded - CA	Helena Chemical Company	
Deposition Aid	Infuse	Loveland Products, Inc.	
Deposition Aid	Intac Plus	Loveland Products, Inc.	
Deposition Aid	Interlock	Winfield Solutions, LLC	✓
Deposition Aid	Liberate	Loveland Products, Inc.	✓
Deposition Aid	LOX	Drexel Chemical Company	
Deposition Aid	LOX PLUS	Drexel Chemical Company	
Deposition Aid	Mist-Control	Miller Chem. & Fert. Corp.	
Deposition Aid	Offside	Exacto, Inc.	
Deposition Aid	Pointblank	Helena Chemical Company	
Deposition Aid	Poly Control 2	Brewer International	
Deposition Aid	ProMate Impel	Helena Chemical Company	
Deposition Aid	Reign	Loveland Products, Inc.	
Deposition Aid	Reign LC	Loveland Products, Inc.	
Deposition Aid	Secure Ultra	Red River Specialties, Inc.	
Deposition Aid	Sta'-Put	Setre (Helena)	
Deposition Aid	Strike Zone DF	Helena Chemical Company	
Deposition Aid	Sustain	Miller Chem. & Fert. Corp.	
Deposition Aid	Syndetic	Chemorse, Ltd	
Deposition Aid	Volare DC	Precision Laboratories, LLC	
Deposition Aid	Weather Gard	Loveland Products, Inc.	
Diluent/Deposition Agent	Bark Oil	Crop Production Services	
Diluent/Deposition Agent	Bark Oil EC	Crop Production Services	
Diluent/Deposition Agent	Elite Premier	Red River Specialties, Inc.	
Diluent/Deposition Agent	Elite Premier Blue	Red River Specialties, Inc.	
Diluent/Deposition Agent	Hy-Grade EC	CWC Chemical, Inc.	
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.	

Adjuvant Type	Trade Name	Manufacturer	ARBO[2]
Foam Marker	Tuff Trax Foam Concentrate	Loveland Products, Inc.	
Invert Emulsion Agent	Redi-vert II	Wilbur-Ellis Co.	
Tank Cleaner	All Clear	Loveland Products, Inc.	
Tank Cleaner	Back Field	Exacto, Inc.	
Tank Cleaner	Cornbelt Tank-Aid	Van Diest Supply Co.	
Tank Cleaner	Elite Vigor	Red River Specialties, Inc.	
Tank Cleaner	Kutter	Wilbur-Ellis Co.	
Tank Cleaner	Neutral-Clean	Wilbur-Ellis Co.	
Tank Cleaner	Pro Tank	Winfield Solutions, LLC	
Tank Cleaner	Red River Tank Cleaner	Red River Specialties, Inc.	
Tank Cleaner	SSC-11	Wilbur-Ellis Co.	
Tank Cleaner	Tank and Equipment Cleaner	Loveland Products, Inc.	
Tank Cleaner	Wipe Out	Helena Chemical Company	
Water Conditioning	AccuQuest WM	Helena Chemical Company	
Water Conditioning	Alligare Water Conditioner	Alligare, LLC	
Water Conditioning	Blendmaster	Loveland Products, Inc.	
Water Conditioning	Breeze	Winfield Solutions, LLC	
Water Conditioning	Choice	Loveland Products, Inc.	
Water Conditioning	Choice Weather Master	Loveland Products, Inc.	
Water Conditioning	Choice Xtra	Loveland Products, Inc.	
Water Conditioning	Climb	Wilbur-Ellis Co.	
Water Conditioning	Completion	Exacto, Inc.	
Water Conditioning	Cornbelt N-Tense	Van Diest Supply Co.	
Water Conditioning	Cut-Rate	Wilbur-Ellis Co.	✓
Water Conditioning	Elite Imperial	Red River Specialties, Inc.	
Water Conditioning	Hel-Fire	Helena Chemical Company	
Water Conditioning	Import	Precision Laboratories, LLC	
Water Conditioning	Sequestra	Drexel Chemical Company	
Water Conditioning	Smoke	Helena Chemical Company	
Water Conditioning	Transport LpH	Precision Laboratories, LLC	
Water Conditioning	Transport Plus	Precision Laboratories, LLC	

1. Approved list as of January 6, 2017.
2. Approved for use near water under ARBO II

Appendix C - Herbicide Risk Assessment Summaries

See the *Human Health and Ecological Risk Assessments* section in Chapter 2 for an introduction to the Risk Assessments. The risk tables presented in this Appendix are used in the individual analysis in Chapter 3.

EPA terms
LD50 Lethal Dose to 50% of the population
LOC Level of Concern
NOAEL No Observed Adverse Effect Level
LOAEL Lowest Observed Adverse Effect Level

BLM terms
RQ Risk Quotient
ECC Estimated Exposure Concentration
TRV Toxicity Reference Value
ARI Aggregated Risk Index

Forest Service terms
HQ Hazard Quotient
RfD Reference Dose
TI Toxicity Index

Risk[82]

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}[83]. LD_{50} (LD = lethal dose) represents the amount of herbicide that results in the death of 50 percent of a test population. Therefore, the lower the LD_{50}, the more toxic the herbicide. Table C-1 shows the three categories that the EPA uses for classifying herbicides (USDI 1992a).

Table C-1. Herbicide Label Categories

Categories	Signal Word Required on Label	Oral LD_{50} (mg./kg.)	Dermal LD_{50} (mg./kg.)	Inhalation LD_{50} (mg./kg.)	Probable Oral Lethal Dose for 150 lb. Human
I – Highly Toxic	DANGER, POISON, skull & crossbones	Up to and including 50	Up to and including 200	Up to and including 0.2	A few drops to a teaspoonful

[82] Adapted from the Oregon FEIS (USDI 2010a:85-91).
[83] or LC_{50} (lethal concentration) in the case of aquatic organisms.

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
II – Moderately Toxic	WARNING	From 50 to 500	From 200 to 2,000	From 0.2 to 2	Over one teaspoonful to one ounce
III – Slightly Toxic	CAUTION	From 500 to 5,000	From 2,000 to 20,000	From 2 to 20	Over one ounce to one pint or one pound.

In addition, the EPA has established Levels of Concern (LOC) for herbicides, which is the dose of the herbicide above which effects would be expected. The LOCs are used by EPA for registration, and to indicate potential risk to non-target organisms and the need to consider regulatory action (USEPA 2007). In the absence of information indicating otherwise, the LOC is generally 1/10th of the Lowest Observed Adverse Effect Level (LOAEL); that is, the lowest dose level where there was a statistically significant increase in frequency or severity of adverse effects[84] to the test organism. In some cases, no adverse reaction happens at any dose (or at any reasonable dose), and the LOC is the No Observed Adverse Effect Level (NOAEL). LOCs include uncertainty factors based on the amount and nature of the toxicity testing on which they are based.

Risk Assessments

One of the *Purposes* identified in Chapter 1 of this EA is: *d. Prevent control treatments from having unacceptable adverse effects to applicators and the public, to desirable flora and fauna, and to soil, air, and water.* To help address this *Purpose*, this EA relies on BLM and 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[85] to direct spray, surface runoff, wind erosion, and accidental spills were analyzed.

The Human Health and Ecological Risk Assessments were developed by the BLM for the 2007 PEIS, the 2016 PEIS, or by the Forest Service for the 2005 *Pacific Northwest Region Invasive Plant Program EIS* (see Table C-2). The Risk Assessments, related separate analyses, and the PEISs include analysis of degradates and other 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

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

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.

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

	Human Health	**Ecological**
2,4-D	BLM (2016)	
Aminopyralid	BLM (2016)	
Chlorsulfuron	Forest Service	BLM (2007)
Clopyralid	BLM (2016)	
Dicamba	Forest Service	
Dicamba + diflufenzopyr	NA	BLM (2007)
Diflufenzopyr	BLM (2007)	NA
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]	

1. Scoping/screening level Risk Assessment, not adopted by the BLM.

When evaluating risks from the use of herbicides proposed in a NEPA planning document, reliance on EPA's herbicide registration process as the sole demonstration of safety is insufficient. The U.S. Forest Service and BLM were involved in court cases in the early 1980s that specifically addressed this question (principally *Save Our Ecosystems v. Clark*, 747 F.2d 1240, 1248 (9th Cir. 1984) and *Southern Oregon Citizens v. Clark*, 720 F. 2d 1475, 1480 (9th Cir. 1983)). These court decisions and others affirmed that although the BLM can use EPA toxicology data, it is still required to do an independent assessment of the potential risks of using herbicides rather than relying on FIFRA registration alone. The Courts have also found that FIFRA does not require the same examination of impacts that the BLM is required to undertake under NEPA. Further, Risk Assessments consider data collected from both published scientific literature and data submitted to EPA to support FIFRA product registration, whereas EPA utilizes the latter data only. The EPA also considers many wildland herbicide uses to be minor. Thus, the project-specific application rates, spectrum of target and non-target organisms, and specialized exposure scenarios evaluated by the BLM are frequently not evaluated by EPA in its generalized registration assessments.

The Risk Assessments and their distillation in the PEIS and Oregon FEIS are the source for much of the individual herbicide information presented in each of the resource sections in this EA, including the high-moderate-low risk categories shown in the tables in this Appendix.

Drift

Assuming non-target animals and plants are not directly sprayed, drift is the process most likely to result in herbicides getting onto non-target plants and animals, as well as herbicides moving outside the treatment area. Drift, defined as that part of a sprayed herbicide that is moved from the target area by wind while it is still airborne, is primarily dependent upon the elevation of the spray nozzle, droplet size, and air movement. The smaller the droplet, the longer it stays suspended and the farther it can travel. Drift is one exposure scenario examined in the Risk Assessments and summarized on the risk tables at the end of this 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 attempt to measure both acute toxicity and chronic toxicity. Chronic toxicity is difficult to measure, especially in humans, but shows the results of sub-lethal doses that could result in cumulative deposits that could cause long-term problems in a vital body function. There is no standard measure for chronic toxicity.

BLM Ecological Risk Assessments

The BLM Ecological Risk Assessments established a Risk Quotient (RQ) for every herbicide and defined risk categories as follows:

0	No Risk	RQ < most conservative LOC for the species
L	Low Risk	RQ = 1 to 10 times the most conservative LOC for the species
M	Moderate Risk	RQ = 10 to 100 times the most conservative LOC for the species (generally equal to LOAEL to 10-times LOAEL)
H	High Risk	RQ > 100 times the most conservative LOC for the species

The RQ is calculated using the Estimated Exposure Concentration (EEC) and the Toxicity Reference Value (TRV). The EEC is the dose that an organism would be exposed to under the test scenario; e.g., *consumption* would indicate the amount of herbicide eaten on a sprayed material (a cow eating only sprayed grass for a day, for example), and *direct spray* indicates that the organism was sprayed directly with a wand or was in a flight path (a non-target plant species, for example). The TRV is the toxicity of the herbicide – usually the LOAEL or NOAEL. The RQ is the EEC divided by the TRV. An uncertainty factor can be brought in if it is thought that a species (or a particular individual within the species) is particularly susceptible to herbicide use, or that the single dose does not represent long-term exposure.

For example, the TRV (the dose that can be consumed with a potentially adverse effect) for a mule deer consuming vegetation contaminated with bromacil[86] 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

[86] An herbicide not included in this analysis.

of RQs exceeding LOCs for each of the 10 BLM herbicide active ingredients was compared to the percent of RQs exceeding LOCs for tank mixes, to determine whether additional risks were predicted for tank mixes.

BLM Human Health Risk Assessments (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

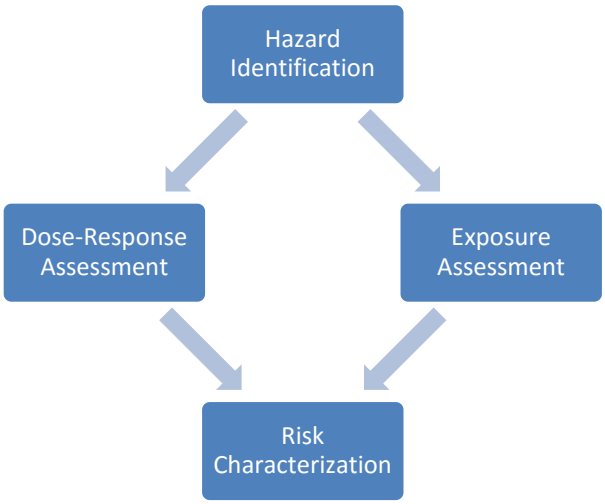
The ARI is a formula for combining LOCs for all exposure avenues (oral, dermal, inhalation), each with different uncertainty factors, and comparing them with the exposure levels that would occur in the scenarios in the Risk Assessments. ARIs less than 1 indicate a concern from at least one of the exposure avenues (USEPA 2001b: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 LOC[87] for the species
M	Moderate Risk	HQ = 10 to 100 times the LOC for the species
H	High Risk	HQ > 100 times the LOC for the species

Figure C-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 C-1 shows the basis for Risk Assessments, which consists of the following parts:

- *Hazard Identification*: what are the dangers inherent with the herbicide? (e.g., endocrine disruption, cancer causing, etc.)
- *Exposure Assessment*: who could come into contact and how much? (specific exposure scenarios)
- *Dose Response Assessment*: how much is too much? At what dose are observable effects observed?

