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Acronyms and Abbreviations

ACEC	Area of Critical Environmental Concern
ALS	Acetolactate synthase
APHIS	Animal and Plant Health Inspection Service
ARBO II	Aquatic Restoration Biological Opinion (2013)
ATP	Annual Treatment Plan
BA	Biological Assessment
BEE	With triclopyr, butoxyethyl ester
BO	Biological Opinion
BSS	Bureau Sensitive Species
BLM	Bureau of Land Management
CFR	Code of Federal Regulations
CX	Categorical Exclusion
DBH	Diameter at Breast Height
DR	Decision Record
EA	Environmental Assessment
EDRR	Early Detection Rapid Response
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FEIS	Final Environmental Impact Statement
FIFRA	Federal Insecticide Fungicide and Rodenticide Act
FLPMA	Federal Land Policy and Management Act
FONSI	Finding of No Significant Impact
FWS	U.S. Fish and Wildlife Service
GIS	Geographic Information System
HUC	Hydrologic Unit Code
HQ	Hazard Quotient
IARC	International Agency for Research on Cancer
IIPM	Integrated Invasive Plant Management EA (2018)
IPM	Integrated Pest Management
IPMAHR	Invasive Plant Management and Habitat Restoration EA (2023)
LD50	Lethal Dose to 50 percent of a population
LOAEL	Lowest Observed Adverse Effect Level
LOC	Level of Concern
NEPA	National Environmental Policy Act
NISIMS	National Invasive Species Information Management System
NMFS	National Marine Fisheries Service

NOAEL	No Observed Adverse Effect Level
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
ODA	Oregon Department of Agriculture
ODEQ	Oregon Department of Environmental Quality
ODFW	Oregon Department of Fish and Wildlife
ODOT	Oregon Department of Transportation
OWRD	Oregon Water Resources Department
pH	Potential of Hydrogen (measure of acidity)
PDF	Project Design Feature
PEIS	Programmatic Environmental Impact Statement
POEA	Polyoxyethyleneamine, a surfactant found in some glyphosate formulations
PUP	Pesticide Use Proposal
RfD	Reference Dose
RMP	Northwestern and Coastal Oregon Resource Management Plan
ROD	Record of Decision
RQ	Risk Quotient
SHPO	State Historic Preservation Office
SSS	Special Status Species
T&E	Threatened and Endangered
TEA	With triclopyr, triethylamine salt
WEW	West Eugene Wetlands Resource Management Plan

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CHAPTER 1. Introduction

The Bureau of Land Management (BLM) Northwest Oregon District (District) manages 714,700 acres in 14 counties. The *Invasive Plant Management and Habitat Restoration (IPMAHR) Environmental Assessment (EA)* project area includes all District BLM-administered lands in Benton, Clackamas, Clatsop, Columbia, Lincoln, Linn, Marion, Multnomah, Polk, Tillamook, Washington, and Yamhill Counties, most BLM-administered lands in Lane County, and a small portion of Douglas County.¹ Additionally, the IPMAHR EA project area includes land managed by BLM partners and, when requested or by permission, on lands adjacent to BLM. The District currently controls invasive weeds in accordance with the proposed action analyzed in the 2018 *Integrated Invasive Plant Management for the Northwest Oregon District (IIPM) EA*. Upon reaching a Finding of No Significant Impact (FONSI), the BLM selected the proposed action alternative in a 2019 Decision Record (DR).

The District proposes updating and revising its existing botany and invasive plant management program to protect, enhance, and restore native conditions in degraded habitats in a cost-effective and environmentally sound manner.

1.1. Background

Executive Order 13112 – *Invasive Species* (February 1999, as amended in December 2016) requires Federal agencies to “(i) prevent the introduction of invasive species; (ii) detect and respond rapidly to and control populations of such species in a cost-effective and environmentally sound manner; (iii) monitor invasive species populations accurately and reliably; [and] (iv) provide for restoration of native species and habitat conditions in ecosystems that have been invaded.” Additionally, the District Land Use Plans (LUP) prepared in accordance with the Federal Land and Policy Management Act of 1976 (FLPMA), the *Northwestern and Coastal Oregon Record of Decision and Resource Management Plan (RMP)* (USDI BLM 2016d: 80) and the *Resource Management Plan for the West Eugene Wetlands (WEW)* (USDI BLM 2015b: 24-25, 29), direct the District to implement measures to prevent, detect, and rapidly control new invasive plant infestations, and to use a variety of direct control methods to manage existing infestations.

The RMP directs the District to 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, and planting or

Invasive plants are non-native aggressive plants with either the potential to cause significant damage to native ecosystems, cause significant economic losses, or both.

Noxious weeds are a subset of invasive plants that are state or federally listed as injurious to public health, agriculture, recreation, wildlife, or any public or private property. Thus, the term “invasive plants” includes noxious weeds in this EA.

Special Status Species are plant and animal species that are either federally listed as endangered, threatened, or proposed under the Endangered Species Act (ESA) or Bureau Sensitive (managed to prevent future listing under the ESA).

¹ See the project’s interactive map available on the BLM’s National NEPA Register (ePlanning): DOI-BLM-ORWA-N000-2022-EA.

seeding native species (USDI BLM 2016d: 87); and to manage naturally occurring special habitats to maintain their ecological function (USDI BLM 2016d: 95).

Additionally, BLM's Special Status Species Management policy objectives are: 1) to conserve and/or recover Endangered Species Act (ESA)-listed species and the ecosystems upon which they depend so that ESA protections are no longer needed for these species, and 2) to initiate proactive conservation measures that reduce or eliminate threats to Bureau Sensitive Species (BSS) to minimize the likelihood of and need for listing these species under the ESA (USDI BLM 2008b, USDI BLM 2008).

The district botany and invasive plants program operates to prevent, treat, and monitor the spread of invasive plant infestations in project areas and roadsides. BLM botanists and weed specialists conduct invasive plant inventories, providing new invader early detection; manage invasive plants for infestation prevention across the landscape after wildfires; conduct restoration activities in special habitats such as meadows, wetlands, and Areas of Critical Environmental Concern (ACECs); and prioritize conservation and recovery of federally listed and Bureau Sensitive Species (BSS) and their habitats.

Invasive plants have harmful, adverse impacts on the structure, composition, and function of ecosystems, including native vegetation displacement; wildlife and livestock habitat and forage reduction; loss of federally listed and BSS populations and habitats; increased soil erosion; reduced water quality; reduced soil productivity; reduced wilderness and recreation values; and changes in the intensity and frequency of fires (USDI BLM 2010a: 7).

In 2018, the District updated its invasive plants program by preparing the IIPM EA, reaching a FONSI, and selecting alternative three in a December 17, 2019 Decision Record (USDI BLM 2019: 1 – 2). The U.S. Fish and Wildlife Service (FWS) issued a Biological Opinion (BO) in 2019 following BLM's section 7 consultation on the proposed action under the ESA. The unprecedented 2020 Labor Day fires resulted in the need to treat and prevent invasive plant infestations at a greater capacity than anticipated in the IIPM EA and subsequent consultation. To facilitate these treatments the BLM obtained a variance from the BO. During the process of determining increased acreage needs for the variance, an error was discovered in the IIPM EA that had been incorporated into the consultation and BLM's Biological Assessment (BA), and consequently written into the BO and DR.

The 2019 IIPM DR for the 2018 IIPM EA program limited herbicide treatments to 25 percent of total planned gross treatment acres. The 25 percent herbicide treatment limitation was an error because gross herbicide treatments in the 2019 Annual Treatment Plan (ATP), Table C-30 in Appendix C of the 2018 IIPM EA, were 75 percent of the total treatment acreage. Additionally, total percentage of herbicide treatments of all anticipated treatments across the District calculated from the Treatment Key,² Tables C-1 through C-27 in Appendix C of the 2018 IIPM EA, was 81.4

² The BLM developed the 2018 IIPM EA's Treatment Key using the best available scientific literature and informed by staff specialists to provide easily accessible IPM guidance for treatment prescriptions. The BLM has updated the Key for the IPMAHR EA based on experience implementing the IIPM EA and with additional recommendations from partners.

percent. The BLM determined, based on the program's implementation, that adherence to this 25 percent limitation does not follow the Treatment Key, is restrictive, costly, and less environmentally sound than basing treatment prescriptions on Integrated Pest Management (IPM) principles and specialist determination.

The BLM sought variances from the FWS's 2019 BO for the 2021 and 2022 ATP due to changed conditions and a deviation from the maximum acreage described in the Biological Opinion's Table 2. The deviation was necessary to address the 25 percent herbicide treatment limitation, as well as the needs to treat and prevent infestation spread following the 2020 Labor Day fires at a much greater capacity. The FWS granted variances for both years; however, the FWS granted the 2022 variance contingent upon the BLM updating and revising the 2018 IIPM EA and re-initiating section 7 consultation for the new proposed action.

1.2. Purpose and Need

The Purposes

The District proposes to update its existing botany and invasive plant management program to:

- Increase the District's invasive plant treatments up to 10,000 gross acres annually.
- Implement herbicide treatments using any of the active ingredients analyzed in the 2018 *Integrated Invasive Plant Management Environmental Analysis*.
- Increase the percentage of herbicide treatments on the District when warranted by conditions and as guided by application of IPM principles.
- Treat any vegetation, including native species, with herbicide to achieve habitat goals specified in the *Recovery Plan for the Prairie Species of Western Oregon and Southwestern Washington* (Recovery Plan) (USDI FWS 2010) and the *Interagency Conservation Agreement for Eucephalus vialis (Wayside Aster)* (Conservation Agreement) (USDI & USDA 2006).
- Implement prescribed fire treatments to achieve habitat goals specified in the Recovery Plan and Conservation Agreement.
- Augment selected Special Status plant species populations to meet recovery and conservation goals specified in the Recovery Plan and Conservation Agreement.
- Remove encroaching woody vegetation from meadows and connecting corridors.
- Treat any vegetation, including native species, with herbicide to achieve safety and operational objectives in administrative sites in accordance with the *Vegetation Treatments Using Herbicides on BLM Lands in Oregon Final Environmental Impact Statement Record of Decision* (USDI BLM 2010b).

The Need

The District needs to increase the herbicide treatment percentage because the current program does not control invasive plants across the District in a sufficiently cost-effective and environmentally sound manner. Unprecedented events such as the 2020 Labor Day fires have shown that planning treatments to control and prevent invasive plants with more flexibility than anticipated in the 2018 IIPM EA is necessary. Even under normal circumstances, contingency planning that includes multiple potential herbicide active ingredients is more effective than planning for one specific active ingredient. For example, this is the case when working with experienced partners making

on the ground judgment calls, or when conditions change between planning and treatments. Planning for contingencies necessitates overestimating treatment acres by counting the same acreages under multiple different treatment scenarios.

BLM needs to increase the total treatment acres because the District increased its regeneration harvests under the 2016 RMP. This harvest type creates a higher risk for weed invasion than thinnings due to the creation of early seral conditions that generalist weed species exploit. Post-fire conditions and subsequent salvage harvests also have a high risk of weed invasion for the same reasons. These harvests increase weed invasion and infestation risk unless BLM takes actions such as designating harvest exclusion areas around existing high priority infestations, competitive seeding and planting, and weed infestation treatments both prior to and following harvest. BLM expects regeneration harvests to increase 11 times the levels they were in the decade preceding the RMP, from 1,764 acres to 19,465 acres (Table 1) (Timber Sale Information System (TSIS) database; Chris Finn, Acting District Forester, pers. comm., 2022; Jay Bernards, Acting District Forester, pers. comm. 2023).

Table 1. Acres of thinning, regeneration, and salvage logging accomplished, planned, and estimated before and after 2016 RMP.

FY	Thinning	Regeneration	Salvage	Status
2007	5,055	224	109	Accomplished
2008	4,996	164	73	Accomplished
2009	3,607	173	47	Accomplished
2010	5,427	92	10	Accomplished
2011	2,536	24	0	Accomplished
2012	5,249	52	0	Accomplished
2013	6,280	87	0	Accomplished
2014	4,611	314	236	Accomplished
2015	5,074	240	84	Accomplished
2016	3,611	394	0	Accomplished
Total	46,446	1,764	559	48,769
2016 RMP In Effect				
2017	2,740	380	37	Accomplished
2018	2,960	302	98	Accomplished
2019	1,977	2,634	107	Accomplished
2020	2,118	1,784	3	Accomplished
2021	1,182	747	2,063	Accomplished
2022	650	940	2,864	Accomplished
2023	1,470	2,978	--	In progress
2024	1,629	3,700	--	Planned
2025	1,974	3,000	--	Estimated
2026	1,686	3,000	--	Estimated
Total	18,386	19,465	5,172	43,023

Directly increasing the proportion of District weed treatments supporting timber projects to match the increased regeneration harvests would increase treatments to greater than 23,100 gross acres per year.³ A direct proportionate increase in invasive plant treatment gross acreage is not necessary, however, because overall harvest acres are not increasing in the comparative time frames (ten years following the RMP as compared to ten years prior to the RMP); they are decreasing by 5,476 acres (11.8 percent). Although regeneration harvests increase the risk of weed invasion, the difference between infestation risk from thinning harvests and regeneration harvests is level of magnitude. Qualitatively, the weed invasion risk from thinning harvests is medium, while weed invasion risk from regeneration harvests is high. The BLM expects high risk of weed invasion on 24,637 acres and medium risk of invasion on 18,386 acres in the decade following the RMP. This is a higher proportion of high-risk conditions than were created under the previous RMP, which had harvests that created a high risk of weed invasion on 2,323 acres and medium risk of weed invasion on 46,446 acres in the ten years prior to the RMP.

The BLM also needs to increase treatments because the District expects generalist weed species to expand in range, and infestations to spread more rapidly due to climate change effects (Clements et al. 2014). Attempts to quantify the projected increase in total annual treatment acres needed are difficult due to complexities associated with predicting both climate change and invasive species spread. The BLM expects increased program and treatment effectiveness to reduce and minimize these effects; however, it is prudent to prepare for the maximum amount of invasive plant treatments the District could reasonably expect to implement. BLM staff estimate that 10,000 is likely to be the maximum amount of acreage the District could treat in one year.

The District botany and invasive plants program implements a variety of actions to restore, maintain, and enhance native plant communities and Special Status species habitats. The program would benefit from a larger suite of restoration tools. There is a need to enhance and augment native plant populations including selected Special Status species, remove encroaching woody vegetation from meadows, and to treat any vegetation with herbicide or prescribed fire to achieve habitat goals specified in the Recovery Plan and Conservation Agreement. These actions, taken to restore and otherwise mimic the historic fire regime, would enhance ongoing native plant and Special Status species habitat restoration efforts.

Western Oregon meadows, which support several of the BLM's Special Status plants, evolved with periodic fire disturbance. Fire suppression and exotic species introduction have altered and degraded western Oregon meadow plant communities, which are susceptible to shrub and conifer encroachment. Restoring fire to these ecosystems would set meadow plant community trajectories towards conditions closer to historic variability levels (USDI FWS 2010). BLM would use herbicide treatments to achieve habitat goals when conditions are not favorable to implement prescribed fire, or to otherwise enhance restoration actions. An example of using herbicide treatments to treat native plants as a restoration tool is to apply cut stump treatments following

³ The 2018 IIPM EA estimated the District would treat an average of 3,000 gross acres per year. Approximately 70% of invasive plant treatments on the District support timber-related projects. Directly proportionate increase is calculated based on multiplying 2,100 gross acres by 11.

manual or mechanical treatments of aggressive woody shrubs, such as native Nootka rose (*Rosa nutkana*) and cluster rose (*R. pisocarpa*), to prevent rapid regrowth and encroachment. BLM removes small diameter woody species via manual and mechanical methods such as pruning and brush-cutting; however, there are situations on the District where removal did not occur and encroaching trees in meadow perimeters and interiors are now mature. There is a need to remove trees up to 40" diameter at breast height (DBH) in meadows where they were historically absent while reserving snags and other wildlife trees, culturally important trees, and host trees for Special Status plants.

Specialist teams have identified implementable actions in cooperative interagency Recovery Plans, Conservation Strategies, and Conservation Agreements. The RMP directs the BLM to:

- 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 (p. 87).
- Manage ESA-listed species consistent with recovery plans, conservation agreements, species management plans, and designated critical habitat, and species-specific or project-specific conservation measures developed with the U.S. Fish and Wildlife Service, including the protection and restoration of habitat, altering the type, timing, and intensity of actions, and implementing other strategies designed to recover populations of species (p. 87).
- Create new and augment existing populations of ESA-listed, proposed, and candidate plant species and Bureau Sensitive plant and fungi species to meet recovery plan or conservation strategy objectives (p. 88).

The Recovery Plan identifies several actions, including population augmentation, prescribed burns, and woody species management by removal and cut stump herbicide treatments, that are needed to preserve, restore, and manage populations and habitat of federally endangered Fender's blue butterfly (*Icaricia icarioides fenderi*) and Willamette daisy (*Erigeron decumbens*); federally threatened Kincaid's lupine (*Lupinus oreganus* var. *kincaidii*), Nelson's checkermallow (*Sidalcea nelsoniana*), recently delisted Bradshaw's lomatium (*Lomatium bradshawii*); and to reintroduce the recently delisted golden paintbrush (*Castilleja levisecta*) to its historical range in the Willamette Valley (USDI FWS 2010). That document identifies recovery actions to benefit Bureau Sensitive Willamette Valley larkspur (*Delphinium nuttallii* ssp. *nuttallii*), shaggy horkelia (*Horkelia congesta* ssp. *congesta*), white-topped aster (*Sericocarpus rigidus*), and Hitchcock's blue-eyed grass (*Sisyrinchium hitchcockii*); as well as two larkspurs formerly considered Bureau Sensitive: pale larkspur (*Delphinium nuttallii* ssp. *ochroleucum*) and peacock larkspur (*Delphinium pavonaceum*).

Succession and fire exclusion are also identified as threats to Bureau Sensitive wayside aster (*Eucephalus vialis*) in the Conservation Agreement, although that document does not specifically identify recovery actions (USDA and USDI 2006).

Finally, there is a need to treat native vegetation at administrative sites to maintain and protect developed infrastructure to meet the District’s directive to “manage constructed facilities and infrastructure, such as seed orchards, roads, communication sites, quarries, buildings, and maintenance yards, as needed for the purposes for which the BLM constructed them” (USDI BLM 2016d, p. 56). For example, BLM would remove plants that are compromising the structural integrity of buildings, sidewalks, and other paved surfaces. The District Office in Salem hosts a power-generating solar array that requires maintenance of bare rock, non-vegetated ground. For these reasons, BLM needs to treat native and non-native plants with herbicide at administrative sites located outside of, and separate from, the wildland environment.

1.3. Scoping

1.3.1. Internal Scoping

The District Botanist, Wildlife Biologist, and Planner presented a briefing paper to the Northwest Oregon District Leadership Team (DLT) on July 1, 2021, explaining the permitted herbicide treatment limit error in the 2018-19 IIPM EA/FONSI and DR, which included a discussion on program background and lessons learned, potential alternatives, and a recommendation for moving forward. The DLT agreed with District specialists’ recommendation to prepare a new EA to correct the 25 percent herbicide treatment limit error, which would provide the botany and invasive species program greater implementation flexibility and efficacy.

The BLM assembled an interdisciplinary team (IDT) to formally begin the proposed project analysis in January 2022. The IDT identified issues for analysis based on the 2016 RMP management direction for natural resources management, along with other relevant legal and policy requirements. Project proposal items identified through internal scoping are:

- Increase ATPs from 2-6,000 gross acres up to 10,000 gross acres for all invasive plant treatments, removing the requirement that treatment plans adhere to a delineated proportion of treatment types.
- Add five restoration components:
 - prescribed fire on native plant species
 - herbicide use on native plant species
 - Special Status species plant population augmentation
 - removal of encroaching woody species including trees up to 40” DBH
 - container plantings up to one gallon in size
- Add treatment of any vegetation, including native vegetation, to meet safety and operational objectives at administrative sites.
- Augment populations of selected Special Status plant species to meet recovery goals specified in approved Recovery Plans, Conservation Strategies, or Conservation Agreements for federally listed or other Special Status species.
- Treat any vegetation, including native species, to meet safety and operation objectives in powerline corridor rights-of-way and administrative sites in accordance with the ROD for the *Vegetation Treatments Using Herbicides on BLM Lands in Oregon Final Environmental Impact Statement* (2010 Oregon FEIS) (USDI BLM 2010a). This Need was subsequently dropped from the EA, see alternatives considered but not analyzed in detail.

1.3.2. Public Scoping

The District provided two 30-day public scoping periods and requested comments on the proposed action. The BLM emailed a public scoping notice to the interested publics list, including 142 individuals, businesses, and agencies, on May 16, 2022. The District provided an additional public scoping opportunity on August 9, 2022. These public scoping notices were also available on the BLM National NEPA Register (ePlanning). The District did not receive any comments during public scoping.

1.4. Consultation

1.4.1. Tribes

The District sent letters on May 13, 2022, to the Confederated Tribes of Warm Springs; Confederated Tribes of the Coos, Lower Umpqua, and Siuslaw Indian; Confederated Tribes of Siletz Indians; and Confederated Tribes of Grand Ronde requesting initiation of consultation on the proposed IPMAHR project “because consultation helps inform our NEPA process and leads to better decision-making.” The District informed the Tribes the most effective way to participate would be to respond by June 15, 2022.

On August 9, 2022, the District sent a second letter to the Tribes to inform them that two additional Needs for the project were added to the EA and that the District was providing them an additional opportunity for input on the proposed project. The District also informed the Tribes of their interest in hearing how the current herbicide application notification process and interactive map on the BLM National NEPA Register (ePlanning) was working for Tribal members. While formal responses were not received from the Tribes, the BLM received positive feedback regarding the interactive map during the annual consultation meeting with the Confederated Tribes of Grand Ronde on May 11, 2023.

1.4.2. 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), the BLM would consult with the State Historic Preservation Office (SHPO) 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 BLM meets its responsibilities under the National Historic Preservation Act and the National Programmatic Agreement among the BLM, the Advisory Council on Historic Preservation, and the National Conference of State Historic Preservation Officers (Oregon SHPO and USDI 2015). A cultural resource specialist would review proposed treatments to determine whether fieldwork is required to identify cultural resources and if additional protection measures would be needed. A qualified archaeologist would survey all units where fire is prescribed prior to implementation, and any cultural resource sites identified during surveys would be avoided.

1.4.3. Endangered Species Act

The District has 18 federally listed species that are known or have potential to occur within the proposed action area (see Table 2).

Table 2. Federally listed species within the Northwest Oregon District

Taxon	Common Name	Scientific Name	Population	Status	Documented or Suspected
Plant	Willamette daisy	<i>Erigeron decumbens</i> var. <i>decumbens</i>		Endangered	Documented
Plant	Kincaid's lupine	<i>Lupinus oreganus</i>		Threatened	Documented
Plant	Nelson's checkermallow	<i>Sidalcea nelsoniana</i>		Threatened	Documented
Anadromous Fish	Coho salmon	<i>Oncorhynchus kisutch</i>	Oregon Coast, Lower Columbia River	Threatened	Documented
Anadromous Fish	steelhead	<i>Oncorhynchus mykiss</i>	Upper Willamette River, Lower Columbia River	Threatened	Documented
Anadromous Fish	Chinook salmon	<i>Oncorhynchus tshawytscha</i>	Upper Willamette River, Lower Columbia River	Threatened	Documented
Anadromous Fish	Pacific eulachon	<i>Thaleichthys pacificus</i>	Southern	Threatened	Suspected
Anadromous Fish	Green Sturgeon	<i>Acipenser medirostris</i>	Southern DPS	Threatened	Suspected
Resident Fish	bull trout	<i>Salvelinus confluentus</i>	All	Threatened	Documented
Insect	Fender's blue butterfly	<i>Plebejus icarioides fenderi</i>	Oak Basin Prairie ACEC, Kelly Creek Timber Sale (2014), Low Down Timber Sale (2014), West Eugene Wetlands	Threatened	Documented
Insect	Taylor's checkerspot butterfly	<i>Euphydryas editha taylori</i>	Habitat present in Oak Basin Prairie ACEC and West Eugene Wetlands; Voucher specimen from West Eugene Wetlands (1940)	Endangered	Suspected
Insect	Oregon silverspot butterfly	<i>Speyeria zerene hippolyta</i>	No known sites but working on reintroduction at Yaquina Lighthouse in coordination with the FWS.	Threatened	Suspected
Bird	streaked horned lark	<i>Eremophila alpestris strigata</i>	Two records of observations (2013) in the West Eugene Wetlands (GeoBOB 2023).	Threatened	Documented
Bird	northern spotted owl	<i>Strix occidentalis caurina</i>	Known sites located in mature and structurally complex forest throughout	Threatened	Documented

Taxon	Common Name	Scientific Name	Population	Status	Documented or Suspected
			the NWOD.		
Bird	marbled murrelet	<i>Brachyramphus marmoratus</i>	Occupied sites located in structurally complex forests in the North Coast Planning Province of the NWOD.	Threatened	Documented
Mammal	gray wolf	<i>Canis lupus</i>	No known Areas of Known Wolf Activity (ODFW 2022) in the action area	Endangered	Documented
Mammal	Pacific marten Coastal DPS	<i>Martes caurina</i>	Extant populations within central coastal Oregon do not occur on BLM-managed lands on the NWOD. However, the extant population along the central coast may expand into the NWOD.	Threatened	Suspected

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

Table 3. Endangered Species Act consultation.

Program / Biological Assessment	Agency / Area	Year	Consultation
<i>Vegetation Treatments Using Herbicides on BLM Lands in 17 Western States Programmatic Environmental Impact Statement</i> (USDI BLM 2007a) <i>Vegetation Treatments on BLM Lands in 17 Western States Programmatic Environmental Report</i> (USDI BLM 2007d) <i>Vegetation Treatments on BLM Lands in 17 Western States Biological Assessment</i> (USDI BLM 2007c)	BLM – 17 Western States	2007	FWS Letter of Concurrence (Reference: FWS/AES/DCHRS/027171)
<i>Vegetation Treatments Using Herbicides on BLM Lands in Oregon Environmental Impact Statement</i> (USDI BLM 2010a) <i>Vegetation Treatments on BLM Lands in 17 Western States Biological Assessment</i> (USDI BLM 2007c)	BLM - Oregon	2010	FWS Letter of Concurrence (TAILS Number: 13420-2010-I-0173)
<i>Biological Assessment for the Resource Management Plan for the West Eugene Wetlands in Lane County, Oregon on the US BLM – Eugene District</i> (USDI BLM 2014)	BLM - West Eugene Wetlands	2014	Biological Opinion (FWS) (Reference: 01EOW00-2014-F-0139)

Program / Biological Assessment	Agency / Area	Year	Consultation
<i>Biological Assessment (USDI BLM 2015d) for Vegetation Treatments Using Aminopyralid, Fluroxypyr, and Rimsulfuron Programmatic Environmental Impact Statement (USDI BLM 2016a)</i>	BLM – 17 Western States	2015 / 2016	FWS Letter of Concurrence (Reference: FWS/AES/DER/BCH/061446; 09E30000-2014-I-0001)
<i>Biological Assessment (USDI BLM 2019) for Integrated Invasive Plant Management for the Northwest Oregon District of the Bureau of Land Management (USDI BLM 2018)</i>	BLM – NW Oregon District	2018 / 2019	Biological Opinion (FWS) (Reference: 01EOFW00-2019-F-0299)
<i>Biological Assessment (USDI BLM 2023) for Integrated Invasive Plant Management for the Northwest Oregon District of the Bureau of Land Management (USDI BLM 2023)</i>	BLM – NW Oregon District	2023	Biological Opinion (FWS) (Reference: xxxxxxxxxxxxxxxxx)
<i>Endangered Species Act Section 7(a)(2) Programmatic Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for Integrated Invasive Plant Management for the Northwest Oregon District, Bureau of Land Management</i>	BLM – NW Oregon District	2019	Biological Opinion (NMFS. WCRO-2019-00059)

Endangered Species Act consultation with U.S. Fish and Wildlife Service occurred at the national level with the 2007 and 2016 Programmatic Environmental Impact Statements (PEISs) and at the Oregon level with the 2010 Oregon FEIS.

For the 2007 PEIS, the BLM consulted with the U.S. Fish and Wildlife Service as required under Section 7 of the Endangered Species Act. The BLM prepared the Biological Assessment for Vegetation Treatments on Bureau of Land Management Lands in 17 Western States (USDI BLM 2007c), with a determination of “may affect, not likely to adversely affect” federally listed species. That Biological Assessment evaluated the likely impacts to federally listed species, species proposed for listing, and critical habitats from the proposed use of herbicides and other treatment methods and identified management practices to minimize impacts to these species and habitats.

The U.S. Fish and Wildlife Service issued a Letter of Concurrence that the proposed action as described in the 2007 PEIS and Biological Assessment, with all Standard Operating Procedures and PEIS Mitigation Measures, would not likely adversely affect any federally listed species under the jurisdiction of the U.S. Fish and Wildlife Service. In addition, the U.S. Fish and Wildlife Service recognized that any future site-specific actions carried out under the PEIS would undergo additional consultation as appropriate (USDI FWS 2006 in USDI BLM 2007b, Appendix C). In 2010, the U.S. Fish and Wildlife Service reviewed the 2010 Oregon FEIS and 2007 Biological Assessment (USDI BLM 2007c) and issued a similar Letter of Concurrence (USDI FWS 2010 in USDI BLM 2010b, Attachment C). In 2016, after reviewing the 2016 PEIS and Biological

Assessment, the U.S. Fish and Wildlife Service issued a similar Letter of Concurrence (USDI FWS 2015 in USDI BLM 2016b).

In 2014, the BLM consulted with the U.S. Fish and Wildlife Service regarding management of the West Eugene Wetlands to contribute to the recovery of federally listed species while providing other benefits, particularly water quality enhancement, and storm water and flood control, habitat for native plant and animal communities, and recreation and environmental education opportunities to the extent compatible with threatened and endangered species management. This includes invasive plant treatments with herbicides (clopyralid, glyphosate, triclopyr, and limited amounts of fluazifop-p-butyl and aminopyralid) to allow for habitat enhancement and restoration. The U.S. Fish and Wildlife Service issued a Biological Opinion (2014) that determined that the proposed action was not likely to jeopardize the continued existence nor adversely modify the critical habitat of any of the listed species present in the West Eugene Wetlands (Fender's blue butterfly, Taylor's checkerspot butterfly, streaked horned lark, Willamette daisy, Kincaid's lupine, and Bradshaw's lomatium) (USDI 2014, p. 104).

1.5. Issues

1.5.1. Issues Analyzed in Detail

Issue 1 (Botany) How would the proposed treatments, including herbicide, manual, mechanical, cultural, and biological, and prescribed fire (limited to invasive plants), affect desirable plant communities and Special Status plants?

Issue 2 (Botany) How would the proposed treatments, including herbicide, manual, mechanical, cultural, and biological, and prescribed fire (limited to invasive plants) affect the rate of spread of invasive species?

Issue 3 (Botany) What are the effects of prescribed fire, tree removal, and container plantings on desirable plant communities, including federally listed plants and Bureau Sensitive plants and fungi?

Issue 4 (Botany) How would augmenting Recovery Plan and Conservation Agreement plant species under the alternatives impact the habitat and recovery of these species?

Issue 5 (Fisheries) How would aquatic manual/mechanical treatments affect BSS and ESA listed fish?

1.5.2. Issues Not Analyzed in Detail

BLM identified several issues during internal and external scoping for the IPMAHR EA that it did not analyze in detail. See **Appendix H** for the BLM's rationale for not analyzing each of these issues in detail.

INAID #1 (Air Quality) How would prescribed fire treatments affect air quality?

INAID #2 (Climate Change) How would the proposed prescribed burn treatments affect climate change, including greenhouse gas emissions, and carbon storage?

INAID #3 (Cultural and Traditional Resources) How would prescribed fire treatments affect cultural resources?

INAID #4 (Cultural) How would manual, mechanical, biological, mulching, rare plant augmentation and competitive seeding affect cultural resource sites?

INAID #5 (Cultural) How would herbicide treatments including Early Detection Rapid Response (EDRR) and aquatic affect traditional plant populations or native plant use?

INAID #6 (Fisheries) How would aquatic and terrestrial herbicide treatments affect Bureau Special Status Species including ESA listed fish and aquatic species?

INAID #7 (Fisheries) How would targeted grazing in Riparian Reserves affect BSS and ESA listed species?

INAID #8 (Fisheries) How would native plant restoration treatments using prescribed fire and felling of large trees affect BSS and ESA listed aquatic species?

INAID #9 (Fuels) How would the use of prescribed fire and commercial removal of encroaching trees into meadows (up to 40 inches DBH) affect Fire Hazard in the Wildland Developed Area (WDA)?

INAID #10 (Human Health) What are the effects to human health from incidentally coming into contact with herbicides used on BLM- administered lands?

INAID #11 (Human Health) What are the hazards to workers treating invasive plants mechanically, manually, and with herbicides?

INAID #12 (Hydrology) How would prescribed fires implemented across a landscape, including within riparian areas, affect stream form and function?

INAID #13 (Recreation) How would manual, mechanical, herbicide and prescribed fire treatments of invasive plants affect the management and use of recreation management areas?

INAID #14 (Soils) How would the proposed herbicide treatments affect soils productivity?

INAID #15 (Soils) How would the proposed prescribed fire treatments affect soil productivity?

INAID #16 (Visual Resource Management) What are the potential impacts from the project on the Visual Resource Management Classes?

INAID #17 (Water Quality) How would treating any riparian vegetation affect stream side shade cover and stream temperature?

INAID #18 (Water Quality) How would treating terrestrial weeds with herbicides affect water quality, including ground and surface water used for domestic and municipal supply?

INAID #19 (Water Quality) How would treating aquatic invasive plants with herbicides affect water quality?

INAID #20 (Water Quality) How does erosion and runoff from upland manual and biological vegetation treatments affect water quality?

INAID #21 (Wildlife) How would herbicides affect terrestrial wildlife species, including Bureau Sensitive Species?

INAID #22 (Wildlife) How would treatments affect terrestrial Special Status Species?

INAID #23 (Wildlife) How would prescribed fire affect Wildlife, including ESA Listed Species and Bureau Sensitive Species?

INAID #24 (Wildlife) How would mechanical and manual treatments affect Wildlife, including ESA Listed Species and Bureau Sensitive Species?

INAID #25 (Wildlife) How would biological treatments affect Wildlife, including ESA Listed Species and Bureau Sensitive Species?

INAID #26 (Wilderness) What are the potential impacts from the project on the Wilderness characteristics as defined in the Wilderness Act of 1964 (Public Law 88-577 [16 U.S.C. 1131-1136])?

INAID #27 (Wild and Scenic Rivers) How would manual, mechanical, cultural, biological, and herbicide invasive plant treatments; native and invasive plant prescribed fire treatments; and management, augmentation, and removal of encroaching native plants in desirable plant communities in special habitats affect the water quality, free-flowing condition, and botany/ecology, cultural/historic, fish/fisheries, geology, recreation, scenic, and wildlife outstandingly remarkable values of designated, suitable, and eligible wild and scenic rivers?

1.6. Tiering and Reference

Tiering refers to the coverage of general matters in broader environmental impact statements with subsequent narrower statements or other environmental analyses. Tiering allows agencies to narrow the range of alternatives, narrow the scope of analysis, and reach a FONSI for an action that may have significant impacts. This allows incorporation by reference of the general discussions to concentrate solely on the issues specific to the statement subsequently prepared (40 CFR 1508.28).

For its analysis of herbicide effects, the IPMAHR EA tiers to three environmental impact statements (EISs), all completed at the state or national level. The IPMAHR EA tiers to the 2007 PEIS for Vegetation Treatments Using Herbicides on BLM Lands in 17 Western States DOI-BLM-WO-WO2100-2007-0002-EIS (USDI BLM 2007a) for the use of chlorsulfuron (west of the Cascades) and diflufenzopyr. In addition, the IPMAHR EA tiers to the 2016 PEIS for Vegetation Treatments Using Aminopyralid, Fluroxypyr, and Rimsulfuron DOI-BLM-WO-WO2100-2012-0002-EIS (USDI BLM 2016a), for the use of those three herbicides. For the remaining herbicides

analyzed in this EA, the IPMAHR EA tiers to the 2010 Final Environmental Impact Statement for Vegetation Treatments Using Herbicides on BLM Lands in Oregon DOI-BLM-ORWA-0000-2008-0001-EIS (USDI BLM 2010a). The 2010 Record of Decision for the Oregon FEIS (USDI BLM 2010b) requires, with few specific exceptions, the preparation of new site-specific analyses before the use of herbicides other than 2,4-D, dicamba, glyphosate, or picloram and these analyses must be tiered to the 2010 Oregon FEIS (USDI BLM 2010b: 9). This EA provides the site-specific analysis for the District. The alternatives (including the No Action Alternative) must incorporate protection measures described in the three EISs (USDI BLM 2010b: 30) including:

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

The BLM has included Mitigation Measures, Standard Operating Procedures, and Conservation Measures adopted with the RODs for these three EISs (USDI BLM 2007b, 2010b, and 2016b in **Appendix E** of this EA. Actions in the IPMAHR EA are designed to be consistent with the actions authorized in the RODs for these three EISs (USDI BLM 2007b, 2010b, and 2016b).

For non-herbicide treatments, the IPMAHR EA tiers to the *Northwest Area Noxious Weed Control Program Final EIS and Supplement* (USDI BLM 1985, 1987a) and is consistent with the actions authorized in its Record of Decision (USDI BLM 1987b). This EA also incorporates by reference the 2021 *Northwest Oregon District Manual and Mechanical Invasive Plant Control Categorical Exclusion*, DOI-BLM-ORWA-N000-2022-0001-CX and elements of the 2007 *Vegetation Treatments on BLM Lands in 17 Western States Programmatic Environmental Report* (PER), which describes the integrated vegetation management program and discloses the general effects associated with non-herbicide control methods (USDI BLM 2007d). This report is a companion to the 2007 *Vegetation Treatments on BLM Lands in 17 Western States Programmatic Environmental Impact Statement* (EIS) (USDI BLM 2007a) and can be found on the BLM's National NEPA Register (ePlanning) page for that document: DOI-BLM-WO-WO2100-2007-0002-EIS.