[87] As noted in the previous discussion, LOCs are generally set at 1/10th of the LOAEL. Thus, an HQ of 1 to 10 times LOC is equivalent to an HQ of 0.1 to 1 in the 2005 Forest Service Invasive Plant EIS (USDA 2005:4-73). The Forest Service EIS goes on to explain "The threshold is intended to help reviewers distinguish moderate risks (HQ=2 to 10 [HQ = 20-100 in this EIS]), which could in most cases be mitigated through exposure-reducing project design criteria from significant health risks (HQ>10 [HQ>100 in this EIS]) that could be difficult to mitigate if Worst-Case situations occur at the project level. For specific situations where a HQ>10 [HQ>100 in this EIS] is identified, the specific physiologic effect and the relationship between the NOAEL and the LOAEL may be evaluated to more precisely determine whether a toxic effect is actually likely to occur (Durkin, personal communication)." (USDA 2005:4-73)

- *Risk Characterization*: indicates whether or not there is a plausible basis for concern (HQ or RQ).

Stated another way, the lower range for the L, or low, risk category is theoretically the level at which an effect began to be discernable in testing or modeling (theoretically, because uncertainty factors have the effect of reducing the dose identified as having the adverse effect). The minimum identified effect may have been skin or eye irritation, leaf damage, and so forth. Uncertainty factors are added to address hypersensitive individuals, or accommodate uncertainties in the measurements, such as inferring effects to one species based on actual tests on other species. Uncertainty factors are typically multiples of 10, so the assumed Lowest Observable Effects (LOAEL) dose could have been inflated 10, 100, or even 1,000 times for uncertainties. Thus, exposure of the average individual to the dose identified as having an effect, probably would not have an effect. Nevertheless, the L or low rating indicates risks start at that point. Moderate risk categories indicate risk starts at doses one-tenth those of the low ratings; high is one-hundredth of the testing scenario dose. Testing scenarios are severe – e.g., soaking the test animal – so Standard Operating Procedures and PEIS Mitigation Measures such as buffers, wind speed limits, and so forth, as well as required safety equipment, limit exposure to substantially less than tested doses. For herbicides with moderate and high risk categories for a particular receptor, special cautions are implemented. For example, buffers for Special Status plant species are as large as 1,500 feet for some herbicides (see Conservation Measures in Appendix A). The low, moderate, or high human health risk categories shown on Tables C-3 through C-8 are more conservative than the EPA ratings used to apply the Caution, Warning, or Danger/Poison signal words to herbicide labels.

The Risk Assessments are summarized on tables showing herbicide risk categories at BLM maximum and typical application rates to vegetation, wildlife, and humans, in a variety of application scenarios. Tables C-3 and C-6 show herbicide risks to vegetation, from BLM and Forest Service Risk Assessments respectively. Tables C-4 and C-7 show herbicide risks to wildlife, fish, and aquatic invertebrates and Tables C-5 and C-8 show the risks to human health. Further information about the Human Health Risk Assessments can be found in the *Human Health and Safety* section of Chapter 4 of the Oregon FEIS.

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 C-3. BLM-Evaluated Herbicide Risk Categories[1] for Vegetation

Application Scenario	Chlorsulfuron		Imazapic		Overdrive ©[3]		Sulfometuron		Aminopyralid		Fluroxypyr		Rimsulfuron	
	Typ.[2]	Max[2]	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]	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]	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]	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]	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	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]	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]	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]	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]	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]	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]	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]	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]	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]	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]	0 [9:9]	0 [9:9]	0 [8:9]	0 [8:9]	0 [8:9]	0 [7:9]	0 [8:9]	0 [8:9]
Aquatic plants, pond	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
Aquatic plants, stream	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE

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 2005c,d,g-j, l), 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.

3. Overdrive is a formulation of diflufenzopyr + dicamba.

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

Application Scenario	Chlorsulfuron		Imazapic		Overdrive ©[3]		Sulfometuron		Aminopyralid		Fluroxypyr		Rimsulfuron	
	Typ.[2]	Max[2]	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
Pollinating insect – 100% absorption	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
Fish pond	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	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	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	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
Pollinating insect – 100% absorption	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
Fish pond	0	0	0	0	0	0	0	0	0 [2:2]	0 [4:4]	0 [2:2]	0 [2:4]	0 [2:2]	0 [4:4]
Fish stream	0	0	0	0	0	0	0	0	0 [2:2]	0 [2:2]	0 [2:2]	0 [2:2]	0 [2:2]	0 [2:2]
Aquatic invertebrates pond	0	0	0	0	0	0	0	0	0 [2:2]	0 [4:4]	0 [2:2]	0 [3:4]	0 [2:2]	0 [4:4]
Aquatic invertebrates stream	0	0	0	0	0	0	0	0	0 [2:2]	0 [2:2]	0 [2:2]	0 [2:2]	0 [2:2]	0 [2:2]
Indirect Contact with Foliage After Direct Spray														
Non Special Status Species														
Small mammal – 100% absorption	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pollinating insect – 100% absorption	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
Special Status Species														
Small mammal – 100% absorption	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
Small mammal – 1st order dermal absorption	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		Overdrive ©[3]		Sulfometuron		Aminopyralid		Fluroxypyr		Rimsulfuron	
	Typ.[2]	Max[2]	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
Small mammalian herbivore – chronic	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
Large mammalian herbivore – chronic	0	0	0	0	L	M	0	0	0	0	0	0	0	0
Small avian insectivore – acute	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small avian insectivore – chronic	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
Large avian herbivore – chronic	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
Large mammalian carnivore – chronic	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
Small mammalian herbivore – chronic	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
Large mammalian herbivore – chronic	0	0	0	0	L	M	0	0	0	0	0	0	0	0
Small avian insectivore – acute	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small avian insectivore – chronic	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
Large avian herbivore – chronic	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
Large mammalian carnivore – chronic	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	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	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	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	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														

Application Scenario	Chlorsulfuron		Imazapic		Overdrive ©[3]		Sulfometuron		Aminopyralid		Fluroxypyr		Rimsulfuron	
	Typ.[2]	Max[2]	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max
Fish, pond	0	0	0	0	0	0	0	0	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]
Fish, stream	0	0	0	0	0	0	0	0	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]
Aquatic invertebrates, pond	0	0	0	0	0	0	0	0	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]
Aquatic invertebrates, stream	0	0	0	0	0	0	0	0	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]
Special Status Species														
Fish, pond	0	0	0	0	0	0	0	0	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]
Fish, stream	0	0	0	0	0	0	0	0	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]
Aquatic invertebrates, pond	0	0	0	0	0	0	0	0	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]
Aquatic invertebrates, stream	0	0	0	0	0	0	0	0	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]
Surface Runoff														
Non Special Status Species														
Fish, pond	0	0	0	0	0	0	0	0	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]
Fish, stream	0	0	0	0	0	0	0	0	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]
Aquatic invertebrates, pond	0	0	0	0	0	0	0	0	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]
Aquatic invertebrates, stream	0	0	0	0	0	0	0	0	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]
Special Status Species														
Fish, pond	0	0	0	0	0	0	0	0	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]
Fish, stream	0	0	0	0	0	0	0	0	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]
Aquatic invertebrates, pond	0	0	0	0	0	0	0	0	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]
Aquatic invertebrates, stream	0	0	0	0	0	0	0	0	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]

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 2005b-k, 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.
3. Overdrive is a formulation of diflufenzopyr + dicamba.

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

Receptor	Diflufenzopyr			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
Hiker/hunter (adult)	0[1]	0	0	NC	NC	NE	NC	NC	NE	NC	NC	NE	NC	NC	NE	0	0	0
Berry picker (child)	0	0	0	NC	NC	NE	NC	NC	NE	NC	NC	NE	NC	NC	NE	0	0	0
Berry picker (adult)	0	0	0	NC	NC	NE	NC	NC	NE	NC	NC	NE	NC	NC	NE	0	0	0
Angler (adult)	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	NC	NC	NE	NC	NC	NE	NC	NC	NE	NC	NC	NE	0	0	0
Residential – contaminated water (adult)	0	0	0	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
Native American (adult)	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	NE	NE	NE
Swimmer (adult)	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	NE	0	0	NE	0	0	NE	0	0	NE	0	0	L - M
Human/horseback - applicator	0	0	NE	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	NE	0	0	NE	0	0	NE	0	0	NE	0	0	L - M
Human/horseback - applicator/mixer/loader	0	0	NE	0	0	NE	0	0	NE	0	0	NE	0	0	NE	0	0	L - M
ATV – applicator[4]	0	0	NE	0	0	NE	0	0	NE	0	0	NE	0	0	NE	0	0	L - M
ATV - mixer/loader	0	0	NE	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	NE	0	0	NE	0	0	NE	0	0	NE	0	0	L - M
Truck - applicator[4]	0	0	NE	0	0	NE	0	0	NE	0	0	NE	0	0	NE	0	0	L - M
Truck - mixer/loader	0	0	NE	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	NE	0	0	NE	0	0	NE	0	0	NE	0	0	L - M
Boat - applicator	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
Boat - mixer/loader	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
Boat - applicator/mixer/loader	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE

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 2005l, 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 C-6. Forest Service-Evaluated Herbicide Risk Categories[1] for Vegetation

	2,4-D[2, 4]		**Clopyralid**		**Dicamba**		**Glyphosate**[3, 4]		**Hexazinone**		**Imazapyr**[3]		**Metsulfuron methyl**		**Picloram**[3]		**Triclopyr**[3,4]		**Fluazifop-P-butyl**[6]	
	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]
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
Direct spray, tolerant plants	L	L	0	L	0	0	L	M	M	M	L	L	L	M	L	M	0	L	0	0
Off-site drift, low boom, susceptible plants	L [3:6]	L [3:6]	L [4:6]	M [3:6]	L [3:6]	H [3:6]	M [3:6]	M [4:6]	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]
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]
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]
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]
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
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
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
Accidental spill, susceptible algae	H	H	L	L	H	H	H	H	H	H	L	L	M	H	H	H	H	H	H	H
Accidental spill, tolerant algae	L	M	0	0	0	L	M	M	H	H	0	0	L	M	0	0	M	H	L	L
Acute exposure, susceptible macrophytes	M	M	0	0	NE	NE	L	L	NE	NE	M	H	L	L	NE	NE	0	L	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
Acute exposure, tolerant algae	0	0	0	0	0	0	0	0	L	M	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
Chronic exposure, susceptible algae	0	0	0	0	0	0	0	0	M	M	0	0	0	0	0	0	0	0	L	M
Chronic exposure, tolerant algae	0	0	0	0	0	0	0	0	0	L	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 C-7. Forest Service-Evaluated Herbicide Risk Categories[1] for Wildlife, Fish, and Aquatic Species

	2,4-D[2,4]		**Clopyralid**		**Dicamba**		**Glyphosate**[3,4]		**Hexazinone**		**Imazapyr**[3]		**Metsulfuron methyl**		**Picloram**[3]		**Triclopyr**[3,4]		**Fluazifop-P-butyl**[6]	
	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]
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
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
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
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
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
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
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
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
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
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
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
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
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
Birds																				
Acute/Accidental Exposures																				
Consumption of contaminated grass, large bird	0	0	0	L	L	M	0	L	L	L	0	0	0	0	0	0	L	M	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
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

	2,4-D[2,4]		**Clopyralid**		**Dicamba**		**Glyphosate**[3,4]		**Hexazinone**		**Imazapyr**[3]		**Metsulfuron methyl**		**Picloram**[3]		**Triclopyr**[3,4]		**Fluazifop-P-butyl**[6]	
	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]
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
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
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
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
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
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
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
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
Aquatic invertebrates – accidental spill	0	0	L	M	L	M	M	M	L	L	0	0	0	0	0	0	L	M	L	L
Aquatic invertebrates – acute exposure, peak EEC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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
Aquatic invertebrates – chronic exposure	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insects																				
Acute Exposures																				
Direct spray, bee, 100% absorption	NE	NE	0	L	NE	NE	NE	NE	L	L	NE	NE	0	0	NE	NE	NE	NE	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
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
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
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

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 C-8. Forest Service-Evaluated Herbicide Risk Categories[1] for Human Health

	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]	
	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]
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
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
Aquatic applications	L	L	NE	NE	NE	NE	NE	NE	0	0	0	NE	0	0	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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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

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 D - Invasive Plant Infestations

Table D-1. Invasive Plants Mapped in NISIMS by Infestation Size. NISIMS (described in the *Inventory* section in Chapter 2) includes 18,100 gross acres of documented invasive plant sites on the Coos Bay District. These are summarized on Table 2-2, and are displayed in Map 2-1 (maps are located at the end of this EA).

Table D-2. *Further Information about Invasive Plant Species*. Includes low priority species (Category IV) as well as family, type (woody, grass, or herbaceous), and life cycle information for species on (or potentially on) the District.

Table D-3. *Estimated Total Treatment Acres, 20-Year Analysis Period, Including Tank Mixes and Application Rates*

Table D-4. *Estimated Total Treatment Acres, 20-Year Analysis Period (Not Including Tank Mixes or Application Rates)*

Invasive Plant Treatments Example

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 meeting, and if not, facilitating management changes that will best ensure that outcomes are met or re-evaluated.

The *Planning* sub-section of the *Integrated Invasive Plant Management* section in Chapter 2 describes that the district manages invasive plants to minimize adverse effects to ecological function and that 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. Because of this, the *Annual Treatment Plan* (Table 2-9) shows that Canada thistle would be treated in the Hunter Creek ACEC as habitat enhancement for the Mardon skipper, a rare butterfly. Canada thistle is in the sunflower family in the *Treatment Key* (Table 2-10), which shows potential treatment options for this infestation. As described in *Invasive Plant* Issue 1, mowing Canada thistle is effective when it is repeated every 3 to 4 weeks over several growing seasons (DiTomaso et al. 2013), but this frequency of mowing is not practical (estimated at 3 to 6 times a year) and woody debris precludes the use of mowing in many areas. Canada thistle can be effectively controlled with dicamba or picloram, but these herbicides are not registered for use in the wetland and riparian areas, like Hunter Creek. Under the Proposed Action, aminopyralid and clopyralid would both be effective treatment methods for Canada thistle. In the first year, clopyralid could be used on Canada thistle, applied at the rosette stage. The *Effectiveness Monitoring* section (Chapter 2) describes that 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 takes two weeks after contact to kill target weeds but can take several weeks for complete control. Staff conducting the monitoring would look at factors such as the size and density of the Canada thistle infestation; the amount of colonization by nearby invasive annual grasses; the amount of damage or mortality in neighboring native species in the figwort family as well as their growth, vigor, and population density; and the need for follow-up treatments. If the native figwort family species were unharmed by this treatment and were able to colonize the site (instead of the invasive annual grasses) 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. Hence, aminopyralid would be used during the second year, as it has longer soil residual than clopyralid. If the original treatment eliminates the Canada thistle but the site is reinfested with invasive annual grasses, the annual grass treatment group in the *Treatment Key* (Table 2-10) indicates that imazapic would be an appropriate treatment method during the second year.

Table D-1. Invasive Plants Mapped in NISIMS by Infestation Size

Common Name	Scientific Name	NISIMS Code	< 0.1 Acres		0.1 to < 0.5		0.5 to <1		1 to < 5		5 to <20		20 to < 100		> 100	
			Acres	Sites	Acres	Sites	Acres	Sites	Acres	Sites	Acres	Sites	Acres	Sites	Acres	Sites
Silver wattle	*Acacia dealbata*	ACDE3	0.12	2												
Biddy-biddy	*Acaena novae-zealandiae*	ACNO4	0.56	9	1.95	5			4.19	1	11.62	1	34.62	1		
European beachgrass	*Ammophila arenaria*	AMAR4	0.12	2	1.28	4	2.74	4	1.24	1			53.32	2		
False brome	*Brachypodium sylvaticum*	BRSY	0.50	5	2.02	6			15.56	6	38.93	3	218.17	6		
Butterfly bush	*Buddleja davidii*	BUDA2					1.53	2	1.45	1			34.62	1		
Meadow knapweed	*Centaurea x moncktonii*	CEDET	1.74	55	9.35	31	22.47	29	59.24	32	62.42	8				
Meadow knapweed	*Centaurea x moncktonii*	CEMO6	9.15	92	8.88	22	1.67	3					34.62	1		
Canada thistle	*Cirsium arvense*	CIAR4	40.60	439	18.16	68	10.01	14	75.83	33	43.00	5				
Bull thistle	*Cirsium vulgare*	CIVU	187.41	1,982	128.14	411	150.80	206	428.81	219	102.19	14				
Old man's beard	*Clematis vitalba*	CLVI6	1.20	13					2.35	1	6.08	1				
Field bindweed	*Convolvulus arvensis*	COAR4	0.20	2												
Jubata grass	*Cortaderia jubata*	COJU2	0.41	8	0.18	1										
One seed hawthorn	*Crataegus monogyna*	CRMO3					1.57	2								
Scotch broom	*Cytisus scoparius*	CYSC4	278.45	3,562	1,102.14	3,681	1,272.67	1,765	3,756.12	1,983	943.91	114	788.57	22	2,286.29	2
Teasel/Fuller's teasel	*Dipsacus fullonum*	DIPSA	1.54	16	5.08	14			11.53	6	12.73	2				
Fennel	*Foeniculum vulgare*	FOVU	0.10	1												
French broom	*Genista monspessulana*	GEMO2	29.46	360	47.82	148	10.14	15	247.77	126	153.30	14	201.95	5	105.19	1
Herb Robert	*Geranium robertianaum*	GERO	11.96	124	16.36	54	6.18	8	33.59	20	25.55	2	25.98	1		
English/Atlantic ivy	*Hedera helix*	HEHE	1.69	21	0.43	1			10.40	5	12.11	1				
St. Johnswort	*Hypericum perforatum*	HYPE	0.93	12	3.77	11	4.23	6	2.43	2						
English holly	*Ilex aquifolium*	ILAQ80					0.76	1								
Yellow flag iris	*Iris psuedacorus*	IRPS	0.00	1												
Perennial peavine	*Lathyrus latifolia*	LALA4	3.14	33	0.73	3	1.96	3	2.94	2						
Oxeye daisy	*Leucanthemum vulgare*	LEVU			0.96	2			2.39	2						
Birdsfoot trefoil	*Lotus corniculatus/ L. angustissimus/ L. pedunculatus*	LOCO6	0.10	1	0.46	1	0.84	1	1.17	1						
Purple loosestrife	*Lythrum salicaria*	LYSA2	0.11	7	4.45	17			12.40	5						
White/yellow sweetclover	*Melilotus albus /M. officianalis*	MEAL2	5.45	56	3.52	8	1.45	2	2.81	2	7.27	1				
Reed canarygrass	*Phalaris arundinacea*	PHAR3			0.36	1										
Japanese knotweed	*Polygonum cuspidatum*	POCU6	1.91	81	0.70	3	2.89	4			5.55	1				
Giant knotweed	*Polygonum sachalinensis*	POSA4	0.77	8	0.33	2										
Himalayan blackberry	*Rubus armeniacus*	RUAR9	159.60	1,716	379.24	1,158	401.13	557	1,409.20	697	782.40	94	714.08	17	2,550.15	3
Evergreen/cutleaf blackberry	*Rubus laciniatus*	RULA	25.70	259	11.11	39	4.92	7	21.79	13						
Tansy ragwort	*Senecio jacobaea*	SEJA	3.84	47	11.41	37	8.08	11	21.87	13						
Gorse	*Ulex europaeus*	ULEU	7.53	113	10.20	33	7.83	10	11.13	4						
Bigleaf/common periwinkle	*Vinca major/V. minor*	VIMI2	0.10	1												
Calla lily	*Zantedeschia aethiopica*	ZAAE	0.00	1												

Table D-2. Further Information about Invasive Plant Species on the District

Category			Common Name	Scientific Name	Treatment Acres	Family	Life Cycle	Type	Treatment Group
I	III	IV							
		x	Alfalfa	*Medicago sativa*	10	Fabaceae	Annual, perennial	Herbaceous	Pea Family
		x	Alsike clover	*Trifolium hybridum*	1	Fabaceae	Annual, perennial	Herbaceous	Pea Family
x			American/European-sea rocket	*Cakile edentula/maritima*	232	Brassicaceae	Annual, biennial, perennial	Herbaceous	Mustard Family
		x	Annual bluegrass	*Poa annua*	1	Poaceae	Annual	Grass	Annual Grasses
		x	Annual honesty	*Lunaria annua*	1	Brassicaceae	Annual	Herbaceous	Mustard Family
		x	Annual rabbitsfoot grass	*Polypogon monspeliensis*	1	Poaceae	Annual	Grass	Annual Grasses
x			Annual ryegrass	*Lolium multiflorum*	10	Poaceae	Annual	Grass	Annual Grasses
	x		Annual yellow sweetclover	*Melilotus indicus*	0	Fabaceae	Annual	Herbaceous	Pea Family
		x	Bachelor buttons	*Centaurea cyanus*	5	Asteraceae	Annual	Herbaceous	Sunflower Family
		x	Barestem teesdalia	*Teesdalia nudicaulis*	1	Brassicaceae	Annual	Herbaceous	Mustard Family
		x	Barnyard grass	*Echinochloa crus-galli*	1	Poaceae	Annual	Grass	Annual Grasses
		x	Bermuda grass	*Cynodon dactylon*	10	Poaceae	Perennial	Grass	Perennial Grasses
x			Biddy-biddy	*Acaena novae-zealandiae*	20	Roseaceae	Perennial	Herbaceous	Misc. Herbaceous
x			Big quakinggrass	*Briza maxima*	30	Poaceae	Annual	Grass	Annual Grasses
x			Bigleaf/common periwinkle	*Vinca major/V. minor*	5	Apocynaceae	Perennial	Herbaceous	Misc. Herbaceous
	x		Bindweed	*Solanum dulcamara*	0	Solanaceae	Perennial	Herbaceous	Misc. Herbaceous
x			Birdsfoot trefoil	*Lotus corniculatus /L. angustissimus/L. pedunculatus*	20	Fabaceae	Perennial	Herbaceous	Pea Family
		x	Bitter dock	*Rumex obtusifolius*	10	Polygonaceae	Perennial	Herbaceous	Knotweed Family
	x		Black locust	*Robinia pseudoacacia*	0	Fabaceae	Perennial	Woody	Woody Species
		x	Black medick	*Medicago lupulina*	10	Fabaceae	Annual, perennial	Herbaceous	Pea Family
		x	Black mustard	*Brassica nigra*	1	Brassicaceae	Annual	Herbaceous	Mustard Family
x			Blessed milkthistle	*Silybum marianum*	1	Asteraceae	Biennial	Herbaceous	Sunflower Family
		x	Blue field madder	*Sherardia arvensis*	1	Rubiaceae	Annual	Herbaceous	Misc. Annual Herbaceous
		x	Blue flax	*Linum bienne*	1	Linaceae	Perennial	Herbaceous	Misc. Herbaceous
		x	Bouncingbet	*Saponaria officinalis*	5	Caryophylllaceae	Perennial	Herbaceous	Carnation Family
		x	Brassbuttons	*Cotula australis*	1	Asteraceae	Annual	Herbaceous	Sunflower Family
		x	Bristleleaf bulrush	*Isolepis setacea*	1	Cyperaceae	Perennial	Grass	Lilies, Iris, Sedges, Rushes
		x	Bristly dogtail grass	*Cynosurus echinatus*	10	Poaceae	Annual	Grass	Annual Grasses
x			Brome fescue	*Vulpia bromoides*	15	Poaceae	Annual	Grass	Annual Grasses
		x	Broomcorn millet	*Panicum miliaceum*	5	Poaceae	Annual	Grass	Annual Grasses
		x	Brown fruited rush	*Juncus pelocarpus*	1	Juncaceae	Perennial	Grass	Lilies, Iris, Sedges, Rushes
		x	Buckhorn plantain	*Plantago coronopus*	10	Plantaginaceae	Perennial	Herbaceous	Misc. Herbaceous
	x		Buffalobur nightshade	*Solanum rostratum*	0	Solanaceae	Annual	Herbaceous	Misc. Annual Herbaceous
x			Bull thistle	*Cirsium vulgare*	500	Asteraceae	Biennial	Herbaceous	Sunflower Family