In addition, **Issue 2** in Chapter 3 and INAIDs **#1**, **#2**, **#9**, and **#15** in **Appendix H**, tier to the analyses in the Proposed RMP and FEIS for RMPs for Western Oregon (USDI BLM 2016c) or the PRMP and FEIS for the BLM West Eugene Wetlands RMP (USDI BLM 2015a).

1.7. Conformance and Consistency with Laws, Regulations, Executive Orders, Policies, Land Use Plans, and Implementation-level Decisions

The BLM's integrated invasive plant management program is the product of decades of laws, executive orders, along with BLM and Department of the Interior policies and direction. Federal laws direct the BLM to manage invasive plants and other vegetation to improve ecosystem health. Section 302(b) of FLPMA directs BLM to "take any action necessary to prevent unnecessary or undue degradation of the lands" (43 U.S.C. 732(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 federally managed lands. The Federal Noxious Weed Act of 1974 (7 U.S.C. 2814(a)) established a program to manage undesirable plants, implemented cooperative agreements with State agencies, and established integrated management systems to control undesirable plant species.

1.7.1. Resource Management Plans on the Northwestern Oregon District

The FLPMA’s implementing regulations require that all management decisions be consistent with the approved land use plan (43 CFR 1610.5-3). Management activities on the District are covered by two RMPs: the Northwestern and Coastal Oregon RMP and ROD (USDI BLM 2016d) and the West Eugene Wetlands RMP and ROD (USDI BLM 2015b). The RMP for Northwestern and Coastal Oregon (USDI 2016d: 80) directs the District to:

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

The RMP for the West Eugene Wetlands (USDI BLM 2015b: 24-25) directs the District to:

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

1.7.2. Northwestern and Coastal Oregon Resource Management Plan

The Northwestern and Coastal Oregon RMP provides management direction and objectives for the management of all resources on BLM-administered lands in the Northwest Oregon District, Coos Bay District, and the Roseburg District’s Swiftwater Field Office. The actions proposed in this EA conform with the management direction of this RMP. BLM has included management objectives and direction related to invasive plant management in the Invasive Species section of the RMP (USDI BLM 2016d: 80). Additional management objectives and direction applicable to the program can be found in the Land Use Allocations – Congressionally Reserved Lands and

National Conservation Lands (USDI BLM 2016d: 55-56), District-Designated Reserve – Areas of Critical Environmental Concern (USDI BLM 2016d: 57), District Designated Reserve – Lands Managed for their Wilderness Characteristics (USDI BLM 2016d: 58), Riparian Reserves (USDI BLM 2016d: 68), Hydrology (USDI BLM 2016d: 79), Rare Plants and Fungi (USDI BLM 2016d: 86), Soil Resources (USDI BLM 2016d: 89-90), Visual Resources Management (USDI BLM 2016d: 93-94), and Wildlife (USDI BLM 2016d: 95) sections.

1.7.3. West Eugene Wetlands Resource Management Plan

The West Eugene Wetlands includes 1,340 acres of BLM-administered lands in the Siuslaw Field Office that the BLM primarily manages for ESA listed species recovery contributions. The actions proposed in this EA conform with the West Eugene Wetlands RMP (USDI BLM 2015b) management direction. This EA tiers to the BLM's West Eugene Wetlands RMP (USDI BLM 2015b) PRMP and FEIS (USDI BLM 2015a). The action alternative perpetuates the availability of these herbicides for treating non-native, invasive plants in the West Eugene Wetlands (Chapter 3). The BLM assigned the BLM-administered lands within the West Eugene Wetlands planning area to one of two land use allocations: Prairie Restoration Areas or Natural Maintenance Areas. BLM directs herbicide use in these areas for managing noxious weeds, non-native invasive plants, and aggressive native plants, allowing for habitat restoration, maintenance, and enhancement. The West Eugene Wetlands RMP directs herbicide use on native plants to achieve habitat goals identified as part of recovery or delisting or for Special Status species conservation management as identified in the Recovery Plan. The 2015 West Eugene Wetlands RMP PRMP and FEIS tiers to the 2010 Oregon FEIS for its herbicide use. BLM included management objectives and direction related to invasive plant management in the RMP's Prairie Restoration Area, Natural Maintenance Area, and Plants sections (USDI BLM 2015b: 24-25). The IPMAHR EA and associated decision would not restrict treatments currently available under the West Eugene Wetlands RMP/ROD. However, it would make additional herbicide active ingredients available for West Eugene Wetlands use.

1.7.4. Implementation Level Decisions

While there are other management plans on the District, the 2018 IIPM EA, the 2021 *Northwest Oregon District Manual and Mechanical Invasive Plant Control Categorical Exclusion* the above-described RMPs, and the Sandy Wild and Scenic River and State Scenic Waterway Management Plan are the only plans specifically addressing or constraining the District's invasive plant management program.

1.7.5. Sandy Wild and Scenic River and State Scenic Waterway Management Plan

The Sandy Wild and Scenic River and State Scenic Waterway Management Plan (USDI BLM 1993) is a framework for cooperatively managing the Sandy River's 12.5-mile section from Dodge Park to Dabney State Park. This river section includes 3.8 miles classified as a Scenic River and 8.7 miles classified as a Recreational River. The BLM and the Oregon State Parks and Recreation Department developed this Plan together. The Plan prohibited pesticide use in federally managed lands in riparian zones. The Plan did not describe specific invasive plant direction. The 2018-19 IIPM EA/FONSI and DR changed this management plan to authorize the use of herbicides on

federally managed lands in riparian zones, allowing for effective treatment of invasive riparian plants such as knotweed species. This project would retain this authority.

CHAPTER 2. ALTERNATIVES

This chapter describes three alternatives: Alternative A, the No Action alternative; Alternative B, the Proposed Action alternative, and Alternative C, the Reference alternative. These are the alternatives addressed in the effects analysis in Chapter 3. This chapter also describes an alternative that the District considered but eliminated from detailed analysis. The Proposed Action alternative addresses the dynamic nature of invasive plants, including increasing numbers of invasive plant species and changing infestation conditions. Invasive plant control is an ongoing need due to their rapid growth and abundance, the land base size involved, and the nature of multiple uses occurring on the landscape. The District's intent is to manage invasive plants to minimize adverse ecological and economic effects. Table 9, *Alternatives comparison*, shows the Proposed Action treatment methods compared to the No Action and Reference Analysis alternatives.

Alternative C would increase the Annual Treatment Plan's herbicide treatments to 55 percent of total treatments, approximating a percentage midway between Alternatives A and C; however, this alternative would not meet the District's need to increase invasive plant treatments to up to 10,000 gross acres annually, nor would it follow the Treatment Key. Alternative C is therefore considered a Reference Alternative.

Alternatives B and C include meadow restoration actions that would enhance the District's ability to restore and maintain habitat for Recovery Plan species and wayside aster.

The 2010 Oregon FEIS, to which this EA tiers, considered three action alternatives, as well as a reference analysis which described the effects of not using herbicides on BLM-administered lands. The Proposed Action alternative in this EA is like Alternative 4 in the 2010 Oregon FEIS. The 2007 PEIS, to which this EA and the 2010 Oregon FEIS tiers, considered four action alternatives. Both EISs considered numerous alternatives not analyzed in detail. The 2016 PEIS, to which this EA tiers, considered three action alternatives.

This EA does not address invasive plant management programs on the Horning Seed Orchard (Cascades Field Office) or Tyrrell Seed Orchard (Siuslaw Field Office). Invasive plant management for these seed orchards is addressed in separate integrated pest management analyses, the 2020 Horning and Tyrrell Seed Orchards Integrated Pest Management Plan EA/FONSI and DR, found on BLM's National NEPA register (ePlanning): DOI-BLM-ORWA-N000-2019-0005-EA.

Further information about the invasive plants on the District and the locations of these plants can be found in the interactive map on BLM's National NEPA Register (ePlanning): DOI-BLM-ORWA-N000-2022-0003-EA.

2.1. Alternative A – No Action Alternative

Under the No Action alternative, the District would continue treating weeds using the parameters established in the 2018 IIPM EA/FONSI and DR. The 2019 DR for the 2018 EA limits the District treatments to 6,000 gross treatment acres annually and 25 percent herbicide treatments. Table 4 lists the maximum gross acres allowed for each treatment type under the current biological opinion.

Table 4. 2018 EA gross treatment acres.

Treatment Type	Gross Acres
Herbicide	
Aminopyralid	390
Glyphosate	150
Imazapyr	150
Triclopyr	345
Other herbicides	330
Non-herbicide	
Manual	2,250
Mechanical	2,025
Other methods	225

The District would continue implementing restoration actions targeting non-native, invasive plant species in meadows and prairies. Habitat restoration actions would not include treating native species with herbicide or using prescribed fire. Encroaching large tree removal and container planting would only occur under existing or other project-level NEPA analyses. Rare plant population augmentation would only occur for plants already covered under existing or other project NEPA.

2.2. Alternative B – Proposed Action

Under the Proposed Action, Alternative B, the District would treat invasive plants in the most cost-effective and environmentally sound manner possible. The District would adhere to IPM principles, tailoring treatments to the target species or plant community and increasing efficiency and treatment efficacy. The District would treat up to 10,000 gross acres annually using the most effective treatment options according to the Treatment Key (**Appendix A**) and specialist determination. The Treatment Key indicates that a theoretical treatment plan addressing all infestations across the District at the percentages anticipated in the Key would result in 82 percent herbicide treatments and 18 percent non-herbicide treatments. This comports with the 2018 Treatment Key which anticipated 81 percent herbicide treatments across the District. The District would develop ATPs allowing the BLM and its partners to implement treatments using appropriate methods for any given plant community composition, using optimal treatment timing windows and other practical considerations. The BLM would authorize treatments for weed infestations that spread or expand from currently mapped source populations. The BLM would authorize treatments for EDRR designated weeds following public and Tribal notification.

The Treatment Key (**Appendix A**) shows how the District would treat invasive plants under this alternative. The Treatment Key provides guidelines for treating invasive species functional groups under ideal conditions. Actual conditions may require variation from ideal treatment types for a

variety of reasons such as plant community composition, herbicide and applicator availability, weather, and timing considerations. Additionally, BLM would update the Treatment Key periodically in response to effectiveness monitoring, new information, and new technologies. The Treatment Key lumps similar species into functional species groups (e.g., the biennial thistles species group would have different treatment options than the perennial grasses species group). In addition to treatments shown in the Treatment Key, the District would continue using competitive seeding and planting, and other methods of preventing invasive plant introduction, spread, and infestations.

Under the Proposed Action, the District would treat Special Status plant and animal species habitats with a larger suite of restoration tools to achieve habitat goals for the Special Status plants and pollinators described in the Recovery Plan and Conservation Agreement. These would include the following treatments, collectively referred to hereafter as meadow restoration actions:

- Prescribed fire treatments
- Remove encroaching woody vegetation, including trees up to, but less than 40" DBH
- Selective herbicide treatments to control encroaching native plant species
- Special Status plant augmentation of Recovery Plan species and wayside aster
- Augmenting native plant populations with container planting where needed

2.2.1. Prescribed Fire

BLM would implement prescribed fire to achieve habitat goals specified in the Recovery Plan and Conservation Agreement as well as provide the greatest ecological benefit, given the native and non-native plant species composition of the site, moisture regime (dry, moist, or wet meadows), and presence or absence of Special Status pollinator species. The BLM would only implement prescribed fire on 25-30 percent of habitat occupied by Special Status pollinators. Prescribed fire treatments would be subject to timing restrictions to avoid critical life cycle stages for Threatened and Endangered Recovery Plan species (Table 5).

Table 5. Species-specific timing for prescribed fire at federally listed and occupied plant and pollinator sites*

Listed Species	Prescribed Fire
Kincaid's lupine	Implementation after August 15
Nelson's checkermallow	Fall burns after August 15; up to 50% of an occupied area
Willamette daisy	Implementation after August 15
Fender's blue butterfly	Implementation on 25-33% of an occupied area** from August 15-November 15
Oregon silverspot butterfly	Implementation on 25-33% of an occupied area** from October 1-July 15
Taylor's checkerspot butterfly	Implementation on 25-33% of an occupied area** during diapause only September 10-February 15

* Meadows that have been identified as potential habitat would not be subject to timing restrictions until and unless they become occupied by one or more Recovery Plan species.

** Prescribed fire would be implemented on 25% of occupied site with fewer than 100 individuals and 33% of occupied sites with 100 or more individuals.

Prescribed fire implemented in occupied habitat of pale larkspur, Willamette Valley larkspur, peacock larkspur, shaggy horkelia, white-topped aster, Hitchcock's blue-eyed grass, golden paintbrush, Bradshaw's lomatium, and wayside aster would similarly be timed after August 15, as most of these species flower and set seed earlier or at a similar time of year as the federally listed species in Table 8. White-topped aster continues producing seed through the month of August but reproduction for that species is mostly vegetative (USDI FWS 2010).

2.2.2. Encroaching woody vegetation reduction

The BLM would reduce the encroachment of meadows by native woody species (Figure 1). This would be accomplished either by converting encroaching woody species to wildlife habitat as snags, downed wood, or piles, or the BLM would chip or burn encroaching woody species to add carbon to the soil, which aids in weed suppression. The BLM would consult a qualified wildlife biologist regarding habitat needs and design. The BLM would girdle trees up to 40" DBH or directionally fell trees away from rare plant populations and sensitive habitats when feasible, based on safety considerations. The BLM would cut and burn (including via biochar creation) felled trees, chip, or leave on site and would not drag trees across sensitive habitats or special status plant populations. The BLM would create wildlife snags by girdling trees using chainsaws at the bases or tops of trees, or via prescribed fire (Figure 2). The BLM would conserve trees established prior to 1850 and trees 40" DBH and larger, along with important wildlife trees, culturally significant trees, and host trees for Special Status epiphytic mosses and lichens. The BLM would authorize cutting smaller trees and encroaching shrubs using chainsaws or brush cutters. Trees and shrubs would be left onsite as wildlife habitat or would be included in prescribed fire treatments.

Figure 1. Trees encroaching a meadow.



Photo credit: Corbin Murphy, Cascades Field Office Northwest Oregon District BLM

Figure 2. Snag creation of larger trees contributing seed to meadow.



Photo credit: Corbin Murphy, Cascades Field Office Northwest Oregon District BLM

2.2.3. Selective herbicide treatments to control encroaching native species

The BLM would use herbicides to control native species encroaching meadow habitats. This action would occur in conjunction with other meadow restoration actions such as prescribed fire and tree removal, reducing the need for manual and mechanical treatments. For example, the BLM would use herbicide treatments to control resprouting woody species when conditions are not favorable to implement prescribed fire treatments.

2.2.4. Augment Special Status plants with Recovery Plan species and wayside aster

The District currently augments Special Status plant populations in several meadows identified for restoration actions, as well as in the West Eugene Wetlands, under other project NEPA. Augmentation involves collecting, cleaning, and increasing seed by growing it out in nurseries and greenhouses, which are then planted or seeded as plugs or seeds. This project would expand the District's ability to enhance and restore Special Status plant populations in occupied and potential habitat.

2.2.5. Augment native plant populations

The BLM would enhance native plant populations both by augmenting Special Status plant species populations as well as by increasing diversity or adding missing functional species groups of non-listed plants. This would be accomplished by planting seeds, plugs, or container plants at the site. Outside of administrative sites and recreation areas, container plantings would normally be one gallon or smaller. This occurs on the District under other project NEPA and this project would expand the District's ability to enhance native plant populations in meadow habitats.

These treatment methods would be available as the BLM supports and implements cooperative terrestrial invasive plant treatments and restoration actions, including those proposed by non-BLM groups on BLM-administered lands and non-federally managed lands. This alternative would allow the District to participate, facilitate, and implement partnership-based invasive plant management and habitat restoration projects on non-federally managed lands.

There are currently 30 units with meadows, prairie remnants, or canopy gaps that would support Recovery Plan and Conservation Agreement plant species that BLM has identified either within ACEC boundaries or within BLM acreage delineated to support prescribed fire operational needs where necessary (Table 6).

Table 6. Recovery Plan species habitat proposed treatments.

Unit Name	Subunit	Treatment 1	Treatment 2	Treatment 3	Acreage
Beaver Creek	--	Prescribed fire	Snag creation or fall and leave, chip, or burn	--	6.1
Dorena Prairie	--	Prescribed fire	Herbicide on natives	--	9.6
Garoutte Prairie	--	Prescribed fire	Snag creation or fall and leave, chip, or burn	Herbicide on natives	74.3

Unit Name	Subunit	Treatment 1	Treatment 2	Treatment 3	Acreage
Grassy Mountain	--	Prescribed fire	Herbicide on natives	--	65.1
McGowan Meadow	--	Prescribed fire	Herbicide on natives	--	71.4
Oak Basin Prairies	Parcel 1	Prescribed fire	Snag creation or fall and leave, chip, or burn	Herbicide on natives	47.9
Oak Basin Prairies	Parcel 2	Prescribed fire	Snag creation or fall and leave, chip, or burn	Herbicide on natives	115.9
Oak Basin Prairies	Parcel 3	Prescribed fire	Snag creation or fall and leave, chip, or burn	Herbicide on natives	60.3
Eagles Rest Parcel 3 proposed ACEC	--	Prescribed fire	Snag creation or fall and leave, chip, or burn	--	23.4
Walker Flat	--	Herbicide on natives	Snag creation or fall and leave, chip, or burn	--	10.5
Mill Creek Ridge	--	Prescribed fire	Snag creation or fall and leave, chip, or burn	Herbicide on natives	112.9
Willamette Valley Prairie Oak and Pine	Coburg Ridge South - Parcel 2	Prescribed fire	Snag creation or fall and leave, chip, or burn	--	103.7
Willamette Valley Prairie Oak and Pine	Twin Prairie Buttes	Prescribed fire	Snag creation or fall and leave, chip, or burn	--	91.4
Willamette Valley Prairie Oak and Pine	Blue Mountain	Prescribed fire	Snag creation or fall and leave, chip, or burn	Herbicide on natives	60.8
Willamette Valley Prairie Oak and Pine	Rattlesnake Prairie	Prescribed fire	Snag creation or fall and leave, chip, or burn	Herbicide on natives	14.9
Willamette Valley Prairie Oak and Pine	Kelly Ck - Parcel 2	Prescribed fire	Snag creation or fall and leave, chip, or burn	--	82.2
Willamette Valley Prairie Oak and Pine	Eagles' Rest - Parcel 2	Snag creation or fall and leave, chip, or burn	--	--	51.9
Willamette Valley Prairie Oak and Pine	Eagles' Rest - Parcel 1	Snag creation or fall and leave, chip, or burn	Herbicide on natives	--	7.7
Willamette Valley Prairie Oak and Pine	Gettings Ck	Snag creation or fall and leave, chip, or burn	--	--	39.0

Unit Name	Subunit	Treatment 1	Treatment 2	Treatment 3	Acreage
Willamette Valley Prairie Oak and Pine	Weiss Rd. Demonstrati on Site - Parcel 3	Prescribed fire	Snag creation or fall and leave, chip, or burn	--	49.2
Willamette Valley Prairie Oak and Pine	Weiss Rd. Demonstrati on Site - Parcel 2	Snag creation or fall and leave, chip, or burn	Herbicide on natives	--	42.6
Willamette Valley Prairie Oak and Pine	SE Cloverdale	Prescribed fire	Snag creation or fall and leave, chip, or burn	Herbicide on natives	48.6
Willamette Valley Prairie Oak and Pine	Mt. Salem	Snag creation or fall and leave, chip, or burn	--	--	95.0
Willamette Valley Prairie Oak and Pine	Cedar Creek	Snag creation or fall and leave, chip, or burn	--	--	329.4
Willamette Valley Prairie Oak and Pine	Wallace Creek Meadows - Parcel 2	Snag creation or fall and leave, chip, or burn	--	--	6.1
Willamette Valley Prairie Oak and Pine	Wallace Creek Meadows - Parcel 1	Prescribed fire	Snag creation or fall and leave, chip, or burn	--	8.3
Willamette Valley Prairie Oak and Pine	Gilkey Ck - Camp Creek Ridge - Parcel 3	Snag creation or fall and leave, chip, or burn	--	--	39.9
Willamette Valley Prairie Oak and Pine	Gilkey Ck - Camp Creek Ridge - Parcel 2	Snag creation or fall and leave, chip, or burn	--	--	77.0
Willamette Valley Prairie Oak and Pine	Coburg Ridge South - Parcel 3	Snag creation or fall and leave, chip, or burn	--	--	25.7
Willamette Valley Prairie Oak and Pine	Kelly Ck - Parcel 1	Prescribed fire	Snag creation or fall and leave, chip, or burn	--	51.3

The BLM would constrain all treatments, including invasive plant treatments and meadow restoration actions, by the Standard Operating Procedures and measures listed in **Appendix E** and by the herbicide application rates listed in Table B-2. **Appendix E** also lists Project Design Features to minimize potential negative effects of the Proposed Action.

2.3. Alternative C – Reference

This alternative is similar to Alternative B but has a maximum of 55 percent herbicide use. The District would treat up to 10,000 gross acres annually using the most effective treatment options according to the Treatment Key (**Appendix A**) and specialist determination, up to a maximum of 55 percent herbicide treatments. Although the Reference alternative would authorize up to 10,000 gross annual treatment acres, analysis revealed that outside of the West Eugene Wetlands and seed orchards,⁴ District manual and mechanical treatment capacity is limited to approximately 1,840 gross acres (Table 7). This includes treatment data from prior to the 2018 IIPM EA when herbicide use was limited, and years when funding levels were supplemented by Burned Area Response (BAR) emergency funds. In 2016, 92 percent of total invasive treatments were non-herbicide treatments, the BLM implemented 1,835 acres of non-herbicide treatments. In 2021, the first year following the 2020 Labor Day fires, the District received additional funds addressing weed treatments in the burned areas. With supplemental funding, BLM treated 1,841 gross acres using non-herbicide methods.

Table 7. Comparison of non-herbicide to herbicide treatments, in acreage* and percent, by year

	2016	2017	2018	2019	2020	2021
Non-herbicide treatments	1,835 92%	734.3 98%	1,028.8 61%	Incomplete data	1,197 83%	1,841 41%
Herbicide treatments	164.5 8%	16 2%	644.5 39%	Incomplete data	244.3 17%	2,703 59%
Total	2,000	750.3	1,673.3	--	1,441	4,544

* Acreage does not include seed orchards or West Eugene Wetlands.

Because the District's capacity to implement non-herbicide treatment methods is limited to 1,840 acres, limiting herbicide treatments to 25 percent of total treatments in an Annual Treatment Plan results in reducing the number of treatment acres under Alternatives A and C (Table 8).

Table 8. Acreage BLM could feasibly treat under the alternatives.

Treatment Method	Alternative A, No Action	Alternative B, Proposed Action	Alternative C, Reference
Herbicide	613	8,382	2,249
Non-herbicide	1,840	1,840	1,840
Total	2,453	10,222*	4,089

* Acreage under Alternative B would be 10,000 acres. The number 10,222 is a theoretical limit based on the actual limit of 1,840 acres the BLM can feasibly treat.

⁴ District ATPs do not include treatments planned in the West Eugene Wetlands or Horning and Tyrrell seed orchards. West Eugene Wetlands would tier to this EA for certain herbicides but has a separate ATP process.

2.4. Annual Treatment Plan

Under both the No Action and Proposed Action alternatives, the District would determine potential treatments based on available tools and funding and develop an ATP prior to invasive plant control treatments. Additionally, the District may develop specific area or project treatment plans in coordination with partners or to implement ad hoc treatments as needed. All invasive species treatment plans other than the actions described in the 2021 *Northwest Oregon District Manual and Mechanical Invasive Plant Control Categorical Exclusion* are subject to an interdisciplinary team review.⁵ The District's ATP ensures that all treatments conform to project design standards, protection measures, best management practices, site-specific considerations, and appropriate mitigation.⁶ The ATP also ensures that the BLM completes the Pesticide Use Proposals, Biological Control Agent Release Proposals, and other authorizations prior to implementation.

The acres treated described in this EA supply analytical assumptions for the issues analyzed in this EA and are not thresholds or targets for treatment. Unexpected events, such as increased or decreased funding, new invaders, wildfire, or weather conditions could alter ATP implementation. The District bases treatment methods on best available current science and invasive plant control professional experience.

2.5. Summary of Alternatives

Table 9 provides a comparison of the differences between the alternatives. Table 10 provides a list of the types of treatments, including herbicide active ingredients that would be retained and available for use from the 2018 IIPM EA. The treatment types listed in Table 10 are therefore common to all alternatives, including the No Action alternative.

Table 9. Comparison of the alternatives.

Treatment	Alternative A, No Action	Alternative B, Proposed Action	Alternative C, Reference
Total Gross Invasive Species Treatment Acreage	6,000	10,000	10,000
Acreage the BLM could feasibly treat	2,453	10,000	4,089
Total Herbicide Treatments	Capped at 25% of total treatment acreage	Follow Treatment Key and specialist determination given site conditions and plant community composition	Capped at 55% of total treatment acreage

⁵ The interdisciplinary teams would include botanists, wildlife and fisheries biologists, archaeologists, and other natural resource specialists with expertise in potentially affected resources.

⁶ For example, Project Design Features adopted by this EA, Standard Operating Procedures, Mitigation Measures, and Conservation Measures (for Special Status species). These are all included in **Appendix E**.

Treatment	Alternative A, No Action	Alternative B, Proposed Action	Alternative C, Reference
Treatments Applied to Native Plant Species			
Herbicide	Herbicide applications target non-native species only	Herbicide applications may target native species for restoration purposes in occupied or potential habitat for Recovery Plan species and wayside aster	Herbicide applications may target native species for restoration purposes in occupied or potential habitat for Recovery Plan species and wayside aster
Prescribed fire	Non-native monocultures or areas where almost all species are non-native	Would authorize prescribed fire both as an invasive plant treatment and for restoration purposes in occupied or potential habitat for Recovery Plan species and wayside aster	Would authorize prescribed fire both as an invasive plant treatment and for restoration purposes in occupied or potential habitat for Recovery Plan species and wayside aster
Encroaching large tree removal	Only authorized under other project NEPA	Would authorize fall and leave, cut, or chip treatments of encroaching trees to improve habitat for Recovery Plan species and wayside aster	Would authorize fall and leave, cut, or chip treatments of encroaching trees to improve habitat for Recovery Plan species and wayside aster
Container planting	Only authorized under other project NEPA	Would authorize container plantings to improve habitat for Recovery Plan species and wayside aster	Would authorize container plantings to improve habitat for Recovery Plan species and wayside aster
Rare plant augmentation	Only species populations already covered under NEPA	Would authorize augmentation of Recovery Plan species and wayside aster populations	Would authorize augmentation of Recovery Plan species and wayside aster populations
Herbicide	Herbicide applications target non-native species only	Allowable for maintenance and operational objectives in admin sites (Salem office)	Allowable for maintenance and operational objectives in admin sites (Salem office)

Table 10. Invasive species treatments common to all alternatives.

Direct Control Methods: Non-Herbicide Methods	
Manual	Aquatic and Terrestrial
Mechanical	Aquatic and Terrestrial
Competitive seeding and planting	Terrestrial
Biological control agents	Terrestrial
Prescribed fire	Terrestrial
Targeted grazing	Terrestrial
Direct Control Methods: Herbicides	

2,4-D	Aquatic and Terrestrial
Aminopyralid	Terrestrial
Chlorsulfuron	Terrestrial
Clopyralid	Terrestrial
Dicamba	Terrestrial
Diflufenzopyr + dicamba	Terrestrial
Fluroxypyr	Terrestrial
Fluridone	Aquatic
Fluazifop-P-butyl*	Terrestrial
Glyphosate	Aquatic and Terrestrial
Hexazinone	Terrestrial
Imazapic	Terrestrial
Imazapyr	Aquatic and Terrestrial
Metsulfuron methyl	Terrestrial
Picloram	Terrestrial
Rimsulfuron	Terrestrial
Sethoxydim*	Terrestrial
Sulfometuron methyl	Terrestrial
Triclopyr	Aquatic and Terrestrial

* Used on research and demonstration plots only (maximum of 15 acres per herbicide per field office without additional environmental analyses).

2.6. Alternatives Considered but Eliminated from Detailed Analysis

An alternative to treat any vegetation, including native species, to meet safety and operation objectives in powerline corridors in accordance with the ROD for the 2010 Oregon FEIS was considered but eliminated from detailed analysis because it didn't meet the project Need. BLM determined that analysis for treating vegetation in powerline corridors is a Need that may be addressed in a future project and declined to identify powerline corridor treatments as a Need for this project.

CHAPTER 3. Affected Environment and Environmental Impacts

3.1. Issue 1 (Botany) How would the proposed treatments, including herbicide, manual, mechanical, cultural, and biological, and prescribed fire (limited to invasive plants), affect desirable plant communities and Special Status plants?

3.1.1. Background

Invasive plant invasions displace native plants, adversely affecting the composition and structure of the plant community and thus the other elements of the ecosystem that are dependent on it. The Oregon FEIS lists the other effects of invasive plants on native plant communities including increased competition, decreased species diversity, and reduced structural complexity; this discussion is incorporated here by reference (USDI 2010a: 148-149). Although the protection of sites known to be occupied by Special Status species is a priority for BLM weed control efforts, success of those efforts will vary depending upon the likelihood of those sites being invaded and whether effective weed treatment tools are available (USDI 2010a: 149).

As illustrated in Figure A-1 in **Appendix A**, gross infestation acres are determined by the area within perimeters of infested areas. Net acres are the actual infestations within the area. In some locations, a large area may have a sparse infestation and net acres would be calculated by multiplying the gross acres by the percent cover of the infestation. Net acres of many infestations on the District are not known or cannot be easily determined prior to treatments. BLM develops inventories, treatment plans, and treatment contracts from gross acreage; hence, acres described in this analysis are gross acres.

Ninety-five percent or more of the herbicide treatments on the District are spot treatments that cause minimal damage to non-target plant species as target species are selectively sprayed. Spot treatments are applied only to the net treatment area (actual infestations) within the larger gross treatment area, in contrast to broadcast treatments in which the net and gross treatment acres are equal. For this reason, gross treatment acres on the District do not correspond directly to amount of herbicide used and are more accurately viewed as acres protected. Net herbicide treatment acres can be mathematically calculated after treatment by dividing gallons of herbicide solution applied by the equipment sprayer calibration rate given in gallons per acre.

The District Invasive Species Coordinator reviewed detailed treatment data in 2021 to compare gross treatment acres to net acres, calculated from pesticide application records. Outside of the seed orchards, net acres of invasive plant species treated with herbicide equal less than five percent of gross acres, including broadcast treatments completed on 3.4 acres in the West Eugene Wetlands.⁷ Broadcast acres for 2021 equal 0.1 percent of herbicide treatments, and 0.06 percent of total treatments. The 2018 IIPM EA analyzes and the 2019 IIPM DR authorizes broadcast treatments on up to five percent of total treatments; similarly, broadcast treatments are proposed for up to five percent of total treatments under this project.

⁷ West Eugene Wetlands has implemented broadcast spray on a treatment unit as large as 27 acres, to date.

Although only one year of detailed data comparing net to gross treatment acreage is readily available, the BLM extrapolates that the District would not exceed one thousand net acres (ten percent of total gross treatment acres) of herbicide treatments under the proposed alternative.

In 2021, NW Oregon District determined that many non-herbicide invasive plant treatments would be excluded from environmental effects analysis under NEPA under a categorical exclusion (CX) and DR. The *Northwest Oregon District Manual and Mechanical Invasive Plant Control CX* is designed to accommodate treatment needs for populations not captured in the annual treatment plan.

3.1.2. Analytical Process

The BLM anticipates that the three alternatives would result in various effects levels to non-target (native and other non-invasive) plant species and plant communities. Those effects are presented in this section in the following three distinct categories:

- *Effects of herbicides on non-target plants* - Non-target native and other non-invasive plants can be adversely affected by herbicides directed at nearby invasive plants and other target vegetation.
- *Effects of invasive plants on desirable native and non-invasive plant communities* - Native and other non-invasive plants are adversely affected by infestations of invasive plants. The degree to which the alternatives slow the spread of invasive plants has a corresponding and generally proportionate beneficial effect on the retention of functional native plant communities.
- *Effects of non-herbicide treatments on non-target plants* - Non-target plants can be adversely affected by non-herbicide treatment methods directed at nearby invasive plants and other target vegetation.

3.1.2.1. Assumptions

As described in the 2010 Oregon FEIS, the BLM assumes that the rate of spread from existing infestations is 12 percent annually. The BLM estimated this rate of spread based on BLM and U.S. Forest Service data which showed that invasive plants spread at an estimated 10 to 15 percent annually (USDI BLM 2010a: 594-603). The projections in the 2010 Oregon FEIS were based on noxious weed data and may not hold true for other invasive plants (USDI BLM 2010a: 595); however, 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.

For analysis purposes, this project assumes a 1:1 direct comparison between acres inventoried and protected from invasive species infestations and acres of desirable native plant populations. In its analysis of effects of invasive plants on native plant populations, the Oregon FEIS notes that “the degree to which these effects apply to the various alternatives is primarily a function of, and directly proportional to, the number of acres that will become infested with weeds under each alternative” (USDI BLM 2010a: 149).

3.1.2.2. Summary of Analytical Methods

The temporal scale of this project is 15 years, and the spatial scale encompasses the Northwest Oregon District.

The effects of most herbicides used on the District (i.e., all herbicides except sethoxydim and District-wide use of fluazifop-P-butyl) on native vegetation were analyzed in NEPA analyses to which this EA tiers: the 2007 and 2016 PEISs (analyzed at the national level), and the 2010 Oregon FEIS (USDI BLM 2010a: 139-155, USDI BLM 2007a: 4-44 to 4-76, USDI BLM 2016a: 4-25 to 4-41). Risk assessments are updated regularly; the most recent risk assessments are available in the project record and online at <https://www.fs.usda.gov/foresthealth/protecting-forest/integrated-pest-management/pesticide-management/pesticide-risk-assessments.shtml>. There are no new circumstances or information that would change the effects anticipated for this EA.

Application of fluazifop-P-butyl and sethoxydim would be highly limited in spatial extent, consistent with research and demonstration purposes of application⁸.

For analysis of non-herbicide treatments, this EA tiers to the Northwest Area Noxious Weed Control Program FEIS and Supplement (USDI BLM 1985, 1987a) and is consistent with the actions authorized in its Record of Decision (USDI BLM 1987b). This EA also incorporates by reference elements of the 2007 Vegetation Treatments on BLM Lands in 17 Western States PER, which describes the integrated vegetation management program and discloses general effects associated with non-herbicide control methods (USDI BLM 2007d). The BLM wrote the 2007 Vegetation Treatments on Bureau of Land Management Lands in 17 Western States PER as a companion document to the 2007 PEIS, which analyzed for the use of 17 herbicide active ingredients in western states. Most BLM districts in the western U.S. analyzed vegetation management in Environmental Impact Statements in the late 1980s and early 1990s and scoping for the 2007 PEIS determined there was no need for additional analysis of non-herbicide invasive plant treatments.

The District is in the process of transitioning from the National Invasive Species Information Management System (NISIMS) database to the Vegetation Management Action Portal (VMAP). Data from the NISIMS database is legacy data, while VMAP is the national database where the BLM records and accesses infestation and treatment data now and in the foreseeable future. These data include spatial and tabular information related to infestations including abundance, distribution, planned and completed treatment records, and other associated characteristics. Because not all the District's NISIMS data has migrated to VMAP, the District combined spatial data from both databases with recently submitted partner and specialist data to create the infestation map publicly available on BLM's National NEPA Register (ePlanning). The District records Special Status plant populations in GeoBOB and ORBIC databases and these are not made available to the public.

Persistence and diversity of native plant communities, population size, and robustness of native plants are all indicators of beneficial effects to native plant species. Monitoring provides data on Special Status plant species populations on BLM managed lands. For a more general accounting of desirable native plant communities, an accessible and appropriate measure of beneficial impacts is the number of acres inventoried and treated for invasive species. A comparable, though not exact, relationship exists between acres protected from invasive species and acres of functioning desirable native plant communities, while an inverse relationship exists between acres infested by invasive plants and acres of desirable native plant communities. Effects to plant species are similar

⁸ 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.

for desirable native species and invasive species within the same functional group, such as perennial grasses or shrubs. For this reason, this project discusses effects in terms of both native and invasive species.

3.1.3. Affected Environment

As described in the 2010 Oregon FEIS, the Northwest Oregon District comprises two biomes: the Willamette Valley Biome and the Western Forest Biome (including the Western Cascades and Oregon Coast Range). The Willamette Valley biome was historically dominated by native oak woodlands, oak savannahs, and upland or wet prairies; however, cultivation, timber harvest, development, and invasive plants have transformed these areas. A 1995 assessment indicated that Willamette Valley prairies are among the most endangered ecosystems in the U.S. (Noss et al, 1995). Drier sites such as oak woodlands and dry prairie remnants are considered highly susceptible to invasion by invasive plants (USDI BLM 2010a: 141-142). With only remnant populations of native plants remaining, many unique Willamette Valley plant communities are imperiled (USDI BLM 2010a: 140). The Western Forest Biome is dominated by dense conifer forests and includes sand dunes, meadows, marshes, bogs, rock outcrops, and woodlands. Dense shade producing forests are the least likely areas to provide opportunities for sun loving invasive plants to establish (Quigley and Arbelbide cited in USDI BLM 2010a: 140), but some species such as invasive geraniums, English ivy, false brome, garlic mustard, and blackberry are shade tolerant and adversely affect native species. A 2008 forest inventory showed 47 percent of plots in the Oregon Coast Range and 68 percent of plots in the Western Cascades (across all ownerships) had invasive plants present, and 6.2 percent of all plant cover in forests was easily identifiable non-native weeds (Donnegan et al. 2008).