Category			Common Name	Scientific Name	Treatment Acres	Family	Life Cycle	Type	Treatment Group
I	III	IV							
x			Burdock	*Arctium minus*	10	Asteraceae	Biennial	Herbaceous	Sunflower Family
x			Butterfly bush	*Buddleja davidii*	5	Scrophulariaceae	Perennial	Woody	Woody Species
x			Calla lily	*Zantedeschia aethiopica*	1	Araceae	Perennial	Herbaceous	Lilies, Iris, Sedges, Rushes
		x	Canada bluegrass	*Poa compressa*	1	Poaceae	Perennial	Grass	Perennial Grasses
		x	Canada rush	*Juncus canadensis*	1	Juncaceae	Perennial	Grass	Lilies, Iris, Sedges, Rushes
x			Canada thistle	*Cirsium arvense*	800	Asteraceae	Perennial	Herbaceous	Sunflower Family
x			Cape ivy	*Delairea odorata*	1	Asteraceae	Perennial	Herbaceous, woody	Woody Species
x			Catchfly	*Silene gallica*	5	Caryophyllaceae	Annual, biennial	Herbaceous	Carnation Family
		x	Changing forget-me-not	*Myosotis discolor (M. bicolor)*	1	Boraginaceae	Annual, perennial	Herbaceous	Borage Family
		x	Cheatgrass	*Bromus tectorum*	1	Poaceae	Annual	Grass	Annual Grasses
		x	Cheeseweed	*Malva neglecta*	5	Malvaceae	Biennial	Herbaceous	Misc. Herbaceous
		x	Chicory	*Cichorium intybus*	5	Asteraceae	Biennial, perennial	Herbaceous	Sunflower Family
		x	Clasping pepperweed	*Lepidium perfoliatum*	1	Brassicaceae	Annual, biennial	Herbaceous	Mustard Family
		x	Clustered dock	*Rumex conglomeratus*	10	Polygonaceae	Perennial	Herbaceous	Knotweed Family
x			Coastal burnweed	*Erechtites (*Syn. *Senecio) minimus*	20	Asteraceae	Annual, perennial	Herbaceous	Sunflower Family
		x	Colonial bent grass	*Agrostis capillaris*	5	Poaceae	Annual	Grass	Annual Grasses
		x	Comfrey	*Symphytum x uplandicum*	1	Boraginaceae	Perennial	Herbaceous	Borage Family
		x	Common chickweed	*Stellaria media*	5	Caryophyllaceae	Annual	Herbaceous	Carnation Family
		x	Common milkwort	*Polygala vulgaris*	0	Polygalaceae	Perennial	Herbaceous	none
		x	Common mullein	*Verbascum thapsus*	5	Scrophulariaceae	Biennial	Herbaceous	Snapdragon Family
		x	Common mustard	*Brassica rapa*	1	Brassicaceae	Annual, biennial	Herbaceous	Mustard Family
		x	Common plantain	*Plantago major*	5	Plantaginaceae	Perennial	Herbaceous	Misc. Herbaceous
x			Common ragweed	*Ambrosia artemisiifolia*	1	Asteraceae	Annual	Herbaceous	Sunflower Family
	x		Common reed	*Phragmites australis*	0	Poaceae	Perennial	Grass	Perennial Grasses
x			Common sow thistle	*Sonchus oleraceus*	40	Asteraceae	Annual	Herbaceous	Sunflower Family
		x	Comon brassbuttons	*Cotula coronipifolia*	1	Asteraceae	Perennial	Herbaceous	Sunflower Family
		x	Corn speedwell	*Veronica arvensis*	10	Plantaginaceae	Annual	Herbaceous	Misc. Annual Herbaceous
x			Corn spurry/sandspurry	*Spergula arvensis/Spergularia maritima/S. rubra*	1	Caryophyllaceae	Annual	Herbaceous	Carnation Family
x			Cotoneaster	*Cotoneaster franchetii/C. lacteus*	20	Roseaceae	Perennial	Woody	Woody Species
		x	Cranesbill	*Geranium molle*	10	Geraniaceae	Annual, biennial, perennial	Herbaceous	Geranium Family
		x	Creeping bent grass	*Agrostis stolonifera*	5	Poaceae	Perennial	Grass	Perennial Grasses
x			Creeping buttercup	*Ranunculus repens*	50	Ranunculaceae	Perennial	Herbaceous	Misc. Herbaceous
		x	Creeping sedge	*Carex chordorrhiza*	2	Cyperaceae	Perennial	Grass	Lilies, Iris, Sedges, Rushes
		x	Creeping wood sorrel	*Oxalis corniculata*	10	Oxalidaceae	Annual, perennial	Herbaceous	Misc. Herbaceous

Category			Common Name	Scientific Name	Treatment Acres	Family	Life Cycle	Type	Treatment Group
I	III	IV							
x			Creeping yellow cress	*Rorippa sylvestris*	1	Brassicaceae	Perennial	Herbaceous	Mustard Family
		x	Crested dogtail grass	*Cynosurus cristatus*	1	Poaceae	Annual	Grass	Annual Grasses
		x	Curly dock	*Rumex crispus*	10	Polygonaceae	Perennial	Herbaceous	Knotweed Family
	x		Cut leaf teasel	*Dipsacus laciniatus*	0	Dipsacaceae	Biennial	Herbaceous	Teasels
		x	Cutleaf burnweed	*Erechtities glomeratus*	10	Asteraceae	Annual, perennial	Herbaceous	Sunflower Family
		x	Cutleaf geranium	*Geranium dissectum*	10	Geraniaceae	Annual, biennial	Herbaceous	Geranium Family
		x	Daggerleaf cottonrose	*Logfia gallica*	1	Asteraceae	Annual	Herbaceous	Sunflower Family
		x	Dallisgrass	*Paspalum dilatatum*	1	Poaceae	Perennial	Grass	Perennial Grasses
	x		Dalmatian toadflax	*Linaria dalmatica*	0	Scrophulariaceae	Perennial	Herbaceous	Snapdragon Family
x			Dandelion	*Taraxacum officinale*	5	Asteraceae	Perennial	Herbaceous	Sunflower Family
x			Darwin's barberry	*Berberis darwinii*	5	Berberidaceae	Perennial	Woody	Woody Species
		x	Deptford pink	*Dianthus armeria*	1	Caryophyllaceae	Annual, biennial	Herbaceous	Carnation Family
		x	Dog rose	*Rosa canina*	1	Roseaceae	Perennial	Woody	Woody Species
		x	Dogfennel	*Anthemis cotula*	1	Asteraceae	Annual	Herbaceous	Sunflower Family
	x		Earth loosestrife	*Lysimachia terrestris*	0	Primulaceae	Perennial	Herbaceous	Loosestrifes
		x	English daisy	*Bellis perennis*	2	Asteraceae	Perennial	Herbaceous	Sunflower Family
x			English holly	*Ilex aquifolium*	10	Aquifoliaceae	Perennial	Woody	Woody Species
x			English/Atlantic ivy	*Hedera helix*	100	Araliaceae	Perennial	Woody	Woody Species
x			European beachgrass	*Ammophila arenaria*	240	Poaceae	Perennial	Grass	Perennial Grasses
		x	European centaury	*Centarium erythraea*	1	Gentianaceae	Annual, biennial	Herbaceous	Misc. Annual Herbaceous
		x	European crabapple	*Malus sylvestris*	0	Roseaceae	Perennial	Woody	Woody Species
x			Evergreen/cutleaf blackberry	*Rubus laciniatus*	100	Roseaceae	Perennial	Woody	Woody Species
		x	Fall panicgrass	*Panicum dichotomiflorum*	1	Poaceae	Annual	Grass	Annual Grasses
x			False brome	*Brachypodium sylvaticum*	200	Poaceae	Perennial	Grass	Perennial Grasses
x			False dandelion	*Hypochaeris radicata/H. glabra*	25	Asteraceae	Perennial	Herbaceous	Sunflower Family
x			Fennel	*Foeniculum vulgare*	10	Apiaceae	Perennial	Herbaceous	Perennial Parsley Family
x			Field bindweed	*Convolvulus arvensis*	10	Convolvulaceae	Perennial	Herbaceous, woody	Misc. Herbaceous
		x	Field burrweed	*Soliva sessilis*	1	Asteraceae	Annual	Herbaceous	Sunflower Family
		x	Field chickweed	*Cerastium arvense*	1	Caryophyllaceae	Perennial	Herbaceous	Carnation Family
		x	Field pennycress	*Thlaspi arvense*	1	Brassicaceae	Annual	Herbaceous	Mustard Family
		x	Fourleaf manyseed	*Polycarpon tetraphyllum*	1	Caryophyllaceae	Annual, biennial, perennial	Herbaceous	Carnation Family
x			French broom	*Genista monspessulana*	500	Fabaceae	Perennial	Woody	Woody Species
		x	Garden vetch	*Vicia sativa*	10	Fabaceae	Annual	Herbaceous	Pea Family
	x		Garden yellow loosestrife	*Lysimachia vulgaris*	0	Primulaceae	Perennial	Herbaceous	Loosestrifes
	x		Garlic mustard	*Alliaria petiolata*	0	Brassicaceae	Annual, biennial	Herbaceous	Mustard Family

Category			Common Name	Scientific Name	Treatment Acres	Family	Life Cycle	Type	Treatment Group
I	III	IV							
		x	German knotgrass	*Scleranthus annuus*	5	Caryophyllaceae	Annual	Herbaceous	Carnation Family
	x		Giant hogweed	*Heracleum mantegazzianum*	0	Apiaceae	Annual	Herbaceous	Misc. Annual Herbaceous
x			Giant knotweed	*Polygonum sachalinensis*	100	Polygonaceae	Perennial	Herbaceous	Knotweed Family
x			Gorse	*Ulex europaeus*	40	Fabaceae	Perennial	Woody	Woody Species
		x	Green bristlegrass	*Setaria viridis*	1	Poaceae	Perennial	Grass	Perennial Grasses
		x	Green stem filaree	*Erodium moschatum*	5	Geraniaceae	Annual, biennial	Herbaceous	Geranium Family
	x		Ground ivy	*Glechoma hederacea*	0	Lamiaceae	Perennial	Herbaceous	Perennial Mints
		x	Hairy crabgrass	*Digitaria sanguinalis*	10	Poaceae	Annual, biennial	Grass	Annual Grasses
		x	Hairy vetch	*Vicia hirsuta*	1	Fabaceae	Annual	Herbaceous	Pea Family
		x	Hardy fuschia	*Fuschia magellanica*	1	Onagraceae	Perennial	Woody	Woody Species
x			Hawkbit	*Leontodon saxatalis*	1	Asteraceae	Annual, biennial, perennial	Herbaceous	Sunflower Family
		x	Hedgemustard	*Sisymbrium officinale*	1	Brassicaceae	Annual	Herbaceous	Mustard Family
x			Herb Robert	*Geranium robertianaum*	25	Geraniaceae	Annual, biennial	Herbaceous	Geranium Family
x			Himalayan blackberry	*Rubus armeniacus*	5,000	Roseaceae	Perennial	Woody	Woody Species
	x		Himalayan knotweed	*Polygonum polystachyum*	0	Polygonaceae	Perennial	Herbaceous	Knotweed Family
		x	Hop clover	*Trifolium campestre*	10	Fabaceae	Annual, biennial	Herbaceous	Pea Family
		x	Horehound	*Marrubium vulgare*	5	Lamiaceae	Perennial	Herbaceous	Perennial Mints
x			Hyssop loosestrife	*Lythrum hyssopifolia*	5	Lythraceae	Perennial	Herbaceous	Loosestrifes
x			Iceplant	*Carpobrotus chilensis*	1	Aizoaceae	Perennial	Herbaceous	Misc. Herbaceous
x			Italian/slenderflower thistle	*Carduus pycnocephalus/C. tenuiflorus*	20	Asteraceae	Biennial	Herbaceous	Sunflower Family
	x		Japanese (Field)brome	*Bromis japonicus (B. arvensis)*	1	Poaceae	Annual	Grass	Annual Grasses
x			Japanese knotweed	*Polygonum cuspidatum*	100	Polygonaceae	Perennial	Herbaceous	Knotweed Family
	x		Jimsonweed	*Datura stramonium*	0	Solanaceae	Annual	Herbaceous	Misc. Annual Herbaceous
x			Jubata grass	*Cortaderia jubata*	10	Poaceae	Perennial	Grass	Perennial Grasses
		x	Kentucky bluegrass	*Poa pratensis L. ssp. pratensis*	1	Poaceae	Perennial	Grass	Perennial Grasses
x			Lance-leaved plantain	*Plantago lanceolata*	10	Plantaginaceae	Perennial	Herbaceous	Misc. Herbaceous
		x	Least lettuce	*Lactuca saligna*	5	Asteraceae	Annual, biennial	Herbaceous	Sunflower Family
		x	Lemon balm	*Melissa officinalis*	1	Lamiaceae	Perennial	Herbaceous	Perennial Mints
	x		Lesser swinecress	*Coronopus (*Syn. *Lepidium) didymus*	0	Brassicaceae	Annual, biennial	Herbaceous	Mustard Family
		x	Little quaking grass	*Briza minor*	10	Poaceae	Annual	Grass	Annual Grasses
		x	Longstalk geranium	*Geranium columbianum*	1	Geraniaceae	Annual	Herbaceous	Geranium Family
		x	Maiden pink	*Dianthus deltoides*	1	Caryophyllaceae	Perennial	Herbaceous	Carnation Family
	x		Maltese starthistle	*Centaurea melitensis*	0	Asteraceae	Annual, biennial	Herbaceous	Sunflower Family
x			Marestail/horseweed	*Conyza bonariensis*	50	Asteraceae	Annual	Herbaceous	Sunflower Family

Category			Common Name	Scientific Name	Treatment Acres	Family	Life Cycle	Type	Treatment Group
I	III	IV							
	x		Matgrass	*Nardus stricta*	0	Poaceae	Perennial	Grass	Perennial Grasses
		x	Meadow foxtail	*Alopecurus pratensis*	5	Poaceae	Perennial	Grass	Perennial Grasses
x			Meadow knapweed	*Centaurea x moncktonii*	500	Asteraceae	Perennial	Herbaceous	Sunflower Family
		x	Mediterranean medick	*Medicago praecox*	1	Fabaceae	Perennial	Herbaceous	Pea Family
	x		Mediterranean rabbitsfoot grass	*Polypogon maritimus*	0	Poaceae	Annual	Grass	Annual Grasses
		x	Mexican-tea	*Dysphania ambrosioides*	1	Amaranthaceae	Annual	Herbaceous	Misc. Annual Herbaceous
x			Montbretia	*Crocosmia X crocosmiflora*	5	Iridaceae	Perennial	Grass	Lilies, Iris, Sedges, Rushes
	x		Morning-glory	*Ipomoea purpurea*	0	Convolvulaceae	Annual	Herbaceous, woody	Misc. Herbaceous
		x	Moth mullein	*Verbascum blattaria*	1	Scrophulariaceae	Biennial	Herbaceous	Snapdragon Family
		x	Mouseear cress	*Arabidopsis thaliana*	1	Brassicaceae	Annual	Herbaceous	Mustard Family
x			Musk thistle	*Carduus nutans*	0	Asteraceae	Biennial	Herbaceous	Sunflower Family
		x	Narrow-leaf clover	*Trifolium angustifolium*	10	Fabaceae	Annual	Herbaceous	Pea Family
		x	Narrowpanicle rush	*Juncus brevicaudatus*	1	Juncaceae	Perennial	Grass	Lilies, Iris, Sedges, Rushes
	x		New Zealand geranium	*Geranium core-core*	0	Geraniaceae	Perennial	Herbaceous	Geranium Family
		x	Nipplewort	*Lapsana communis*	5	Asteraceae	Annual	Herbaceous	Sunflower Family
		x	Nit grass	*Gastridium (Syn. Pheoides) ventricosum*	1	Poaceae	Annual	Grass	Annual Grasses
		x	Northern St. Johnswort	*Hypericum mutilum*	1	Hypericaceae	Perennial	Herbaceous	Misc. Herbaceous
x			Old man's beard	*Clematis vitalba*	10	Ranunculaceae	Perennial	Woody	Woody Species
x			Old-man-in -the-spring	*Senecio vulgaris*	50	Asteraceae	Annual, biennial	Herbaceous	Sunflower Family
x			One seed hawthorn	*Crataegus monogyna*	1	Roseaceae	Perennial	Woody	Woody Species
		x	Orchard grass	*Dactylis glomerata*	10	Poaceae	Perennial	Grass	Perennial Grasses
x			Oxeye daisy	*Leucanthemum vulgare*	50	Asteraceae	Perennial	Herbaceous	Sunflower Family
x			Pampas grass	*Cortaderia selloana*	10	Poaceae	Perennial	Grass	Perennial Grasses
		x	Pasture rush	*Juncus effusus spp. effusus*	10	Juncaceae	Perennial	Grass	Lilies, Iris, Sedges, Rushes
x			Pennyroyal	*Mentha pulegium*	20	Lamiaceae	Perennial	Herbaceous	Perennial Mints
x			Perennial peavine	*Lathyrus latifolia*	100	Fabaceae	Perennial	Herbaceous	Pea Family
x			Perennial ryegrass	*Lolium perenne*	10	Poaceae	Perennial	Grass	Perennial Grasses
		x	Petty spurge	*Euphorbia peplus*	10	Euphorbiaceae	Annual	Herbaceous	Misc. Annual Herbaceous
	x		Pine echium	*Echium pininana*	0	Boraginaceae	Biennial	Herbaceous	Borage Family
		x	Pineapple weed	*Matricaria discoidea*	5	Asteraceae	Annual	Herbaceous	Sunflower Family
x			Poison hemlock	*Conium maculatum*	10	Apiaceae	Perennial	Herbaceous	Perennial Parsley Family
	x		Policemen’s helmet	*Impatiens glandulifera*	0	Balasaminaceae	Annual	Herbaceous	Misc. Herbaceous
	x		Portuguese broom	*Cytisus striatus*	0	Fabaceae	Perennial	Woody	Woody Species
		x	Poverty brome	*Bromus sterilis*	1	Poaceae	Annual	Grass	Annual Grasses
		x	Prickly lettuce	*Lactuca serriola*	10	Asteraceae	Annual, biennial	Herbaceous	Sunflower Family

Category			Common Name	Scientific Name	Treatment Acres	Family	Life Cycle	Type	Treatment Group
I	III	IV							
		x	Procumbent pearlwort	*Sagina procumbens*	1	Caryophyllaceae	Perennial	Herbaceous	Carnation Family
		x	Proliferous pink	*Petrorhagia nanteuilii*	1	Caryophyllaceae	Annual	Herbaceous	Carnation Family
		x	Prostrate knotweed	*Polygonum aviculare*	5	Polygonaceae	Perennial	Herbaceous	Knotweed Family
	x		Puncturevine	*Tribulus terrestris*	0	Zygophyllaceae	Annual	Herbaceous	Misc. Annual Herbaceous
x			Purple deadnettle	*Lamium purpureum*	20	Lamiaceae	Annual	Herbaceous	Misc. Annual Herbaceous
		x	Purple foxglove	*Digitalis purpurea*	20	Scrophulariaceae	Biennial	Herbaceous	Snapdragon Family
x			Purple loosestrife	*Lythrum salicaria*	25	Lythraceae	Perennial	Herbaceous	Loosestrifes
		x	Quackgrass	*Elymus repens*	1	Poaceae	Perennial	Grass	Perennial Grasses
		x	Queen Anne's lace	*Daucus carota*	5	Apiaceae	Perennial	Herbaceous	Perennial Parsley Family
		x	Rabbitfoot clover	*Trifolium arvense*	10	Fabaceae	Annual	Herbaceous	Pea Family
x			Rat-tail fescue	*Vulpia myuros*	10	Poaceae	Annual	Grass	Annual Grasses
		x	Red clover	*Trifolium pratense*	10	Fabaceae	Biennial, perennial	Herbaceous	Pea Family
		x	Red escallonia	*Escallonia rubra*	10	Escalloniaceae	Perennial	Woody	Woody Species
		x	Red sepaled evening-primrose	*Oenothera glazioviana*	5	Onagraceae	Biennial	Herbaceous	Misc. Herbaceous
	x		Red valerian	*Centranthus ruber*	0	Valarianaceae	Perennial	Herbaceous	Misc. Herbaceous
		x	Redstem storks bill	*Erodium cicutarium*	5	Geraniaceae	Biennial	Herbaceous	Geranium Family
x			Reed canarygrass	*Phalaris arundinacea*	1,200	Poaceae	Perennial	Grass	Perennial Grasses
		x	Rescue grass	*Bromus catharticus*	0	Poaceae	Annual, perennial	Grass	Perennial Grasses
	x		Ribbongrass	*Phalaris arundinacea var picta*	0	Poaceae	Perennial	Grass	Perennial Grasses
x			Ripgut brome	*Bromus diandrus*	30	Poaceae	Annual	Grass	Annual Grasses
x			Rose campion	*Lychnis coronaria*	50	Caryophyllaceae	Perennial	Herbaceous	Carnation Family
		x	Rose clover	*Trifolium hirtum*	5	Fabaceae	Annual	Herbaceous	Pea Family
x			Saltmeadow rush	*Juncus gerardi* ssp. *gerardi*	1	Juncaceae	Perennial	Grass	Perennial Grasses
		x	Scarlet pimpernel	*Anagallis arvensis*	0	Primulaceae	Annual, biennial	Herbaceous	none
x			Scotch broom	*Cytisus scoparius*	2,000	Fabaceae	Perennial	Woody	Woody Species
	x		Scotch thistle	*Onopordum acanthium*	0	Asteraceae	Biennial	Herbaceous	Sunflower Family
		x	Self heal	*Prunella vulgaris var vulgaris*	0	Lamiaceae	Perennial	Herbaceous	Perennial Mints
		x	Sharpleaf cancerwort	*Kickxia elatine*	1	Scrophulariaceae	Annual	Herbaceous	Snapdragon Family
x			Sheep sorrel	*Rumex acetosella*	40	Polygonaceae	Perennial	Herbaceous	Knotweed Family
		x	Shepherd’s cress	*Teesdalia coronopifolia*	1	Brassicaceae	Annual	Herbaceous	Mustard Family
		x	Shepherd’s-purse	*Capsella bursa-pastoris*	1	Brassicaceae	Annual	Herbaceous	Mustard Family
		x	Shepherd’s needle	*Scandix pecten-veneris*	1	Apiaceae	Annual	Herbaceous	Misc. Annual Herbaceous
	x		Shiny leaf geranium	*Geranium lucidum*	0	Geraniaceae	Annual, biennial	Herbaceous	Geranium Family
		x	Sickelgrass	*Parapholis incurva*	1	Poaceae	Annual	Grass	Annual Grasses
x			Silver wattle	*Acacia dealbata*	1	Fabaceae	Perennial	Woody	Woody Species
		x	Silver/little hairgrass	*Aira caryophylla/praecox*	10	Poaceae	Annual	Grass	Annual Grasses

Category			Common Name	Scientific Name	Treatment Acres	Family	Life Cycle	Type	Treatment Group
I	III	IV							
		x	Slender oat	*Avena barbata*	1	Poaceae	Annual	Grass	Annual Grasses
		x	Small burnet	*Sanguisorba (Poterium) minor*	0	Roseaceae	Perennial	Herbaceous	Misc. Herbaceous
	x		Small flower buttercup	*Ranunculus parviflorus*	5	Ranunculaceae	Annual	Herbaceous	Misc. Herbaceous
		x	Smooth brome	*Bromus inermis spp inermis*	1	Poaceae	Perennial	Grass	Perennial Grasses
		x	Smooth hawksbeard	*Crepis capillaris*	1	Asteraceae	Annual, biennial	Herbaceous	Sunflower Family
		x	Soft chess	*Bromus hordeaceus*	10	Poaceae	Annual	Grass	Annual Grasses
	x		Spanish broom	*Spartium junceum*	0	Fabaceae	Perennial	Woody	Woody Species
	x		Spanish heath	*Erica lusitanica*	0	Ericaceae	Perennial	Woody	Woody Species
x			Spiny sow thistle	*Sonchus asper*	20	Asteraceae	Annual	Herbaceous	Sunflower Family
x			Spotted knapweed	*Centaurea stoebe*	10	Asteraceae	Biennial, perennial	Herbaceous, woody	Sunflower Family
		x	Spotted ladysthumb	*Polygonum persicaria*	1	Polygonaceae	Perennial	Herbaceous	Knotweed Family
x			Spotted medick	*Medicago arabica*	20	Fabaceae	Annual	Herbaceous	Pea Family
		x	Spreading hedgeparsley	*Torilis arvensis*	1	Apiaceae	Annual	Herbaceous	Misc. Annual Herbaceous
	x		Spurge laurel	*Daphne laureola*	0	Thymelaeaceae	Perennial	Woody	Woody Species
x			St. Johnswort	*Hypericum perforatum*	20	Hypericaceae	Perennial	Herbaceous	Misc. Herbaceous
		x	Sticky chickweed	*Cerastium glomeratum*	1	Caryophyllaceae	Annual	Herbaceous	Carnation Family
x			Stinging nettle	*Urtica dioica ssp dioica*	1	Urticaceae	Perennial	Herbaceous	Misc. Herbaceous
x			Subterranean clover	*Trifolium subterraneum*	20	Fabaceae	Annual	Herbaceous	Pea Family
		x	Suckling clover	*Trifolium dubium*	10	Fabaceae	Annual	Herbaceous	Pea Family
	x		Sulfur cinquefoil	*Potentilla recta*	0	Roseaceae	Perennial	Herbaceous	Misc. Herbaceous
x			Sweet vernal grass	*Anthoxanthum odoratum*	25	Poaceae	Perennial	Grass	Perennial Grasses
		x	Sweet violet	*Viola odorata*	10	Violaceae	Perennial	Herbaceous	none
	x		Sweetbriar rose	*Rosa rubiginosa*	0	Roseaceae	Perennial	Woody	Woody Species
x			Tall fescue	*Schedonorus arundinaceus*	10	Poaceae	Perennial	Grass	Perennial Grasses
		x	Tall wheatgrass	*Thinopyrum pontica*	1	Poaceae	Perennial	Grass	Perennial Grasses
x			Tansy ragwort	*Senecio jacobaea*	50	Asteraceae	Biennial	Herbaceous	Sunflower Family
x			Teasel/Fuller's teasel	*Dipsacus fullonum*	50	Dipsacaceae	Biennial	Herbaceous	Teasels
x			Three-sided leek	*Allium triquetrum*	1	Liliaceae	Perennial	Herbaceous	Lilies, Iris, Sedges, Rushes
		x	Timothy	*Phleum pratense*	1	Poaceae	Perennial	Grass	Perennial Grasses
x			Tree-of-heaven	*Ailanthus altissima*	1	Simaroubaceae	Perennial	Woody	Woody Species
x			Velvetgrass	*Holcus lanatus*	20	Poaceae	Perennial	Grass	Perennial Grasses
	x		Velvetleaf	*Abutilon theophrasti*	5	Malvaceae	Annual	Herbaceous	Misc. Herbaceous
		x	Wall bedstraw	*Galium divaricatum*	0	Rubiaceae	Annual	Herbaceous	Misc. Annual Herbaceous
		x	Wall lettuce	*Mycelis murialis*	5	Asteraceae	Annual	Herbaceous	Sunflower Family
		x	Water speedwell	*Veronica anagallis-aquatica*	1	Plantaginaceae	Biennial	Herbaceous	Misc. Herbaceous