Federally listed species include species listed as Endangered, Threatened, or Proposed under the Endangered Species Act. Federally listed plant species on the District are all Recovery Plan species, found in open meadow and prairie remnant habitats. Open, non-forested habitats are highly vulnerable to invasion by non-native species. In the absence of historic disturbance levels, these habitats are also vulnerable to native species encroachment due to successional processes.

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. Bureau Sensitive species management "must not result in a loss of species viability or create significant trends toward Federal listing" (USDI BLM 2008b).

There are three federally listed plant species known or suspected to occur on the District (Table 11). Additionally, there are 139 Bureau Sensitive plant and fungi species known or suspected to occur on the District including recently de-listed golden paintbrush, Bradshaw's lomatium and water howellia (**Appendix D**). All four federally listed species are vascular plants. Bureau Sensitive species include 66 vascular plants, 28 bryophytes, 19 lichens, and 26 fungi species.

Table 11. Threatened and endangered plants known or suspected on NWO BLM District.

Species	Common Name	Status	Occurrence NWO BLM
<i>Erigeron decumbens</i>	Willamette daisy	Endangered	D
<i>Lupinus oregonus</i>	Kincaid's lupine	Threatened	D

<i>Sidalcea nelsoniana</i>	Nelson's checkermallow	Threatened	D

Special Status plants occur in a variety of habitats on the District, including open meadows, old growth forest, and aquatic systems. These rare species display narrow ecological amplitudes and are geographically restricted, making them particularly vulnerable to degradation from invasive plants (USDI BLM 2010a: 149). There are 320 Special Status vascular plant sites that are presumed occupied, or extant,⁹ within 100 feet of an invasive plant species. Populations threatened by invasive plant infestations include all three federally listed species known to occur on the District – Willamette daisy, Kincaid's lupine, and Nelson's checkermallow – and 28 Bureau Sensitive species. Loss of native plant communities in the Willamette Valley biome has led to the Federal listing of Kincaid's lupine, Nelson's checkermallow, and Willamette daisy (USDI FWS 2010).

There are currently 113 invasive plant species mapped across 25,673 gross acres on the District. Many invasive species sites overlap with other invasive species sites. For example, a Scotch broom site exists in the same area as a shining geranium site and also a Himalayan blackberry site (Table A-3, *Mapped invasive plants by infestation size*). **Appendix A** displays these species and acreages, organized by 27 species groups. The District provides a viewing of the mapped invasive species sites as 59,553 gross acres of overlapping non-native infestation polygons in an interactive map on BLM's National NEPA Register (ePlanning): <https://eplanning.blm.gov/eplanning-ui/project/2018524/580>. Low priority species that are widespread throughout the District are often unmapped and precise acreage is unknown. The Treatment Key indicates that the most effective treatments for all mapped invasive species on the District would result in an annual treatment strategy averaging 82 percent herbicide treatments.

The BLM currently treats encroaching native species at Walker Flat, Oak Basin, and other special habitats using manual and mechanical methods. Monitoring data and partner¹⁰ recommendations indicate that the District needs herbicide treatments to control regrowth after manual and mechanical removal.

Native and non-native plants currently grow beneath a solar panel array the Salem District office, which is in an urban (non-wildland) setting. No Special Status plants or fungi occur at this site.

3.1.4. Direct and Indirect Effects (All Alternatives)

3.1.4.1. Summary

This project characterizes herbicide treatment effects to desirable plant communities, including Special Status plants, in terms of detrimental direct effects resulting from non-target herbicide damage, and beneficial indirect effects resulting from additional availability of land and resources for desirable native and non-invasive plants following the removal of invasive plants.

⁹ The BLM presumes sites are extant if the last observation date is 1989 or later.

¹⁰ Institute of Applied Ecology

In the absence of protective measures, potential risks to non-target plants from direct spray and drift, and in the case of aquatic plants, from accidental spills, are high (USDI BLM 2010a: 94-95). The BLM expects this because herbicides are designed to kill plants.

The District decreases these risks by applying protective measures designed to minimize damage to off-target plants including selective herbicides, selective treatment methods, and drift reduction agents. The BLM protects Special Status plants with additional protective measures such as no-spray buffers, selective (spot) treatment requirements, and the use of spray shields, buckets, or tarps to protect nearby plants from drift during herbicide application. Projects that have the potential to disturb Special Status plants and plant habitat require pre-project clearances, including review for potential habitat and surveys in suitable habitat to identify populations and necessary protection measures. See **Appendix E** for a full list of protective measures.

The BLM would decrease direct effects to desirable plant communities resulting from herbicide injury by applying these protective measures; however, adverse effects to individuals could occur. Risks to Special Status species are greater than risks to other native vegetation due to limited population size, which increases the importance of individuals.

The BLM would specifically design proposed herbicide treatments in occupied and potential Special Status plant habitats, including treatments applied to encroaching native species in habitat for Recovery Plan species and wayside aster, to improve Special Status plant and pollinator habitats. However, there could be short term adverse effects from some habitat improvement treatments designed by the BLM to benefit Special Status populations in the long term. There would not be significant adverse effects to federally listed or Bureau Sensitive plants from this project.

The District compared beneficial indirect effects across the alternatives by comparing total gross acres treated, as there is a correlative relationship between removal or reduction of invasive plants and increased soil, light, and nutrient availability for native plants. As noted on page 149 in the 2010 Oregon FEIS,

Federally listed and other Special Status species are particularly at risk from noxious weeds and other invasive plants. Rare species generally display narrow ecological amplitudes, keeping them geographically restricted and unable to compete over a wide range of site conditions. When invasive plants invade those sites, fragmentation of populations and extirpation often result. Although the protection of sites known to be occupied by Special Status species is a priority for BLM weed control efforts, success of those efforts will vary depending upon the likelihood of those sites being invaded and whether effective weed control tools are available.

The degree to which these effects apply to the various alternatives is primarily a function of, and directly proportional to, the number of acres that will become infested with weeds under each alternative.

3.1.4.2. *Herbicide effects on non-target plants:*

The type and amount of herbicide treatments under all alternatives are wholly within the actions analyzed in the EISs to which this analysis tiers. The BLM would apply all Standard Operating Procedures and Mitigation Measures analyzed in those documents to all alternatives, including all Conservation Measures developed to protect Special Status plants. The BLM would adopt

additional project design features following consultation with FWS. The BLM would design all treatment plans with field office and district specialists and these would be subject to additional review by a qualified botanist to ensure that the BLM prescribes herbicide treatments in such a way that minimizes potential damage to Special Status plant species on the District.

Effects of herbicide treatments on desirable plant communities are well-summarized in chapter four of the 2010 Oregon FEIS in terms of both effects to non-target plants as well as effects of invasive plants upon desirable plant communities (USDI BLM 2010a: 144-156). The 2010 Oregon FEIS provides the following description of effects (page 144).

Herbicides have the potential to harm non-target plants, including plants that are culturally important, Federally listed or otherwise designated as Special Status species... Some damage to non-target plant species from herbicide application is probable despite cautious planning and implementation. Herbicide impacts to non-target plants depend on (but are not limited to) the herbicide used, its selectivity, application rate, concentration, relative toxicity to the plants in the treatment area, likelihood of exposure, timing and method of application, environmental conditions during application, and plant stage of growth. Herbicide treatments impact non-target plants through direct application, overspray, off-site movement, and/or accidental spills. Potential impacts include mortality, reduced productivity, and abnormal growth... Risk to off-site plants from surface runoff and movement through soil (leaching) is influenced by precipitation rate and timing, soil type, and application area. Measures taken to limit exposure, such as selective application methods (e.g., spot spraying, or wiping), typical application rates that are less than the maximum allowed on the label..., drift reduction agents, and application restrictions based on environmental conditions (wind, precipitation, temperature, etc.), reduce the off-target movement of herbicides.

The 2010 Oregon FEIS, pages 145-147 describe detailed effects to different non-target plant types from 2,4-D, bromacil, chlorsulfuron, clopyralid, dicamba, diflufenzopyr, fluridone, glyphosate, hexazinone, imazapic, imazapyr, metsulfuron methyl, picloram, sulfometuron methyl, and triclopyr, grouped by method of action from the herbicide active ingredient. The District incorporates these here by reference. Acetolactate synthase (ALS) inhibitors (chlorsulfuron, metsulfuron methyl, sulfometuron, imazapic, and imazapyr) pose the greatest risk to non-target plants due to their potency and longevity. Picloram, a synthetic auxin, also poses significant risk to non-target broadleaf and woody plants. Table 3-1 on pages 59-61 of the 2010 Oregon FEIS presents information about the herbicides themselves, including selectivity, pre-emergency, soil adsorption, solubility, and off-site movement potential. The 2016 *Vegetation Treatments Using Aminopyralid, Fluroxypyr, and Rimsulfuron PEIS* provides detailed summaries of effects to plants from aminopyralid, fluroxypyr, and rimsulfuron on pages 4-27 to 4-33 and these are incorporated by reference. Table 4-5 on page 4-17 of that document displays information about soil adsorption, solubility, and off-site movement potential.

Herbicide treatments have the potential to damage individuals of Special Status plant and fungi species. From page 156 of the 2010 Oregon FEIS:

In general, plants in the sunflower, legume, and mustard families tend to be more susceptible to broadleaf herbicides. Therefore, there may be increased risk from these herbicides for federally listed species such as Kincaid's lupine... in the legume family; [and] Willamette valley daisy... of the sunflower family... The ALS-inhibiting herbicides are highly active, and extremely low concentrations could injure Special Status... plants. Chlorsulfuron may cause severe reduction in seed production of some non-target crops if they are exposed at critical stages of development (Fletcher et al. 1993). Rare or susceptible annual plants in particular may suffer if they are unable to produce seed due to exposure to chlorsulfuron... Metsulfuron methyl is known to be harmful to commercial onion crops of the lily family, so other plants in that family... may be more readily affected by this herbicide. Another study reported that risks to non-target plants associated with ALS-inhibitors are similar to those associated with other herbicides used at higher application rates (Obrigawitch et al. 1998).

In addition to federally listed Kincaid's lupine and Willamette daisy, there are several Bureau Sensitive plants on the District in the sunflower, legume, and mustard families that may be more susceptible to broadleaf herbicides. Table 12 lists these species, as well as Bureau Sensitive annuals that would be damaged by chlorsulfuron,¹¹ and Bureau Sensitive plants in the lily family that would be more readily affected by metsulfuron methyl.

Table 12. Bureau Sensitive plants more susceptible to broadleaf herbicides, chlorsulfuron, and metsulfuron methyl.

Plants in the sunflower, legume, and mustard families more susceptible to broadleaf herbicides: • tall agoseris (<i>Agoseris elata</i>) • Saddle Mountain bittercress (<i>Cardamine pattersonii</i>) • Howell's daisy (<i>Erigeron howellii</i>) • Gorman's aster (<i>Eucephalus gormanii</i>) • wayside aster (<i>Eucephalus vialis</i>) • thin-leaved peavine (<i>Lathyrus holochlorus</i>)	Annuals that would be damaged by chlorsulfuron: • pink sand-verbena (<i>Abronia umbellata</i> var. <i>brevifolia</i>) • Saddle Mountain bittercress (<i>Cardamine pattersonii</i>) • Oregon timwort (<i>Cicendia quadrangularis</i>) • sharp-pointed flatsedge (<i>Cyperus acuminatus</i>) • tricolor monkeyflower (<i>Diplacus tricolor</i>) • Kellogg's dwarf rush (<i>Juncus kelloggii</i>) • white fairypoppy (<i>Meconella oregana</i>) • Willamette navarrettia (<i>Navarrettia willamettensis</i>)	Plants in the lily family more susceptible to metsulfuron methyl: • dwarf brodiaea (<i>Brodiaea terrestris</i>) • Coast range fawn lily (<i>Erythronium elegans</i>) • black lily (<i>Fritillaria camschatcensis</i>) • twisted stalk (<i>Streptopus streptopoides</i>)

¹¹ Water howellia (*Howellia aquatilis*) and humped bladderwort (*Utricularia gibba*) are Bureau Sensitive aquatic annuals that would not be affected by chlorsulfuron. Humped bladderwort is a submerged species, and water howellia could only be affected by chlorsulfuron when stranded on dried lake edges and sloughs during low water events; however, once dried the plants would no longer be viable and seed production would therefore not be affected (Richar Halse, pers. comm., 2023).

• California cudweed (Pseudognaphalium californicum) • racemose pyrrocoma (Pyrrocoma racemosa var. racemosa) • white-topped aster (Sericocarpus rigidus)	• California cudweed (Pseudognaphalium californicum) • Thompson’s mistmaiden (Romanzoffia thompsonii) • lowland rotala (Rotala ramosior)	

Many Bureau Sensitive lichens and bryophytes are epiphytes or rock-dwelling species that would not be at risk of direct spray from herbicides, although drift could affect them. Non-vascular plants are very sensitive to environmental toxins and would be more affected by drift than vascular plants. Ground-dwelling species would be at risk from direct spray as well as drift. Survey requirements in potential habitat for Special Status species and protective measures such as no-spray buffers, drift reduction agents and spray nozzle size would decrease risks to Bureau Sensitive lichens and bryophytes.

As noted in the 2010 Oregon FEIS, there are few studies investigating the effects of herbicides on fungi. “In studies using rates similar to amounts proposed for use on BLM lands, fungi seem relatively unaffected by herbicides” (Busse et al. 2003, Huston et al. 1998b both quoted in USDI BLM 2010a: 144). In the abstract of a 2014 paper investigating interactions between glyphosate, earthworms, and mycorrhizae the authors state that “studies testing glyphosate effects on AMF [arbuscular mycorrhizal fungi] show an inhibition of [arbuscular mycorrhizal] fungal spore germination and germ tube growth or reduced mycorrhiza in soil, however only at concentrations greater than those recommended for field use. Several other reports show no effect of glyphosate on mycorrhiza when applied at recommended doses” That study, however, found that hyphal and spore biomass declined with the application of glyphosate (Zaller et al.).

The 2010 Oregon FEIS describes that “The risk of herbicide contamination to wild edible mushrooms (e.g., chanterelles, matsutakes, porcinis) is expected to be limited because proposed herbicide use would be focused on invasive plants infestations and rights-of-ways, rather than healthy forests where these species are dependent on the roots of conifer trees.” Likewise, the BLM expects to limit the risk of herbicide contamination to Special Status fungi because these species exhibit a narrow ecological amplitude; in other words, they tend to occur in specific microclimates in healthy interior forests where there is a greater abundance of mycorrhizal connections and fewer infestations.

The BLM would decrease direct effects to desirable plant communities resulting from herbicide injury due to protective measures designed to minimize damage to off-target plants; however, adverse effects to individuals could occur. Risks to Special Status species are greater than risks to other native vegetation due to limited population size, which increases the importance of individuals.

Herbicide treatments proposed in occupied and potential Special Status plant habitats, including treatments applied to encroaching native species in habitat for Recovery Plan species and wayside

aster, would be specifically designed to improve Special Status plant habitats. Effects would therefore be beneficial because these treatments would counteract plant successional processes that frequent fire disturbance historically limited. Treatment methods such as selective spot spraying, distance buffers, and using baffling systems and other physical barriers would prevent Recovery Plan species and wayside aster from contact with herbicides. This project provides additional conservation measures designed to protect federally listed and Bureau Sensitive plant species from herbicide treatments below and in **Appendix E**.

This project provides results from Ecological and Human Health Risk Assessments (**Appendix G**), synthesizing them into high, moderate, and low risk categories for various scenarios representing possible exposures from BLM applications for each herbicide for various species including humans (Tables G-5 and G-8). Risks are based on exposures modeled in Risk Assessments and where these ratings are higher than 0, the ratings guide development of Standard Operating Procedure and PEIS Mitigation Measures (**Appendix E**) designed to keep actual exposures below what would potentially result in significant adverse effects. The BLM deemed federally listed and other Special Status species not at significant risk because of required pre-project clearances, consultation requirements, and/or additional buffer requirements.

3.1.4.3. *Invasive plant effects on desirable native and non-invasive plant communities*

The 2010 Oregon FEIS, pages 147-149 provide the following descriptions.

Native plant communities are in dynamic balance, where plants, animals, and organisms keep each other in check. Each plant is part of a complex food chain; break one of the links and others are likely to be adversely affected. One disappearing plant can take with it up to thirty other species that depend on it, including insects, higher animals and even other plants (Wood 1996). Invasive plants are typically introduced into these ecosystems without the plants, animals, and diseases they evolved with, giving them a competitive advantage. The resulting invasion displaces native and other non-invasive plants, adversely affecting the composition and structure of the plant community and thus the other elements of the ecosystem dependent upon it. Adverse effects begin gradually and are often well underway by the time the effects become apparent or significant. At that point, restoration is expensive and often not possible because of the loss of the supporting ecosystem components such as soil depth and water table. Once a threshold is exceeded, permanent loss of historical plant association and the organisms that depend on them occurs... The impact of invasive plants can be permanent when economic and environmental factors limit the ability of a managing agency to restore the ecosystem to a healthy state (NAS 2002). The fewer invasive plants present, the more likely it is that restoration is possible...

Native ecosystems are currently stressed by increasing demand for goods and services, heavy visitor use, human development, altered fire regimes and increased fire intensities, climate shifts, and the rapid spread of invasive plants. The anthropogenic rate of species' invasions far exceeds the natural background rate and is accelerating (Lodge and Shriver-Frechette 2003). Exotic [non-native] plants were rated as one of the six primary elements of global change (Vitousek et al. 1997). The International Union for the Conservation of Nature (IUCN) notes that a significant proportion of species now considered extinct were

driven to extinction by invasive species, and generally ranks invasive species as one of the top ten threats to currently threatened species (IUCN 2008)...

Many invasive plants modify invaded sites, so that the site becomes inhospitable to the original plant community... Knapweeds and starthistles are known to increase sheet erosion and produce chemicals that prevent other species from germinating (Boersma et al. 2006). Reed canarygrass decreases species' diversity and reduces the structural complexity of the plant community through its aggressive, rapid growth and ability to eliminate safe sites for the establishment of native plants (Hovick and Reinartz 2007).

Most invasive plants are known for forming monocultures, but even where invasive plants do not ultimately dominate plant communities, they can adversely influence succession. For example, Scotch broom initially forms a dense canopy on harvested forest sites, shading out regenerating conifers and other plants. As the broom ages and the canopy opens, there is a partial recovery of ground cover, though not by all pre-existing species (Smith 1994). Shade tolerant Himalayan blackberry germinates under dense Scotch broom plants and frequently becomes dominant on those sites. Blackberry fruit is a seasonal food source for introduced starlings and rats and the vines shelter them from predation. Even after the blackberries overtake the Scotch broom, long-lived scotch broom seed remains viable for decades, ready to respond to future disturbances.

Natural disturbances are important to ecosystem renewal, and invasive plants alter historic disturbance regimes. Many plant communities are adapted to fire cycles, with fires maintaining the full range of successional stages, species, and habitats. Invasive plants can interfere with this process by maturing, drying and then burning earlier in the season, burning more often, and burning hotter. They also directly compete with the various native plant seedlings that would have naturally followed the disturbance. Similarly, landslides, high flows, and stream bank erosion are natural processes that shape stream courses and deposit large wood in streams. When invasive plants prevent native plants from repopulating these disturbed sites, accelerated erosion and watershed degradation is the result. Even in old-growth forests where the most common natural disturbance pattern is the small gaps created as individual large trees die or fall, invasive plants are interfering with the reestablishment of the native hardwoods and conifers important to maintaining the multi-layered structure of these stands (Hobbs and Huenneke 1992).

Flying squirrels and other spotted owl prey species, for example, rely on the cover provided by this intermediate crown layer to reach and utilize the upper forest crown layer; prey species and owl numbers decrease when this layer is not present. Noxious weeds such as tansy ragwort, thistles, and rush skeletonweed threaten this natural process, because they can spread great distances by wind, even in forestlands. Water and wildlife also carry weed seeds (Asher and Spurrier 1998).

Native ecosystems on non-BLM lands also suffer when invasive plants spread from BLM lands. Adjacent landowners may control these weeds with less environmentally friendly methods or products, or by using more herbicides to combat invading plants than would be needed if all ownerships were participating. Collateral damage may occur near property

lines, and landscape-scale values such as watershed or wildlife values may be degraded by these well-intended treatments, particularly west of the Cascades where the checkerboard ownership often means the BLM manages no more than 50 percent of any watershed. In addition, native and other non-invasive plants including crops on adjacent lands can suffer irreparable damage when uncontrolled invasive plants from BLM lands move across property lines.

Federally listed and other Special Status species are particularly at risk from noxious weeds and other invasive plants. Rare species generally display narrow ecological amplitudes, keeping them geographically restricted and unable to compete over a wide range of site conditions. When invasive plants invade those sites, fragmentation of populations and extirpation often result. Although the protection of sites known to be occupied by Special Status species is a priority for BLM weed control efforts, success of those efforts will vary depending upon the likelihood of those sites being invaded and whether effective weed control tools are available.

The degree to which these effects apply to the various alternatives is primarily a function of, and directly proportional to, the number of acres that will become infested with weeds under each alternative.

As described above, invasive plant treatments on the District would benefit native plant communities in the long-term by reducing the density and distribution of invasive plants. Invasive plant invasions displace native plants, adversely affecting the composition and structure of the plant community and thus the other elements of the ecosystem that are dependent on it such as species diversity, structural complexity, and available light and nutrients (USDI BLM 2010a: 148-149).

The 2010 Oregon FEIS described that in the absence of effective treatment methods, native plant communities will suffer loss of native species and alteration of community function in the long term almost regardless of the level of effort or priority given to their consideration (USDI BLM 2010a: 152).

Appendix B describes the prioritization considerations for invasive plant treatments. The District will prioritize new invaders and EDRR species, proximity to ground-disturbing activities such as timber project sites, proximity to vectors of spread such as high use recreation sites, and proximity to sensitive resources such as Special Status plants and special habitats. The BLM also considers the effectiveness of available treatment methods when prioritizing treatments. For example, the suite of treatment methods currently available to BLM includes herbicides that are only moderately effective on perennial grasses; therefore treatment plans do not prioritize herbicide treatments on perennial grasses such as false brome and reed canarygrass. Manual and mechanical treatments are more ground-disturbing than herbicide treatments, which increases the risk of re-infestation and thus, additional treatment needs using non-herbicide methods. Additionally, manual and mechanical treatment methods may not be effective for certain invasive species or functional groups.

The selection of Alternative A or C would restrict BLM and partners from using the most appropriate treatments available based on Integrated Pest Management principles and the Treatment Key. Limitations under the current EA and associated Biological Opinion motivated one partner to caution:

“I know we have talked at great length about the implications of the acre by active ingredients issue. That said, I think it is important for me to formally relay that because of the acreage limitations by active ingredient, we will be deviating from Best Management Practices for some systems, will be treating with less effective herbicides, introducing new inefficiencies toward long term management, and curtailing some activities. The set up will also inhibit us from responding to new and emergent threats not fully identified as we work through this discovery phase in the Molalla Basin, especially within the burn areas.

That said, we will do our best to manage these noxious weeds within the constraints outlined. Any momentum you can muster to help ease these provisions would be much appreciated” (Sam Leininger, Clackamas Soil and Water Conservation District, pers. comm., 2021).

3.1.4.4. *Non-herbicide treatment effects on non-target plants*

Non-herbicide treatments are more habitat-disturbing than herbicide treatments. These treatment methods include manual and mechanical treatment methods, competitive seeding and planting, solarization, prescribed fire, and biological treatments (insects and targeted grazing). Please see **Appendix B: Integrated Invasive Plant Management** for detailed descriptions of these types of treatments. Chapter 4 of the 2007 PER (pp. 4-33 – 4-59) describes the non-herbicide invasive plant treatment effects to desirable vegetation. The BLM summarized sections relevant to western Oregon biomes and supplemented them with District specific information.

3.1.4.5. *Manual*

Manual treatments benefit native plant communities on public lands without the risks of adverse effects to non-target species associated with most of the other treatment methods. Manual methods are highly selective, causing injury and mortality only to target plants/fuels. The BLM limits manual treatments because of their high cost and applies them in limited areas where other treatment methods are not feasible. Manual treatments would result in small amounts of trampling or accidental removal of non-target plants, particularly since manual treatments requires repeated treatments to prevent the reestablishment of aggressive weeds. Manual treatments of some species, such as Scotch broom and invasive geraniums, are less effective or even ineffective as the disturbance created by pulling roots promotes rapid re-establishment of the population from established seed banks.

3.1.4.6. *Mechanical*

Mechanical treatments would injure or kill plants by removing plant material on the treatment site. The BLM would target undesirable vegetation with an overall goal of restoring ecosystem health; however, methods that remove only aboveground plant biomass would have few lasting effects on native plant communities, as non-target species would be able to recover quickly by resprouting. Mechanical treatments used most often on the District include the use of brush cutters, string

trimmers, and propane torches. These treatment methods are selective and would minimize damage to non-target plants present at the treatment site. Mowing occurs infrequently on the District outside of the West Eugene Wetlands.

Herbaceous plants would be more resilient to top-removal treatment methods than woody species, as many herbaceous species die back annually. Herbaceous plant growth increases after mechanical treatments due to reduced competition with woody species for light, nutrients, and water. Therefore, mechanical treatments would increase desirable herbaceous species growth due to removing invasive woody species. Treatments occurring during the growing period and prior to seed maturation and dispersal would have the greatest potential effects on invasive herbaceous species.

Some changes in understory species composition could occur following mechanical treatments, as certain species respond favorably to mechanical treatments, and others do not. Repeated non-selective mechanical treatments such as mowing could adversely affect native communities by altering species composition. Removal of shrubs using techniques that cut only aboveground portions of vegetation would result in little change to plant communities, as shrub species would rapidly resprout from buds in the base, rhizomes, or roots (Cable 1975, as referenced in USDI BLM 2007). Shrubs would also return from seeds, favoring species that do not require fire to germinate. Therefore, these treatments would be likely to affect native plant communities by altering their species composition over the long term.

The use of heavy equipment in oak woodlands could negatively affect oaks as the shallow root systems of oaks could be physically damaged by heavy equipment.

Mechanical methods are effective in removing thick stands of vegetation, but the machinery can spread seed and treatments often don't kill roots. There are also minor risks associated with spilling oil and fuels from hand-held equipment, such as chainsaws, which could kill or harm plants.

3.1.4.7. *Prescribed Fire*

Prescribed fire can injure and kill native plants. Fire would negatively affect some species that are not adapted to fire; however, the Willamette Valley and Cascade foothills evolved with frequent fires and many native species respond positively to fire. Fire effects to woody species include short-term reduction in woody plant canopies, but most woody invasive plants on the District are shrubs that would rapidly reestablish in the absence of additional treatment methods. Fire effects to herbaceous species would be variable but would generally result in a short-term decrease in cover and consumption of thatch, followed by an increase in cover the season following treatment due to an increase in soil nutrients. Prescribed fire would reset highly invaded sites to a condition conducive for restoration activities by removing the bulk of competing plant biomass. The BLM must carefully plan prescribed fire because there is potential for fire to promote some invasive plant species growth on the District, such as false brome (Mark V. Wilson, pers. comm., 2010; Fjeran 2014). The BLM must follow up with additional invasive plant treatments such as competitive seeding and planting, and herbicide treatments to treat invasive species re-growth after prescribed fire treatments; otherwise, it's possible that negative impacts would outweigh positive impacts. Prescribed fire treatments that are well-planned and customized to the plant community would result in long-term benefits to desirable native plant communities by reducing invasive plant cover and fuel loads across the landscape, which also reduces the risk of wildfires.

Prescribed fire as an invasive plant treatment would not affect T&E or Bureau Sensitive plants because fire prescribed for this purpose would only occur in monocultures of weeds or areas where all species are invasive.

3.1.4.8. *Biological*

Classical biocontrol agents (insects, nematodes, mites, and pathogens) negatively affect native species in a negligible amount because of the extensive testing by United State Department of Agriculture (USDA) Animal and Plant Health Inspection Service (APHIS) and Oregon Department of Agriculture (ODA) requiring host-specific approval. Biocontrols reduce susceptible invasive plant species populations and provide beneficial effects to native plants.

Targeted grazing is not widespread on the District, although there are situations in which the BLM would use grazing as an appropriate treatment for invasive species or for encroaching native species. This project limits grazing to goats or sheep; there are no sites on the District identified as suitable for cattle grazing. Targeted grazing would occur in herbaceous communities (annual and perennial grassland and perennial forb communities) that have significant weed infestations. Domestic animals would affect non-target vegetation by browsing and trampling/kicking up plants. The extent of effects to non-target vegetation would depend on the animal species used, the plant species' tolerance to grazing, management of the grazing system (i.e., timing, area, intensity, frequency, and duration), and the site's pre-treatment condition and disturbance history. Different types of livestock have different food preferences. Sheep and goats typically prefer broadleaved forbs, although sheep will consume more grass than goats (Walker et al. 1994, as referenced in USDI BLM 2007). The diet preferences of livestock could result in alterations to plant species composition after prolonged periods of grazing.

Many weed species are of poor forage quality and have low palatability due to toxins, spines, and distasteful compounds, which causes domestic animals to avoid them in favor of native plant species. Goats, however, can be trained on specific invasive species to preferentially target those plants. The effects of grazing would be greatest when conducted before plants have produced seed (resulting in reduced reproductive capacity), during times of drought or stress, or if conducted repeatedly.

The use of domestic animals would indirectly affect native plant communities by encouraging weed infestations as a result of soil disturbance and by spreading propagules in fur or dung. Therefore, grazing treatments not confined to areas of high weed infestation would adversely affect the surrounding native plant communities, or other grazing sites, by increasing the weed coverage within them.

Livestock could alter the nutrient cycling processes of native plant communities receiving grazing treatments by depositing organic nitrogen in urine and feces, and by mixing surface organic matter. High soil nitrogen could also assist in the spread of established weeds, such as downy brome and medusahead, by stimulating seed germination (Belsky and Gelbard 2000, as referenced in USDI BLM 2007).

Because of the numerous factors involved in determining the extent of effects to native plant communities from grazing, the BLM's grazing management systems require involving the right combination of animals, timing, and stocking density, and must be carefully designed, managed,

and monitored to avoid effects to native plant communities on treatment sites (Olson 1999, as referenced in USDI BLM 2007d).

3.1.4.9. *Special Status*

In general, the potential effects to special status plant species from the proposed vegetation treatments would be similar to those described for vegetation as a whole. Disturbances from treatments are more likely to affect special status species and their habitats because of their rarity and sensitivity. The BLM would require additional mitigation for all treatments where Special Status plants occur (see **Appendix E**) Protection Measures).

3.1.4.10. *Alternative A – No Action Alternative*

Under Alternative A, native plant communities would continue to become infested at an average rate of 10 percent over a 15-year period¹². The total amount of gross acreage the BLM could feasibly treat per year would be 2,453 acres. Field Office specialists would prioritize infestations using a triage approach. The BLM would give top priority to new invaders and EDRR species for the most effective treatments and to protect the greatest possible acreage of native plant communities from infestation. The BLM would give next priority to invasive plant treatments threatening sensitive habitats and other special areas, and infestations within and near project areas; however, many of these infestations would remain untreated or would be treated using suboptimal methods, as treatments would not follow the Treatment Key for 57 percent of treatments, on average. Many sites of invasive species for which non-herbicide methods have limited effectiveness, such as Himalayan blackberry, knotweeds, and invasive geraniums, would go untreated, as herbicide treatments would be implemented on only the highest priority sites. Under Alternative A, there would be increased risk of re-infestation and additional treatment needs both for perennial grass infestations and at 57 percent of total weed treatment site acreage. Native plant communities would become infested on four times the current area from 25,673 mapped infested acres¹³ to 109,432 acres, equaling 15 percent of BLM land on the District.

3.1.4.11. *Alternative B – Preferred Alternative*

Under Alternative B, the proposed action alternative, the BLM would be able to maintain native plant communities at their current levels, provided it implements ATPs of at least 4,000 acres per year. The amount of acreage BLM could feasibly treat is optimized at 10,000 acres and would be limited only by funding and staffing levels. All infestations would be treated according to the Treatment Key. Specialists would prescribe the most appropriate treatments grounded in Integrated Pest Management principles. Under Alternative B, manual and mechanical treatments would be prescribed at small or easily accessible sites, sites with high public use such as recreation sites, and ad hoc treatments implemented upon discovery of an infestation or to create efficiency by implementing treatments while at the site for other purposes. There would be an increased risk of re-infestation and additional treatment needs only for perennial grass infestations. This would decrease infested acres over a 15-year period from 25,673 acres to 24,210 acres, equaling 3.4

¹² ¹² This rate is compared to 12 percent, the rate of invasive plant spread estimated in Alternative 2, the No Action Alternative in the Oregon FEIS (USDI BLM 2010a: 133).

¹³ This number represents overlapping infestations wherein infested acreage from all weeds are only counted once. Infestations mapped by species total 59,553 acres of overlapping infestations.

percent of BLM land on the District. If only 3,000 acres were treated per year, infested acres would double over a 15-year period from 25,673 acres to 53,288 acres, equaling 7.5 percent of BLM land on the District. BLM could conserve and restore all infested acres to native species within 10 years by consistently treating between 6,000 and 10,000 acres per year (See **Issue 2 (Botany)** *How would the proposed treatments, including herbicide, manual, mechanical, cultural, and biological, and prescribed fire (limited to invasive plants) affect the rate of spread of invasive species?*).

3.1.4.12. *Alternative C – Reference Alternative*

Under the Reference Alternative, native plant communities would become infested at an average rate of five percent over a 15-year period. The BLM could feasibly treat 4,089 acres per year implementing Alternative C. Field office specialists would prescribe treatments for the highest priority sites according to the Treatment Key but treatments would not follow the Treatment Key for 27 percent of treatment acreage, on average, and the overall program would remain suboptimal. Total treatments of all types across the District would be less than half of the acreage the BLM would treat under Alternative B, the preferred alternative. Alternative C would increase the risk of re-infestation and additional treatment needs both for perennial grass infestations and at 27 percent of total weed treatment site acreage. Native plant communities would become infested over a 15-year period with total infested acres doubling from 25,673 mapped infested acres¹⁴ to 53,624 acres, equaling eight percent of BLM land on the District. Note that due to decreased program effectiveness, the District would need to treat 25 percent more land on an annual basis, 4089 acres, than required to achieve the same infested acreage reduction as would be achieved by treating 3,000 acres under Alternative B, the proposed action.

3.1.4.13. *Alternatives Summary*

Effects of invasive species treatments under the alternatives are considered for BLM and partner land across the District, including beneficial as well as harmful effects. The District considered short term, or immediate effects and contrasted them with long term anticipated trajectories of habitat improvement or decline. Impacts to desirable plant communities from treatments affecting non-target species range from negligible to adverse.

The proposed action, Alternative B, would result in the greatest benefit to native plant communities by reducing invasive plants on the greatest amount of gross acreage across the landscape. Table 14 in Section 3.2.4.4 compares infested acreage projections over the next 15 years by alternative, including typical and maximum projected ATPs under the proposed action. As noted in Section 3.1.2. Analytical Process, the degree to which the alternatives slow the spread of invasive plants has a corresponding and generally proportionate beneficial effect on the retention of functional native plant communities.

3.1.5. Cumulative Effects

The 2010 Oregon FEIS, Chapter Four - Environmental Effects addressed cumulative effects and states that “because this is a statewide programmatic document covering the estimated level of

¹⁴ This number represents overlapping infestations wherein infested acreage from all weeds are only counted once. Infestations mapped by species total 59,553 acres of overlapping infestations.

future herbicide use in Oregon (that will be subsequently covered by district or project site-specific analysis), this entire analysis is itself a cumulative effects analysis” (USDI BLM 2010a: 117). Adjacent landowners that implement herbicide treatments include the Forest Service, U.S. Army Corps of Engineers, Oregon State Forests, Oregon State Parks, municipalities including counties, cities, and towns, private industrial timber, private agriculture, and other private businesses and residential lands. The 2010 Oregon FEIS states that:

Herbicide use rates on immediately adjacent non-BLM lands are unknown, and therefore cumulative effects at the small watershed scale are impossible to quantify. However, statewide herbicide use levels... indicate the proposed BLM use would be less than one percent of all use in the State (on 25 percent of the State’s area) [this percentage would be lower for BLM districts in western Oregon due to a smaller proportion of broadcast treatments compared to districts east of the Cascades, and the absence of aerial treatments, both of which are applied to generally larger acreages on eastern Oregon BLM lands]. This, and the application of Standard Operating Procedures and PEIS Mitigation Measures, the proposed application methods, and the expected size and distribution of the treatment sites, indicates little if any contribution to cumulative off-site effects even at small geographic scales. In fact, the control of invasive plants on BLM lands has the potential to reduce herbicide use on adjacent non-BLM lands (USDI BLM 2010a: 115-116).

Adjacent private landowner values and uses would benefit from improved invasive weed control on BLM lands because reducing overall weed spread on BLM lands also reduces weed spread onto adjacent non-BLM lands. In addition, weed control would be more efficient for private owners and BLM managers combined, because additional herbicides would make cooperative, cross-boundary treatments more feasible. Effectively treating weed spread on BLM lands and cooperative cross boundary treatments would reduce herbicide use on adjacent BLM lands. Such a reduction would be effective in places like... the checkerboard O&C lands west of the Cascades (USDI BLM 2010a: 117).

Under all alternatives, BLM would implement treatments within the constraints of the 2007 and 2015 PEISs and the 2010 FEIS, incorporating all relevant and appropriate protection measures. There would be no cumulative effects outside of or in addition to the effects analyzed in those documents.

3.2. Issue 2 (Botany) How would the proposed treatments, including herbicide, manual, mechanical, cultural, and biological, and prescribed fire (limited to invasive plants) affect the rate of spread of invasive species?

3.2.1. Background

Timber harvest, road construction, and recreation all contribute to invasive plant spread, along with management actions such as special forest products, right-of-way agreements, road maintenance, and fuels reduction treatments (USDI BLM 2016c: 419-438). Even restoration actions such as riparian restoration projects, planting, and manual and mechanical weed removal can be ground-disturbing and require follow-up weed treatments.