Category			Common Name	Scientific Name	Treatment Acres	Family	Life Cycle	Type	Treatment Group
I	III	IV							
		x	Weedy brome	*Bromus stamineus*	1	Poaceae	Annual	Grass	Annual Grasses
		x	Western mannagrass	*Glycera x occidentalis*	0	Poaceae	Perennial	Grass	Perennial Grasses
		x	Wheat	*Triticum aestivum*	1	Poaceae	Annual	Grass	Annual Grasses
		x	White clover	*Trifolium repens*	10	Fabaceae	Perennial	Herbaceous	Pea Family
	x		White ramping fumitory	*Fumaria capreolata*	0	Fumariaceae	Perennial	Herbaceous	Misc. Herbaceous
x			White/yellow sweetclover	*Melilotus albus/M officianalis*	50	Fabaceae	Annual, biennial, perennial	Herbaceous	Pea Family
		x	Wild oats	*Avena fatua*	1	Poaceae	Annual	Grass	Annual Grasses
x			Wild radish	*Raphanus raphanistrum/R. sativas*	232	Brassicaceae	Annual, biennial	Herbaceous	Mustard Family
x			Woodland tansy	*Senecio sylvaticus*	100	Asteraceae	Annual	Herbaceous	Sunflower Family
		x	Yarrow	*Achillea millefolium*	5	Asteraceae	Perennial	Herbaceous	Perennial Parsley Family
	x		Yellow archangel	*Lamiastrum galeobdolon*	0	Lamiaceae	Perennial	Herbaceous	Perennial Mints
x			Yellow flag iris	*Iris psuedacorus*	5	Iridaceae	Perennial	Grass	Lilies, Iris, Sedges, Rushes
	x		Yellow foxtail	*Setaria pumila*	1	Poaceae	Annual	Grass	Annual Grasses
x			Yellow glandweed	*Parentucellia viscosa*	40	Scrophulariaceae	Annual	Herbaceous	Snapdragon Family
x			Yellow nutsedge	*Cyperus esculentus*	0	Cyperaceae	Perennial	Grass	Lilies, Iris, Sedges, Rushes
		x	Yellow salsify	*Tragopogon dubius*	1	Asteraceae	Annual, biennial	Herbaceous	Sunflower Family
x			Yellow starthistle	*Centaurea solstitialis*	1	Asteraceae	Annual	Herbaceous	Sunflower Family
	x		Yellow toadflax	*Linaria vulgaris*	0	Scrophulariaceae	Perennial	Herbaceous	Snapdragon Family

Table D-3. Estimated Total Treatment Acres, 20-Year Analysis Period, Including Tank Mixes and Application Rates

Treatment Method	Lbs./Acre[1]	No Action[2]	Proposed Action[2]	Alternative 3
2,4-D	0.95	10.00	24.76	24.76
2,4-D	**1.90**	3.50	6.30	6.30
2,4-D	0.95 to **1.90**	-	0.00	0.00
Aminopyralid	**0.11**	-	0.00	0.00
Aminopyralid	0.05 to **0.11**	-	1,480.62	1,480.62
Aminopyralid + Metsulfuron methyl	**0.08** to **0.11** + 0.12 to **0.15**	-	170.69	170.69
Aminopyralid + Triclopyr	**0.11** + **1.00**	-	156.12	156.12
Chlorsulfuron	**0.05**	-	44.93	44.93
Chlorsulfuron	0.04 to **0.05**	-	0.00	0.00
Chlorsulfuron	**0.05** to **0.12**	-	0.00	0.00
Chlorsulfuron + 2,4-D	**0.05** + 0.95	-	23.23	23.23
Chlorsulfuron + 2,4-D	**0.06** + 0.95	-	73.80	73.80
Chlorsulfuron + Clopyralid + 2,4-D	**0.05** + **0.38** + 0.95	-	46.46	46.46
Clopyralid	0.09 to 0.19	-	2.25	2.25
Clopyralid	0.23 to **0.49**	-	163.35	163.35
Clopyralid	0.25 to **0.38**	-	1.30	1.30
Clopyralid + 2,4-D	0.16 to **0.38** + **1.00** to **1.90**	-	1.00	1.00
Clopyralid + 2,4-D	**0.38** + 0.95	-	116.15	116.15
Dicamba	**1.00**	-	6.70	6.70
Dicamba + 2,4-D	**0.50** + 0.95	98.15	3.46	3.46
Dicamba + 2,4-D	**0.50** to **1.00** + 0.95	6.00	15.30	15.30
Dicamba + 2,4-D	**0.50** to **2.00** + 0.95	4.00	1.50	1.50
Dicamba + 2,4-D	**0.75** + 0.25	1.25	2.80	2.80
Dicamba + 2,4-D	**1.00** + 0.95	-	6.70	6.70
Dicamba + Diflufenzopyr	0.18 to **0.35**	-	135.75	135.75
Fluazifop-P-butyl	**0.38**	-	-	30.00
Fluroxypyr	**0.49**	-	-	2.80
Fluroxypyr	0.13 to 0.49	-	-	0.90
Glyphosate	**<3.00**	7,683.61	1,494.42	1,490.72
Glyphosate + 2,4-D	0.50 + 0.70	6.00	16.10	16.10
Hexazinone	0.75	-	-	2.80
Hexazinone	**2.00**	-	-	87.15
Hexazinone	**2.00** to 4.00	-	-	0.00
Imazapic	**0.06** to **0.12**	-	161.84	92.94
Imazapic	**0.13** to **0.19**	-	77.62	77.62
Imazapic + Glyphosate	**0.06** to **0.09** + 0.13 to 0.19	-	0.90	0.90
Imazapic + Glyphosate	**0.06** to **0.19** + 0.13 to 0.38	-	69.72	69.72
Imazapyr	**0.75**	-	6.75	6.75
Imazapyr	0.38 to **0.75**	-	8.40	8.40
Imazapyr	**0.75 to 1.00**	-	187.50	187.50
Imazapyr	**0.75** to **1.50**	-	177.65	160.22
Imazapyr	**1.00** to **1.50**	-	393.30	393.30
Imazapyr + Glyphosate	**0.75** to **1.50** + **3.00**	-	226.59	313.74
Metsulfuron methyl	0.01 to 0.02	-	12.10	12.10
Metsulfuron methyl	0.01 to 0.08	-	3.40	3.40
Metsulfuron methyl	0.02 to **0.04**	-	273.27	273.27
Metsulfuron methyl	**0.04** to **0.08**	-	4.50	4.50
Metsulfuron methyl + 2,4-D	**0.04** + 0.95	-	0.20	0.20
Picloram	**1.00**	-	0.00	0.00
Picloram	**0.50** to **0.95**	5.00	0.00	0.00
Picloram + 2,4-D	0.25 + 0.95	-	0.00	0.00
Picloram + 2,4-D	**0.50** + 0.95	0.80	0.00	0.00
Picloram + 2,4-D	**0.50** + 1.50	-	0.00	0.00

Treatment Method	Lbs./Acre[1]	No Action[2]	Proposed Action[2]	Alternative 3
Picloram + 2,4-D + Dicamba	0.25 + 0.95 + 0.50	19.63	23.23	23.23
Rimsulfuron	0.03 to **0.06**	-	-	138.62
Sulfometuron methyl	**0.19**	-	0.60	0.60
Sulfometuron methyl	0.05 to 0.09	-	0.00	0.00
Sulfometuron methyl + Chlorsulfuron	0.05 + **0.14**	-	0.00	0.00
Triclopyr	1.00	-	1.50	1.50
Triclopyr	**2.00**	-	4,200.38	4,200.38
Triclopyr	**<6.00**	-	390.30	390.30
Triclopyr	0.50 to **2.00**	-	27.60	27.60
Triclopyr	0.75 to **5.00**	-	4.20	4.20
Triclopyr	**1.50 to 3.00**	-	11.70	11.70
Triclopyr + 2 4-D	**1.50** + 0.95	-	0.00	0.00
Triclopyr + 2 4-D	**2.00** + 0.95	-	780.60	780.60
Biological control agents		901.55	546.95	546.95
Prescribed fire		0.00	2,000.00	2,000.00
Manual control		351.13	708.12	708.12
Mechanical control		467.53	686.77	460.18
Propane torch		-	21.05	21.05
Weed barrier mats		-	5.00	5.00
Targeted grazing (cattle)		200.00	200.00	200.00
Targeted grazing (goats or sheep)		-	1.00	1.00
Targeted grazing (goats)		5.00	5.00	5.00
Targeted grazing (sheep)		-	0.25	0.25
Competitive seeding and planting		2,000.00	2,000.00	2,000.00

1. Lbs./acre in bold are at the typical application rate or above. Red indicates lbs./acre at the maximum application rate.
2. A dash indicates that the treatment method would not be used under that alternative. 0.00 indicates that the treatment would be used under the alternative, but on acres that round to 0.00 (e.g. 0.003 acres).

Table D-4. Estimated Total Treatment Acres, 20-Year Analysis Period
(Not including tank mixes or application rates)

Treatment Method	No Action Acres[1]	Proposed Action		Alternative 3		
		Acres[1]	% change from No Action	Acres[1]	% change from No Action	% change from Proposed Action
2,4-D	149.33	360.99	142%	360.99	142%	0%
Aminopyralid	-	1,807.43	NA	1,807.43	NA	0%
Chlorsulfuron	-	188.42	NA	188.42	NA	0%
Clopyralid	-	330.51	NA	330.51	NA	0%
Dicamba	129.03	59.69	-54%	59.69	-54%	0%
Dicamba + Diflufenzopyr	-	135.75	NA	135.75	NA	0%
Fluazifop-P-butyl	-	-	NA	30.00	NA	NA
Fluroxypyr	-	-	NA	3.70	NA	NA
Glyphosate	7,689.61	1,807.73	-76%	1,891.18	-75%	5%
Hexazinone	-	-	NA	89.95	NA	NA
Imazapic	-	310.08	NA	241.18	NA	-22%
Imazapyr	-	1,000.19	NA	1,069.91	NA	7%
Metsulfuron methyl	-	464.16	NA	464.16	NA	0%
Picloram	25.43	23.23	-9%	23.23	-9%	0%
Rimsulfuron	-	-	NA	138.62	NA	NA
Sulfometuron methyl	-	0.60	NA	0.60	NA	0%
Triclopyr	-	5,572.40	NA	5,572.40	NA	0%
Biological control agents	901.55	546.95	-39%	546.95	-39%	0%
Prescribed fire	0.00	2,000.00	NA	2,000.00	NA	0%
Manual control	351.13	708.12	102%	708.12	102%	0%
Mechanical control	467.53	686.77	47%	460.18	-2%	-33%
Propane torch	-	21.05	NA	21.05	NA	0%

Treatment Method	No Action Acres[1]	Proposed Action		Alternative 3		
		Acres[1]	% change from No Action	Acres[1]	% change from No Action	% change from Proposed Action
Weed barrier mats	-	5.00	NA	5.00	NA	0%
Targeted grazing (cattle)	200.00	200.00	0%	200.00	0%	0%
Targeted grazing (goats or sheep)	5.00	6.25	25%	6.25	25%	0%
Competitive seeding and planting	2,000.00	2,000.00	0%	2,000.00	0%	0%

1. A dash indicates that the treatment method would not be used under that alternative.

Appendix E - Prevention

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

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:9015.8).[88] If there is a moderate or high risk of spread, actions to reduce the risk must be implemented and monitoring of the site. See the ***Noxious Weed Risk Assessment Factors and Rating*** section, below (taken from BLM Manual 9015, *Integrated Weed Management*, USDI 1992b).

Invasive Plant Prevention Measures

Invasive Plant Prevention Measures are designed to prevent the spread of invasive plants by minimizing the amount of existing non-target vegetation that is disturbed or destroyed during project or vegetation treatment actions (USDI 2007d:2-20). They are designed to work in conjunction with BLM's policy requiring that planning for ground-disturbing projects in the Resource Area, or those that have the potential to alter plant communities, include an assessment of the risk of introducing noxious weeds, and if there is a moderate or high risk of spread, actions to reduce the risk must be implemented and monitoring of the site must be conducted to prevent establishment of new infestations.