Within any plant community or infestation, the rate of spread fluctuates over time (Figure 3). As described in the 2010 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. Rapid growth follows this phase and continues until the invasive plant species reaches the bounds of its new range (USDI BLM 2010a: 132).

Invasive plant control programs are most effective in the earliest phases (before establishment and spread). Eighty-three percent of the mapped invasive plant infestation sites on the District are smaller than one acre (Table A-1, *Summary of mapped invasive plants 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 eradication is possible with effective treatment.

Three percent of sites are larger than 5 acres, but account for 59 percent of mapped acres (Table A-1). As described in the *Prioritizing Areas for Treatment* section in **Appendix B**, the BLM would treat these larger sites to prevent spread (containment) and to decrease the infestation as funds and staffing are available by treating the periphery first and working inward.

The District would not treat all invasive plants or all infestations. The District selects treatment acres based on type of species, location, potential for spread, and efficacy of available treatments. Further information is available in **Appendix B**, in the *Prioritizing Areas for Treatment* section.

3.2.2. Analytical Process

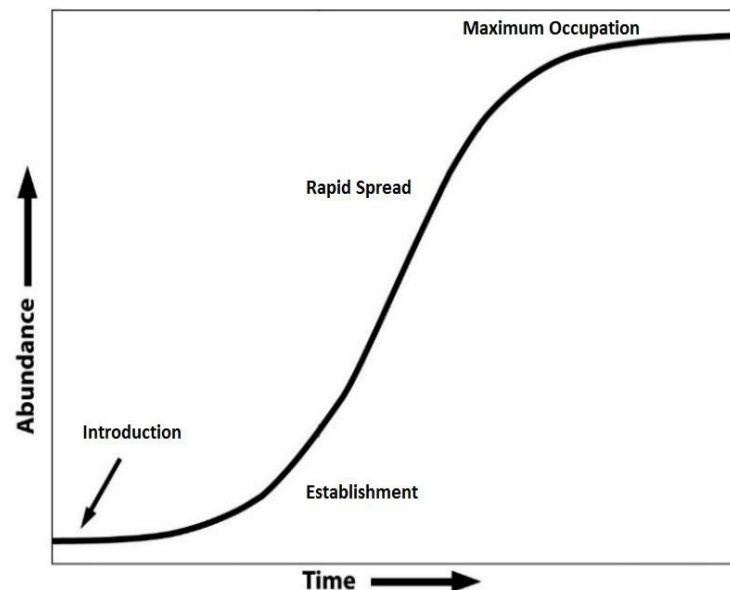
The BLM considered the following factors in the analysis of this issue:

- Current District invasive plant infestation acres
- Invasive plant infestation rate of spread
- Invasive plant infestation treatment acres
- Treatment method adequacy; and
- Overall program effectiveness

3.2.2.1. Assumptions

The Treatment Key (**Appendix A**) recommends herbicide treatments 82 percent of the time. Following the Treatment Key 100 percent of the time would result in 82 percent herbicide treatments if the BLM targeted all infestations at once. In practice, this percentage amount would vary between ATPs designed to treat a subset of infestations that don't perfectly mirror the

Figure 3. Infestation size and density over time



distribution of acres of all mapped invasive species groups across the District. For analysis purposes, we remove this consideration so that theoretical ATPs mirror the distribution of acres.

This project assumes program effectiveness given available treatment methods to be 78 percent under all alternatives. The 2010 Oregon FEIS estimated that program effectiveness would be 80 percent in a program where the suite of treatment methods and available herbicides is sufficiently broad for treatments to meet the program's invasive plant management objectives (USDI BLM 2010a: 136). Hence this project estimates treatment efficacy to be 80 percent for most terrestrial plants except for perennial grasses. Treatment efficacy for perennial grasses is estimated at 60 percent.

As shown in the Treatment Key (**Appendix A**), the District estimates that there is “no adequate control” for 10 percent of perennial grass infestations included in ATPs developed with the current suite of available herbicides. As described in **Issue 2 (Botany)**, treatment methods currently available to BLM are only moderately effective on perennial grasses. For this reason, treatment plans do not prioritize herbicide treatments for species in this functional group, such as false brome and reed canarygrass, as often as the District would prescribe if effective and selective herbicides for this functional group¹⁵ were available. The District might decline to use non-selective herbicides on infestations of perennial grasses in areas where there are desirable or sensitive broadleaf plants growing interspersed with invasive perennial grasses. Perennial grass infestations comprise 10 percent of mapped invasive species on the District; therefore, the BLM estimates total program effectiveness to be 78 percent.¹⁶

As described in section 3.1.1, limiting herbicide treatments to 25 percent of District ATPs results in limiting the District's feasible annual treatments to 2,453 gross acres. Limiting herbicide treatments to 55 percent of ATPs results in limiting feasible annual treatments to 4,089 gross acres, while following the Treatment Key recommendations would optimize feasible treatment acreage to more than 10,000 gross acres.

As described in the 2010 Oregon FEIS and section 3.1.2.1, the BLM assumes that the rate of spread from existing infestations is 12 percent annually.

The BLM calculates rates of spread from all mapped District infestations, including the West Eugene Wetlands, seed orchards, and in some cases neighboring ownerships. The District develops ATPs independently from the West Eugene Wetlands and seed orchards, which implement separate treatment plans. Due to this disparity, rates of spread under various District ATP scenarios are inexact. The uncertainty of future invasive plant rates of spread due to climate change effects, as well as program funding and emphasis uncertainties, limit accurate acreage infestation and spread estimates. The various treatment scenarios would proportionally reduce overall density and net treatment acres; however, correlating density or net acreage reduction to gross acreage reduction is less predictable. It is common to treat infested acres multiple times even when treatments are effective because invasive plant seeds and other underground propagules emerge in subsequent years and the BLM must re-treat the area. With multiple successive treatments, the

¹⁵ At the national level, BLM is analyzing a suite of active ingredients including some that are more effective on perennial grasses than those currently authorized.

¹⁶ $(80\% \text{ effectiveness} \times 90\% \text{ acreage} = 72\%) + (60\% \text{ effectiveness} \times 10\% \text{ acreage} = 6\%) = 78\%$.

density of invasive species decreases until the seed bank is exhausted. The estimates presented are therefore approximate, but useful and appropriate for purposes of comparing alternatives.

This project estimates a temporal time scale for treatment applications over the next 10 to 20 years. Actual annual treatment levels would vary from year to year based on changes in program emphasis or priorities, fluctuations in annual budgets and staffing, opportunities for cost savings with partnerships, availability of external funding, and in response to unforeseen events, such as wildfires or even COVID, which negatively affected volunteer and partner projects in 2020 and 2021.

For the purposes of comparison, this analysis assumes that treatments are effective only when following the Treatment Key recommendations. This exaggerates the number of acres of treatments that would be unsuccessful.

3.2.2.2. *Analytical Method Summary*

The BLM treats all possible invasive plant species within project sites during invasive plant treatments; the removal of only one species at a site where several species are intermingled would lead to the other invasive plants at the site revegetating the area. The BLM would not effectively treat all invasive plants in a given area using the same method, and some invasive species require multiple treatments within the same year to be effective. The District designs ATPs with multiple seasonally appropriate treatments in an area to address the composition of invasive species at a given site. The BLM calculated annual treatment plan acreage and rate of spread under the project alternatives using the 25,673 total gross infestation acres that accounts for species overlap, rather than the 59,553 gross acres of overlapping species-specific infestation polygons.

Alternative A, the No Action Alternative, limits herbicide treatments to 25 percent. Therefore, the District would not follow the Treatment Key 57 percent of the time. The District would follow the Treatment Key only 43 percent of the time under this alternative.

Alternative B, the Preferred Action Alternative, would authorize the District to follow the Treatment Key 100 percent of the time.

Alternative C, the Reference Alternative, limits herbicide treatments to 55 percent. Therefore, the District would not follow the Treatment Key 27 percent of the time. The District would follow the Treatment Key 73 percent of the time under this alternative.

This project compares program effectiveness under each of the alternatives by multiplying 78 percent potential treatment effectiveness, based on the availability of effective treatment methods, by the percentage of times the BLM follows the Treatment Key (Table 13). Program effectiveness percentages in this model represent a scenario in which implementing treatment methods other than those recommended by the Treatment Key are ineffective, which would not always be the case. This project considers these projections to be reasonable approximations of the relative, rather than absolute, differences among the alternatives.

Table 13. Program effectiveness by alternative.

	Available Treatment Method Effectiveness	Percentage of Times/Acres Treatment Key is Followed	Program Effectiveness
Alternative A	78%	43%	34%
Alternative B	78%	100%	78%
Alternative C	78%	73%	57%

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

3.2.3. Affected Environment

There are currently 113 invasive plant species mapped across 25,673 gross acres on the District. Many invasive species sites overlap with other invasive species sites. For example, a site of Scotch broom may exist in the same area as a site of shining geranium and a site of Himalayan blackberry (Table A-3, *Mapped invasive plants by infestation size*). **Appendix A** displays these species and acreages, organized by 27 species groups. The District provides mapped invasive species sites for viewing, 59,553 gross acres of overlapping non-native infestation polygons across the District in an interactive map on the BLM's National NEPA Register (ePlanning): <https://eplanning.blm.gov/eplanning-ui/project/2018524/580>.

The District has not mapped all infestations. The District has inconsistently mapped low priority species throughout the District and precise acreage is unknown. It is unknown if they will become a priority for treatment (see **Appendix B** Prioritizing Areas for Treatment section); however, the District would map these infestations before treatments occur. For analysis of this issue, the BLM calculated program-wide efficacy based on mapped acres.

Most infestations on the Northwest Oregon District occur on roadsides within forests, at recreation sites, in meadows, and in forest openings where invasive plants have more access to sunlight and less competition from native woody plants. The District has mapped two aquatic invasive species. **Appendix C** describes in additional detail the District's invasive plant species and infestations.

3.2.4. Direct and Indirect Effects

The 2010 Oregon FEIS notes on page 135:

While projections of weed spread in this section are based on considerable published data, it is acknowledged that attempts to quantify future weed spread require many assumptions. Some of these assumptions may not be entirely accurate, either because management emphasis may change or because the assumptions themselves are simply flawed. Therefore, the projections in this section should be viewed not so much as predictions of what will occur over time, but as reasonable approximations of the relative differences between the alternatives.

Estimating rates of spread does not take into account climate change effects. The BLM expects climate change to increase invasive plant spread and to increase the differences between alternatives as well (USDI BLM 2010a: 139, 171-172). Infestations and treatments on neighboring land ownerships would also condition projections, which cannot be easily quantified.

3.2.4.1. *Alternative A – No Action*

Under Alternative A, the No Action Alternative, the District would treat up to 2,453 acres per year, following the Treatment Key 43 percent of the time. Alternative A would authorize treating 1,055 acres per year using the optimal methods recommended by the Treatment Key. Under all alternatives, available treatment methods indicate a 78 percent effectiveness rate, and the District therefore expects treatments to be successful on 834 acres per year under this alternative. Treatments would be less effective than the preferred alternative 57 percent of the time. Overall, the program would be 34 percent effective.

Invasive plants would continue to spread at their current rate, estimated at 12 percent per year. Given a 12 percent rate of spread and effective treatment of 834 acres annually, the 25,673 acres of mapped infestations would spread to 109,432 acres over the next 15 years.

3.2.4.2. *Alternative B – Preferred Alternative*

Under Alternative B, the Preferred Alternative, the District would treat up to 10,000 acres per year, following the Treatment Key 100 percent of the time. Alternative B would authorize up to 10,000 treatment acres per year using the optimal methods recommended by the Treatment Key. The District would target non-herbicide treatment methods in areas where such methods are most effective or used in conjunction with herbicide methods to enhance treatment effectiveness. Under all alternatives, available treatment methods indicate a 78 percent effectiveness rate and successful treatments on 7,800 acres in a given year, when treating the maximum gross acreage. Overall, the program would be 78 percent effective.

Invasive plants would continue to spread at their current rate, estimated at 12 percent per year. Effective annual treatments of 7,800 acres would completely treat all 25,673 acres of mapped infestations within five years.

Because current funding and staffing levels would not support a program this aggressive for multiple consecutive years, this project also provides analysis under this alternative mirroring more typical ATPs.

Under a 3,000-acre ATP, Alternative B would authorize treating all infestation acres using the optimal methods recommended by the Treatment Key, and the BLM expects successful treatments on 2,340 of those acres given available treatment methods. The District estimates mapped infestations to spread from 25,673 acres to 53,288 acres over the next 15 years, given a 12 percent rate of spread and effective treatment of 2,340 acres annually.

Under a 4,000-acre ATP, Alternative B would authorize treating all infestation acres using the optimal methods recommended by the Treatment Key, and the BLM expects successful treatments on 3,120 of those acres given available treatment methods. The District expects a 4,000-acre ATP

to reduce mapped infestations from 25,673 to 24,210 acres over the next 15 years, given a 12 percent rate of spread and effective treatment of 3,120 acres annually.

Under a 6,000-acre ATP, Alternative B would authorize treating all infestation acres using the optimal methods recommended by the Treatment Key, and the BLM expects successful treatments on 4,680 of those acres given available treatment methods. The District expects a 6,000-acre ATP to completely treat the mapped 25,673 infestation acres over the next 10 years, given a 12 percent rate of spread and effective treatment of 4,680 acres annually.

3.2.4.3. *Alternative C – Reference Alternative*

Under Alternative C, the Reference Alternative, the District would treat up to 4,089 acres per year, following the Treatment Key 73 percent of the time. Alternative A would authorize treating 2,985 acres per year using the optimal methods recommended by the Treatment Key. Under all alternatives, available treatment methods indicate a 78 percent effectiveness rate, and the District therefore expects treatments to be successful on 2,388 acres per year under this alternative. Treatments would be less effective than the preferred alternative 27 percent of the time. Overall, the program would be 58 percent effective.

Invasive plants would continue to spread at their current rate, estimated at 12 percent per year. Given a 12 percent rate of spread and effective treatment of 2,331 acres annually, the 25,673 acres of mapped infestations would spread to 53,624 acres over the next 15 years.

3.2.4.4. *Alternatives Summary*

Table 14 summarizes invasive plant spread by alternative. The BLM would prevent infestation spread from their current levels under Alternative B, with an annual 4,000-acre treatment. The BLM expects progress toward decreasing infestations if the District treats more than 4,000 acres per year on a consistent basis. Under Alternative A, the District expects infestations to increase to 109,432 acres over the next 15 years, approximately four times the current infestation levels. Under Alternative C, the District expects infestations to increase to 53,624 acres over the next 15 years, approximately doubling current infestation levels.

Table 14. Projected invasive plant spread rates for each alternative. ^{† ‡}

Alternatives	Percent annual spread of noxious weeds in 15 years	Total acres noxious weeds in 15 years*	Acreage difference from No Action	Approximate change from current condition
Alternative A	10%	109,432	0	4 times current infestation levels
Alternative B treat 4,000 acres annually	-0.3%	24,210	85,222 fewer infested acres	Slight decrease from current infestation levels
Alternative B treat 10,000 annually**	-15%	0	109,432 fewer infested acres	Complete treatment
Alternative C	5%	53,624	55,808 fewer infested acres	2 times current infestation levels

† Calculations are based on treating all overlapping weeds at a site. Removing overlap from mapped polygons results in 25,673 acres of infested BLM land on the District.

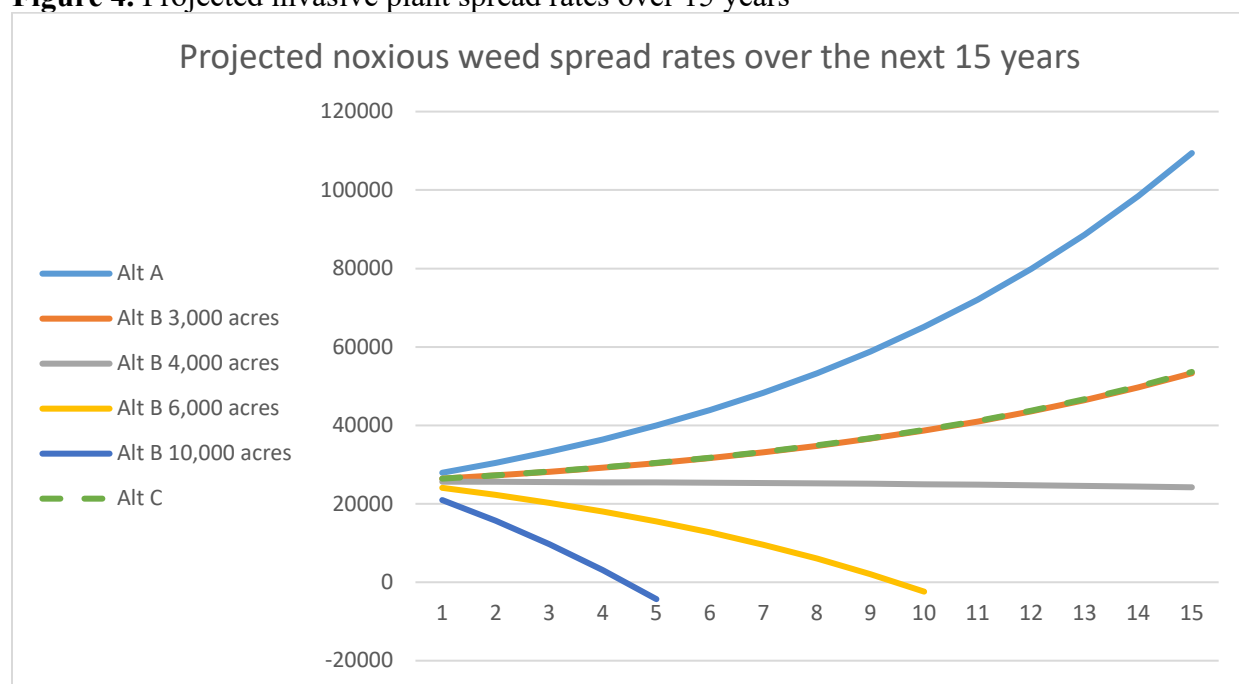
‡ Projected spread rates are calculated from all mapped weeds on the District, including West Eugene Wetlands and seed orchards.

* Calculated from spread rate; does not reflect the potential for biological saturation.

** Idealized for comparison purposes; it is unlikely the BLM would have funding and staffing to treat 10,000 acres consistently for 15 years.

Figure 4 graphically illustrates the projected rate of spread under each alternative and under different treatment scenarios under the alternatives. Acres treated across the District vary from year to year, depending on funding and staffing levels. Notably, treating 3,000 acres annually under Alternative B results in an identical projected rate of increase as treating 4,089 acres annually under Alternative C.

Figure 4. Projected invasive plant spread rates over 15 years¹⁷



The selection of Alternative A or C would unnecessarily restrict BLM and partners from using the most appropriate treatments available and from implementing treatments on as many infested acres as possible. Infestation spread would increase and treatments would be less cost-effective than Alternative B, as greater investment would be required per acre to make up for less effective treatments.

3.2.5. Cumulative Effects

Additional herbicide active ingredients that are more effective on and selective for perennial invasive grasses would increase program effectiveness. A BLM programmatic Environmental

¹⁷ Alternative B 3,000-acre projection is nearly identical to Alternative C

Impact Statement is currently underway that would authorize several new herbicide active ingredients, including three that would be useful to the District for controlling perennial grasses: clethodim, fluazifop-p-butyl (currently only available for research and demonstration plots), and flumioxazin. Reed canarygrass and false brome are perennial grasses the District currently treats with broad-spectrum herbicides such as glyphosate. Increasing the number of herbicide active ingredients effective on perennial grasses would decrease the risk of chemical resistance to those active ingredients currently authorized. The District would develop a new Environmental Analysis to authorize use of the new active ingredients so that treatments of perennial grasses would be more effective, and to reduce the risk of resistance to the broad-spectrum herbicides currently used to treat that species group.

See Section 3.1.5 for additional discussion of cumulative effects relevant to the District's invasive plant treatments.

3.3. Issue 3 (Botany) What are the effects of prescribed fire, tree removal, and container plantings on desirable plant communities, including federally listed plants and Bureau Sensitive plants and fungi?

3.3.1. Background

Analysis for this issue tiers to the *Northwest Area Noxious Weed Control Program* FEIS and Supplement (USDI BLM 1985, 1987) and incorporates by reference those elements of the 2007 PER relevant to prescribed fire. The 2018 IIPM EA also included prescribed fire as a tool for invasive plant management. That document similarly tiers to the 1985 FEIS and 1987 Supplement and incorporates by reference elements of the 2007 PER. The 2018 IIPM EA, however, specifically limited its analysis to non-native species. The District's Botany and Invasive Plants program is therefore, with few exceptions, limited to prescribing broadcast fires in monocultures of weeds or areas where all species are invasive; and limited to pile burning only invasive species. There is a need to restore historical ecological processes, including more frequent fires, in areas that are not monocultures of weeds or areas where all species are invasive, and to pile burn native woody encroaching species as well as non-native, invasive species. There is a need to remove encroaching native woody vegetation, including trees, from meadow habitats, prairie remnants, and canopy gaps that fire historically maintained. There is also a need to restore and enhance meadow communities by planting container plants. This issue addresses ground disturbance caused by container plantings of any plant species for restoration purposes. This project addresses plant augmentation of Special Status species as a genetics and species recovery issue in **Issue 4 (Botany)**.

This project would prescribe fire treatments for meadow restoration (as opposed to fire prescribed solely as an invasive species treatment) and would improve habitat for plants addressed in the *Recovery Plan for the Prairie Species of Western Oregon and Southwestern Washington* (USDI FWS 2010) and the *Interagency Conservation Agreement for Eucephalus vialis (Wayside Aster)* (USDI & USDA 2006).

3.3.2. Analytical Process

The 2018 IIPM EA analyzed treating on average 400 acres of invasive plants annually with prescribed fire. Although the 2018 IIPM EA limited the prescribed fire usage to invasive plant populations, consultation with the FWS resulted in a Biological Assessment for the project that included project design features and analysis for prescribed fire on 80 acres of Recovery Plan species habitat over any five-year period. The District does not have a need to treat more than 400 total acres of prescribed fire on the District for this project. This includes fire prescribed for Recovery Plan habitat restoration and for invasive plant treatments; however, there is a need to analyze an increase in annual acres prescribed specifically for Recovery Plan habitat restoration.

3.3.2.1. *Assumptions*

The District assumes that wayside aster would benefit from prescribed fire due to its habitat needs of open woodland and canopy gaps and occurrence in areas with historically moderate to high fire frequency. This assumption is supported by section V.1. Succession and Fire Exclusion in the Conservation Agreement (USDI & USDA 2006 p. 4). The District assumes that Nelson's checkermallow would tolerate prescribed fire treatments because its habitat needs are the same as other Recovery Plan species which evolved in Willamette Valley prairies that were maintained by frequent fires. This assumption is supported by the professional opinion of qualified botanists and ecologists at BLM and the Institute of Applied Ecology (Tom Kaye, pers. comm. 2023).

3.3.2.2. *Analytical Method Summary*

Short term prescribed fire effects are observable immediately after burning, while long term effects describe the habitat improvement trajectory provided by prescribed fire treatments. The District has limited prescribed fire for meadow restoration spatially to habitats capable of supporting plant and pollinator populations listed in the Recovery Plan and Conservation Agreement listed above. When prescribing fire solely to treat invasive plants, the District would limit the treatment spatially to weed monocultures or areas where all species are invasive.

Special status plants described in the Recovery Plan have been studied and monitored prior to and following prescribed fire treatments. Descriptions of effects to these species such as increased vigor, increased population size, number of individuals, and percent cover have been compiled from many peer-reviewed papers and journal articles.

3.3.3. Affected Environment

Western Oregon meadows and prairies, which support several of the BLM's Special Status plants, evolved with periodic fire disturbance. Fire suppression and exotic species introduction have altered and degraded western Oregon meadow plant communities, which are susceptible to shrub and conifer encroachment. Willamette Valley prairies in the lowlands and foothills have been largely displaced by agricultural lands and now cover less than one percent of their historic area, making this habitat type one of the rarest ecosystems in North America (Noss et al. 1995). Many native meadow and prairie plant species have become increasingly rare as meadows undergo altered plant communities and successional trajectories. BLM specialists have identified meadows, meadow complexes (meadows in close proximity to each other, ideally with connection corridors

to aid dispersal), and units with canopy gaps on the District where prescribed fire would improve occupied or potential habitat for species listed in the 2010 Recovery Plan or 2006 Conservation Agreement. The BLM mapped these in polygons within Areas of Critical Environmental Concern (ACEC) boundaries or included them in polygons with adjacent acreage to account for prescribed fire operational needs (see Table 6), available for public viewing on an interactive map on BLM's National NEPA Register (ePlanning) and presented, with descriptions, in the list below. The BLM may identify additional restoration opportunities in outgoing years, either on land managed by BLM or by partners.

1. Beaver Creek is a complex of two small meadows in the Beaver Creek Watershed in the Cascades field office, in the northeast portion of the District. It is a remnant oak woodland with thin, rocky soils supporting native prairie flora as well as Oregon white oak (*Quercus garryana*). There are several small populations of pale larkspur within two miles of the Beaver Creek meadows, which would be suitable habitat for that and potentially other imperiled prairie species. Oregon ash (*Fraxinus latifolia*), ocean spray (*Holodiscus discolor*), Lewis's mock orange (*Philadelphus lewisii*), and common snowberry (*Symphoricarpos albus*) comprise the woody plant species in the meadow.
2. Dorena Prairie is an ACEC located just west of Dorena Lake in Lane County, Oregon. The BLM portion of the prairie is 9.6 acres in size. A mature conifer forest, riparian hardwood forest, the Army Corp of Engineers Schwarz campground and park, and Row River Road all border this ACEC. Most of the plants growing at Dorena Prairie are upland species, but the prairie is flat and ponding rainwater exists during the winter through early summer. Historically, Roemer's fescue (*Festuca idahoensis* ssp. *roemerii*) dominated this meadow but now the most frequent native grasses are California oatgrass (*Danthonia californica*) and blue wildrye (*Elymus glaucus*). The most frequent native forbs are wild strawberry (*Fragaria virginiana*), yarrow (*Achillea millefolium*), rose checkermallow (*Sidalcea malviflora* ssp. *virgata*), and riverbank lupine (*Lupinus rivularis*). Invasive plants at the site include false brome, meadow knapweed, invasive thistles, invasive blackberries, Scotch broom, and medusahead. Common snowberry is a native encroaching woody species. In 2016, the BLM introduced 200 plugs of Bureau Sensitive thinleaf pea (*Lathyrus holochlorus*) plugs to the meadow; as of 2021, a population of 20 plants has persisted. This site could serve as habitat for shaggy horkelia, wayside aster, white-topped aster, and checkermallows.
3. Eagles Rest Parcel 3 is a small meadow bisected by Eagles Rest Road. A population of Kincaid's lupine occurs on either side of the road, although butterfly surveys have not detected Fender's blue larvae at this site. Eagles Rest Parcel 3 is one of the few remaining upland prairie remnants in the Cascade foothills of the southern Willamette Valley that, while containing some non-native species, also contains a substantial native plant community. The BLM characterizes Eagles Rest Parcel 3 as a forest opening harboring a diverse native upland prairie plant community. In addition to Kincaid's lupine, this site could serve as habitat for Hitchcock's blue-eyed grass. Conservation threats in this meadow include encroachment of shrubs, invasion by exotic plant species and damage by off-road vehicle (ORV) use. Invasive blackberries, Scotch broom, St. Johnswort, and sweetclover are roadside invasives threatening this meadow.
4. Garoutte Prairie is an ACEC containing a 46-acre floodplain meadow, located near the shore of Dorena reservoir. Garoutte Prairie contains representative native wetland prairie

plant species and is home to Bureau Sensitive wayside aster as well as the rare lichen *Sulcaria badia*. Garoutte Prairie represents the northernmost site for this lichen's range and the population is therefore genetically important. Oregon ash trees are present in this wet meadow and serve as the main host plant for the *Sulcaria*; however, the ash trees, along with Douglas-fir, are encroaching upon and altering the ecology of the open, wet meadow habitat at the site. Active management of these floodplain meadows is needed to prevent weed introduction and expansion, and to remove encroaching trees. The meadow provides culturally important Native American foods such as camas. This meadow contains a high diversity of prairie species: small camas (*Camassia quamash*), dense sedge (*Carex densa*), tufted hairgrass (*Deschampsia cespitosa*), denseflower willowherb (*Epilobium densiflorum*), and common woolly sunflower (*Eriophyllum lanatum*). Invasive plants include Scotch broom, invasive blackberries, false brome, butter-and-eggs, meadow knapweed, oneseed hawthorn, invasive thistles, and English ivy. This site could serve as habitat for Hitchcock's blue-eyed grass, shaggy horkelia, wayside astery, white-topped aster, and checkermallows.

5. Grassy Mountain is a 74-acre meadow system surrounded by Douglas-fir and Pacific Madrone, located in the Cascades foothills. It is a grassy bald with thin soil overlaying sub-surface rock with vernal seepages. It is one of the District's best representative native fescue grasslands with extensive blue wildrye and Roemer's fescue populations. Oaks are present along the south and west meadow edges, 10 of which are greater than 15 inches DBH. Seasonal moisture fluctuations support native species including Clarkia (*Clarkia* spp.), Tolmie's star-tulip (*Calochortus tolmiei*), common woolly sunflower, Roemer's fescue, seep monkeyflower (*Mimulus guttatus*), shortspur seablush (*Plectritis congesta*), tarweed (*Madia* spp.), wild clover (*Trifolium* spp.), and common biscuitroot (*Lomatium utriculatum*). The meadows at Grassy Mountain are fragile, sensitive, rare, and easily disturbed. The highest short-term concerns for the habitat quality of this site are invasion by non-native grasses and conifer encroachment, although native poison oak is also encroaching into the meadow. This site is potential habitat for shaggy horkelia, Bradshaw's lomatium, and wayside aster.
6. McGowan Meadow is an ACEC comprised of a regionally rare mid-elevation wet meadow surrounded by old-growth forest. The 74-acre ACEC and six-acre meadow are in the Cascade foothills northeast of Springfield, Oregon. The meadow provides a high degree of botanical diversity with long-lasting wildflower displays including meadow checkermallow (*Sidalcea campestris*), an increasingly uncommon Willamette Valley endemic plant species. McGowan Meadow is significant due to its unique mixture of Willamette Valley and montane Cascades plant species. Due to local site conditions, populations of plant species here may have unique adaptations to colder winters and a shorter growing season and could therefore represent important genetic ecotypes that differ phenologically from their valley bottom counterparts. The hydrology of the meadow has shifted due to road construction and has had heavy ground disturbance in the past from ORV incursion. Conifers and shrubs, particularly native *Rosa* species, are encroaching upon the meadow from the meadow perimeter, and Himalayan blackberry is encroaching from the road. A seasonal spring and the meadow's location at the base of a steep slope result in high levels of soil moisture on the northern portions of the meadow that support tufted hairgrass, white bog-orchid (*Habenaria dilatata*), soft rush (*Juncus effusus*), Oregon geranium (*Geranium oregonum*), and seep monkeyflower. This

site could serve as habitat for Kincaid's Lupine and Hitchcock's blue-eyed grass, and checkermallows.

7. Mill Creek Ridge is the largest Oregon White Oak meadow complex in the Marys Peak Field office at 113 acres. Mill Creek Ridge meadows contain many vascular plant species known from southern Oregon. These disjunct populations and northward range extensions represent populations with elevated genetic importance. Bureau Sensitive Willamette Valley larkspur occurs nearby on BLM land within pollinator dispersal distance of two miles. A population of federally endangered Fender's blue butterfly and two populations of federally threatened Kincaid's lupine occur just over two miles away on protected state-owned land. Several native woody species are encroaching the meadows at Mill Ridge including Douglas-fir (*Pseudotsuga menziesii*), bigleaf maple (*Acer macrophyllum*), Pacific madrone (*Arbutus menziesii*), ocean spray, poison oak (*Toxicodendron diversilobum*), and tall Oregon grape (*Mahonia aquifolium*). Scotch broom is invading the central south portion of the meadow complex.
8. Oak Basin Prairies ACEC is a 226-acre ridgetop complex of prairies, oak woodland/savanna, and coniferous forests located on the Willamette Valley margin along the west edge of the Coburg Hills. The prairie habitats at Oak Basin are some of the most intact upland prairie habitat plant communities in the ecoregion. Multiple agencies and partners have identified Oak Basin as a high priority protection area. It is home to the federally endangered Fender's blue butterfly and its host plant, the federally threatened Kincaid's lupine. Both species are endemic to western Oregon prairies. The Fender's blue butterfly population at Oak Basin is important because it is one of only three known sites to occur east of Interstate 5 and is one of the highest elevation sites for the species throughout its range. Oak Basin Prairies ACEC currently meets eight out of 11 recovery criteria for Fender's blue butterfly and Kincaid's lupine, including sufficient foliar cover, growth, and evidence of reproduction of Kincaid's lupine, prairies with less than 15 percent cover of encroaching woody species, and sufficient native prairie species diversity. BLM's restoration efforts at this site should focus on maintaining current recovery goals for meeting the criteria, and to improve upon the recovery goals that are falling short: increase the size of the Fender's blue butterfly population, increase the overall native cover of the meadow, and increase the abundance and diversity of native nectar species for Fender's blue butterfly. In addition to Kincaid's lupine, Oak Basin supports populations of Bureau Sensitive Hitchcock's blue-eyed grass (*Sisyrinchium hitchcockii*) and wayside aster. The prairies contain rare Roemer's fescue communities, oak woodlands, and oak savannas. These prairies are threatened by non-native grasses including tall fescue (*Schedonorus arundinaceus*), orchard grass (*Dactylis glomerata*), and bristly dog's tail (*Cynosurus echinatus*), as well as noxious weeds such as invasive thistles and blackberries, shining geranium, and false brome. Encroaching native species include Douglas-fir, bigleaf maple, Pacific madrone, grand fir (*Abies grandis*), Oregon ash, incense cedar (*Calocedrus decurrens*), ocean spray, poison oak, Oregon grape (*Mahonia spp.*), bracken fern (*Pteridium aquifolium*), common snowberry, Nootka and dwarf rose (*Rosa gymnocarpa.*), and serviceberry (*Amelanchier alnifolia*).
9. Walker Flat is a 10-acre ACEC containing a Coast foothills wet meadow surrounded by Douglas-fir dominated conifer forest. It represents the largest population of federally threatened Nelson's checkermallow in the Coast range and is critical for recovery and delisting of that species under the Endangered Species Act. The habitat and Nelson's

checkermallow population are in decline due to woody encroachment and invasive species. Three distinct wetland communities at the site include grass-sedge meadow, shrub thicket, and red alder riparian forest. The BLM characterizes this ACEC as largely a grass-sedge meadow with hydrophytic grasses with some sedges and rushes, ericaceous shrubs, and forbs including false hellebore (*Veratrum spp.*), wild strawberry, buttercup (*Ranunculus spp.*), water parsley (*Oenanthe sarmentosa*), self-heal (*Prunella vulgaris*), monkeyflower, speedwell (*Veronica spp.*), and some skunk cabbage (*Lysichiton americanus*) in wetter areas. Encroaching woody species include Douglas-fir, red alder (*Alnus rubra*), and serviceberry. Weeds include non-native thistles, tansy ragwort, Scotch broom, oxeye daisy, Queen Anne's lace, velvetgrass, and creeping bentgrass. BLM's recent monitoring reports indicate the need for herbicide to help control resprouting woody encroaching species.

10. Willamette Valley Prairie Oak and Pine ACEC is a 1663-acre ACEC spread across 26 parcels, nominated as an ACEC by both the Nature Conservancy (TNC) and the BLM. A 2010 report on TNC-nominated parcels found that they all supported Oregon white oak and some element of associated native understory herbaceous vegetation (Alverson), and that most supported Bureau Sensitive wayside aster. Bureau Sensitive golden paintbrush, thin-leaved peavine, Hitchcock's blue-eyed grass and shaggy horkelia are also present in some parcels. This project selected parcels containing occupied or potential habitat for these species and federally threatened Kincaid's lupine, totaling 1,225 acres. Most parcels support meadows on thin, rocky soils, with oaks mostly around the meadow margins. Only two parcels lacked this oak habitat type. Three parcels support oak and ash wetlands, a unique habitat type now imperiled by the presence of emerald ash borer in Oregon.

Species described in the *Recovery Plan for the Prairie Species of Western Oregon and Southwestern Washington* (USDI FWS 2010) and the *Interagency Conservation Agreement for Eucephalus vialis (Wayside Aster)* (USDI & USDA 2006), are all federally threatened, federally endangered, Bureau Sensitive, or species of concern that are no longer considered Bureau Sensitive due to recent taxonomic changes or management decisions that exclude species not known to occur on federal land from Bureau Sensitive status (see below). Threat analyses were conducted for federally listed plant species for listing determination and in development of the Recovery Plan. These analyses "showed that all of the listed species addressed in this plan have declined as their native prairie habitats have been destroyed, fragmented and degraded" (p. IV-1). Bureau Sensitive species are species that require special management to prevent the need for listing at the federal level.

Bureau Sensitive species of *Delphinium* have undergone taxonomic revision since the 2010 Recovery Plan was written but naming conventions of the local botanical community (Chambers 2018, Oregon Flora Project 2022, ISSSSP 2022) are conserved for this project. The BLM no longer considers Pale larkspur (*Delphinium leucophaeum*) and peacock larkspur (*D. pavonaceum*) Bureau Sensitive because they are not known to occur on BLM land; however, this project includes analysis for these species because there are opportunities to enhance potential habitat for them on BLM land. Additional opportunities may arise to restore occupied or potential habitat for these species on land owned or managed by NW Oregon BLM partners. Golden paintbrush (*Castilleja levisecta*) and Bradshaw's lomatium (*Lomatium bradshawii*) were recently de-listed at the federal

level and are now Bureau Sensitive. Detailed descriptions of all Recovery Plan species and wayside aster are in **Appendix C**.

3.3.4. Direct and Indirect Effects

3.3.4.1. *Alternative A – No Action*

There are no direct effects to meadows and meadow plant communities, including federally listed and Bureau Sensitive species, from the no action alternative because prescribed fire, tree removal, and container planting would not occur unless authorized under other analyses. Indirect effects of not returning prescribed fire to the landscape include the continued decline and closure of meadows, prairie remnants, and canopy gaps in the Willamette Valley and Cascades foothills. Desirable plant communities in these habitats would continue to decline in the absence of fire as the landscape continues a trajectory that deviates from historical levels of variability for ecosystems maintained by frequent fires. Thatch layers would continue to accumulate, hindering recruitment of native forbs, including Recovery Plan species and wayside aster (Figure 5). Populations of federally listed and Bureau Sensitive species that depend on these habitats would either continue to decline or the BLM would maintain them using other actions. BLM would continue to remove encroaching native vegetation with manual and mechanical methods, or with prescribed fire analyzed under other projects.

Figure 5. Comparison between prescribed fire treatment followed by seeding with native seed (left) versus mowing (right). Thatch accumulation prevents seed establishment in the absence of fire.



Photo credit: Jessica Celis, Upper Willamette Field Office, Northwest Oregon District BLM

Indirect effects of not removing trees encroaching dry and mesic meadow habitats are similar to effects described as a result of not prescribing fire, as fire was the historical disturbance that maintained open meadow and prairie remnants in the Willamette Valley and Cascades foothills. In the absence of fire or manual/mechanical tree removal, successional processes would result in continued woody species encroachment. Mature trees and shrubs would continue to contribute seed to the meadow, increasing the rate of encroachment over time.

Effects of not planting container plants would be negligible at any of the meadows currently identified for restoration, except in the case of planting Recovery Plan species or wayside aster. This project analyzes effects from augmenting those species in **Issue 4 (Botany)** *How would augmenting Recovery Plan and Conservation Agreement plant species under the alternatives impact the habitat and recovery of these species?*.

3.3.4.2. *Alternatives B and C – Preferred and Reference Alternatives*

Prescribed Fire

Please see effects section of **Issue 1 (Botany)** for additional effects as there is overlap between anticipated effects of fire prescribed to treat weeds and fire prescribed to restore meadows that evolved with fire. The District would more likely prescribe fire in areas with a mix of native and non-native species, rather than in monocultures of weeds or areas where all species are invasive, as described in the 2018 IIPM EA and **Issue 1 (Botany)**.

Fire used as a restoration tool is usually most effective either in areas with few non-native species or in areas with abundant non-native species that do not respond positively to fire. A study comparing burning and mowing treatments at a Willamette Valley wet prairie remnant concludes with the observation:

[T]here are two situations where the use of fire is especially appropriate. The first is in high quality prairies, where the abundance of native herbaceous plants compared to non-native species makes an overall positive response most likely. In such sites, even where certain native species experience a decline, there is a higher probability that the openings thus created will be colonized by another native species, compared to the response in a low-quality prairie (sic). Second, fire is a preferred management tool over mowing in lower quality prairies where individual non-native species that exhibit a desirable response to fire are specific management targets (Nuckols et al. 2011).

The District would prescribe fire for meadow restoration only after careful evaluation of the plant community and expected responses by a qualified botanist. The District would tailor fire prescriptions to each meadow to provide the greatest ecological benefit, given the native and non-native plant species composition of the site. Prescribed fire would promote some perennial weed growth without follow up invasive plant treatments and competitive seeding. Additionally, pile burning often results in the patch of ground beneath the pile being burned at high temperatures, which can result in weed infestations (Helen Lau, Shawna Bautista, pers. comm., 2021). The BLM would plan follow-up treatments such as manual removal, mowing, herbicide, and competitive seeding, in conjunction with fire prescriptions. Direct effects to meadows, including critical habitat for federally listed species, and meadow plant communities, including federally listed and Bureau Sensitive species, from prescribed fire treatments may appear at first to be detrimental as above-ground plant parts and some of the seed bank, roots, and rhizomes would be damaged or killed, but successful implementation of thoughtfully prescribed fire treatments would cause an immediate beneficial change in trajectory of the site toward historical conditions over the long term.

Indirect, or long term, prescribed fire effects in meadows that evolved with frequent fires would be beneficial, restoring the historical fire disturbance regime to the site. The 2010 Recovery Plan summarizes the beneficial effects of prescribed fire on native western Oregon meadows and prairies: prescribed fire would help maintain meadow habitats by preventing encroachment by woody species, and by mimicking the historical conditions of frequent anthropogenic (human-caused) and natural (lightning) fire disturbance on these ecosystems. Perennial plants would persist, and annuals would re-establish from the surrounding area. The BLM would design follow-up treatments to increase the proportion of native to non-native plants, eradicate or decrease invasive plants, and enhance or restore Special Status plant populations in meadow habitats.

Project design features such as survey requirements and timing of prescribed fire would ensure long term persistence of Recovery Plan species and wayside aster populations. Table 15, adapted from the Decision Record for the 2018 IIPM EA, shows how prescribed fire and mowing treatments in Recovery Plan species' habitats would be timed to avoid critical stages for Threatened and Endangered Recovery Plan species that would be affected by these actions.

Table 15. Species-specific timing for mowing and prescribed burns for meadow restoration at sites occupied by federally listed and recently delisted plants¹⁸

Listed Species	Prescribed Fire Timing	Mowing Timing and Deck Height	Spring Mowing Allowed?
Bradshaw's Lomatium	Fall burns after August 15	Fall mowing after August 15 [15 cm (6 inches)]	Yes, with restrictions
Golden paintbrush	Fall burns after August 15	Late winter (Feb. to March 15) mowing okay, then mow again after Sept. 15 if site not burned	Yes, with restrictions. Complete by mid--March
Kincaid's lupine	Fall burns after August 15	Fall mowing after August 15 [15 cm (6 inches)]	Yes, with restrictions
Nelson's checkermallow	Fall burns after August 15; up to 50% of an occupied area	Fall mowing after August 15 [15 cm (6 inches)]	Yes, with restrictions
Willamette daisy	Fall burns after August 15	Fall mowing after August 15 [15 cm (6 inches)]	Yes, with restrictions

Prescribed fire for occupied habitat of pale larkspur, Willamette Valley larkspur, peacock larkspur, shaggy horkelia, white-topped aster, Hitchcock's blue-eyed grass, and wayside aster would similarly be timed after August 15, as most of these species flower and set seed earlier or at a similar time of year as the federally listed species in Table 19. White-topped aster continues producing seed through the month of August but reproduction for that species appears to be almost entirely vegetative (USDI FWS 2010).

The BLM would design prescribed fires from this project to burn at low intensities; fire that burns at high enough intensity to kill the top portions of perennial plants would cause seeds to become unviable (McKernan and Meinke, 2004). This project could adversely affect individual Special Status plants, but the treatment designs would enhance Special Status plant populations and improve Special Status plant and pollinator habitats, overall. This project would only prescribe fire for Special Status plant species for which prescribed fire would be beneficial.

Recent research indicates that fire prescribed more frequently than every five years could negatively impact the seedbank of some Special Status plant species (Martin 2022). Research in this area is ongoing; some Special Status plants respond positively to more frequent burning. An older study in Fort Lewis, Washington, indicated that prairie and oak habitat deteriorated when fire exclusion intervals were less than or greater than 3-5 years (Tveten and Fonda 1999). An

¹⁸ Meadows identified as potential habitat would not be subject to the timing and mowing restrictions listed in Table 15 until and unless they become occupied by one or more Recovery Plan species.

adaptive management approach would inform ideal fire frequency intervals at meadow restoration sites on the District. Implementing fire prescriptions on the District is currently challenging due to seasonal and staffing restrictions, and the BLM may not meet an ideal fire frequency. The District would implement manual and mechanical removal of encroaching species, along with herbicide treatments, when prescribing fire is not feasible.

From Chapter Four of the 2007 PER:

Use of fire would help to restore native vegetation and natural ecosystem processes. It is effective in controlling some invasive annuals with short-lived seed banks, such as downy brome, especially when followed up with herbicide treatments (Asher et al. 2001; Grace et al. 2001). One strategy for altering the balance between non-native annuals and native perennials is to burn early during the spring after the ground has dried out. Fires at this time would destroy much of the seed crop of both annuals and perennials, although the resprouting of the latter would make them more resilient to burning (Keeley 2001).¹⁹ However, other invasive species populations, such as... bull thistle, sowthistle and diffuse knapweed, could be stimulated with fire, especially if large seedbanks were present (Harrod and Reichard 2001). In addition, restoration, including seeding, would have to occur in a timely manner after treatment to minimize the potential for erosion or weed invasion (Brooks and Pyke 2001).

Although high-severity fires effectively suppress false brome, one of the District's most problematic invasive perennial grasses, low-severity fires also increase its spread (Poulos 2015).

In some situations, fire can promote establishment of invasive annual grasses (Martin 2022). East of the Cascades, acres of invasive annual grasses that dry up earlier in the season than native perennial bunchgrasses create conditions that promote wildfires that burn earlier and more frequently than the historic range of variability for those ecosystems. This results in a positive feedback loop, promoting the invasion of increasing acres of invasive annual grasses (Davies and Nafus 2012). This is not as likely to be a problem in most ecosystems west of the Cascades; however, fire could produce similar effects in dry site meadows in the absence of additional actions such as competitive seeding and herbicide treatments.

A 2014 study in South Puget Sound prairies noted a decrease in native prairie annuals compared to historical descriptions of plant composition in selected prairies, due to either invasions of non-native species or restoration practices favoring seeding with native perennials over native annuals (Dunwiddie et. al 2014). This reduction in native annuals as a functional group could also occur in meadows proposed for restoration on the District. The Botany and Invasive Plants program on the District has a seed strategy that includes native annuals as well as native perennials, which would minimize loss of native annuals as a functional group. Species richness of this functional group may be negatively impacted, however, as the number of species the District can grow out for restoration seeding is limited.

Fire can also stimulate bracken fern, which, although native, can suppress establishment of other native species following fire.

¹⁹ Spring burning would not be prescribed in occupied habitat of federally listed and Bureau Sensitive species but may be prescribed in potential habitat.

A 1999 study in the Puget Trough indicated that burning in the fall, which this project proposes, was preferable to spring burning for the purpose of sustaining native plant species (Tveten and Fonda 1999). Studies by Sprenger and Dunwiddie (2011) and Storm and Shebitz (2006) concluded that most historical burns managed by Native Americans in western Washington prairies occurred in the fall. Nisqually Tribal member and historian Cecelia Carpenter recalled:

The information has been passed down to us by our Nisqually ancestors that for as many years as they could remember that during the fall of each year the vast prairie areas that lay on both sides of the lower segment of the Nisqually River were burned. By burning in the fall of the year at a time when the fall rains had begun, the likelihood of the fire getting out of hand and moving into the forests was minimal. The main purpose [sic] of burning the thick layer of rich prairie grass was twofold. These prairies... were each fall covered with a thick carpet of prairie grass, that, if left during the winter, would lay as a heavy carpet over the land prohibiting the spring crop of camas plants from pushing up to the sunlight... The camas bulbs, as well as the tender shoots of the bracken ferns, which also thrived on the burnedover land, were two main sources of food of the traditional Nisqually people. (Carpenter 1986, quoted in Storm and Shebitz 2006).

The earliest written records of Kalapuya burning in the Willamette Valley, from the 1826 journals of Alexander McLeod and botanist David Douglas, likewise indicate that burning occurred in the fall, as the valley was thoroughly burned when they arrived in mid-September (Boyd 1999). Douglas returned to the Willamette Valley in November after the rains and described the formerly scorched landscape as “country open, rich, level, and beautiful” (*ibid.*).

Prescribing fall burns would therefore mimic the timing of historic disturbance conditions, which would benefit meadows that evolved under those conditions. Late-season fall burns applied when there is copious moisture would result in patchy burns that would increase heterogeneity within the habitat and increase species diversity (Hamman et al. 2011).

Most of the District’s meadows identified for this project are in ACECs, which have been thoroughly inventoried. Qualified botanists regularly monitor Special Status plant populations in ACECs. The District would survey or re-survey all meadows, including those identified as potential rather than occupied habitat for Recovery Plan species and wayside aster as needed, prior to treatments for monitoring purposes and to compare population sizes before and after treatments.

Early investigations by the Institute for Applied Ecology into the response of Willamette daisy to prescribed fire indicated that it responded negatively to both mowing and burning (Thorpe and Kaye 2007, quoted in USDI FWS 2010); however, a 2014 study by the same organization indicated that burning combined with the application of glyphosate increased plant size and reproduction of Willamette daisy (Giles and Bahm 2015).

Kincaid’s lupine, the host plant for Fender’s blue butterfly, responds positively to fire. “Prescribed fire and mowing before or after the growing season have been effective in reducing the cover of invasive non-native plants; following treatments, *Lupinus sulphureus* ssp. *kincaidii* has responded with increased leaf and flower production (Wilson *et al.* 2003 quoted in USDI BLM 2010c).”

Golden paintbrush (*Castilleja levisecta*) would benefit from prescribed fire. “Field observations suggest that *C. levisecta* is a poor competitor, intolerant of shade cast by tall exotic species and accumulated litter in fire suppressed prairies” (Lawrence and Kaye 2005). A 2001 study investigating effects of fire on *C. levisecta* found that populations increased up to six years

following fire, and that of plants that established following burns, 20 percent more persisted than in control plots.

The 2010 Recovery Plan documents positive effects of low intensity prescribed fire on the recently delisted *Lomatium bradshawii*:

Low intensity fire appears to stimulate population growth of *Lomatium bradshawii*. The density and abundance of reproductive plants increased following fires (Pendergrass et al. 1999), although monitoring showed the effects to be temporary, dissipating after one to three years. Frequent burns may be required to sustain population growth, as determined from population models (Caswell and Kaye 2001, Kaye et al. 2001).

Although research is sparse on direct effects to several Bureau Sensitive and otherwise desirable prairie and oak meadow species, all species in the 2010 Recovery Plan are at risk due to habitat loss, alteration of disturbance regimes, and habitat invasion by trees, shrubs, and non-native weeds (USDI FWS 2010). Beneficial effects would occur to most of these species from prescribed fire treatments as the District would design treatments to restore historical fire regimes, reduce encroachment by woody species, and manage weeds. An adaptive management approach that monitors treatment results would increase the knowledge base needed for managing these species wherever they occur in western Oregon and Washington.

Likewise, the 2006 Conservation Agreement for wayside aster describes how important fire was to maintaining open woodlands and canopy gaps. The District expects beneficial effects for this species from prescribed fire treatments in smaller canopy gap situations and at meadow perimeters, and in mixed and oak woodlands.

All of the plant species in the 2010 Recovery Plan are perennials and as such the District expects that the underground portions of plants would persist after prescribed fire treatments. Additionally, the District does not anticipate effects to federally listed and Bureau Sensitive plant species other than Recovery Plan species and wayside aster from fire prescribed for meadow restoration, with one exception: thin-leaved peavine (*Lathyrus holochlorus*) grows in Dorena Prairie as well as the Wallace Cr Meadows – Parcel 2 unit of the Willamette Valley Prairie Oak and Pine ACEC, and may occur in future treatment areas. The original Recovery Plan considered this species for inclusion but excluded it due to lack of published information (USDI FWS 2010). This Willamette Valley prairie species would be expected to either benefit from prescribed fire treatments, as it evolved to be adapted to Willamette Valley prairies and the frequent fires that maintained them, or else it would be unaffected as it would be senescent in the fall when fires would be prescribed (Tom Kaye, pers. comm. August 2023). The BLM has reported Nuttall's larkspur (*Delphinium nuttallii*) from the Gettings Creek unit of the Willamette Valley Prairie Oak and Pine ACEC; however, this species' taxonomy is under revision. The species at Gettings Creek is likely Willamette Valley larkspur (*D. nuttallii* ssp. *oreganum*) as recent literature indicates that the range of Nuttall's larkspur is in "the Columbia Gorge, SW Washington, and higher elevations in Wasco and Hood River counties" (Chambers 2018). The BLM would survey any meadows or prairie remnants identified for future projects by a qualified botanist prior to implementation and would protect or exclude any Special Status plants other than Recovery Plan species and wayside aster from prescribed fire. The discussion below provides the effects of prescribed fire and other meadow restoration actions on desirable fungi, including Bureau Sensitive fungi.

Large tree removal

Direct effects to meadows, including critical habitat for federally listed species, and meadow plant communities, including federally listed and Bureau Sensitive species, from removing encroaching woody species, including larger trees, would be beneficial. This project would reduce harmful effects by project design features such as directional felling away from sensitive habitats and Special Status plant populations; however, it is possible that individual plants or seedbank locations under a felled tree could be harmed either by trampling or by being crushed or smothered under a felled tree. The BLM would not drag trees across the site and effects would therefore be similar to effects that would occur if a tree were to fall under natural circumstances. Beneficial direct effects would include the immediate reduction of canopy cover over meadow and prairie species that are adapted to open conditions.

Depending on fuel loading and levels of soil organic material at the site, trees would either be left, burned, or cut and chipped. Indirect effects would therefore include the addition of organic material to the soil and reduction of fuels at some sites. Carbon addition significantly reduced invasive plants at Finley Wildlife Refuge in a study designed to inform the management of Willamette daisy. Carbon addition limits soil nutrients available for plant uptake. This limit selectively depresses invasive plant vigor. Additionally, native plants are less susceptible to low soil nutrient levels (Bahm 2014). Indirect effects of cutting and leaving, burning, or chipping encroaching woody plants would result in decreasing competition from invasive plants at the site via carbon addition.

Removing mature seed-producing trees and shrubs would also reduce the rate of encroachment at the site by removing the seed source.

Container Planting

Container planting has potential to affect seeds, roots, rhizomes, and other underground parts of plants, including federally listed and Bureau Sensitive plants and fungi, and there is risk of trampling desirable plants when implementing restoration actions such as planting to augment desirable plant populations. Container planting effects would occur immediately and would affect individual plants rather than populations. The District expects long-term effects to be beneficial, due to choosing plants specifically for habitat improvement. Container plants grown in nurseries have potential to become infested with weed propagules, which could introduce new invaders to sensitive meadow habitats. This project's design features would minimize this risk by ensuring weed-free growing conditions for container plants. Post-restoration monitoring would allow early detection and rapid response of any invasive species introduced into sensitive habitats.

Fungi

Prescribed fire and removing large trees are both actions that have the potential to affect fungi, including Bureau Sensitive fungi and desirable forage species. However, effects would be localized effects to forest edges. Mature, interior conifer forests provide the habitat for most Bureau Sensitive and edible fungi. There are no Bureau Sensitive fungi known to occupy meadows and prairie remnants as preferred habitat. *Entoloma occidentale* is known to occur in low elevation mixed woodlands, similar to habitats where wayside aster and shaggy horkelia occur. There are no known sites of this species on the District, but it is known from the Siuslaw National Forest and the District suspects it occurs on BLM lands. Prescribed fire authorized by this project, however,

would occur in open conditions that would not support this species. The BLM would require additional effects analysis prior to conducting prescribed fire in mixed woodlands with closed canopies. Tree removal to increase canopy gaps would be highly spatially limited and effects to potential unidentified sites of *E. occidentale* would be negligible. Prescribed fire would increase the occurrence of edible morels (*Morchella spp.*) at the edges of meadows where mycorrhizal associations with conifers occur.

The BLM would design prescribed broadcast fires to burn at low intensities that would cause minimal damage to underground biota and organic matter, but it is possible that some fungi could be damaged. This project could impact mycorrhizal associations; these impacts would be limited to roots of encroaching species, mostly at meadow peripheries. Pile burning would create high intensity fire conditions that could damage soil biota including fungi, but this would only affect fungi beneath or directly adjacent to the burn pile.

3.3.4.3. *Alternatives Summary*

Alternative A, the no-action alternative, would result in continued decline for western Oregon meadows and meadow species, including Recovery Plan species and wayside aster. BLM and partners would continue implementing authorized removal of encroaching woody species with manual and mechanical techniques; however, this would not restore fire's ecological benefits to sensitive ecosystems on the District that evolved with fire. Some large trees would continue shading and contributing seed to meadow environments. Alternatives B and C would result in enhanced ability to implement restoration actions. This includes restoring fire, a critical form of disturbance that maintains early seral ecosystems, to those ecosystems that evolved with and depend on frequent fire. Removing encroaching woody species, including large trees, would also help prevent canopy closure in meadow environments. Augmenting plant populations with container plants, as needed, would enhance native plant populations.

3.3.5. Cumulative Effects

This project would also authorize herbicide treatments on native species for the purpose of enhancing, protecting, or restoring occupied and potential habitat for Recovery Plan species and wayside aster. Augmenting manual and mechanical woody species removal with herbicide treatments would reduce the amount of manual and mechanical treatments by controlling resprouting deciduous species. This project would increase effectiveness of the District's woody encroachment control efforts by authorizing additional tools which would reduce the risk of trampling and crushing individual Special Status and other desirable plants that could occur from woody species removal via manual and mechanical implementations.

The BLM has collected ecological data in oak woodlands, savannahs, and prairies over the past several years to prepare analyses for projects that would address restoration broadly across the landscape in ecosystems that were historically maintained by frequent fire return intervals. Once complete, such analyses may generate future prescribed fire projects that include habitats not currently identified as occupied or potential habitat for the species described in the Recovery Plan and Conservation Agreement. Additionally, consultation with USFWS may generate a broader definition of potential habitat for these species than BLM used to identify meadow restoration sites for this analysis. The preferred alternative would amplify beneficial effects from these additional

prescribed fire and meadow restoration projects as more habitats on the District would be set on trajectories toward historical conditions, increasing connectivity between such habitats across the landscape. As described in the Recovery Plan, “maintenance of suitable but currently unoccupied habitats is also important to recovery of rare species that occur in a mosaic of occupied and unoccupied suitable habitats” (USDI FWS 2010: IV-5). Desirable native plant communities would cumulatively benefit from these combined actions.

Oregon has detected emerald ash borer for the first time, on lands adjacent to the Tillamook field office on the District. This pest has the potential to decimate Oregon ash populations. Meadows of the oak/ash wetland type, including those in Garoutte Prairie and some parcels in the Willamette Valley Prairie Oak and Pine ACEC, could become altered by a loss of the ash component in ways that could affect the hydrology and environmental chemistry of the sites. Although this project authorizes removal of encroaching ash trees where increased canopy is impacting Special Status species and meadow habitats, these sites and others on the District may become future project areas for analysis of preventive insecticides to preserve high-priority ash habitat.

Other restoration actions the BLM implements in meadows include invasive plant treatments and augmentation of native plant populations. The various restoration treatments within meadows and applied fire treatments would have beneficial cumulative effects.

3.4. Issue 4 (Botany) How would augmenting Recovery Plan and Conservation Agreement plant species under the alternatives impact the habitat and recovery of these species?

3.4.1. Background

The RMP directs the District to manage federally listed and Bureau Sensitive species consistent with recovery plans and conservation agreements (USDI BLM 2016d p. 87). The BLM proposes to augment federally listed and Bureau Sensitive plant species described in the Recovery Plan and Conservation Agreement on BLM-administered and partner lands across the District. Augmentation would take place in occupied or potential habitat for these species. Potential habitat is defined here as meadows, prairie remnants, or canopy gaps within two miles of a known site or by specialist determination.²⁰ The Recovery Plan identifies population augmentation as a necessary recovery action to set back succession and to preserve, restore, and manage prairie species populations and habitat. The Conservation Agreement identifies threats to wayside aster populations that are similar to those of Recovery Plan species, including canopy closure due to succession and fire exclusion, so that species is included in this analysis, as well.

The proposed plant augmentation would impact the habitat and recovery of the following species:

- Willamette daisy, *Erigeron decumbens*
- White-topped aster, *Sericocarpus rigidus*
- Bradshaw’s lomatium, *Lomatium bradshawii*
- Kincaid’s lupine, *Lupinus oregonus* var. *kincaidii*
- Nelson’s checkermallow, *Sidalcea nelsoniana*

²⁰ Generally, a qualified botanist or ecologist would determine potential habitat for Recovery Plan and Conservation Agreement plants and a qualified wildlife biologist would determine potential habitat for Recovery Plan butterfly species; however, population augmentation is only analyzed here for plants.

- Golden paintbrush, (*Castilleja levisecta*)
- Pale larkspur, *Delphinium leucophaeum*
- Willamette Valley larkspur, *Delphinium oreganum*
- Peacock larkspur, *Delphinium pavonaceum*
- Shaggy horkelia, *Horkelia congesta* ssp. *congesta*
- Hitchcock's blue-eyed grass, *Sisyrinchium hitchcockii*
- Wayside aster, *Eucephalus vialis*

Of the species analyzed in this issue there are three federally listed plant species: Willamette daisy, Kincaid's lupine, and Nelson's checkermallow. Golden paintbrush and Bradshaw's lomatium were both recently de-listed and their status is under a FWS memorandum for continued management (USDI FWS 2020). Most of the remaining species are Bureau Sensitive, with two exceptions.²¹ See section 3.3.3, **Affected Environment**, in **Issue 3 (Botany)** *What are the effects of prescribed fire, tree removal, and container plantings on desirable plant communities, including federally listed plants and Bureau Sensitive plants and fungi?* for more information on current species' status and **Appendix C** for detailed descriptions of all Recovery Plan species and wayside aster.

Recovery Plan species occur on meadows and prairie remnants ranging from southwestern Washington through Oregon's Willamette Valley and Umpqua Valley, including in the Cascades and Coast ranges foothills. They are all threatened by the continued degradation, loss, and fragmentation of their native prairie ecosystems. Wayside aster occurs in sites ranging in successional phases from clear-cuts to mature forests; however, its preferred habitat is thought to have been maintained historically by frequent fires that created canopy gaps with high light levels (USDI & USDA 2006 p. 4).

This issue focuses on the lands outlined in the Recovery Plan and lands supporting the northernmost populations of wayside aster. The project area includes natural areas within which the RMP directs the District to maintain or restore natural processes, native species composition, and vegetation structure through augmentation activities like planting or seeding native species (USDI BLM 2016 p.87). The area includes naturally occurring special habitats such as meadows, wetlands, and other habitats supporting federally listed and Bureau Sensitive Species (BSS). Many units proposed for augmentation activities include District-designated Areas of Critical Environmental Concern (ACECs).

The proposed action would add to the existing populations of each species within the project area. Geographic Biotic Observations (GeoBOB) standards define sites as groups of plants separated by 300 feet. Most sites within the project area are within the 2-mile pollinator distance of each other and are considered to be of the same populations according to the FWS (USDI FWS 2010: IV-20, IV-26, IV-57).

3.4.2. Analytical Process

This analysis examines Recovery Plan and Conservation Agreement plant populations in the meadows, prairie remnants, and canopy gaps identified for restoration actions in Table 6. Abundance, distribution, frequency, available habitat, connectivity, and other trends are evaluated.

²¹ Pale larkspur and peacock larkspur are no longer considered Bureau Sensitive because of a management decision to remove Special Status determinations from species not known to occur on federal land.

Increased abundance is not calculated for golden paintbrush, peacock larkspur, or Bradshaw's lomatium as habitat for these species is not identified in units currently selected for this project. Additional opportunities for augmentation of Recovery Plan and Conservation Agreement species may be identified in future projects authorized under this EA, either on land managed by BLM or partners. Abundance for all Recovery Plan and Conservation Agreement species can be calculated for any suitable habitat acreage given seeding, planting, and establishment rates shown in Table 16.

This analysis does not include West Eugene Wetlands because the West Eugene Wetlands RMP provides analysis and direction regarding plant augmentation.

For purposes of gene flow, this analysis uses a two-mile radius for plant augmentation. The Recovery Plan estimates a two-mile maximum threshold distance for sub-population connectivity. (USDI FWS 2010 pp. IV-20, IV-26, IV-57). This project considers populations within a two-mile radius distance connected because this distance allows pollinator movement and gene flow.

3.4.2.1. *Assumptions*

This issue analysis includes the following assumptions. These assumptions are not design features of or restrictions on the alternatives.

- The BLM assumes that the existing populations of each of the plant species in units identified for restoration actions would remain static. There is insufficient information on natural recruitment for each plant species to reasonably foresee natural changes in populations over the analysis period.
- The BLM would plant all suitable sites identified as occupied or potential habitat under Alternatives B and C.
- The BLM assumes planting all plugs/seeds in one year to estimate plug survival and seedling establishment.
- Optimal seed planting densities for Willamette daisy and white-topped aster are still being established. The BLM assumes a 1% seedling establishment rate as per IAE's estimate until more data becomes available.
- The BLM assumes planting seed and plugs in available habitat at the recommended densities shown in Table 20. Due to information gaps, planting densities were developed from surrogate data and other research.
- At sites with occupied or potential habitat for multiple species, the BLM considered each species separately to determine available habitat. The BLM assumes survival of all species planted at the prescribed densities, and that all augmented populations would be able to coexist when planted in sites with habitat for multiple Recovery Plan or Conservation Agreement species.
- The BLM used surrogate species data for *Delphinium leucophaeum*, *Delphinium pavonaceum*, and *Delphinium oreganum* because there is little information on these species (Tom Kaye, pers. comm., 2022).
- Abundance and site data are determined from Fish and Wildlife Service spatial data, and GeoBOB and ORBIC spatial databases, supplemented by recent reports.
- This analysis uses a 20 percent plug survival rate after 4 years for species lacking sufficient data.
- The District would participate in, facilitate, and implement partnership-based invasive

plant management and habitat restoration projects on lands not managed by BLM. There is no specific information available on future augmentation of these recovery species.

- A population is defined as a group of species individuals occupying a defined area, isolated from other similar groups. Population clusters were determined by Nearest Neighbor Analysis.

Table 16. Suggested planting methods, densities, survival, and establishment for Recovery Plan and Conservation Agreement plant species.

Species	Recommended planting method and density	Plug survival after 4 years	Seedling establishment after 4 years
Willamette daisy	Seeds: TBD Plugs: 5/m ²	20%	1%
Bradshaw's lomatium	Seeds: 50/m ² Plugs: 5/m ²	35%	25%
White-topped aster	Plugs: 8/m ²	20%	1%
Kincaid's lupine*	Seeds: 80/m ² Plugs: 2/m ²	20%	5%
Nelson's checkermallow**	Seeds: 50/m ² Plugs: 2/m ²	20%	5%
Golden paintbrush	Seeds: 50/m ² Plugs: 2/m ²	20%	8-12%†
Pale larkspur‡	Seeds: 50/m ² Plugs: 2/m ²	20%	5%
Willamette Valley larkspur‡	Seeds: 50/m ² Plugs: 2/m ²	20%	5%
Peacock larkspur‡	Seeds: 50/m ² Plugs: 2/m ²	20%	5%
Hitchcock's blue-eyed grass	Seeds: 50/m ² Plugs: 2/m ²	20%	5%
Shaggy horkelia	Density: 1/m ² Seeds: 50/m ²	20%	5%
Wayside aster	Density: 1/m ² Seeds: 50/m ²	20%	5%

* Surrogate species: narrowleaf lupine (*Lupinus angustifolius*).

** Institute for Applied Ecology's 2014 *Nelson's checkermallow Final Report* suggests that seeded plots perform well except in wetter areas and seeds may outperform plugs at a seedbed. The report does not provide specific seed and plug densities in recovery estimates.

† USDI FWS 2019b. FWS *Species Biological Report for Golden paintbrush*. Pacific Region (Region 1) Lacey, Washington. Increase abundance is calculated using 10% average establishment rate for seeding.

‡ Surrogate data: Nuttall's larkspur (*Delphinium nuttallianum*).

3.4.2.2. *Analytical Methods*

Geographic scope: BLM-administered lands within the counties of Benton, Clackamas, Clatsop, Columbia, Lincoln, Linn, Marion, Multnomah, Polk, Tillamook, Washington, and Yamhill Counties, most BLM-administered lands in Lane County, and a small portion of Douglas County define the spatial scale for this issue, including land managed by BLM partners and, when requested or by permission, on lands adjacent to BLM.

Temporal scope: this issue's analysis will consider effects for four years after augmentation. The BLM has estimates of planting survival and seedling establishment for up to four years; forecasting effects beyond four years would be speculative because of insufficient data on planting survival beyond four years.

Available Habitat, Density, and Survival Rates: This issue's analysis gathers data from published sources and uses surrogate species when data is unavailable. The BLM calculated available habitat in square meters, planting density in plants per square meter, and seeds per square meter. Survival rates for seedlings (grown from seed) and plugs are determined from best available data.

Abundance: This issue's analysis estimates Recovery Plan and Conservation Agreement species' abundance for four years after augmentation by:

- Determining area of unoccupied habitat and potential habitat for all target species at a given site.
- Applying the species-specific survival rates for plugs and seedlings to the potential planting number of plugs and seedlings at each site.

Connectivity – This analysis looks at species connectivity under each alternative. Sufficient connectivity is necessary among subpopulations to ensure adequate gene flow and prevent problems associated with isolated small populations (USDI FWS 2010: IV-28).

The BLM measured connectivity by:

- Creating a two-mile buffer around known sites and potential habitats for each Recovery Plan and Conservation Agreement plant species representing the “stepping-stone distance” described in the Recovery Plan as the distance pollinators would be able to fly between two plant populations; and
- Qualitatively evaluating the increased connectivity between plant populations that would result from augmentation actions in potential habitats.

3.4.3. *Affected Environment*

See section 3.3 for a description of Willamette Valley meadows and prairies as described in the Recovery Plan and Conservation Agreement, and section 3.3.3 for descriptions of the areas where Recovery Plan and Conservation Agreement plant species augmentation actions are proposed. Detailed descriptions of all Recovery Plan and Conservation Agreement plant species are in **Appendix C**.

The project area lies within six of the 10 recovery zones as outlined in the Recovery Plan: Salem East, Salem West, Corvallis East, Corvallis West, Eugene East, and Coast Range. There are 30

units (See Table 6) within four recovery zones in this analysis. Future augmentation efforts could occur in any of the six recovery zones that occur within the project area.

The Recovery Plan identifies recovery targets for the following species under a variety of conditions including population trends, habitat quality, and habitat management. The following are recovery targets for abundance in the project area²² (USDI FWS 2010: IV-29 – IV-37):

- 60,000 Willamette daisy plants in at least 20 populations
- 55,000 Bradshaw's lomatium plants in at least 18 populations
- 40,000 meters² foliar cover of Kincaid's lupine in at least 16 populations
- 90,000 Nelson's checkermallow plants in at least 18 populations
- 5,000 golden paintbrush plants in at least five populations.

3.4.4. Direct and Indirect Effects

Plant augmentation usually provides beneficial effects for T&E and Special Status plants, but not always. Some plants can outcompete others and some plants may inhibit others (Tom Kaye, pers. comm., 2022). Generally, different species can and do successfully co-occur on the same site. Special Status plants are not good competitors with other established native vegetation and invasive species (Tom Kaye, pers. comm., 2022).

For this reason, the ability to augment existing Special Status species populations and introduce new populations is partially dependent on invasive plant treatment methods. The ability to use manual, mechanical, biological, chemical, and prescribed fire treatment methods to reduce or eradicate invasive plants provides opportunities for successful plant augmentation.

The BLM calculates the number of new plants by determining available habitat by alternative, simulating planting at the density recommended in Table 16, and applying the survival rates in Table 16. Increasing available habitat enhances connectivity. The objective of augmentation is to both increase the number of plant populations and increase connectivity among the constituent populations to enhance adequate gene flow and prevent problems associated with isolated small populations (USFWS 2010, p. IV-28).

This project analyzes the No Action alternative as well as the Action and Reference alternatives. The Action and Reference alternatives would increase the BLM's augmentation efforts of several Recovery Plan species and propose augmentation of additional Recovery Plan species and the Conservation Agreement species, wayside aster.

3.4.4.1. *Alternative A – No Action*

Under the No Action alternative, rare plant population augmentation would only occur for plants and sites already covered under existing analysis decisions. Population augmentation would not occur in unoccupied habitat unless already covered under existing analysis decisions.

²² Totals are derived by subtracting Recovery Goals for SW Washington and Douglas County Recovery Zones from the overall totals, as SW Washington is outside of the project area and only a small portion of Douglas County lies within the project area.

Under the No Action alternative, populations of Recovery Plan and Conservation Agreement plant species in the project area would remain the same as current levels unless augmented under other projects. Kincaid's lupine would remain at 165 m² of foliar cover, or 404 plants. The number of Willamette daisy plants would remain at zero. The number of Nelson's checkermallow plants would remain at approximately 625. The number of golden paintbrush plants would remain at one. The number of White-top aster plants would remain at zero. The number of pale larkspur plants would remain at zero. The number of Willamette Valley larkspur plants would remain at zero. The number of shaggy horkelia plants would remain at approximately 458. The number of Bradshaw's lomatium plants would remain at zero. The number of Hitchcock's blue-eyed grass plants would remain at approximately 35. The number of wayside aster plants would remain at approximately 454.

3.4.4.2. *Alternatives B and C – Proposed Action and Reference Alternative*

Under the Action and Reference alternatives, population augmentation would occur in occupied and potential habitat for Recovery Plan and Conservation Agreement plant species as shown in Table 17. Populations of Kincaid's lupine would increase from 404 to 119,350 plants. Populations of Willamette daisy would increase from zero to 53 plants. The Nelson's checkermallow population would increase from 625 to 1,052 plants. The golden paintbrush population would increase from a single documented plant to 12,110 plants. The white-topped aster population would increase from zero to 25,204 plants. The pale larkspur population would increase from zero to 4,897 plants. The Willamette Valley larkspur population would increase from zero to 29,413 plants. The shaggy horkelia population would increase from 458 to 230,428 plants. The Hitchcock's blue-eyed grass population would increase from 35 to 107,930 plants. The wayside aster population would increase from 454 to 547,904 plants. BLM has not identified new potential habitat for peacock larkspur and Bradshaw's lomatium and therefore new plant establishment is not calculated for these species; however, potential habitat for these species could be identified in the future.

Table 17. Increased abundance of Recovery Plan and Conservation Agreement species.