Information included in this *Invasive Plant Prevention Measures* section is a compilation of information originally presented in:

- the Vegetation Treatments on BLM Lands in 17 Western States Programmatic Environmental Report (USDI 2007d);

As stated in the BLM's *Partners Against Weeds - An Action Plan for the BLM* (USDI 1996), prevention and public education are the highest priority weed management activities. Priorities are as follows:

- Priority 1: Take actions to prevent or minimize the need for vegetation control when and where feasible, considering the management objectives of the site.
- Priority 2: Use effective nonchemical methods of vegetation control when and where feasible.
- Priority 3: Use herbicides after considering the effectiveness of all potential methods or in combination with other methods or controls.

Prevention is best accomplished by ensuring the seeds and vegetatively reproductive plant parts of new weed species are not introduced into new areas. The BLM is required to develop a noxious weed risk assessment when it is determined that an action may introduce or spread noxious weeds or when known habitat exists (USDI 1992b). If the risk is moderate or high, the BLM may modify the project to reduce the likelihood of weeds infesting the site, and to identify control measures to be implemented if weeds do infest the site. To prevent the spread of weeds,

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

the BLM takes actions to minimize the amount of existing non-target vegetation that is disturbed or destroyed during project or vegetation treatment actions. During project planning, the following steps are taken:

- Incorporate measures to prevent introduction or spread of weeds into project layout, design, alternative evaluation, and project decisions.
- During environmental analysis for projects and maintenance programs, assess weed risks, analyze potential treatment of high-risk sites for weed establishment and spread, and identify prevention practices.
- Determine prevention and maintenance needs, to include the use of herbicides if needed, at the onset of project planning.
- Avoid or remove sources of weed seed and propagules to prevent new weed infestations and the spread of existing weeds.

During project development, weed infestations are prioritized for treatment in project operating areas and along access routes. Weeds present on or near the site are identified, a risk assessment is completed, and weeds are controlled as necessary. Project staging areas are weed free, and travel through weed-infested areas is avoided or minimized. Examples of prevention actions to be followed during project activities include cleaning all equipment and clothing before entering the project site; avoiding soil disturbance and the creation of other soil conditions that promote weed germination and establishment; and using weed-free seed, hay, mulch, gravel, soil, and mineral materials on public lands where there is a state or county program in place.

Conditions that enhance invasive species abundance should be addressed when developing mitigation and prevention plans for activities on public lands. These conditions include excessive disturbance associated with road maintenance, poor grazing management, and high levels of recreational use. If livestock grazing is managed to maintain the vigor of native perennial plants, particularly grasses, the chance of weeds invading rangeland is much less. By carefully managing recreational use and educating the public on the potential impacts of recreational activities on vegetation, the amount of damage to native vegetation and soil can be minimized at high use areas, such as campgrounds and OHV trails. Early detection in recreation areas is focused on roads and trails, where much of the weed spread occurs.

The BLM participates in the National Early Warning and Rapid Response System for Invasive Plants. The goal of this System to minimize the establishment and spread of new invasive species through a coordinated framework of public and private processes by:

- Early detection and reporting of suspected new plant species to appropriate officials;
- Identification and vouchering of submitted specimens by designated specialists;
- Verification of suspected new state, regional, and national plant records;
- Archival of new records in designated regional and plant databases;
- Rapid assessment of confirmed new records; and
- Rapid response to verified new infestations that are determined to be invasive.

Project Planning Prevention Measures

- Incorporate prevention measures into project layout and design, alternative evaluation, and project decisions to prevent the introduction or spread of weeds.
- Determine prevention and maintenance needs, including the use of herbicides, at the onset of project planning.
- Before ground-disturbing activities begin, inventory weed infestations and prioritize areas for treatment in project operating areas and along access routes.
- Remove sources of weed seed and propagules to prevent the spread of existing weeds and new weed infestations.
- Pre-treat high-risk sites for weed establishment and spread before implementing projects.

- Post weed awareness messages and prevention practices at strategic locations such as trailheads, roads, boat launches, and public land kiosks.
- Coordinate project activities with nearby herbicide applications to maximize the cost-effectiveness of weed treatments.

Project Development Prevention Measures

- Minimize soil disturbance to the extent practical, consistent with project objectives.
- Avoid creating soil conditions that promote weed germination and establishment.
- To prevent weed germination and establishment, retain native vegetation in and around project activity areas and keep soil disturbance to a minimum, consistent with project objectives.
- Locate and use weed-free project staging areas. Avoid or minimize all types of travel through weed-infested areas, or restrict travel to periods when the spread of seeds or propagules is least likely.
- Prevent the introduction and spread of weeds caused by moving weed-infested sand, gravel, borrow, and fill material.
- Inspect material sources on site, and ensure that they are weed-free before use and transport. Treat weed-infested sources to eradicate weed seed and plant parts, and strip and stockpile contaminated material before any use of pit material.
- Survey the area where material from treated weed-infested sources is used for at least 3 years after project completion to ensure that any weeds transported to the site are promptly detected and controlled.
- Prevent weed establishment by not driving through weed-infested areas.
- Inspect and document weed establishment at access roads, cleaning sites, and all disturbed areas; control infestations to prevent spread within the project area.
- Avoid acquiring water for dust abatement where access to the water is through weed-infested sites.
- Identify sites where equipment can be cleaned. Clean equipment before entering public lands.
- Clean all equipment before leaving the project site if operating in areas infested with weeds.
- Inspect and treat weeds that establish at equipment cleaning sites.
- Ensure that rental equipment is free of weed seed.
- Inspect, remove, and properly dispose of weed seed and plant parts found on workers' clothing and equipment. Proper disposal entails bagging the seeds and plant parts and incinerating them.

Revegetation Prevention Measures

- Include weed prevention measures, including project inspection and documentation, in operation and reclamation plans.
- Retain bonds until reclamation requirements, including weed treatments, are completed, based on inspection and documentation.
- To prevent conditions favoring weed establishment, re-establish vegetation on bare ground caused by project disturbance as soon as possible using either natural recovery or artificial techniques.
- Maintain stockpiled, uninfested material in a weed-free condition.
- Revegetate disturbed soil (except travel ways on surfaced projects) in a manner that optimizes plant establishment for each specific project site. For each project, define what constitutes disturbed soil and objectives for plant cover revegetation. Revegetation may include topsoil replacement, planting, seeding, fertilization, liming, and weed-free mulching, as necessary.
- Where practical, stockpile weed-seed-free topsoil and replace it on disturbed areas (e.g., road embankments or landings).
- Inspect seed and straw mulch to be used for site rehabilitation (for wattles, straw bales, dams, etc.) and certify that they are free of weed seed and propagules.

- Inspect and document all limited term ground-disturbing operations in noxious weed infested areas for at least 3 growing seasons following completion of the project.
- Use native material where appropriate and feasible. Use certified weed-free or weed-seed-free hay or straw where certified materials are required and/or are reasonably available.[89]
- Provide briefings that identify operational practices to reduce weed spread (for example, avoiding known weed infestation areas when locating fire lines).
- Evaluate options, including closure, to regulate the flow of traffic on sites where desired vegetation needs to be established. Sites could include road and trail ROW, and other areas of disturbed soils.

District Weed Prevention Schedule

General Prevention Activity	Description *(Describe the activity and where it will take place)*	When *(season)*	Who
GENERAL - All Field-going Employees			
Check and clean vehicles- Check any vehicle that is used off of established roads or on overgrown roads and clean with best available method prior to moving into relatively weed-free areas.	Avoid driving through vegetation or parking in vegetation. When driving through or parking in vegetation is necessary, (especially known invasive plants) inspect vehicle for seeds or other plant materials. Check body, undercarriage, wheel wells, grill, inside bumpers, frame, bed, etc. for plant materials, soil, and mud and plant material and remove with best available method (sweep, pick off plant parts, power wash, etc.) prior to travelling into other areas.	All Year	All field-going employees that operate pick-ups, ATVs, boats, or other vehicles
Attend Weed Awareness Training – Learn employee responsibilities for weed prevention and control.	Attend training annually. Learn top 10-12 weeds and what to do when you see them.	Spring	All field-going employees
Report location of known or suspected weeds.	Collect location information such as Township-Range-Section, Rd. #, approximate mileage to nearest land mark or road junction or UTMs of suspected infestations and report to weed coordinator.	All Year	All field-going employees
GENERAL - Planning Documents – All Resources			
Ensure that all NEPA and planning documents include an invasive plant element for analysis.	Include Weed Risk Assessment and invasive plant inventory in planning document file. Where possible, minimize soil and vegetation disturbance.	All Year	NEPA Coordinators
Assess weed potential/risk when developing project proposals.	On all soil or vegetation disturbing projects, conduct pre – disturbance weed surveys and include results in project file. Complete a Weed Risk Assessment (BLM Manual 9015) that considers the likelihood and consequences of infestation and prescribe weed prevention measures commensurate with activity and risk.	All Year	Botanist or Weed Coordinator
Prevent weed spread into weed free areas.	Incorporate appropriate Standard Operating Procedures (SOPs) from 2007 and 2010 Vegetation Treatments EISs and ER. These include Best Management Practices and mitigation measures to prevent the spread of weeds.	All Year	Botanist or Weed Coordinator, NEPA Coordinators
GENERAL - Facilities and Buildings			
Ensure that the BLM facilities and compounds are kept free of priority invasive plants.	Control invasive plants on BLM compounds. Coordinate with weed coordinator for effective treatments and correct deficiencies identified monitoring.	Spring/Summer	Recreation and Facilities Supervisors
Use native, weed-free seed and plants for revegetation and erosion prevention.	When planting or seeding use native plants or seed that is free of invasive plants. Use native plants unless a NEPA analysis has shown the need for other species.	Spring/Summer/Fall	Project Leads

[89] The Coos Bay District requires the use of weed-free hay or straw on District lands.

General Prevention Activity	Description *(Describe the activity and where it will take place)*	When *(season)*	Who
Obtain gravel, mulch and fill from weed free sources.	Obtain or purchase weed-free mulch, gravel, fill or similar materials OR inspect and control weeds for a minimum of 3 years following the use of materials that are not certified weed-free.	All Year	Procurement, Engineering
Road Construction/Maintenance			
Ensure that the BLM maintenance compounds are kept free of invasive plants	Control invasive plants on BLM compounds. Coordinate with weed coordinator for effective treatments and correct deficiencies identified monitoring.	Spring/Summer	Maintenance Supervisor
Clean equipment	Clean equipment regularly of mud, soil and plant parts to avoid moving weed seed.	All Year	Equipment Operators
Avoid spreading weeds when brushing or grading.	When possible grade or brush up to weed infestation rather than away from them, particularly when seeds are present on plants. Work with weed coordinator to include problem areas in spray contracts.	All Year	Equipment Operators
Obtain gravel, mulch and fill from weed free sources.	Inspect and control weeds in stockpiles and fill sources. Purchase weed-free gravel, mulch and fill OR inspect and control weeds for a minimum of 3 years following the use of materials that are not known to be weed-free.	All Year	Maintenance Supervisor
Prevent weed establishment on bare soil from slides, etc.	Apply native grass seed to bare soil and soil piles following slide removal, or similar projects.	Fall or Spring	Road Maintenance staff
Address weeds during road maintenance planning. Prevent weed spread into weed-free areas.	For soil or vegetation disturbing projects, identify and implement ways to prevent weeds from being introduced or spreading into the proposed project area. Work with weed coordinator to include projects in annual weed contracts.	Annual Meeting in August	Maintenance Supervisors, Maintenance staff and District Weed Coordinator
Recreation			
Ensure that the BLM facilities and compounds are kept free of priority invasive plants.	Control invasive plants on BLM compounds. Coordinate with weed coordinator for effective treatments and correct deficiencies identified monitoring.	Spring/Summer	Recreation
Promote and maintain weed free campgrounds, trails and recreation sites.	Install signs/posters to inform visitors of weed concerns and how to prevent weed spread into recreation areas, especially at high use times. Consider boot cleaning stations at trailheads. Consider weed pulling/cutting activities with volunteers or youth crews.	Year round	Recreation Specialist /Technician
Ensure all developed and semi-developed recreation sites have regular weed inventory and on-site weed control.	Work with weed coordinators to ensure weed inventory is up to date and included in District weed GIS layer. Conduct invasive plant removal as needed.	Spring/Summer/Fall	Recreation Specialist /Recreation Technician
Use weed free seed and plant materials.	When planting or seeding disturbed areas use native plants or seed that is free of invasive plants. Use native plants unless a NEPA analysis has shown the need for other species.	Spring/Summer/Fall	Recreation Specialist /Recreation Technician
Obtain gravel, mulch and fill from weed free sources.	Inspect and control weeds in stockpiles and fill sources. Purchase weed-free gravel, mulch and fill OR inspect and control weeds for a minimum of 3 years following the use of materials that are not known to be weed-free.	All Year	Maintenance Supervisor
ACECs			
Ensure that all ACECs have current weed inventory, monitoring and on- site weed control.	Work with botanists/weed coordinators to keep weed inventory on ACECs up to date and included in District weed GIS layer.	Spring, Summer, Fall	ACEC Lead