Species	Potential Habitat Acres mapped in MRUs	Potential Habitat m ² mapped in MRUs	Existing Plants/ Foliar Cover in MRUs	Seeds or Plugs	Planting Density	Establishment Rate	New Plants	Total Plants
Kincaid's lupine	73.73	298,375	404 plants	Plugs	2/m ²	20%	118,946	119,350
Willamette daisy	2.19	88.63	--	Plugs	3/m ²	20%	53	53
Nelson's checkermallow	2.60	10,522	625 plants	Plugs	2/m ²	20%	427	1,052
Golden paintbrush	0.60	2,422	1 plant	Seeds	50/m ²	10%	12,109	12,110
White-top aster	31.14	126,019	--	Plugs	1/m ²	20%	25,204	25,204
Pale larkspur	6.05	24,483	--	Plugs	1/m ²	20%	4,897	4,897

Willamette Valley larkspur	36.34	147,063	--	Plugs	1/m ²	20%	29,413	29,413
Shaggy horkelia	113.88	460,856	458 plants	Plugs	2/m ²	25%	229,970	230,428
Hitchcock's blue-eyed grass	53.34	215,859	35 plants	Plugs	2/m ²	25%	107,895	107,930
Wayside aster	270.78	1,095,808	454 plants	Plugs	2/m ²	25%	547,450	547,904

Connectivity would be increased for several Recovery Plan and Conservation Agreement species by planting in unoccupied potential habitat. Connectivity increase would be negligible for Nelson's checkermallow and golden paintbrush unless additional unoccupied habitat is identified. Four years after augmentation, species' connectivity within the project area would be increased from the No Action alternative as shown in Table 18.

Table 18. Habitat connectivity four years after augmentation

Plant	No Action Connectivity	Amplitude of Increase	Action Alternatives Connectivity
Willamette daisy	High	Slight Increase	High
Golden paintbrush	Medium	Negligible	Medium
White-topped aster	Low	Slight Increase	Low
Kincaid's lupine	High	Moderate Increase	High
Nelson's checkermallow	High	Negligible	High
Pale larkspur	Low	Slight Increase	Low
Willamette Valley larkspur	Low	Slight Increase	Low
Shaggy horkelia	Medium	Moderate Increase	Medium-High
Hitchcock's blue-eyed grass	Low	Moderate Increase	Medium
Wayside aster	High	Moderate Increase	High

3.4.4.3. Cumulative Effects

The 2010 Oregon FEIS notes that vegetation management practices have the potential to affect Special Status plants. Any management action focused on preventing, reducing, or eliminating the spread of noxious weeds and invasive plants will directly or indirectly benefit these species (USDI BLM 2010a: 155). Effects from vegetation treatments are similar for all Special Status plant species. The BLM would design treatments to reduce or eliminate adverse effects to these species; however, adverse effects could occur under any alternative for some treatment methods on some individual plants (See **Issue 1 (Botany)** *How would the proposed treatments, including herbicide, manual, mechanical, cultural, and biological, and prescribed fire (limited to invasive plants), affect desirable plant communities and Special Status plants?*). Some projects would have short-term adverse effects to individual plants to gain long-term benefits for the species. For example,

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habitat improvement projects or reducing competition from invasive plants may injure individual plants (USDI BLM 2010a: 155).

3.5. Issue 5 (Fisheries) How would aquatic manual/mechanical treatments affect federally listed and Bureau Sensitive listed fish?

3.5.1. Affected Environment

Habitat conditions for aquatic species are varied across the District and are the result of many decades of land management, riparian forest stand management, and road building. Upstream and downstream, private landowners including industrial timber management, agricultural development, and rural residential landowners also influence stream conditions. The only submerged and emergent aquatic infestations known to occur on the District include areas that total less than one acre: three sites at the Hult Pond (parrot feather) and one site along Kelly Creek (yellow flag iris). These aquatic treatments are a high priority for the Northwest Oregon District to prevent them from spreading further.

Table 19. Federally listed and Bureau Sensitive aquatic species found in aquatic systems across the District with potential to be affected by treatments

Common Name	Scientific Name	Federal status
Lower Columbia coho salmon	<i>Oncorhynchus kitsuch</i>	Threatened
Lower Columbia Chinook salmon	<i>Oncorhynchus tshawytscha</i>	Threatened
Lower Columbia steelhead trout	<i>Oncorhynchus mykiss</i>	Threatened
Upper Willamette River steelhead trout	<i>Oncorhynchus mykiss</i>	Threatened
Upper Willamette River Chinook salmon	<i>Oncorhynchus tshawytscha</i>	Threatened
Oregon Coast coho salmon	<i>Oncorhynchus kitsuch</i>	Threatened
Bull trout	<i>Salvelinus confluentus</i>	Threatened
Pacific lamprey	<i>Entosphenus tridentatus</i>	Bureau Sensitive
Coastal cutthroat trout (SW Washington/Columbia River DPS)	<i>Oncorhynchus 78ntirrh clarkii</i>	Bureau Sensitive
Western ridged mussel	<i>Gonidea 78ntirrh</i>	Bureau Sensitive

3.5.2. Environmental Impacts

3.5.2.1. Methodology

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

The descriptions of intensity and duration of effects are as follows:

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

3.5.2.2. *Assumptions*

- BLM will apply aquatic manual/mechanical treatments to areas that are not candidates for herbicide treatments (e.g., systems that are always open to adjacent flowing water). Emergent vegetation in streams with ESA listed aquatic species may be treated using the approved aquatic formulations.
- BLM will apply aquatic manual/mechanical treatments during the Oregon in-water work window (ODFW 2023) when there would be no direct effects to spawning salmonids or eggs.

3.5.3. Direct and Indirect Effects

3.5.3.1. *Effects Common to All Alternatives*

Effects from herbicide treatments on ESA listed and Bureau Sensitive fish would be similar between the no action alternative (2018 EA) and each action alternative. The BLM is not proposing additional herbicide formulations or application types that would differ from the no action. It is not anticipated that the acreage of stream courses would differ substantially between the no action and the action alternative and therefore the effects to listed and Bureau Sensitive fish would be the same.

This would include effects from manual/mechanical removal of weeds in running or standing waters across the District. Manual treatment methods used on aquatic invasive plants include hand-pulling, rakes, shovels, or bottom barriers/weed mats, and mechanical methods include diver assisted suction harvest or tractors. The BLM would use manual methods to treat aquatic plants 50 percent of the time and mechanical methods about 1 percent of the time (the remainder would be herbicide).

Certain manual and mechanical treatments within riparian areas that disturb soil, such as grubbing and pulling, carried out over a large area, may lead to increased erosion and stream sedimentation. Resultant sedimentation may adversely affect fish by covering eggs or spawning gravels, reducing prey availability, or directly harming fish gills, reducing stream carrying capacity for fish. However, the risk of harm to aquatic ecosystems due to fine sediment production from manual treatment or use of motorized hand tools is low, and short-term, resulting in localized and minor effects (USDI BLM 2010a: 231). Pulling of invasive plants may inadvertently result in the removal of aquatic macroinvertebrates from aquatic habitat, particularly those species that live and forage

in and around aquatic vegetation. This would result in temporary localized displacement or a reduction in population size. However, many individuals would escape or remain in undisturbed areas, and populations would quickly rebound. Therefore, effects to aquatic macroinvertebrate species diversity or populations would be negligible. Additionally, “mechanical, manual, and herbicide treatments, and in some cases biological treatments, that reduce the amount of invasive aquatic vegetation would improve habitats for fish and other aquatic organisms” (USDI BLM 2007d: 4-69).

Placement of weed mats would result in a temporary (lasting up to a few years) conversion of the bottom substrate of portions of treated ponds from mud (the substrate in which parrot feather would likely occur) to a non-natural mat. This could result in less burrowing habitat for some species of macroinvertebrates. Over time, it is likely that additional fine sediments and decomposing organic materials would settle out and eventually cover the mats, and that eventually the treated areas would be indistinguishable from non-treated areas. Non-treated areas would remain adjacent to the installed mats, so these species would have other available habitats to utilize in the interim, resulting in negligible effects to macroinvertebrate species diversity or populations.

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

3.5.3.2. *Alternatives Summary*

Each of the alternatives are similar in their effect at the site scale to aquatic species and their habitat. Effects from aquatic and riparian herbicide treatments are similar across all alternatives. BLM will apply aquatic manual/mechanical treatments to only a small percentage of all known invasive populations during any annual treatment window as there are few aquatic infestations on the District and manual/mechanical treatments have limited effectiveness treating them. The localized effects would not extend beyond a quarter mile downstream of treatment boundaries when applied in flowing water. Effects would be direct and short-term lasting days up to several weeks post treatment before return to baseline conditions except in the case of weed mats which will persist for the duration of the application (approximately 1-3 years). Species would be expected to disperse in the short term from sediment and turbidity pulses and reduction of aquatic macroinvertebrate availability but would be largely unaffected in the long term.

3.5.3.3. *Cumulative Effects*

Other actions across the District that could have direct effects to instream habitat could include large wood placement and habitat restoration; and fish passage restoration and culvert

replacements. The District aquatic program averages eight miles of stream treatments with large wood placement and four fish bearing culvert replacements across the District per year. These actions have short term effects to turbidity and physical habitat within those project areas, but the long-term effect is an improvement in habitat and stream form and function (USDI BLM 2020: 41).

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APPENDIX A – Invasive Plants on the Northwest Oregon District and Treatment Key Recommendations

This appendix summarizes information about infestations of invasive plants on the District, including potential new invaders, and includes the Treatment Key with recommendations showing how infestation treatments would typically be prescribed.

Invasive plants thrive and spread aggressively outside the species' natural range. An invasive species that colonizes a new area may gain an ecological edge since the insects, diseases, and foraging animals that naturally keep its growth in check in its native range are not present in its new habitat. The susceptibility of plant communities to colonization by invasive plants is influenced by many factors, including community structure, disturbance, proximity to infested areas, and the biological traits of the invading species.

The BLM developed the Treatment Key for the 2018 IIPM EA based on relevant literature²³ and knowledge transfer from other BLM districts. The District modified the 2018 key based on partner recommendations and the BLM's experience implementing treatments from 2019 onward. Treatment recommendations are displayed as percentages reflecting how often treatments would be prescribed by BLM for mapped infestations. The Treatment Key Recommendations tables are organized by functional species groups which can be easily expanded to include new invader species.

Existing Invasive Plant Sites

This section describes infestations known to occur on the District. Acreage information and number of sites are provided for all mapped infestations. Low priority invasive species that are widespread on the District are often unmapped; however, they would be mapped prior to treatment if they become a priority. Invasive plant inventories on the District focus on locations where invasive plants are most likely to occur and spread, such as waterways, road corridors, and areas with recent or frequent disturbance. The BLM also conducts project clearance or risk assessment surveys²⁴ in advance of planned projects, such as forest management projects, so the BLM can take measures to prevent the introduction and spread of invasive plants into and from project areas. The District maps and documents invasive plant infestations found through inventories, project risk assessment surveys, incidental observations made during the course of conducting other land management work, and from partner-collected data. Some infestations are mapped on land adjacent to BLM or on land owned by partners that may or may not be available for treatment by BLM; having these infestations mapped allows BLM to monitor for spread onto BLM-managed land. Most of the known invasive plant sites documented on the District have been found by BLM staff and contractors completing inventories and project risk assessment surveys. The BLM is required to monitor new project areas with moderate

²³ Most treatments are suggestions provided by *Weed Control in Natural Areas in the Western United States* (DiTomaso et al. 2013).

²⁴ Surveys 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.

likelihood of noxious weed introduction²⁵ and spread for the first three years after completion and areas with high likelihood for five years (USDI BLM 1992b).

The BLM has historically had data sharing agreements with the Oregon Department of Agriculture to make District noxious weed distribution information available to the public on their WeedMapper website. The BLM also shares data with the ImapInvasives website. Planned treatment data is made available to the public via BLM's National NEPA Register (ePlanning).

The District is in the process of transitioning spatial infestation data from the National Invasive Species Information Management System (NISIMS) database to the Vegetation Management Action Portal (VMAP). Data from the NISIMS database is now legacy data, while VMAP is the national database where infestation and treatment data is accessed and stored now and in the foreseeable future. These data include spatial and tabular information related to infestations including abundance, distribution, planned and completed treatment records, and other associated characteristics. Because not all of the District's NISIMS data has migrated to VMAP, infestation data for this project comprises spatial data from both databases, combined with recently submitted partner and specialist data. While the parent data provides detailed information on percent cover and previous treatments that is useful for planning ATPs, the District simplified the infestation data for this project. The BLM dissolved site polygons to remove overlap, and updated species names to improve consistency and facilitate analysis. For example, BLM records all invasive blackberry sites other than evergreen, or cutleaf blackberry, in the project map on BLM's National NEPA Register, (ePlanning) as Himalayan blackberry, or *Rubus armeniacus*. This convention was adopted even though the Oregon Flora Project lists the most recent accepted name for this species as *Rubus bifrons*, and even though many mapped populations on the District are actually European blackberry (*Rubus vestitus*), a separate species. As a federal agency, it is appropriate for the BLM to use the accepted name from the USDA Plants database, *R. armeniacus*. The physical differences between *R. armeniacus* (or *R. bifrons*) and *R. vestitus* are somewhat cryptic and the latter has been mapped inconsistently; moreover, invasive qualities and treatment recommendations between the two species are nearly identical. For these reasons, all species mapped as either *R. vestitus* or any synonym of *R. armeniacus* are mapped as *R. armeniacus*, Himalayan blackberry. Similarly, many sites that are mapped as *Rumex crispus*, curly dock, are likely *R. obtusifolius*, bitter dock, a look-alike species that displays similar invasiveness and would have the same treatment recommendations.

The most prevalent species mapped on the District are Scotch broom, slender false brome, St. Johnswort, tansy ragwort, thistles, and blackberry (Himalayan and cutleaf).²⁶ Mapped infestations on the District include 113 different invasive plant species occupying 25,673 acres on 54,520 sites²⁷ on the District. In addition, there are species and infestations that are known to occur on the District but

²⁵ Generally, any type of project resulting in ground disturbance, such as slash / pile / burn units, timber harvest areas, road / bridge construction, and trail construction. Current handbook direction requires this assessment only for noxious weeds (USDI 1992b). Handbook direction is in the process of being updated to include all invasive plant species to comply with Executive Order 13112 (February 1999, amended December 2016).

²⁶ St. Johnswort, tansy ragwort, and thistle infestations tend to be less dense than other widespread species; these species may occur on more gross acres but have fewer net acres than other pervasive invasive plants.

²⁷ Many of these sites overlap with sites of other invasive plants species. For example, a blackberry infestation may exist on the same acreage as a thistle infestation. Overlapping invasive plant sites mapped by species total 59,553 acres.

are not mapped. When unmapped infestations become prioritized for treatment, they are mapped as part of the treatment planning process. Mapped invasive plants on the District can be viewed on BLM's National NEPA Register (ePlanning): <https://eplanning.blm.gov/eplanning-ui/project/2018524/580>.

As shown in Figure A-1, the gross infested area is the area of land defined by drawing a line around the general perimeter of the infestation and does not reflect the percent cover of the plants. This area may contain large areas of land that are not occupied by an invasive plant species. Net acres are the actual infestation within the area. In some locations, a large area may have a sparse infestation and net acres would be calculated by multiplying the gross acres by the percent cover of the infestation. The net acres of many infestations on the District are not known or cannot be easily determined prior to treatments; however, net acreage of herbicide treatments can be calculated following treatments from information recorded in Pesticide Application Records.²⁸ BLM develops inventories, treatment plans, and treatment contracts from gross acreage; hence, acres described in this analysis are gross acres.

²⁸ Net herbicide treatment acres are mathematically calculated by dividing gallons of herbicide solution applied by the equipment sprayer calibration rate given in gallons per acre. It can be extrapolated from comparing net to gross herbicide treatment data from 2021 that net herbicide treatments on the District would not exceed 1,000 acres.

Figure A-1. Gross and net treatment acres.

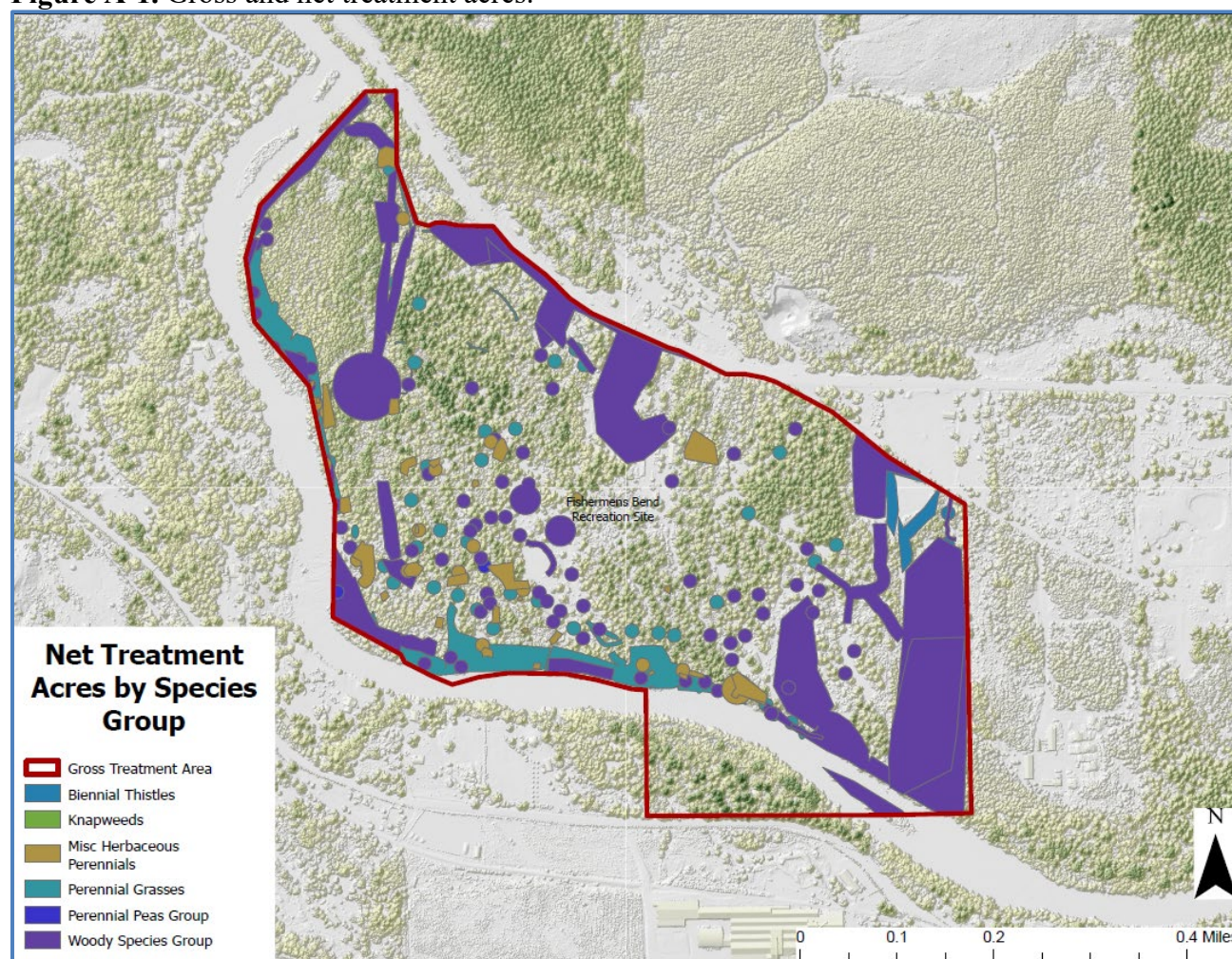


Table A-1. Summary of mapped invasive plants by infestation size

Infestation Size (acres)	Number of Sites	Percent of Total Sites	Total Acres	Percent of Total Acres
< 0.1	24,244	44%	1,473	2%
0.1 to < 0.5	15,863	29%	4,574	8%
0.5 to < 1	5,418	10%	3,909	7%
1 to < 5	7,047	13%	14,543	24%
5 to < 20	1,494	3%	13,507	23%
20 to <100	426	<1%	15,674	26%
>100	28	<1%	5,872	10%

Tables A-1 and A-3 indicate the size of invasive plant infestations mapped within the Northwest Oregon District boundary. Eighty-three percent of mapped sites are smaller than one gross acre each;

however, a relatively small number of large sites account for a majority of infested acres (about 59 percent of the mapped acres are on sites that are larger than 5 gross acres).

Spread from Existing Invasive Plant Sites

As described in the 2010 Oregon FEIS, the current spread rate for noxious weeds is estimated to be 12 percent annually (USDI BLM 2010a: 135-137, 594-597); new sites are found on the District with each invasive plant inventory. As described in the *Proposed Resource Management Plan/Final Environmental Impact Statement for the Resource Management Plans for Western Oregon*, timber harvest, road construction, and public motorized vehicle use can all contribute to invasive plant spread as well as actions such as management of special forest products, right-of-way agreements, road maintenance, and fuels reduction treatments (USDI BLM 2016c: 419-438). Invasive plants can spread quickly and over great distances by wind, water, animals, and humans through vehicle and foot traffic.

Infestations begin mostly on disturbed sites such as roads and trails, logged areas, burned areas, cultivated fields and pastures, wildlife concentration areas, mining areas, and recreation sites. Roads are well-known vectors for weeds (Parendes and Jones 2000), and forest edges created by gaps and landings increase the area for weeds to disperse into forest stands (McDonald and Urban 2006). Thinning young forest stands helps diversify forest understories, resulting in more late-seral shrub and forb species and overall plant species composition more similar to old growth than is found in unthinned stands (Lindh and Muir 2003); however, silvicultural prescriptions such as gaps, shelterwoods, and regeneration harvests that call for more open canopies create greater risk of weed infestation. Wildlife (including birds) can introduce invasive plant seeds from their coats and feces (USDI BLM 2010a: 132). Activities such as hiking, dispersed camping, and other recreational pursuits have the potential to spread invasive plants to a moderate degree (Pickering and Mount 2009). Proximity to urban areas and the checkerboard ownership pattern increases opportunities for invasive plant movement onto the District.

Linear disturbances such as roads and utility corridors are primary pathways for spread on the District. Many invasive plant species are spread along roads by vehicles. Powerline corridors where early seral conditions must be maintained for safety and operational purposes also create conditions conducive to invasive species infestation and spread.

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

Streams are also major pathways for the movement of invasive plants. The Willamette, Sandy, Nestucca, Siletz, and their tributaries transport invasive plant propagules downstream. These areas attract birds, wildlife, and humans who spread invasive plants along these corridors.

Recreation sites, both developed and dispersed, are the hub of several means of invasive plant spread. Recreation sites bring together people and their recreation equipment, vehicles, pack stock, and pets where roads, trails, and waterways converge. Invasive plants are easily transported from one site to other areas on the District and beyond.

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

Mineral material sites such as quarries are continuously disturbed and may have numerous users. Vegetation and topsoil are removed during mining activities, and revegetation efforts may need several successional phases to reclaim the site. During these phases, the site may be vulnerable to establishment by invasive plants.

Potential New Invaders

Species of invasive plants not previously documented on the District may be found at any time. Initial infestations are small but may become large before being discovered. BLM staff, partners, and contractors check common routes of spread (e.g., roads and waterways) regularly. Species of concern not yet documented on the District but documented on adjacent lands include false indigo bush, Eurasian watermilfoil, large-flower primrose-willow, floating primrose-willow, and yellow floatingheart. New invaders including garlic mustard, tree-of-heaven, Italian plumeless thistle, oblong spurge, purple loosestrife, giant reed, white bryony, dodder, and Mediterranean sage are newly documented on the District; they were listed as potential new invaders as recently as the 2018 IIPM EA. The BLM works with numerous entities to coordinate early detection activities across jurisdictional boundaries and educate the public about new invasive plants that are invading the area. The BLM assigns all new invaders a high priority for treatment in order to prevent them from becoming established on the District (see further information in the *Prioritizing Areas for Treatment* section in **Appendix B**).

Table A-2. Invasive plants on the Northwest Oregon District

Common Name	Scientific Name	Species Group (Treatment Key Table)	Known on District?	Noxious Weed?
Red top, creeping bentgrass	<i>Agrostis stolonifera</i>	Perennial Grasses	Existing	
Tree of heaven	<i>Ailanthus altissima</i>	Woody Species	Existing	Yes
Silver hairgrass	<i>Aira caryophylla</i>	Annual Grasses	Existing	
Garlic mustard	<i>Alliaria petiolata</i>	Mustards	Existing	Yes
Meadow foxtail	<i>Alopecurus pratensis</i>	Perennial Grasses	Existing	
European beachgrass	<i>Ammophila arenaria</i>	Perennial Grasses	Existing	
False indigo bush	<i>Amorpha fruticosa</i>	Perennial Peas	Potential new invader	Yes
Common bugloss	<i>Anchusa officinalis</i>	Borage	Potential new invader	Yes
Sweet vernal grass	<i>Anthoxanthum odoratum</i>	Perennial Grasses	Existing	
Common burdock	<i>Arctium minus</i>	Biennial Thistles	Existing	
Tall oatgrass	<i>Arrhenatherum elatius</i>	Perennial Grasses	Existing	
Italian arum	<i>Arum italicum</i>	Lilies, Iris, Sedges, Rushes	Potential new invader	
Giant reed	<i>Arundo donax</i>	Perennial Grasses	Existing	Yes
Wild oat	<i>Avena fatua</i>	Annual Grasses	Existing	Yes
Slender false brome	<i>Brachypodium sylvaticum</i>	Perennial Grasses	Existing	Yes
Field mustard	<i>Brassica rapa</i>	Mustards	Existing	
Ripgut brome	<i>Bromus diandrus</i>	Annual Grasses	Existing	

Common Name	Scientific Name	Species Group (Treatment Key Table)	Known on District?	Noxious Weed?
Soft brome	<i>Bromus hordeaceus</i>	Annual Grasses	Existing	Yes
Cheatgrass	<i>Bromus tectorum</i>	Annual Grasses	Existing	
White bryony	<i>Bryonia alba</i>	Miscellaneous Herbaceous – Perennial	Existing	Yes
Butterfly bush	<i>Buddleja davidii</i>	Woody Species	Existing	Yes
Flowering rush	<i>Butomus umbellatus</i>	Aquatic Species	Potential new invader	Yes
Italian plumeless thistle	<i>Carduus pycnocephalus</i>	Biennial Thistles	Existing	Yes
Hanging sedge	<i>Carex pendula</i>	Lilies, Iris, Sedges, Rushes	Potential new invader	
Distaff thistle	<i>Carthamus lanatus</i>	Biennial Thistles	Potential new invader	Yes
Garden cornflower	<i>Centaurea cyanus</i>	Knapweeds	Existing	
Diffuse knapweed	<i>Centaurea diffusa</i>	Knapweeds	Existing	Yes
Malta thistle	<i>Centaurea melitensis</i>	Knapweeds	Potential new invader	
Meadow knapweed	<i>Centaurea ×moncktonii</i>	Knapweeds	Existing	Yes
Lesser knapweed	<i>Centaurea nigra</i>	Knapweeds	Existing	
Tyrol knapweed	<i>Centaurea nigrescens</i>	Knapweeds	Existing	
Yellow starthistle	<i>Centaurea solstitialis</i>	Knapweeds	Existing	Yes
Spotted knapweed	<i>Centaurea stoebe</i> L. ssp. <i>micranthos</i>	Knapweeds	Existing	Yes
Canada thistle	<i>Cirsium arvense</i>	Canada Thistle	Existing	Yes
Bull thistle	<i>Cirsium vulgare</i>	Biennial Thistles	Existing	Yes
Old man's beard	<i>Clematis vitalba</i>	Woody Species	Potential new invader	Yes
Poison hemlock	<i>Conium maculatum</i>	Carrot Family	Existing	Yes
Field bindweed	<i>Convolvulus arvensis</i>	Miscellaneous Herbaceous – Perennial	Existing	Yes
Jubata grass	<i>Cortaderia jubata</i>	Perennial Grasses	Potential new invader	Yes
Cotoneaster spp.	<i>Cotoneaster</i>	Woody Species	Existing	
Hawthorn	<i>Crataegus</i>	Woody Species	Existing	
Oneseed hawthorn	<i>Crataegus monogyna</i>	Woody Species	Existing	Yes
Smooth hawksbeard	<i>Crepis capillaris</i>	Sunflower Family	Existing	
Bristly hawksbeard	<i>Crepis setosa</i>	Sunflower Family	Existing	
Dodder spp.	<i>Cuscuta</i> spp.	Miscellaneous Herbaceous – Annual	Potential new invader	Yes
Gypsyflower/ houndstounge	<i>Cynoglossum officinale</i>	Borage	Existing	Yes
Scotch broom	<i>Cytisus scoparius</i>	Woody Species	Existing	Yes
Striated broom	<i>Cytisus striatus</i>	Woody Species	Existing	Yes
Orchardgrass	<i>Dactylis glomerata</i>	Perennial Grasses	Existing	
Spurge laurel	<i>Daphne laureola</i>	Woody Species	Existing	Yes
Purple foxglove	<i>Digitalis purpurea</i>	Snapdragons	Existing	
Fuller's teasel	<i>Dipsacus fullonum</i>	Teasel	Existing	
Cutleaf teasel	<i>Dipsacus laciniatus</i>	Teasel	Existing	Yes
Common viper's bugloss	<i>Echium vulgare</i>	Borage	Potential new invader	Yes
Pine echium	<i>Echium pininana</i>	Borage	Potential new invader	Yes
Patterson's curse	<i>Echium plantagineum</i>	Borage	Potential new invader	Yes
Weeping lovegrass	<i>Eragrostis curvula</i>	Perennial Grasses	Potential new invader	
Leafy spurge	<i>Euphorbia esula</i>	Spurges	Existing	Yes
Oblong spurge	<i>Euphorbia oblongata</i>	Spurges	Existing	Yes
Common fennel	<i>Foeniculum vulgare</i>	Carrot Family	Potential new invader	
French broom	<i>Genista monspessulana</i>	Woody Species	Existing	Yes
Cutleaf geranium	<i>Geranium dissectum</i>			
Shining geranium	<i>Geranium lucidum</i>	Geranium	Existing	Yes
Herb Robert	<i>Geranium robertianum</i>	Geranium	Existing	Yes
Waxy mannagrass	<i>Glyceria declinata</i>	Perennial Grasses	Potential new invader	
English ivy	<i>Hedera helix</i>	Woody Species	Existing	Yes
Giant hogweed	<i>Heracleum mantegazzianum</i>	Carrot Family	Existing	Yes

Common Name	Scientific Name	Species Group (Treatment Key Table)	Known on District?	Noxious Weed?
Orange hawkweed	<i>Hieracium aurantiacum</i>	Hawkweeds	Existing	Yes
Meadow hawkweed	<i>Hieracium caespitosum</i>	Hawkweeds	Existing	Yes
Yellow hawkweed	<i>Hieracium floribundum</i>	Hawkweeds	Potential new invader	Yes
Common hawkweed	<i>Hieracium lachenalii</i>	Hawkweeds	Existing	
New England hawkweed	<i>Hieracium sabaudum</i>	Hawkweeds	Existing	
Common velvet grass	<i>Holcus lanatus</i>	Perennial Grasses	Existing	
Creeping velvet grass	<i>Holcus mollis</i>	Perennial Grasses	Existing	
Hydrilla	<i>Hydrilla verticillata</i>	Aquatic Species	Potential new invader	Yes
St. Johnswort	<i>Hypericum perforatum</i>	St. Johnswort	Existing	Yes
English holly	<i>Ilex aquifolium</i>	Woody Species	Existing	
Ornamental jewelweed	<i>Impatiens glandulifera</i>	Miscellaneous Herbaceous – Annual	Existing	Yes
Yellow flag iris / paleyellow iris	<i>Iris pseudacorus</i>	Lilies, Iris, Sedges, Rushes	Existing	Yes
Dyers woad	<i>Isatis tinctoria</i>	Mustards	Potential new invader	Yes
Yellow archangel	<i>Lamiastrum galeobdolon</i>	Perennial Mints	Existing	Yes
Perennial pea	<i>Lathyrus latifolius</i>	Perennial Peas	Existing	Yes
Flat pea	<i>Lathyrus sylvestris</i>	Perennial Peas	Existing	
Field pepperweed	<i>Lepidium campestre</i>	Mustards	Existing	
Purpleanther field pepperweed	<i>Lepidium heterophyllum</i>	Mustards	Existing	
Oxeye daisy	<i>Leucanthemum vulgare</i>	Sunflower Family	Existing	
Butter and eggs	<i>Linaria vulgaris</i>	Snapdragons	Existing	Yes
Pale flax	<i>Linum bienne</i>	Miscellaneous Herbaceous – Perennial	Existing	
Perennial ryegrass	<i>Lolium perenne</i>	Perennial Grasses	Existing	
Birdsfoot trefoil	<i>Lotus corniculatus</i>	Perennial Peas	Existing	
Large-flower primrose-willow	<i>Ludwigia grandiflora</i> ssp. <i>hexapetala</i>	Aquatic Species	Potential new invader	Yes
Floating water primrose	<i>Ludwigia peploides</i>	Aquatic Species	Potential new invader	Yes
Money plant	<i>Lunaria annua</i>	Mustards	Potential new invader	
Creeping jenny	<i>Lysimachia nummularia</i>	Loosestrifes	Existing	
Garden loosestrife	<i>Lysimachia vulgaris</i>	Loosestrifes	Potential new invader	Yes
Purple loosestrife	<i>Lythrum salicaria</i>	Loosestrifes	Potential new invader	Yes
Black medick	<i>Medicago lupulina</i>	Annual Peas	Existing	
Sweetclover	<i>Melilotus officinalis</i>	Annual Peas	Existing	
Pennyroyal	<i>Mentha pulegium</i>	Perennial Mints	Existing	
Parrot feather	<i>Myriophyllum aquaticum</i>	Aquatic Species	Existing	Yes
Eurasian watermilfoil	<i>Myriophyllum spicatum</i>	Aquatic Species	Potential new invader	Yes
Daffodil	<i>Narcissus</i>	Lilies, Iris, Sedges, Rushes	Existing	
Fragrant water lily	<i>Nymphaea odorata</i>	Aquatic Species	Potential new invader	
Yellow floating heart	<i>Nymphoides peltata</i>	Aquatic Species	Potential new invader	Yes
Redsepal evening primrose	<i>Oenothera glazioviana</i>	Miscellaneous Herbaceous – Perennial	Existing	
Scotch cottonthistle	<i>Onopordum acanthium</i>	Biennial Thistles	Existing	Yes
Japanese sweet coltsfoot	<i>Petasites japonicus</i>	Sunflower Family	Existing	
Bulbous canarygrass	<i>Phalaris aquatica</i>	Perennial Grasses	Existing	
Reed canarygrass	<i>Phalaris arundinacea</i>	Perennial Grasses	Existing	
Timothy	<i>Phleum pratense</i>	Perennial Grasses	Existing	
Bristly oxtongue	<i>Picris echioides</i>	Sunflower Family	Potential new invader	
Japanese knotweed	<i>Polygonum cuspidatum</i>	Buckwheat Family	Existing	Yes
Cultivated knotweed	<i>Polygonum polystachyum</i>	Buckwheat Family	Existing	Yes
Giant knotweed	<i>Polygonum sachalinense</i>	Buckwheat Family	Existing	Yes

Common Name	Scientific Name	Species Group (Treatment Key Table)	Known on District?	Noxious Weed?
Bohemian knotweed	<i>Polygonum X bohemicum</i>	Buckwheat Family	Existing	
Sulfur cinquefoil	<i>Potentilla recta</i>	Miscellaneous Herbaceous – Perennial	Potential new invader	Yes
Sweet cherry	<i>Prunus avium</i>	Woody Species	Existing	
Cherry laurel	<i>Prunus laurocerasus</i>	Woody Species	Potential new invader	
Kudzu	<i>Pueraria lobata</i>	Perennial Peas	Potential new invader	Yes
Common pear	<i>Pyrus communis</i>	Woody Species	Existing	
Lesser celandine	<i>Ranunculus ficaria</i>	Buttercups	Potential new invader	Yes
Creeping buttercup	<i>Ranunculus repens</i>	Buttercups	Existing	
Cultivated radish	<i>Raphanus sativus</i>	Mustards	Existing	
Creeping yellowcress	<i>Rorippa sylvestris</i>	Mustards	Existing	Yes
Non-native invasive roses	<i>Rosa</i>	Woody Species	Existing	
Multiflora rose	<i>Rosa multiflora</i>	Woody Species	Existing	
Sweetbriar rose	<i>Rosa rubiginosa</i>	Woody Species	Existing	
Cutleaf blackberry	<i>Rubus laciniatus</i>	Woody Species	Existing	
Himalayan blackberry	<i>Rubus armeniacus</i>	Woody Species	Existing	Yes
European blackberry	<i>Rubus vestitus</i>	Woody Species	Existing	
Common sheep sorrel	<i>Rumex acetosella</i>	Buckwheat Family	Existing	
Curly dock	<i>Rumex crispus</i>	Buckwheat Family	Existing	
Bitter dock	<i>Rumex obtusifolius</i>	Buckwheat Family	Existing	
Mediterranean sage	<i>Salvia aethiopis</i>	Perennial Mints	Existing	Yes
Tall fescue	<i>Schedonorus arundinaceus</i>	Perennial Grasses	Existing	
Tansy ragwort	<i>Senecio jacobaea</i>	Sunflower Family	Existing	Yes
Bladder campion	<i>Silene vulgaris</i>	Carnations	Existing	
Milk thistle	<i>Silybum marianum</i>	Biennial Thistles	Existing	Yes
Bittersweet / Climbing nightshade	<i>Solanum dulcamara</i>	Miscellaneous Herbaceous – Perennial	Existing	
Spiny sowthistle	<i>Sonchus arvensis</i>	Sunflower Family	Existing	
Common sowthistle	<i>Sonchus oleraceus</i>	Sunflower Family	Existing	
Spanish broom	<i>Spartium junceum</i>	Woody Species	Existing	Yes
Medusahead	<i>Taeniatherum caput-medusae</i>	Annual Grasses	Existing	Yes
Puncturevine	<i>Tribulus terrestris</i>	Miscellaneous Herbaceous – Annual	Potential new invader	Yes
Coltsfoot	<i>Tussilago farfara</i>	Sunflower Family	Potential new invader	Yes
Common gorse	<i>Ulex europaeus</i>	Woody Species	Existing	Yes
North Africa grass	<i>Ventenata dubia</i>	Annual Grasses	Existing	
Brazilian verbena	<i>Verbena bonariensis</i>	Miscellaneous Herbaceous – Perennial	Existing	
Garden vetch	<i>Vicia sativa</i>	Annual Peas	Existing	
Bigleaf periwinkle	<i>Vinca major</i>	Miscellaneous Herbaceous – Perennial	Existing	
Common periwinkle	<i>Vinca minor</i>	Miscellaneous Herbaceous – Perennial	Existing	

Table A-3. Mapped invasive plants by infestation size²⁹

Common Name	Scientific Name	Sites >100 acres		Sites 20 – 100 acres		Sites 5 – 20 acres		Sites 1 – 5 acres		Sites 0.5 – 1 acre		Sites 0.1 and <0.5 acres		Sites <0.1 acre	
		Number of Sites	Total Acres	Number of Sites	Total Acres	Number of Sites	Total Acres	Number of Sites	Total Acres	Number of Sites	Total Acres	Number of Sites	Total Acres	Number of Sites	Total Acres
Bigleaf periwinkle	<i>Vinca major</i>					1	9.15					2	0.21	4	0.30
Birdsfoot trefoil	<i>Lotus corniculatus</i>											3	0.60	2	0.03
Black medick	<i>Medicago lupulina</i>									1	1.59				
Bohemian knotweed	<i>Polygonum X bohemicum</i>					1	9.00	7	21.82	3	2.99	1	0.29	51	0.59
Bristly dogstail grass	<i>Cynosurus echinatus</i>			2	53.87	10	89.05	18	37.17	12	9.36	16	4.01	7	0.25
Bristly hawksbeard	<i>Crepis setosa</i>							1	1.46			1	0.80		
Bulbous canarygrass	<i>Phalaris aquatica</i>									2	1.24	1	0.13	11	0.24
Bull thistle	<i>Cirsium vulgare</i>	2	383.39	36	1270.89	74	639.77	830	1528.69	700	510.09	1424	501.05	2087	110.70
Butter and eggs	<i>Linaria vulgaris</i>					1	12.56	1	4.96	2	1.48			9	0.68
Canada thistle	<i>Cirsium arvense</i>	1	122.05	30	1104.90	75	643.31	578	1090.42	522	381.16	1076	377.35	1596	86.78
Cheatgrass	<i>Bromus tectorum</i>					1	11.00	1	2.45	1	0.58	1	0.26	6	0.06
Climbing nightshade	<i>Solanum dulcamera</i>							1	1.10	3	2.02	12	4.44	7	0.62
Common gorse	<i>Ulex europaeus</i>													1	0.02
Common hawkweed	<i>Hieracium lachenalia</i>													5	0.03
Common pear	<i>Pyrus communis</i>			1	28.66										
Common periwinkle	<i>Vinca minor</i>			3	119.94			1	1.90	5	2.92	15	3.45	54	3.23
Common sheep sorrel	<i>Rumex acetosella</i>							1	2.02			1	0.27	3	0.27
Common sowthistle	<i>Sonchus oleraceus</i>													1	0.10
Common velvetgrass	<i>Holcus lanatus</i>			6	234.67	17	175.80	16	32.28	8	5.79	16	3.90	27	0.71
Cotoneaster spp.	<i>Cotoneaster</i>													4	0.23
Creeping bentgrass	<i>Agrostis stolonifera</i>			2	76.75	2	22.07	5	16.21	3	2.63	5	1.48	17	0.61
Creeping buttercup	<i>Ranunculus repens</i>											2	0.53	10	0.59
Creeping jenny	<i>Lysimachia nummularia</i>											1	0.41	1	0.01
Creeping velvetgrass	<i>Holcus mollis</i>									1	0.58	1	0.30	43	4.03
Creeping yellowcress	<i>Rorippa sylvestris</i>													1	0.08
Cultivated knotweed	<i>Polygonum polystachyum</i>													3	0.25
Cultivated radish	<i>Raphanus sativus</i>													1	0.10
Curly dock	<i>Rumex crispus</i>							1	1.60	3	1.94	7	1.38	15	0.91
Cutleaf blackberry	<i>Rubus laciniatus</i>	1	111.86	9	371.35	75	648.34	578	1145.43	506	368.59	1657	507.22	2332	133.51
Cutleaf geranium	<i>Geranium dissectum</i>									2	1.78	6	1.00	2	0.06

²⁹ Mapped infestations on the District include West Eugene Wetlands, the Horning and Tyrrell seed orchards, and sometimes neighboring or partner land ownerships.

Common Name	Scientific Name	Sites >100 acres		Sites 20 – 100 acres		Sites 5 – 20 acres		Sites 1 – 5 acres		Sites 0.5 – 1 acre		Sites 0.1 and <0.5 acres		Sites <0.1 acre	
		Number of Sites	Total Acres	Number of Sites	Total Acres	Number of Sites	Total Acres	Number of Sites	Total Acres	Number of Sites	Total Acres	Number of Sites	Total Acres	Number of Sites	Total Acres
Cutleaf teasel	<i>Dipsacus laciniatus</i>					1	10.17							1	0.10
Diffuse knapweed	<i>Centaurea diffusa</i>							1	1.06	2	1.50	1	0.14	2	0.12
Dodder	<i>Cuscuta spp.</i>									1	0.61				
English holly	<i>Ilex aquifolium</i>					1	5.58	2	5.24			26	5.45	67	3.19
English ivy	<i>Hedera helix</i>					4	31.12	10	17.13	5	3.21	33	8.66	84	4.16
European beachgrass	<i>Ammophila arenaria</i>					2	30.63	1	2.09					4	0.25
Field bindweed	<i>Convolvulus arvensis</i>									1	0.99	32	11.59	3	0.11
Field mustard	<i>Brassica rapa</i>													9	0.81
Field pepperweed	<i>Lepidium campestre</i>													1	0.01
Field sowthistle	<i>Sonchus arvensis</i>													3	0.30
Flat pea	<i>Lathyrus sylvestris</i>							1	2.86			2	0.67	3	0.23
French broom	<i>Genista monspessulana</i>					2	15.84	2	4.28			4	1.28	4	0.13
Fuller's teasel	<i>Dipsacus fullonum</i>			2	68.24	2	11.52	2	3.20	8	5.59	19	3.79	123	3.92
Garden cornflower	<i>Centaurea cyanus</i>													1	0.10
Garden vetch	<i>Vicia sativa</i>							1	1.59	1	0.67			1	0.04
Garlic mustard	<i>Alliaria petiolata</i>											1	0.41		
Giant hogweed	<i>Heracleum mantegazzianum</i>											2	0.40		
Giant knotweed	<i>Polygonum sachalinense</i>							3	6.46			5	1.49	3	0.14
Giant reed	<i>Arundo donax</i>													3	0.23
Gypsyflower / Houndstongue	<i>Cynoglossum officinale</i>													1	0.10
Hairy cat's ear	<i>Hypochaeris radicata</i>					4	40.46	3	7.29			4	1.58	1	0.10
Himalayan blackberry	<i>Rubus armeniacus</i>	9	2298.34	70	2920.87	243	2314.39	977	2078.36	790	562.34	3319	824.57	4881	346.03
Italian plumeless thistle	<i>Carduus nutans</i>							1	1.05	2	1.36	6	1.24	6	0.40
Japanese knotweed	<i>Polygonum cuspidatum</i>			2	52.24	1	7.55	5	9.56	4	2.90	24	6.55	54	2.00
Japanese sweet coltsfoot	<i>Petasites japonicus</i>													1	<0.01
Leafy spurge	<i>Euphorbia esula</i>							1	1.38						
Lesser burdock	<i>Arctium minus</i>					1	12.72	4	5.12	3	1.98	13	4.34		
Lesser knapweed	<i>Centaurea nigra</i>									1	0.65	3	0.64	30	2.99
Meadow foxtail	<i>Alopecurus pratensis</i>			1	22.38	2	20.70	3	12.38			3	0.43	11	0.24
Meadow hawkweed	<i>Hieracium caespitosum</i>									1	0.66	1	0.50	9	0.13
Meadow knapweed	<i>Centaurea ×moncktonii</i>			6	157.12	15	152.18	64	142.13	53	38.76	177	45.06	314	16.91
Mediterranean sage	<i>Salvia aethiopis</i>													13	0.99
Medusahead	<i>Taeniatherum caput-medusae</i>			2	52.34	2	17.13	4	7.95	1	0.53			3	0.25
Multiflora rose	<i>Rosa multiflora</i>					1	10.23	3	6.10	3	1.73	9	2.09	35	0.73
New England hawkweed	<i>Hieracium sabaudum</i>					1	8.34							9	0.10
Oblong spurge	<i>Euphorbia oblongata</i>											1	0.16	1	<0.01

Common Name	Scientific Name	Sites >100 acres		Sites 20 – 100 acres		Sites 5 – 20 acres		Sites 1 – 5 acres		Sites 0.5 – 1 acre		Sites 0.1 and <0.5 acres		Sites <0.1 acre	
		Number of Sites	Total Acres	Number of Sites	Total Acres	Number of Sites	Total Acres	Number of Sites	Total Acres	Number of Sites	Total Acres	Number of Sites	Total Acres	Number of Sites	Total Acres
Oneseed hawthorn	<i>Crataegus monogyna</i>			1	28.66	1	12.49	1	1.06			1	0.12	31	0.21
Orange eye butterflybush	<i>Buddleja davidii</i>													5	0.33
Orange hawkweed	<i>Hieracium aurantiacum</i>													4	0.15
Orchardgrass	<i>Dactylis glomerata</i>			2	52.34	6	38.70	14	32.20	3	1.76	2	0.59	19	0.43
Ornamental jewelweed / Policeman's helmet	<i>Impatiens glandulifera</i>							1	2.49	3	1.84	23	5.19	194	3.20
Oxeye daisy	<i>Leucanthemum vulgare</i>			2	25.87	9	70.86	13	29.73	4	2.82	23	4.67	98	3.66
Pale flax	<i>Linum bienne</i>									1	0.66	1	0.14		
Parrot feather watermilfoil	<i>Myriophyllum aquaticum</i>											2	0.31	1	0.01
Perennial pea	<i>Lathyrus latifolius</i>			7	357.35	3	46.23	14	30.66	22	16.40	95	30.89	124	9.07
Perennial ryegrass	<i>Lolium perenne</i>							3	6.24	1	0.83				
Poison hemlock	<i>Conium maculatum</i>					1	10.17					7	1.46	18	0.34
Purple foxglove	<i>Digitalis purpurea</i>			3	74.47	70	581.55	548	1077.67	421	306.61	808	287.82	5	0.21
Purple loosestrife	<i>Lythrum salicaria</i>													4	0.20
Purpleanther field pepperweed	<i>Lepidium heterophyllum</i>													4	0.03
Queen Anne's lace	<i>Daucus carota</i>									1	0.75			1	0.06
Rattail fescue	<i>Vulpia myuros</i>					4	40.69	5	10.46	3	2.35	4	1.34		
Redsepal evening primrose	<i>Oenothera glazioviana</i>													1	0.10
Reed canarygrass	<i>Phalaris arundinacea</i>			1	21.25	5	39.91	31	56.84	50	36.17	180	58.86	365	15.45
Ripgut brome	<i>Bromus diandrus</i>					5	38.16	9	17.81	7	5.02	4	1.24	87	0.09
Robert's geranium / herb Robert	<i>Geranium robertianum</i>	1	125.67	3	116.30	28	250.45	150	344.22	120	84.22	588	132.16	1187	80.83
Scotch broom	<i>Cytisus scoparius</i>	7	1078.06	97	3757.06	289	2814.79	932	2009.54	698	497.18	2395	609.53	4026	273.64
Scotch cottonthistle	<i>Onopordum acanthium</i>											1	0.33	3	0.30
Shining geranium	<i>Geranium lucidum</i>			3	88.70	17	114.86	58	118.89	42	30.57	222	54.51	635	32.99
Silver hairgrass	<i>Aira caryophylla</i>					2	23.79	6	12.07	1	0.68	7	2.14	1	< 0.01
Slender false brome	<i>Brachypodium sylvaticum</i>	3	908.38	33	1068.27	89	768	298	687.45	238	167.34	1355	308.10	440	43.77
Smooth cat's ear	<i>Hypochaeris glabra</i>					2	28.96	6	11.40	3	2.29	5	1.44	2	0.15
Smooth hawkbeard	<i>Crepis capillaris</i>					1	18.41	3	3.93					1	0.06
Soft brome	<i>Bromus hordeaceus</i>					2	24.31	8	17.96	6	4.79	13	3.39	20	0.74
Spanish broom	<i>Spartium junceum</i>											1	0.68	1	0.38
Spotted knapweed	<i>Centaurea stoebe</i> L. ssp. <i>Micranthos</i>					5	47.06	11	19.06	30	20.96	124	34.61	85	5.92
Spreading hedgeparsley	<i>Torilis arvensis</i>											2	0.40		
St. Johnswort	<i>Hypericum perforatum</i>	2	385.92	61	2048.34	236	2106.77	736	1671.28	318	232.59	512	171.22	325	23.92
Sweet vernalgrass	<i>Anthoxanthum odoratum</i>			5	197.04	12	117.86	13	33.39	4	2.26	14	3.13	14	0.48

Common Name	Scientific Name	Sites >100 acres		Sites 20 – 100 acres		Sites 5 – 20 acres		Sites 1 – 5 acres		Sites 0.5 – 1 acre		Sites 0.1 and <0.5 acres		Sites <0.1 acre	
		Number of Sites	Total Acres	Number of Sites	Total Acres	Number of Sites	Total Acres	Number of Sites	Total Acres	Number of Sites	Total Acres	Number of Sites	Total Acres	Number of Sites	Total Acres
Sweetbriar rose	<i>Rosa rubiginosa</i>							1	1.06			1	0.16	13	0.08
Sweetclover	<i>Melilotus officinalis</i>					3	21.54	83	169.76	91	67.25	269	96.19	3	0.16
Tall fescue	<i>Schedonorus arundinaceus</i>			2	52.34	9	81.32	18	46.81	6	4.31	12	3.15	27	0.99
Tall oatgrass	<i>Arrhenatherum elatius</i>					2	18.72	4	7.70	8	5.45	10	2.15	12	0.53
Tansy ragwort	<i>Senecio jacobaea</i>	2	458.05	33	1195.89	154	1243.04	952	1917.42	683	493.86	1242	428.32	2714	142.47
Timothy	<i>Phleum pratense</i>									1	0.78	3	0.59	6	0.22
Tree of Heaven	<i>Ailanthus altissima</i>							1	1.14						
Tyrol knapweek	<i>Centaurea nigrescens</i>											1	0.33	1	0.01
White bryony	<i>Bryonia alba</i>													1	0.08
Wild oat	<i>Avena fatua</i>													6	0.08
Yellow archangel	<i>Lamiastrum galeobdolon</i>			1	29.98					1	0.87	4	0.94	1	0.09
Yellow flag iris / paleyellow iris	<i>Iris pseudacorus</i>											1	0.19	1	0.01
Yellow starthistle	<i>Centaurea solstitialis</i>													3	0.25

Treatment Key Recommendations

The *Treatment Key Recommendations* portion of Table A-4 shows treatment options as well as considerations for when treatment methods may be used. Factors that could lead to the highest probability treatment methods not being appropriate are listed in the *Treatment Considerations* column, and include variables such as plant life cycle, soil types, plant resistance to herbicides, infestation size, herbicide selectivity to neighboring desirable vegetation, weather conditions, and protective measures or label restrictions that limit areas an herbicide could be used in. The *Treatment Considerations* column includes common treatment considerations and is not an exhaustive list. Application rates are shown as pounds per acre (lbs./acre) and are averages. Actual formulations may vary slightly, depending on mixes of herbicides or adjuvants, timing, and other factors that could increase effectiveness. Lbs./acre are calculated from rates per acre on the label and can vary based on formulation. Table B-2, *Herbicide information*, in **Appendix B**, lists typical and maximum application rates analyzed in the FEIS and PEIS documents to which this EA tiers. In the Application Rate column of Table A-4, *Treatment Key Recommendations*, lbs./acre listed in bold are at or above the typical application rate. Underlined numbers indicate lbs./acre at the maximum application rate. Rates are rounded to two digits; e.g., the max rate of imazapic, 0.1875 lbs./acre, is shown as 0.19 in this table. In some cases, application rate is listed as (minimal), which indicates that the rate would be 1/10th or less of the typical application rate.

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

Within each species group, the *Percent of Treatment Acres* columns add up to 100 percent and show how often a treatment method would be used when a species infestation is targeted for treatment.³⁰ For example, woody species would be controlled manually 10 percent of the time, mechanically 15 percent of the time, and with herbicide 75 percent of the time. BLM based these estimates on treatment of known sites and acres treated, not on number of sites treated. For example, if 20 one-acre sites had invasive plants that were manually pulled, and one 20-acre site is sprayed with imazapyr, manual and imazapyr would both be 50 percent each. Expectations from the 2018 EA Treatment Key are provided for comparison.

It should be noted that the District would not necessarily treat all invasive plants or infestation acreages listed in these tables. The District would treat up to 10,000 gross acres annually, depending on budget and staffing, and these acres would be selected based on type of species, location, and potential for spread. Further information is in **Appendix B** in the *Prioritizing Areas for Treatment* section. The perennial grasses group includes a row for “no adequate control” after the listed treatment methods. This indicates the percent of acres targeted for treatment that the District cannot control because adequate control methods are unavailable or unfeasible and treatments would not be attempted even in high priority circumstances.

³⁰ Treatment methods recommended less than one percent of the time do not contribute to the 100% sum.

Table A-4. Treatment Key Recommendations

Bold typeface indicates pounds per acre (lbs./acre) application rates at or above typical application rates analyzed in FEIS documents to which this EA tiers.

Underlined typeface indicates lbs./acre application rates at the maximum application rate analyzed in FEIS documents to which this EA tiers.

Green shaded rows indicate species that have been mapped on the District.

Annual Grasses Group: Locations (Species Acreage and Habitat)

Common Name	Scientific Name	Acres	Common Habitat
Bristly dogstail grass	<i>Cynosurus echinatus</i>	193.72	Roadsides, fields, grasslands, oak woodlands, coastal bluffs and terraces, riverbanks, and other disturbed places
Cheatgrass	<i>Bromus tectorum</i>	14.35	Disturbed areas, sagebrush steppe, degraded grasslands, roadsides
Medusahead	<i>Taeniatherum caput-medusae</i>	78.2	Clay soils and open disturbed areas
North Africa grass	<i>Ventenata dubia</i>	--	Roadsides, open areas, grasslands, plantations
Rattail fescue	<i>Vulpia myuros</i>	54.83	Open areas, roadsides, pastures, fields, slopes, washes, and open woodlands
Ripgut brome	<i>Bromus diandrus</i>	62.31	Disturbed open areas, degraded grasslands
Silver hairgrass	<i>Aira caryophylla</i>	38.69	Roadsides and other disturbed areas in vernal moist to dry, sandy to rocky, open sites
Soft brome	<i>Bromus hordeaceus</i>	51.2	Forest, woodland, roadside, riparian
Wild oat	<i>Avena fatua</i>	0.08	Meadows, fields
Total		493.38	

Annual Grasses Group: Treatment Key Recommendations (Methods and Considerations)

Treatment Method	Application Rate (lbs./acre)	Percent of Treatment Acres Expectation from 2018 EA	Percent of Treatment Acres Updated for 2023 IPMAHR EA	Treatment Considerations
Manual control	NA	5%	<1%	Small sites can be controlled through hand-pulling.
Mechanical control	NA	5%	3%	Mowing at the bolt to early flowering stage may help to suppress plants. However, mowing after seed set will disperse seeds.
Imazapic	0.06 to 0.12	45%	40%	Apply at the pre-emergent stage in the fall, when desirable grasses and forbs are dormant.
Rimsulfuron	0.03 to <u>0.06</u>	35%	35%	Apply pre-emergence to early post-emergence when target plants are young and actively growing. Perennial grasses are tolerant to fall applications.

Treatment Method	Application Rate (lbs./acre)	Percent of Treatment Acres Expectation from 2018 EA	Percent of Treatment Acres Updated for 2023 IPMAHR EA	Treatment Considerations
Glyphosate	<3.00	1%	20%	Apply at the seedling stage. Since it is non-selective, minimize exposure to non-target plants.
Fluazifop-P-butyl	<u>0.38</u>	<1%	<1%	Research and Demonstration herbicide. See Special Local Needs Label (FIFRA Sec 24, OR-120016). Apply to actively growing grasses. Repeat applications may be needed.
Sulfometuron methyl	0.05 to 0.09	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	1%	1%	Apply pre-emergence or early post-emergence. Use primarily on road rights-of-way.
Sethoxydim	0.30	1%	<1%	Research and Demonstration herbicide.
Targeted grazing (cattle)	NA	1%	<1%	Would be used only in limited situations, primarily in meadows from late fall to early spring. Would be used to reduce biomass and seed production of grasses. Would be followed by broadcast applications of imazapic or rimsulfuron at some heavily infested sites. Would often be followed by competitive seeding with native grasses and forbs.
No adequate control methods	NA	0%	0%	

Annual Peas Group: Locations (Species Acreage and Habitat)

Common Name	Scientific Name	Acres	Common Habitat
Black medick	<i>Medicago lupulina</i>	1.59	Riparian areas, meadows, lawns, roadsides, disturbed areas
Garden vetch	<i>Vicia sativa</i>	2.3	Fields, roadsides, waste areas
Sweetclover	<i>Melilotus officinalis</i>	354.9	Meadows, prairies, open woodlands, waste areas
Total		358.79	

Annual Peas Group: Treatment Key Recommendations (Methods and Considerations)

Treatment Method	Application Rate (lbs./acre)	Percent of Treatment Acres Expectation from 2018 EA	Percent of Treatment Acres Updated for 2023 IPMAHR EA	Treatment Considerations
Manual control	NA	25%	5%	Hand-pulling can be used on small infestations or isolated plants, as long as below- ground tissue is also removed (to prevent re-sprouting).
Aminopyralid	0.05 to 0.11	35%	25%	Apply in spring before flowering.
Clopyralid	0.09 to 0.19	15%	25%	Apply in spring before flowering.
Triclopyr	2.00	15%	30%	Apply in spring when plants are rapidly growing.
Glyphosate	<3.00	5%	3%	Apply in spring before flowering.
2,4-D	1.00	5%	2%	Apply in spring to actively growing plants, particularly at bud to flower.
Picloram	0.50 to 0.95	<1%	<1%	Appropriate from rosette to flowering stage, where there are seed banks and where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse effects to desirable vegetation can be minimized. Evaluate soil, slope, and proximity to water when considering this herbicide. Works best when plants are growing rapidly in spring before full bloom or in late summer to early fall.
Mechanical control	NA	<1%	10%	Target plants are suppressed with mowing or weed whackers before seed set, non- selectively removes growth of desirable species. May require multiple treatments/year for effective weed control.
Targeted grazing (goats or sheep)	NA	<1%	<1%	Targeted grazing can reduce the biomass of invasive plants. Fencing or herding required.
No adequate control methods	NA	0%	0%	

Aquatic Species Group: Locations (Species Acreage and Habitat)

Common Name	Scientific Name	Acres	Common Habitat
Eurasian watermilfoil	<i>Myriophyllum spicatum</i>	--	Aquatic
Flowering rush	<i>Butomus umbellatus</i>	--	Aquatic
Fragrant water lily	<i>Nymphaea odorata</i>	--	Aquatic
Hydrilla	<i>Hydrilla verticillata</i>	--	Aquatic
Parrot feather	<i>Myriophyllum aquaticum</i>	0.32	Aquatic, river

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Common Name	Scientific Name	Acres	Common Habitat
Water primrose	<i>Ludwigia hexapetala</i>	--	Aquatic in shallow slow-moving water along rivers, ditches, ponds
Floating water primrose	<i>Ludwigia peploides</i>	--	Aquatic in shallow slow-moving water along rivers, ditches, ponds
Yellow floating heart	<i>Nymphoides peltata</i>	--	Aquatic
Total		0.32	

Aquatic Species Group: Treatment Key Recommendations (Methods and Considerations)

Treatment Method	Application Rate (lbs./acre)	Percent of Treatment Acres Expectation from 2018 EA	Percent of Treatment Acres Updated for 2023 IPMAHR EA	Treatment Considerations
Manual control	NA	50%	40%	Weed mats, held in place with a heavy object, can be used to eradicate infestations. Hand pulling can be effective on small infestations.
Glyphosate	(Minimal)	10%	18%	Non-selective. Likely to be used on smaller infestations where exposure to non-target plants can be minimized.
Triclopyr	(Minimal)	35%	23%	Emergent shoots of parrot feather are difficult to “wet” due to dense waxy cuticle and a surfactant should be used. Broadleaf selective (more selective than 2,4-D).
Imazapyr	(Minimal)	4%	18%	Slow acting systemic. Non-selective.
Mechanical control	NA	1%	1%	Diver assisted suction harvest or tractor. Tractor can be effective but difficult to get entire plant.
Fluridone	(Minimal)	<1%	<1%	Use various formulations (variable release-rates) or repeated applications for five to seven weeks. Would only be applied in ponds, lakes, and other non-flowing water bodies. Non selective.
2,4-D	(Minimal)	<1%	<1%	Emergent shoots of parrot feather are difficult to “wet” due to dense waxy cuticle and a surfactant should be used. Broadleaf selective; use infestations where exposure to non-target plants can be minimized.
No adequate control methods	NA	0%	0%	

Biennial Thistles Group: Locations (Species Acreage and Habitat)

Common Name	Scientific Name	Acres	Common Habitat
Bull thistle	<i>Cirsium vulgare</i>	4,944.58	Roadside, open forest, clearings
Distaff thistle	<i>Carthamus lanatus</i>	--	Roadsides, disturbed openings

Common Name	Scientific Name	Acres	Common Habitat
Italian plumeless thistle	<i>Carduus pycnocephalus</i>	4.05	Urban, grassland
Lesser burdock	<i>Arctium minus</i>	24.17	Open forests, roadside, riparian areas
Milk thistle	<i>Silybum marianum</i>	--	Roadsides, grasslands, disturbed openings
Scotch cottonthistle	<i>Onopordum acanthium</i>	0.63	Roadside, rangeland, prairies, riparian
Total		4,973.43	

Biennial Thistles Group: Treatment Key Recommendations (Methods and Considerations)

Treatment Method	Application Rate (lbs./acre)	Percent of Treatment Acres Expectation from 2018 EA	Percent of Treatment Acres Updated for 2023 IPMAHR EA	Treatment Considerations
Manual control	NA	5%	3%	Grubbing and pulling can be effective in controlling existing plant, but will not be effective on seed bank. Would only be used on small infestations.
Mechanical control	NA	15%	7%	Thistles can be controlled with mowing or weed whackers, but can adversely affect desirable intermingled species.
Aminopyralid	0.08 to 0.11	48%	50%	Preferred treatment method. Longer soil residual activity than clopyralid. 90 percent control if applied at the bud stage.
Metsulfuron methyl	0.04	10%	2%	Good choice at the rosette to bud stage. It is harder on some wet-meadow grass species than chlorsulfuron.
Glyphosate	1.00	5%	<1%	Non-selective. Apply post-emergence to plants in the rosette state in spring or before freeze-up in the fall.
Picloram + 2,4-D	0.25 + 0.95	<1%	<1%	Appropriate from rosette to flowering, where there is an established seed bank at site, where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse effects to desirable vegetation can be minimized.
Dicamba + 2,4-D	0.50 + 0.95	3%	10%	Appropriate if treatment occurs at spring and fall rosette stage.
Chlorsulfuron + Clopyralid + 2,4-D	0.05 + 0.38 + 0.95	1%	1%	Appropriate when there is an established seed bank at site. Treat from rosette to flowering. This treatment is particularly useful when Canada thistle occurs in the infestation mix. Combination to consider using when burn-down to prevent seed formation / set is needed or where resistance to sulfonylureas is a concern. It adds a second mode or site of action.

Treatment Method	Application Rate (lbs./acre)	Percent of Treatment Acres Expectation from 2018 EA	Percent of Treatment Acres Updated for 2023 IPMAHR EA	Treatment Considerations
Chlorsulfuron + 2,4-D	0.05 + 0.95	1%	1%	Combination to consider using when burn-down to prevent seed formation / set is needed or where resistance to sulfonylureas is a concern. It adds a second mode or site of action.
Chlorsulfuron	0.05	1%	1%	Treatment at the rosette to bud stage. This treatment is particularly useful when Canada thistle occurs in the infestation mix.
Clopyralid	0.38	<1%	25%	Post-emergence in spring up to bud stage. Can also apply to fall re-growth. Results are best if applied to rapidly growing weeds. More selective than picloram.
Picloram + 2,4-D + Dicamba	0.25 + 0.95 + 0.50	<1%	<1%	Appropriate from rosette to flowering stage, where there are seed banks and where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse effects to desirable vegetation can be minimized. Apply where residual control is desired.
Chlorsulfuron + Picloram	0.05 + 0.50	<1%	<1%	Use when there is an established seed bank at site, treat from rosette to flowering, where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse effects to desirable vegetation can be minimized.
Targeted grazing (goats)	NA	1%	<1%	Goats will eat young plants.
No adequate control methods	NA	0%	0%	

Within the Northwest Oregon District boundary, the ODA releases and tracks biological control agents on bull and milk thistle infestations. See Table B-1, *Widespread biological control agents on the Northwest Oregon District*, for further information.

Borage Group: Locations (Species Acreage and Habitat)

Common Name	Scientific Name	Acres	Common Habitat
Common bugloss	<i>Anchusa officinalis</i>	--	Fields, roadsides, riparian, waste areas
Gypsyflower / houndstounge	<i>Cynoglossum officinale</i>	0.10	Roadsides, pastures, meadows, open forest
Common viper's bugloss	<i>Echium vulgare</i>	--	Open woodlands, pastures, roadsides
Pine echium	<i>Echium pininana</i>	--	Disturbed hillsides in coastal habitats
Patterson's curse	<i>Echium plantagineum</i>	--	Open areas, pastures

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Common Name	Scientific Name	Acres	Common Habitat
Total		0.10	

Borage Group: Treatment Key Recommendations (Methods and Considerations)

Treatment Method	Application Rate (lbs./acre)	Percent of Treatment Acres Expectation from 2018 EA	Percent of Treatment Acres Updated for 2023 IPMAHR EA	Treatment Considerations
Manual control	NA	50%	5%	Hand pulling is feasible for scattered plants or for areas where other control methods are not feasible. Manual control would be limited to small infestations.
Aminopyralid + Metsulfuron methyl	(0.08 to 0.11) + (0.12 to 0.15)	0%	75%	Can be used safely around grasses. Early post-emergence, apply early spring to be most effective.
Glyphosate	3.00	15%	15%	Preferred herbicide near water.
Metsulfuron methyl	0.04 to 0.08	8%	5%	Can be used safely around grasses. Early post-emergence, apply early spring to be most effective.
Chlorsulfuron + 2,4-D	0.06 + 0.95	15%	<1%	Combination to consider using when burn-down to prevent seed formation / set is needed or where resistance to sulfonyleureas is a concern. This combination adds a second mode or site of action.
Metsulfuron methyl + 2,4-D	0.04 + 0.95	10%	<1%	Combination to consider using when burn-down to prevent seed formation / set is needed or where resistance to sulfonyleureas is a concern. This combination adds a second mode or site of action. Less expensive than chlorsulfuron but is harder on some wet meadow grass species.
Dicamba + 2,4-D	0.50 + 0.95	1%	<1%	Appropriate from the seedling to flowering stage. Option to prevent resistance to sulfonyleureas.
Picloram + 2,4-D	0.50 + 0.95	1%	<1%	Appropriate from rosette to flowering stage, where there are seed banks and where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse effects to desirables can be minimized.
No adequate control methods	NA	0%	0%	

Buckwheat Family Group: Locations (Species Acreage and Habitat)

Common Name	Scientific Name	Acres	Common Habitat
Bohemian knotweed	<i>Polygonum X bohemicum</i>	34.69	Riparian, waste areas, forest edges

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Common Name	Scientific Name	Acres	Common Habitat
Common sheep sorrel	<i>Rumex acetosella</i>	2.57	Roadsides, cultivated fields, waste places, disturbed areas, lawns, meadows, railroad gravels, sandy and muddy shores
Cultivated knotweed	<i>Polygonum polystachyum</i>	0.25	Riparian, waste areas, forest edges
Curly dock, bitter dock	<i>Rumex crispus</i> , <i>Rumex obtusifolius</i>	5.83	Open disturbed areas
Giant knotweed	<i>Polygonum sachalinense</i>	8.1	Riparian, waste areas, forest edges
Japanese knotweed	<i>Polygonum cuspidatum</i>	80.83	Riparian, waste areas, forest edges
Total		132.27	

Buckwheat Family Group: Treatment Key Recommendations (Methods and Considerations)

Treatment Method	Application Rate (lbs./acre)	Percent of Treatment Acres Expectation from 2018 EA	Percent of Treatment Acres Updated for 2023 IPMAHR EA	Treatment Considerations
Manual control	NA	<1%	<1%	Recommended when rhizomes can be completely removed. Should only be used for very small upland infestations (less than 50 stems).
Imazapyr	0.75 to 1.00	50%	65%	Most effective treatment method. Repeat applications necessary.
Aminopyralid	<u>0.11</u>	30%	<1%	Apply in mid-summer to fall when plants are fully leafed. Optimum results when plants are 3-5 ft. tall. Repeat applications necessary. Partners note this chemical is not very effective and is best used only as an alternative mode of action and to prevent resistance to imazapyr and glyphosate.
Glyphosate	3.00	15%	35%	Apply mid-summer to fall when plants are fully leafed. Injection treatments are also effective. Repeat applications necessary. Use after two consecutive annual Imazapyr treatments or in sites that have high potential for off target damage.
Triclopyr	0.50 to 2.00	3%	<1%	Apply midsummer to actively growing plants.
Triclopyr + 2,4-D	1.50 + 0.95	2%	<1%	Apply midsummer to actively growing plants.
No adequate control methods	NA	0%	0%	

Buttercups Group: Locations (Species Acreage and Habitat)

Common Name	Scientific Name	Acres	Common Habitat
Creeping buttercup	<i>Ranunculus repens</i>	1.12	Roadside, fields, pastures, forest edges, riparian
Lesser celandine	<i>Ranunculus ficaria</i>	--	Woodland, urban, wetland, riparian
Total		1.12	

Buttercups Group: Treatment Key Recommendations (Methods and Considerations)

Treatment Method	Application Rate (lbs./acre)	Percent of Treatment Acres Expectation from 2018 EA	Percent of Treatment Acres Updated for 2023 IPMAHR EA	Treatment Considerations
Manual methods	NA	5%	<1%	Roots must be removed from site, will regenerate from stem fragments and runners.
Aminopyralid	0.05 to 0.11	25%	15%	Apply to actively growing plants.
Glyphosate	3.00	10%	35%	Effective when applied in summer/fall before leaf dieback. Lesser celandine top kills if tank mix is too hot. Field trials have demonstrated that a tank mix of 1% triclopyr amine, 1% glyphosate and 1% nonionic vegetable surfactant provide excellent control.
Metsulfuron methyl	0.01 to 0.08	20%	15%	Apply early when plants are small and actively growing.
Chlorsulfuron	0.05	10%	<1%	Treat marshes, swamps and bogs after water has receded as well as seasonally dry flood deltas.
Dicamba + 2,4-D	(0.50 to 1.00) + 0.95	5%	<1%	Apply early spring before flowers appear.
Triclopyr	2.00	15%	35%	Apply when actively growing to full bloom.
Triclopyr + 2 4-D	2.00 + 0.95	5%	<1%	Apply when actively growing to full bloom.
2,4-D	0.95	5%	<1%	Apply in spring to rosettes.
Picloram	0.50 to 0.95	<1%	<1%	Appropriate from rosette to flowering stage, where there are seed banks and where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse effects to desirables can be minimized. Evaluate soil, slope, and proximity to water when considering this herbicide.
Targeted grazing (sheep)	NA	<1%	<1%	Sheep will feed on seedlings and young vines at ground level. (Some buttercup species can be toxic.)
Mechanical control	NA	0%	<1%	Tillage must be conducted before roots become well established.
No adequate control methods	NA	0%	0%	

Canada Thistle Group: Locations (Species Acreage and Habitat)

Common Name	Scientific Name	Acres	Common Habitat
Canada thistle	<i>Cirsium arvense</i>	3,805.96	Grasslands, open forest, roadside, pastures, clearings
Total		3,805.96	

Canada Thistle Group: Treatment Key Recommendations (Methods and Considerations)

Treatment Method	Application Rate (lbs./acre)	Percent of Treatment Acres Expectation from 2018 EA	Percent of Treatment Acres Updated for 2023 IPMAHR EA	Treatment Considerations
Clopyralid	<u>0.50</u>	35%	40%	One of the preferred herbicide treatments, post-frost.
Aminopyralid	<u>0.08</u> to <u>0.11</u>	30%	35%	One of the most effective herbicides. Apply post-emergence, bud stage to senescence. Applications can be made into winter if conditions permit.
Glyphosate	(Minimal)	24%	5%	Would be used where herbicide treatments could get into the water.
Chlorsulfuron	0.06	5%	5%	Can be used for Canada thistle at any stage.
Clopyralid + 2,4-D	<u>0.50</u> + 0.95	1%	<1%	Treatment for young plants (actively growing thru flowering). Adding 2,4-D is helpful if treatment occurs at the bud to flowering stage.
Dicamba + 2,4-D	(0.50 to 1.00) + 0.95	0%	15%	Appropriate if treatment occurs at spring and fall rosette stage.
Picloram + 2,4-D	0.25 + 0.95	<1%	<1%	Appropriate at sites where there is a known seed bank, where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse effects to desirable vegetation can be minimized. Adding 2,4-D is helpful if treatment occurs at the bud to flowering stage.
Picloram	0.25	<1%	<1%	Appropriate from rosette to flowering stage, where there are seed banks and where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse effects to desirable vegetation can be minimized.
Mechanical control	NA	5%	<1%	Mowing can be used to reduce the nutrient storage in the roots and suppress flower formation. However, for mowing to be effective it must be repeated at least every 3-4 weeks for several seasons. Or should be combined with other control practices.
Manual	NA	<1%	<1%	Pulling is an inadequate control method; cutting and bagging heads can reduce seed set.