General Prevention Activity	Description *(Describe the activity and where it will take place)*	When *(season)*	Who
Actively control known infestations to prevent spread to un-infested areas.	When practical, control invasive plants before seed set to protect resources for which ACEC is designated.		ACEC Lead
Re-vegetate bare soils and sparse vegetation with weed-free seed and mulch.	Use locally adapted native seed to re-vegetate disturbed areas. Use certified weed free seed. Check with botanist for appropriate seed and requirements before purchasing. Make every reasonable effort to obtain weed free mulch.	All Year	ACEC Lead
Forest Management			
Include weed prevention in timber management activities.	On all proposed soil or vegetation disturbing projects include and implement weed prevention measures such as pre-disturbance weed inventory, risk assessment and weed treatments, followed by post disturbance monitoring and treatment for 3-5 years to avoid spreading weeds or allowing them to establish in weed-free areas.	All Year	Forester/Project lead
Re-vegetate bare soils with weed-free seed and mulch.	Use locally adapted native seed to re-vegetate disturbed areas. All seed used will be certified weed free. Make every reasonable effort to obtain weed free mulch. Check with botanist for appropriate seed and requirements before purchasing.	All Year	Forester/Project lead
Obtain standard stipulations for weed prevention and include in contracts.	See weed coordinator for standard contract stipulations and include in all contracts. Standard stipulations include equipment cleaning, use of certified weed free seed and mulch and reporting of suspect weeds.	All Year	Contract writer
Enforce weed prevention measures in contracts or activity plans.	Become familiar with weed prevention stipulations in contracts or activity plans and enforce them by inspecting vehicles, seed, mulch or other materials, reporting known or suspected weeds.	All Year	PI or COR
Monitor timber harvest areas for invasive plants and control them at earliest opportunity	Include weed survey and inventory in silvicultural activity planning. Include invasive plant control in contracts for release, pruning, etc. Report invasive plants and suspected weeds to weed coordinator.	All Year	Silviculture
Use weed free materials	Use weed free mulch, gravel and other materials to prevent weed introduction and establishment. If this is not possible, then monitor and treat weeds for at least 3 years following disturbance.	All year	Project lead
Hydro & Fisheries Management			
Clean equipment to prevent the spread of aquatic weeds and other invasive species.	Clean equipment (including waders, boots, boats, etc.) and allow to dry thoroughly before moving from one water body to another.	All Year	Hydrologists, Fish Biologists
Minimize risk of weed spread on hydrologic and fisheries projects.	Monitor and control weeds until vegetation is sufficiently grown to exclude weeds.	All Year	Hydrologists, Fish Biologists
On all proposed soil or vegetation disturbing projects prescribe and implement weed prevention measures.	Ensure that pre – disturbance weed surveys and weed control are done as appropriate. Following soil or vegetation disturbance monitor for invasive weeds and control weeds for 3-5 years to avoid weed spread or establishment into areas that were free from weeds prior to project.	Spring/Summer	Project Lead
Establish native plants that will compete with weed seedlings and prevent establishment.	Seed areas of bare soil and sparse vegetation with native weed free seed/plants to prevent weed establishment.	Spring and Fall	Project Lead
Use weed free materials	Use weed free mulch, gravel and other materials to prevent weed introduction and establishment. If this is not possible, then monitor and treat weeds for at least 3 years following disturbance.	All year	Project lead

General Prevention Activity	Description *(Describe the activity and where it will take place)*	When *(season)*	Who
Wildlife Management			
Consider the risk of weed spread and effects when planning habitat improvements. Be proactive in preventing habitat degradation by weeds.	Determine appropriate weed prevention measures when developing wildlife habitat improvement projects. Identify and fund weed control activities to preserve or improve wildlife habitat	All Year	Wildlife Biologists
On all proposed soil or vegetation disturbing projects prescribe and implement weed prevention measures.	Ensure that pre-disturbance weed surveys and weed control are done as appropriate. Following soil or vegetation disturbance monitor for invasive weeds and control weeds for 3-5 years to avoid weed spread or establishment into areas that were free from weeds prior to project.	Spring/Summer	Project Lead
Establish native plants that will compete with weed seedlings and prevent establishment.	Seed areas of bare soil and sparse vegetation with native weed free seed/plants to prevent weed establishment.	Spring and Fall	Project Lead
Use weed free materials	Use weed free mulch, gravel and other materials to prevent weed introduction and establishment. If this is not possible, then monitor and treat weeds for at least 3 years following disturbance.	All year	Project lead
Botany (Plant Conservation)			
Document invasive plants during project surveys.	Survey for and report invasive plants during pre-project surveys. Submit reports for incorporation into District weed database. Include survey and risk assessment reports in project NEPA.	All Year	Botanists
Identify unknown plants	Identify plants brought in by employees and report suspected weeds to weed coordinator	All Year	Botanists
Establish native plants that will compete with weed seedlings and prevent establishment.	On habitat improvement projects, seed areas of bare soil and sparse vegetation with native weed free seed/plants to prevent weed establishment. Monitor for and control weeds.	Spring and Fall	Project Lead
Use weed free materials	Use weed free mulch, gravel and other materials to prevent weed introduction and establishment. If this is not possible, then monitor and treat weeds for at least 3 years following disturbance.	All year	Project lead
Fire and Fuels Management			
Prevent weed spread on fires.	In planning and on–the-ground activities include weed prevention measures such as cleaning engines; preventing crews from walking through known infestations, seed bare soils with weed free native seed and mulch.	All Year	Fire/Fuels Management
Prevent weed spread on prescribed burns.	Ensure that pre-burn weed surveys are done. Consider changes in weed infestation as a result of timing and intensity of burn. Time burn to favor desired native plants and reduce weed infestation.	All Year	Project Lead
Post burn weed monitoring and control	Monitor burn for invasive weeds and control weeds until vegetation has recovered sufficiently to exclude weeds.	Spring/Summer	Project Lead
Establish native plants that will compete with weed seedlings and prevent establishment.	Seed areas of bare soil and sparse vegetation with native weed free seed/plants to prevent weed establishment.	Spring and Fall	Project Lead
Use weed free materials	Use weed free mulch, gravel and other materials to prevent weed introduction and establishment. If this is not possible, then monitor and treat weeds for at least 3 years following disturbance.	All year	Project lead
ROW, Lands & Realty			

General Prevention Activity	Description *(Describe the activity and where it will take place)*	When *(season)*	Who
Include assessment for weed control in all land tenure adjustments.	As needed	All Year	Realty Specialists
Include weed prevention stipulations in all rights-of-way authorizations.	See weed coordinator for standard contract stipulations and include in all contracts. Standard stipulations include equipment cleaning, use of certified weed free seed and mulch and reporting of suspect weeds.	All Year	Realty and Access Specialists
Include weed prevention stipulations in tail hold authorizations.	See weed coordinator for standard contract stipulations and include in tail hold authorization. Standard stipulations include equipment cleaning, use of certified weed free seed and mulch and reporting of suspect weeds.	All Year	Realty and Access Specialists
Enforce weed prevention stipulations as appropriate.	Monitor authorizations for compliance with weed stipulations. Report known or suspected weeds to weed coordinator and permittee.		
Engineering & Project Contract Administration			
Obtain standard stipulations for weed prevention and include in contracts.	See weed coordinator for standard contract stipulations and include in all contracts. Standard stipulations include equipment cleaning, use of certified weed free seed and mulch and reporting of suspect weeds.	All Year	Contract writer
Enforce weed prevention measures in contracts.	Become familiar with weed prevention stipulations in contracts or activity plans and enforce them by inspecting vehicles, seed, mulch or other materials, reporting known or suspected weeds.		PIs, CORs
Re-vegetate bare soils with weed-free seed and mulch.	Use locally adapted native seed to re-vegetate areas of disturbed soil or vegetation. Use only certified weed free seed. Check with botanist for appropriate seed and requirements before purchasing.	All Year	Project lead
On all proposed soil or vegetation disturbing projects prescribe and implement weed prevention measures.	Ensure that pre – disturbance weed surveys and weed control are done as appropriate. Following soil or vegetation disturbance monitor for invasive weeds and control weeds for 3-5 years to avoid weed spread or establishment into areas that were free from weeds prior to project.	Spring/Sum mer	Project Lead
Use weed free materials	Use weed free mulch, gravel and other materials to prevent weed introduction and establishment. If this is not possible, then monitor and treat weeds for at least 3 years following disturbance.	All year	Project lead
General- Weed Management			
Conduct weed awareness training for field-going employees and managers.	Present the “Dirty Dozen”, how to identify a potential new invader and how to report suspected weed infestations.	Spring	District Weed Coordinator
Review documents involving vegetation or ground disturbance for appropriate weed prevention measures.	Provide standard stipulation to prevent weed introduction and spread for contracts, ROW agreements, EAs, CXs, DNAs. When needed, review documents for appropriate weed prevention measures. Prescribe additional measures as needed.	All year	Weed Coordinator
Survey the District lands to detect new invaders and expansions of established invasive plants.	Systematically inventory the District to detect new invaders and expansions of established invasive plants. Document using current data standards and enter into Oregon SDE and NISIMS.	Spring/Sum mer/fall	District & Resource Area Weed Coordinators, and GIS Specialists
Alert employees to new invaders	Send out weed alerts when new weeds are found or likely to be found on the District	Spring-Fall	Weed Coordinator

General Prevention Activity	Description *(Describe the activity and where it will take place)*	When *(season)*	Who
Monitor treatments sites for implementation and effectiveness.	Review Pesticide Applicator Reports and monitor on the ground treatments for compliance with SOPs, Mitigation Measures and effectiveness of treatments.	Summer/Fall	Weed Coordinators
Coordinate with partners and the public to prevent weed spread, particularly into weed free areas.	Participate in county weed boards. Coordinate weed prevention materials and activities with watershed councils.	All Year	District Weed Coordinator
Distribute information and brochures to the public	Display weed brochures for the public in the front lobby. Distribute weed identification and control information to partners and the public at county fair and other events.	Year round	Front desk District Weed Coordinator
Establish and maintain partnerships to prevent the spread and control existing weeds.	Work closely with Oregon Dept. of Agriculture, County Weed Boards, Watershed Councils and Soil and Water Conservation Districts to develop and maintain mutually beneficial weed management efforts. Work with partners to develop and distribute educational and outreach brochures, articles and presentations.	All Year	District Weed Coordinator
Work with adjacent landowners on weed awareness and control strategies.	Engage adjacent landowners to address mutually beneficial weed control strategies and activities. Attend annual ROW and Road Maintenance meetings.	All Year	District and Resource Area Weed Coordinators

Noxious Weed Risk Assessment Factors and Rating

Risk Assessment Factors

Factor 1: *Likelihood of Noxious Weed Species Spreading to Project Area*:

None: Noxious weed species not located within or adjacent to the project area. Project activity is not likely to result in the establishment of noxious weed species in the project area.

Low: Noxious weed species present in areas adjacent to but not within the project area. Project activities can be implemented and prevent the spread of noxious weeds into the project area.

Moderate: Noxious weed species located immediately adjacent to or within the project area. Project activities are likely to result in some area becoming infested with noxious weed species even when preventative management actions are followed. Control measures are essential to prevent the spread of noxious weeds within the project area.

High: Heavy infestations of noxious weeds are located within or immediately adjacent to the project area. Project activities, even with preventative management actions, are likely to results in the establishment and spread of noxious weeds on disturbed sites throughout much of the project area.

Factor 2: *Consequence of Noxious Weed Establishment in Project Area*:

Low to Nonexistent (1): None. No cumulative effects expected.

Moderate (5): Possible adverse effects on site and possible expansion of infestation within project area. Cumulative effects on native plant community are likely, but limited.

High (10): Obvious adverse effects within the project area and probable expansion of noxious weed infestations to area outside the project area. Adverse cumulative effects on native plant community are probable.

Risk Rating

Step 1 – Identify level of likelihood and consequence of adverse effects and assign values according to the following:

None	0
Low	1
Moderate	5
High	10

Step 2 – Multiply level of likelihood times consequences.

Step 3 – Use the value resulting in Step 2 to determine Risk Rating and Action as follows:

Value	Risk Rating	Action
0	None	Proceed as planned.
1-10	Low	Proceed as planned. Initiate control treatment on noxious weed populations that get established in the area.
25	Moderate	Develop preventative management measures for the proposed project to reduce the risk of introduction or spread of noxious weeds into the area. Preventative management measures should include modifying the project to include seeding the area to occupy disturbed sites with desirable species. Monitor area for at least 3 consecutive years and provide for control of newly established populations of noxious weeds and follow-up treatment for previously treated infestations.
50-100	High	Project must be modified to reduce risk level through preventative management measures, including seeding with desirable species to occupy disturbed sites and controlling existing infestations of noxious weed prior to project activity. Project must provide at least 5 consecutive years of monitoring. Projects must also provide for control of newly established populations of noxious weeds and follow-up treatment for previously treated infestations.