Treatment Method	Application Rate (lbs./acre)	Percent of Treatment Acres Expectation from 2018 EA	Percent of Treatment Acres Updated for 2023 IPMAHR EA	Treatment Considerations
No adequate control methods	NA	0%	0%	

Within the Northwest Oregon District boundary, the ODA releases and tracks biological control agents on Canada thistle infestations. See Table B-1, *Widespread biological control agents on the Northwest Oregon District*, for further information.

Carnations Group: Locations (Species Acreage and Habitat)

Common Name	Scientific Name	Acres	Common Habitat
Bladder campion	<i>Silene vulgaris</i>	--	Open areas and meadows
Deptford pink	<i>Dianthus armeria</i>	--	Roadsides, fields, shores, open woods, waste places
European centaury	<i>Centaureum erythraea</i>	--	Fields, roadsides
Total		Unmapped	

Carnations Group: Treatment Key Recommendations (Methods and Considerations)

Treatment Method	Application Rate (lbs./acre)	Percent of Treatment Acres Expectation from 2018 EA	Percent of Treatment Acres Updated for 2023 IPMAHR EA	Treatment Considerations
Manual control	NA	50%	15%	Hand pull scattered plants or for areas where other control methods are not feasible. Limited to small infestations.
Mechanical control	NA	5%	15%	Repeated mowing of small patches is laborious but effective.
Dicamba + 2,4-D	0.50 + 0.95	5%	<1%	Apply in spring from rosettes to bolting, on plants with green basal leaves.
Glyphosate	3.00	32%	20%	Apply in spring to actively growing plants from germination to bolting, with green basal leaves.
Triclopyr	1.00	0%	25%	Apply when actively growing to full bloom.
Aminopyralid + Metsulfuron methyl	(0.08 to 0.11) + (0.12 to 0.15)	3%	25%	Apply pre-emergence in fall or when target plants are in the seedling to rosette stage.
2,4-D	0.95	5%	<1%	Apply to spring rosettes or to bolting plants with green basal leaves.

Treatment Method	Application Rate (lbs./acre)	Percent of Treatment Acres Expectation from 2018 EA	Percent of Treatment Acres Updated for 2023 IPMAHR EA	Treatment Considerations
No adequate control methods	NA	0%	0%	

Carrot Family Group: Locations (Species Acreage and Habitat)

Common Name	Scientific Name	Acres	Common Habitat
Common fennel	<i>Foeniculum vulgare</i>	--	Roadsides, ditches, open disturbed sites
Giant hogweed	<i>Heracleum mantegazzianum</i>	0.4	Riparian, clearings, meadows, roadsides
Poison hemlock	<i>Conium maculatum</i>	11.97	Roadside, meadow, riparian, flood plains, ditches
Queen Anne's lace	<i>Daucus carota</i>	0.8	Roadsides, fields, pastures, disturbed sites
Spreading hedgeparsley	<i>Torilis arvensis</i>	0.4	Woodlands, pastures, fields, forest margins, disturbed roadsides
Total		13.57	

Carrot Family Group: Treatment Key Recommendations (Methods and Considerations)

Treatment Method	Application Rate (lbs./acre)	Percent of Treatment Acres Expectation from 2018 EA	Percent of Treatment Acres Updated for 2023 IPMAHR EA	Treatment Considerations
Manual control	NA	5%	5%	Good for single plants or small infestations, try to get as much of the taproot as possible to prevent regrowth.
Mechanical control	NA	5%	5%	Target plants are suppressed with mowing or weed whackers before seed set, nonselectively removes growth of desirable species. May require multiple treatments per year for effective weed control.
Aminopyralid + Metsulfuron methyl	(0.08 to 0.11) + (0.12 to 0.15)	30%	35%	Pre-emergence in fall, or post-emergence in the seedling to rosette stage.
Metsulfuron methyl + Dicamba + 2,4-D	0.02 + 0.50 + 1.00	25%	25%	Appropriate for use in rights-of-way.
Imazapyr	0.50	15%	5%	Non-selective. Apply pre-emergence or in the rosette stage. Can be used near water.

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Treatment Method	Application Rate (lbs./acre)	Percent of Treatment Acres Expectation from 2018 EA	Percent of Treatment Acres Updated for 2023 IPMAHR EA	Treatment Considerations
Triclopyr	1.00	0%	20%	Apply when actively growing to full bloom.
Chlorsulfuron + 2,4-D	0.05 + 0.95	10%	2%	Treat marshes, swamps and bogs after water has receded as well as seasonally dry flood deltas. (Do not make application to natural or man-made bodies of water such as lakes, reservoirs, ponds, streams and canals.)
Metsulfuron methyl	0.07	5%	2%	Treat marshes, swamps and bogs after water has receded as well as seasonally dry flood deltas. (Do not make application to natural or man-made bodies of water such as lakes, reservoirs, ponds, streams and canals.)
Glyphosate	2.00	5%	1%	Use where herbicide treatments could contact water. For glyphosate, apply to rosettes before they bolt.
No adequate control methods	NA	0%	0%	

Geranium Group: Locations (Species Acreage and Habitat)

Common Name	Scientific Name	Acres	Common Habitat
Cutleaf geranium	<i>Geranium dissectum</i>	2.84	Roadsides, fields, pastures, waste places, disturbed open woodlands, shrublands
Robert's geranium	<i>Geranium robertianum</i>	1,133.85	Roadside, forest
Shining geranium	<i>Geranium lucidum</i>	440.52	Roadside, forest
Total		1,577.21	

Geranium Group: Treatment Key Recommendations (Methods and Considerations)

Treatment Method	Application Rate (lbs./acre)	Percent of Treatment Acres Expectation from 2018 EA	Percent of Treatment Acres Updated for 2023 IPMAHR EA	Treatment Considerations
Manual control	NA	2%	<1%	Pull, dig, or till before flowers and seeds. Shining and Robert's geranium require multiple, integrated treatments per year that are most effective when followed by competitive seeding.
Propane torch	NA	35%	20%	Effective for fall, winter, spring treatments. Shining and Robert's geranium require multiple, integrated treatments per year that are most effective when followed by competitive seeding.

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Treatment Method	Application Rate (lbs./acre)	Percent of Treatment Acres Expectation from 2018 EA	Percent of Treatment Acres Updated for 2023 IPMAHR EA	Treatment Considerations
Triclopyr	1.00	35%	30%	Provides excellent control (>95%). Shining and Robert's geranium require multiple, integrated treatments per year that are most effective when followed by competitive seeding.
Glyphosate	3.00	10%	5%	Apply to rapidly growing plants. Use higher rates on larger plants. Shining and Robert's geranium require multiple, integrated treatments per year that are most effective when followed by competitive seeding.
Aminopyralid	0.05 to 0.11	5%	20%	Apply in spring on rosette to flowering stages or in fall to seedlings or rosettes. Shining and Robert's geranium require multiple, integrated treatments per year that are most effective when followed by competitive seeding.
Metsulfuron methyl	0.01 to 0.02	5%	20%	Apply on rapidly growing plants. Shining and Robert's geranium require multiple, integrated treatments per year that are most effective when followed by competitive seeding.
Imazapyr	0.38 to 0.75	3%	3%	Apply pre- or post-emergence to control visible plants and seeds. Shining and Robert's geranium require multiple, integrated treatments per year that are most effective when followed by competitive seeding.
Dicamba + 2,4-D	0.75 + 0.25	5%	2%	Apply in spring before flowering on rapidly growing plants. Shining and Robert's geranium require multiple, integrated treatments per year that are most effective when followed by competitive seeding.
2,4-D	0.95	<1%	<1%	Apply from seedling to flowering, to actively growing plants. Shining and Robert's geranium require multiple, integrated treatments per year that are most effective when followed by competitive seeding.
Dicamba + Diflufenzopyr	0.18 to 0.35	<1%	<1%	Apply to actively growing weeds. Shining and Robert's geranium require multiple, integrated treatments per year that are most effective when followed by competitive seeding.
Imazapic	0.03	<1%	<1%	Shining and Robert's geranium require multiple, integrated treatments per year that are most effective when followed by competitive seeding.
Sulfometuron methyl	0.14	<1%	<1%	Apply when weeds are rapidly growing, has mixed selectivity and desired grasses may be stunted. Shining and Robert's geranium require multiple, integrated treatments per year that are

Treatment Method	Application Rate (lbs./acre)	Percent of Treatment Acres Expectation from 2018 EA	Percent of Treatment Acres Updated for 2023 IPMAHR EA	Treatment Considerations
				most effective when followed by competitive seeding.
Fluroxypyr	<u>0.49</u>	<1%	<1%	Apply to rapidly growing plants. Use higher rates on larger plants. Shining and Robert's geranium require multiple, integrated treatments per year that are most effective when followed by competitive seeding.
No 13Intirrh methods	NA	0%	0%	Geranium can only be adequately controlled by multiple, integrated treatments per year.

Hawkweeds Group: Locations (Species Acreage and Habitat)

Common Name	Scientific Name	Acres	Common Habitat
Common hawkweed	<i>Hieracium lachenalii</i>	0.03	Open fields, mountain meadows, forest clearings, permanent pastures, cleared timber units, abandoned farmland, roadsides and other disturbed areas
Meadow hawkweed	<i>Hieracium caespitosum</i>	1.28	Disturbed areas, pastures, open woods, roadsides, river-banks
Mouse-ear hawkweed	<i>Hieracium pilosella</i>	--	Grasslands, roadsides, lawns, disturbed areas
New England hawkweed	<i>Hieracium sabaudum</i>	8.45	Disturbed sites (grasslands, open woods)
Orange hawkweed	<i>Hieracium aurantiacum</i>	0.15	Roadside, open forest, pasture, rangeland
Tall hawkweed	<i>Hieracium piloselloides</i>	--	Disturbed sites
Yellow hawkweed	<i>Hieracium floribundum</i>	--	Roadside, grasslands, forest
Total		9.91	

Hawkweeds Group: Treatment Key Recommendations (Methods and Considerations)

Treatment Method	Application Rate (lbs./acre)	Percent of Treatment Acres Expectation from 2018 EA	Percent of Treatment Acres Updated for 2023 IPMAHR EA	Treatment Considerations
Manual control	NA	5%	<1%	Hand pulling effective for small infestations.
Clopyralid	0.25 to <u>0.5</u>	45%	45%	For meadow hawkweed, apply up to bloom stage. For orange hawkweed, apply in the spring before bolting. Preferred on orange hawkweed.

Treatment Method	Application Rate (lbs./acre)	Percent of Treatment Acres Expectation from 2018 EA	Percent of Treatment Acres Updated for 2023 IPMAHR EA	Treatment Considerations
Aminopyralid	0.08 to 0.11	20%	45%	Apply from seedling to full bloom in spring.
Triclopyr + Aminopyralid	1.00 + 0.11	0%	10%	Apply from seedling to full bloom in spring.
Dicamba + 2,4-D	0.50 + 0.95	<1%	<1%	Appropriate from the seedling to flowering stage.
Picloram	0.25 to 0.50	<1%	<1%	Appropriate from rosette to flowering stage, where there are seed banks and where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse effects to desirable vegetation can be minimized.
Glyphosate	2.00	<1%	<1%	Non-selective.
No adequate control methods	NA	0%	0%	

Knapweeds Group: Locations (Species Acreage and Habitat)

Common Name	Scientific Name	Acres	Common Habitat
Brown knapweed	<i>Centaurea jacea</i>	--	Disturbed areas, roadsides, fields, pastures
Diffuse knapweed	<i>Centaurea diffusa</i>	2.82	Roadsides, waste areas
Garden cornflower	<i>Centaurea cyanus</i>	0.1	Disturbed areas, grasslands, open forests, roadsides, fields
Lesser knapweed	<i>Centaurea nigra</i>	4.27	Disturbed areas, roadsides, fields
Malta thistle	<i>Centaurea melitensis</i>	--	Disturbed soils, grassy areas
Meadow knapweed	<i>Centaurea ×moncktonii</i>	552.16	Roadsides, fields, meadows, forest openings, waste areas
Spotted knapweed	<i>Centaurea stoebe</i> ssp. <i>micranthos</i>	127.62	Roadside, pasture, open forests, prairies, waste areas
Tyrol knapweed	<i>Centaurea nigrescens</i>	0.34	Roadsides, fields, waste areas
Yellow starthistle	<i>Centaurea solstitialis</i>	0.25	Grasslands, rangelands, roadside
Total		687.56	

Knapweeds Group: Treatment Key Recommendations (Methods and Considerations)

Treatment Method	Application Rate (lbs./acre)	Percent of Treatment Acres Expectation from 2018 EA	Percent of Treatment Acres Updated for 2023 IPMAHR EA	Treatment Considerations
Manual control	NA	17%	10%	Hand pulling is feasible for scattered plants or for areas where other control methods are not feasible. Manual control would be limited to small infestations and would be needed up to 3 times a year. Sometimes an inadequate control method in hard compacted soils (roadsides).
Aminopyralid	0.05 to <u>0.11</u>	48%	50%	One of the most effective herbicides for knapweeds. Apply post-emergence, bud stage to senescence. Applications can be made into winter if conditions permit.
Aminopyralid + Metsulfuron methyl	(<u>0.08</u> to <u>0.11</u>) + (<u>0.12</u> to <u>0.15</u>)	15%	20%	Apply to plants in spring.
Clopyralid	0.38	10%	15%	Apply at the rosette to bolting stage.
Clopyralid + 2,4-D	0.38 + 0.95	5%	5%	Treat invasive plants from rosette to flowering. It also offers residual control for late season applications to kill fall rosettes and to inhibit seedling growth the following year.
Dicamba + 2,4-D	0.50 + 0.95	<1%	<1%	Apply post-emergence from rosette to beginning of bolting, or autumn rosette. Optimal at early flowering stage.
Picloram + 2,4-D	0.50 + 0.95	<1%	<1%	Appropriate from rosette to flowering stage, where there are seed banks and where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse effects to desirable vegetation can be minimized.
Glyphosate	(minimal)	5%	<1%	Appropriate where adverse effects to desirable vegetation can be minimized. Use where treatments could get into the water.
No adequate control methods	NA	0%	0%	

Within the Northwest Oregon District boundary, the ODA releases and tracks biological control agents on diffuse, meadow, and spotted knapweed and yellow starthistle infestations. See Table B-1, *Widespread biological control agents on the Northwest Oregon District*, for further information.

Lilies, Iris, Sedges, Rushes: Locations (Species Acreage and Habitat)

Common Name	Scientific Name	Acres	Common Habitat
Daffodil	<i>Narcissus</i>	--	Roadsides, wet meadows, old homesites
Hanging sedge	<i>Carex pendula</i>	--	Shaded riparian areas

Common Name	Scientific Name	Acres	Common Habitat
Italian arum	<i>Arum Italicum</i>	--	Urban areas, forests, roadsides, shady areas
Yellow flag iris	<i>Iris pseudacorus</i>	0.2	Aquatic, wet shores of rivers, ditches, and in marshes
Total		0.2	

Lilies, Iris, Sedges, Rushes: Treatment Key Recommendations (Methods and Considerations)

Treatment Method	Application Rate (lbs./acre)	Percent of Treatment Acres Expectation from 2018 EA	Percent of Treatment Acres Updated for 2023 IPMAHR EA	Treatment Considerations
Manual control	NA	15%	10%	Hand pulling can be effective on single plants.
Imazapyr	0.75 to 1.00	50%	60%	Apply post-emergence to plants at pre-bloom stage or to late season plants in autumn.
Glyphosate	3.00	25%	25%	Apply post-emergence to foliage when plants are growing rapidly, but before flowering in late spring or early summer. Can also apply in fall.
2,4-D	1.00	5%	5%	Post-emergence to early bloom. Use aquatic formulations near water.
Mechanical control	NA	5%	<1%	Tractor can be effective but difficult to get entire rhizome.
Hexazinone	0.75	<1%	<1%	Apply pre-emergence or early post-emergence. Primarily for road rights-of-way. Not registered for aquatic use; would not be used on yellow flag iris.
No adequate control methods	NA	0%	0%	

Loosestrifes Group: Locations (Species Acreage and Habitat)

Common Name	Scientific Name	Acres	Common Habitat
Creeping jenny	<i>Lysimachia nummularia</i>	0.41	Riparian, meadows, marshes, forests
Garden loosestrife	<i>Lysimachia vulgaris</i>	--	Riparian along lakeshores, rivers, open wetland habitats
Purple loosestrife	<i>Lythrum salicaria</i>	0.2	Riparian areas, ditches, wetlands, pond and lake margins
Total		0.61	

Loosestrifes Group: Treatment Key Recommendations (Methods and Considerations)

Treatment Method	Application Rate (lbs./acre)	Percent of Treatment Acres Expectation from 2018 EA	Percent of Treatment Acres Updated for 2023 IPMAHR EA	Treatment Considerations
Manual control	NA	25%	20%	Hand pulling or digging can be effective on single plants.
Triclopyr	1.00	40%	45%	Preferred treatment. Use aquatic formulations. It can be used at all stages but primarily at the flowering stage.
Glyphosate	3.00	15%	15%	Can be applied at all stages but primarily at the flowering stage. This is a non-selective product and care should be taken to avoid treating desirable vegetation.
Imazapyr	0.75 to 1.00	15%	15%	Apply after mid-bloom until killing frost.
Metsulfuron methyl	0.04 to 0.08	5%	5%	Most effective at flower-bud and flowering stage but can be applied earlier.
No adequate control methods	NA	0%	0%	

Within the Northwest Oregon District boundary, the ODA releases and tracks biological control agents on purple loosestrife infestations. See Table B-1, *Widespread biological control agents on the Northwest Oregon District*, for further information.

Miscellaneous Herbaceous – Annual: Locations (Species Acreage and Habitat)

Common Name	Scientific Name	Acres	Common Habitat
Dodder	<i>Cuscuta</i>	0.61	Fence rows, abandoned land and other waste areas with sufficient soil moisture
Ornamental jewelweed	<i>Impatiens glandulifera</i>	12.73	Riparian, woodland, wetland
Puncturevine	<i>Tribulus terrestris</i>	--	Disturbed sites, roadsides, open disturbed areas, sandy soils
Total		13.34	

Miscellaneous Herbaceous – Annual: Treatment Key Recommendations (Methods and Considerations)

Treatment Method	Application Rate (lbs./acre)	Percent of Treatment Acres Expectation from 2018 EA	Percent of Treatment Acres Updated for 2023 IPMAHR EA	Treatment Considerations
Manual control	NA	10%	15%	Hand pulling can be effective on single plants or small infestations.

Treatment Method	Application Rate (lbs./acre)	Percent of Treatment Acres Expectation from 2018 EA	Percent of Treatment Acres Updated for 2023 IPMAHR EA	Treatment Considerations
Mechanical control	NA	10%	<1%	Target plants are suppressed with mowing or weed whackers before seed set, non-selectively removes growth of desirable species. May require multiple treatments/year for effective weed control.
Imazapyr	0.75	20%	20%	Non-selective and long soil residual activity. Use where adverse effects to desirable vegetation can be minimized.
Glyphosate	3.00	20%	20%	Apply in spring to actively growing plants from germination to bolting, with green basal leaves.
Triclopyr	1.00	10%	10%	Apply at flowering. Can be used at all stages.
Aminopyralid	0.05 to 0.11	4%	10%	Apply to actively growing plants.
Dicamba + Diflufenzopyr	0.18 to 0.35	8%	10%	Apply in spring to actively growing weeds. Use higher rates on perennials or large plants.
Metsulfuron methyl	0.12 to 0.15	3%	10%	Apply early when plants are small and rapidly growing.
2,4-D	1.00	<1%	5%	Apply in spring to rosettes.
Dicamba + 2,4-D	0.50 + 0.95	7%	<1%	Apply to actively growing plants.
Glyphosate + 2,4-D	0.50 + 0.70	8%	<1%	Apply in late spring, prior to seed set.
Picloram	0.50 to 0.95	<1%	<1%	Appropriate from rosette to flowering stage, where there are seed banks and where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse effects to desirable vegetation can be minimized.
Picloram + 2,4-D	0.50 + 0.95	<1%	<1%	Appropriate from rosette to flowering stage, where there are seed banks and where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse effects to desirable vegetation can be minimized. Evaluate soil, slope, and proximity to water when considering this herbicide.
Targeted grazing (sheep)	NA	<1%	<1%	Sheep selectively choose broadleaved plants over grass. Fencing or herding required.
Propane torch	NA	<1%	<1%	Most effective on small plants.
No adequate control methods	NA	0%	0%	

Within the Northwest Oregon District boundary, the ODA releases and tracks biological control agents on puncturevine infestations. See Table B-1, *Widespread biological control agents on the Northwest Oregon District*, for further information.

Miscellaneous Herbaceous – Perennial: Locations (Species Acreage and Habitat)

Common Name	Scientific Name	Acres	Common Habitat
Bigleaf periwinkle	<i>Vinca major</i>	9.66	Forest, roadside, old home sites, residential areas
Brazilian verbena	<i>Verbena bonariensis</i>	--	Wetlands, open areas
Climbing nightshade	<i>Solanum dulcamara</i>	8.19	Roadsides, moist clearings, open forests
Common periwinkle	<i>Vinca minor</i>	131.44	Forest, roadside
Field bindweed	<i>Convolvulus arvensis</i>	12.69	Roadsides, residential and agricultural areas
Pale flax	<i>Linum bienne</i>	0.8	Grasslands, woodlands, disturbed places
Redsepal evening primrose	<i>Oenothera glazioviana</i>	0.1	Open, disturbed sites
Sulfur cinquefoil	<i>Potentilla recta</i>	--	Roadsides, open areas, grasslands
White bryony	<i>Bryonia alba</i>	0.08	Riparian, thickets, stream terraces, irrigation ditches, seeps, moist slopes, draws, lawns, roadsides, fencerows, picnic areas, disturbed sites
Total		13.34	

Miscellaneous Herbaceous – Perennial: Treatment Key Recommendations (Methods and Considerations)

Treatment Method	Application Rate (lbs./acre)	Percent of Treatment Acres Expectation from 2018 EA	Percent of Treatment Acres Updated for 2023 IPMAHR EA	Treatment Considerations
Manual control	NA	10%	10%	Hand pulling can be effective on single plants or small infestations.
Mechanical control	NA	5%	5%	Target plants are suppressed with mowing or weed whackers before seed set, non- selectively removes growth of desirable species. May require multiple treatments/year for effective weed control.
Imazapyr	0.75 to 1.00	20%	10%	Non-selective and long soil residual activity. Use where adverse effects to desirable vegetation can be minimized.
Glyphosate	3.00	20%	10%	Apply in spring to actively growing plants from germination to bolting, with green basal leaves.
Triclopyr	2.00	10%	20%	Apply at flowering. Can be used at all stages.
Glyphosate + 2,4-D	0.50 + 0.70	5%	1%	Apply in late spring, prior to seed set.
Dicamba + Diflufenzopyr	0.18 to 0.35	10%	3%	Apply in spring to actively growing weeds. Use higher rates on perennials or large plants.
Dicamba + 2,4-D	(0.50 to 1.00) + 0.95	5%	5%	Apply to actively growing plants.
Aminopyralid	0.05 to 0.11	10%	20%	Apply to actively growing plants.

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Treatment Method	Application Rate (lbs./acre)	Percent of Treatment Acres Expectation from 2018 EA	Percent of Treatment Acres Updated for 2023 IPMAHR EA	Treatment Considerations
Metsulfuron methyl	0.01 to 0.08	3%	15%	Apply early when plants are small and rapidly growing.
2,4-D	0.95	1%	1%	Apply in spring to rosettes.
Picloram	0.50 to 0.95	<1%	<1%	Appropriate from rosette to flowering stage, where there are seed banks and where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse effects to desirable vegetation can be minimized. Evaluate soil, slope, and proximity to water when considering this herbicide.
Picloram + 2,4-D	0.50 + 0.95	<1%	<1%	Appropriate from rosette to flowering stage, where there are seed banks and where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse effects to desirable vegetation can be minimized. Evaluate soil, slope, and proximity to water when considering this herbicide.
Targeted grazing (sheep)	NA	<1%	<1%	Sheep selectively choose weeds over grass. Fencing or herding required.
No adequate control methods	NA	0%	0%	

Within the Northwest Oregon District boundary, the ODA releases and tracks biological control agents on field bindweed infestations. See Table B-1, *Widespread biological control agents on the Northwest Oregon District*, for further information.

Mustards Group: Locations (Species Acreage and Habitat)

Common Name	Scientific Name	Acres	Common Habitat
Creeping yellowcress	<i>Rorippa sylvestris</i>	0.08	Disturbed wetlands, ditches, wet meadows, poorly drained areas
Cultivated radish	<i>Raphanus sativus</i>	0.1	Waste areas, fields
Dyers woad	<i>Isatis tinctoria</i>	--	River banks, roadsides, flood plains
Field mustard	<i>Brassica rapa</i>	0.81	Disturbed areas including roadsides, ditches, cultivated fields, orchards, and gardens
Field pepperweed	<i>Lepidium campestre</i>	0.01	Disturbed areas, roadsides, pastures, gardens, rocky slopes, forests
Garlic mustard	<i>Alliaria petiolata</i>	0.41	Forests, woodlands, urban, riparian
Money plant	<i>Lunaria annua</i>	--	Forests, woodlands, near residential and urban areas

Common Name	Scientific Name	Acres	Common Habitat
Purpleanther field pepperweed	<i>Lepidium heterophyllum</i>	0.03	Riparian, floodplains, marshes, meadows, roadsides
Total		1.44	

Mustards Group: Treatment Key Recommendations (Methods and Considerations)

Treatment Method	Application Rate (lbs./acre)	Percent of Treatment Acres Expectation from 2018 EA	Percent of Treatment Acres Updated for 2023 IPMAHR EA	Treatment Considerations
Manual control	NA	20%	10%	Can work on individuals or small populations. Remove as much of the root as possible.
Triclopyr	1.00	1%	35%	Apply post-emergence in spring when plants are in rosette stage.
Aminopyralid + Metsulfuron methyl	0.02 + 0.01	15%	30%	Optimum timing is when the plants are in the bloom stage.
Chlorsulfuron + 2,4-D	0.06 + 0.95	35%	15%	Combination to consider using where resistance to sulfonylureas is a concern. It adds a second mode or site of action. Apply when weeds are germinating or actively growing.
Glyphosate	3.00	25%	10%	Non-selective.
Chlorsulfuron	0.06	1%	<1%	Safe around grasses and most effective at flower bud or flowering stage.
Imazapic	0.06 to 0.09	1%	<1%	Apply post-emergence fall or early spring.
Metsulfuron methyl + 2,4-D	0.07 + 0.95	1%	<1%	Combination to consider using where resistance to sulfonylureas is a concern. Aquatic 2,4-D would be used in riparian areas.
Mechanical control	NA	1%	<1%	Mowing multiple times can reduce root reserves and seed production.
No adequate control methods	NA	0%	0%	

Perennial Grasses Group: Locations (Species Acreage and Habitat)

Common Name	Scientific Name	Acres	Common Habitat
Bulbous canarygrass	<i>Phalaris aquatica</i>	1.61	Roadsides, forests, grasslands
Common velvetgrass	<i>Holcus lanatus</i>	453.16	Meadows, woodlands
Creeping bentgrass	<i>Agrostis stolonifera</i>	119.76	Riparian, wet meadows
Creeping velvet grass	<i>Holcus mollis</i>	4.91	Meadows, woodlands
European beachgrass	<i>Ammophila arenaria</i>	32.98	Dunes

Common Name	Scientific Name	Acres	Common Habitat
Giant reed	<i>Arundo donax</i>	0.23	Ditches, culverts, and roadsides where water accumulates
Jubata grass	<i>Cortaderia jubata</i>	--	Ditch banks, coastal habitats, forests, roadsides
Meadow foxtail	<i>Alopecurus pratensis</i>	56.13	Meadows, fields
Orchardgrass	<i>Dactylis glomerata</i>	126.02	Roadsides, meadows
Perennial ryegrass	<i>Lolium perenne</i>	7.07	Roadsides, fields, pastures
Reed canarygrass	<i>Phalaris arundinacea</i>	228.49	Roadside, ditches, marshes, wet meadows
Ribbongrass	<i>Phalaris arundinacea</i> var. <i>picta</i>	--	Roadside, ditches, marshes, wet meadows
Slender false brome	<i>Brachypodium sylvaticum</i>	4,053.76	Roadside, forest, woodland, riparian, shady areas
Sweet vernal grass	<i>Anthoxanthum odoratum</i>	354.15	Meadows, pastures
Tall fescue	<i>Schedonorus arundinaceus</i>	188.92	Damp grasslands, river banks, coastal habitats
Tall oatgrass	<i>Arrhenatherum elatius</i>	34.55	Forest edges, meadows, fields
Timothy	<i>Phleum pratense</i>	1.59	Meadows, pastures, woodlands
Waxy mannagrass	<i>Glyceria declinata</i>	--	Ditches, swales, seasonally wet habitats, disturbed areas
Weeping lovegrass	<i>Eragrostis curvula</i>	--	Roadsides, disturbed areas, residential areas
Total		1.44	

Perennial Grasses Group: Treatment Key Recommendations (Methods and Considerations)

Treatment Method	Application Rate (lbs./acre)	Percent of Treatment Acres Expectation from 2018 EA	Percent of Treatment Acres Updated for 2023 IPMAHR EA	Treatment Considerations
Fluazifop-P-butyl	<u>0.38</u>	<1%	<1%	Research and Demonstration herbicide. Apply post-emergence. Spring is best to control seedlings, but established plants can be treated in mid-summer to fall.
Sethoxydim	<<u>0.38</u>	<1%	<1%	Research and Demonstration herbicide. Apply post-emergence. Spring is best to control seedlings, but established plants can be treated in mid-summer to fall.
Manual control	NA	25%	10%	Remove entire plant. Effective for smaller populations of false brome.
Imazapyr	0.75 to <u>1.50</u>	10%	15%	Apply early spring when reed canarygrass is sprouting.
Sulfometuron methyl	0.14 to <u>0.38</u>	5%	5%	Appropriate for use on roadsides.

Treatment Method	Application Rate (lbs./acre)	Percent of Treatment Acres Expectation from 2018 EA	Percent of Treatment Acres Updated for 2023 IPMAHR EA	Treatment Considerations
Imazapyr + Glyphosate	(0.75 to 1.50) + 3.00	25%	15%	Apply in spring to young growth.
Glyphosate	3.00	10%	30%	Non-selective. Good for pure stands. May require 2 to 3 years of retreatments.
Hexazinone	2.00	5%	5%	Pre- or post-emergence. Mobile in soil and has long soil residual activity. Should not be used in areas with shallow water table. Ideal for upland use.
Mechanical control	NA	10%	10%	Mow to remove annual seed production, clean equipment prior to moving it elsewhere. Not effective treatment by itself.
No adequate control methods	NA	10%	10%	Increased effectiveness could be achieved with herbicides specific to perennial grasses.

Perennial Mints Group: Locations (Species Acreage and Habitat)

Common Name	Scientific Name	Acres	Common Habitat
Mediterranean sage	<i>Salvia aethiopus</i>	0.99	Disturbed sites, pastures, roadsides
Pennyroyal	<i>Mentha pulegium</i>		Wetlands, agricultural areas.
Yellow archangel	<i>Lamium galeobdolon</i>	31.88	Roadside, forest edges, riparian
Total		32.87	

Perennial Mints Group: Treatment Key Recommendations (Methods and Considerations)

Treatment Method	Application Rate (lbs./acre)	Percent of Treatment Acres Expectation from 2018 EA	Percent of Treatment Acres Updated for 2023 IPMAHR EA	Treatment Considerations
Manual control	NA	10%	5%	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	45%	35%	Apply when plants are mature. Most effective when they have bolted but before seed production.
Glyphosate + Triclopyr	2.00 + 2.00	25%	45%	Apply when actively growing and not during drought stress.

Treatment Method	Application Rate (lbs./acre)	Percent of Treatment Acres Expectation from 2018 EA	Percent of Treatment Acres Updated for 2023 IPMAHR EA	Treatment Considerations
Glyphosate	3.00	10%	5%	Apply when plants are bolting but before seed production.
Metsulfuron methyl	0.10	2%	10%	Effective on dry sites.
Mechanical control	NA	2%	<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.
2,4-D	1.00	5%	<1%	Apply after bolting and before seed production.
No adequate control methods	NA	0%	0%	

Perennial Peas Group: Locations (Species Acreage and Habitat)

Common Name	Scientific Name	Acres	Common Habitat
Bird's foot trefoil	<i>Lotus corniculatus</i>	0.64	Roadsides, meadows, pastures, riparian
False indigo bush	<i>Amorpha fruticosa</i>	--	Riparian along lakeshores, rivers, open wetland habitats
Flat pea	<i>Lathyrus sylvestris</i>	3.76	Forest edges, meadows
Kudzu	<i>Pueraria lobata</i>	--	Forest, woodland, urban
Perennial pea	<i>Lathyrus latifolius</i>	490.6	Roadside, forest edges
Total		495.0	

Perennial Peas Group: Treatment Key Recommendations (Methods and Considerations)

Treatment Method	Application Rate (lbs./acre)	Percent of Treatment Acres Expectation from 2018 EA	Percent of Treatment Acres Updated for 2023 IPMAHR EA	Treatment Considerations
Manual control	NA	30%	5%	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	25%	30%	Apply in spring before flowering.
Clopyralid	0.23 to 0.49	10%	30%	Apply in spring before flowering.
Triclopyr	2.00	15%	25%	Apply in spring when plants are rapidly growing.
Glyphosate	3.00	10%	5%	Apply in spring before flowering.

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Treatment Method	Application Rate (lbs./acre)	Percent of Treatment Acres Expectation from 2018 EA	Percent of Treatment Acres Updated for 2023 IPMAHR EA	Treatment Considerations
Imazapyr	0.45	4%	4%	Non-selective with long residual soil activity. Appropriate where adverse effects to desirable vegetation can be minimized.
2,4-D	0.95	1%	1%	Apply in spring to actively growing plants, particularly at bud to flower stage.
Picloram	0.50 to 0.95	<1%	<1%	Appropriate from rosette to flowering stage, where there are seed banks and where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse effects to desirable vegetation can be minimized. Evaluate soil, slope, and proximity to water when considering this herbicide.
Picloram + 2,4-D	0.50 + 1.50	1%	<1%	Most cost-effective chemical treatment for kudzu on open level ground within labeled distances from water or wells, from summer to fall.
Chlorsulfuron	0.05	1%	<1%	Safe around grasses and most effective at flower bud or flowering stage.
Metsulfuron methyl	0.03	1%	<1%	Safe around grasses and most effective at flower bud or flowering stage.
Sulfometuron methyl	0.14	1%	<1%	Non-selective and can be used in limited areas (roadsides).
Targeted grazing (goats or sheep)	NA	1%	<1%	Delay spring grazing until target plants are at least 8 inches tall. Some species in this group are toxic to livestock.
Mechanical control	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.
No adequate control methods	NA	0%	0%	

Snapdragons Group: Locations (Species Acreage and Habitat)

Common Name	Scientific Name	Acres	Common Habitat
Butter and eggs	<i>Linaria vulgaris</i>	19.69	Meadows, roadsides, waste places
Purple foxglove	<i>Digitalis purpurea</i>	2,328.34	Roadside, open forests, clearings
Total		2,348.03	

Snapdragons Group: Treatment Key Recommendations (Methods and Considerations)

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Treatment Method	Application Rate (lbs./acre)	Percent of Treatment Acres Expectation from 2018 EA	Percent of Treatment Acres Updated for 2023 IPMAHR EA	Treatment Considerations
Manual control	NA	15%	4%	Effective in spring on small infestations.
Metsulfuron methyl	0.12 to 0.15	20%	20%	Apply in spring or fall to plants in the rosette stage or to bolting plants less than 12 inches tall.
Chlorsulfuron + 2,4-D	0.05 + 0.70	20%	15%	Apply in spring or fall to plants in the rosette stage or to bolting plants less than 12 inches tall.
Chlorsulfuron	0.05	20%	20%	Apply in fall for most consistent control.
Imazapyr	0.75 to 1.50	10%	20%	Apply in spring when plants are growing rapidly or apply in mid-fall to dormant infestation.
Picloram + 2,4-D	0.50 + 1.50	<1%	<1%	Appropriate from rosette to flowering stage, where there are seed banks and where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse effects to desirable vegetation can be minimized.
Glyphosate	3.00	13%	20%	Apply in spring to rapidly growing plants.
Picloram	0.50 to 0.95	<1%	<1%	Appropriate from rosette to flowering stage, where there are seed banks and where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse effects to desirable vegetation can be minimized. Evaluate soil, slope, and proximity to water when considering this herbicide.
Mechanical control	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.
No adequate control methods	NA	0%	0%	

Within the Northwest Oregon District boundary, the ODA releases and tracks biological control agents on butter and egg infestations. See Table B-1, *Widespread biological control agents on the Northwest Oregon District*, for further information.

Spurges Group: Locations (Species Acreage and Habitat)

Common Name	Scientific Name	Acres	Common Habitat
Leafy spurge	<i>Euphorbia esula</i>	1.38	Roadsides, pastureland, waste areas
Myrtle spurge	<i>Euphorbia myrsinites</i>	--	Scrub oak communities, open ground near forests, shrub-steppes
Oblong Spurge	<i>Euphorbia oblongata</i>	0.16	Riparian

Common Name	Scientific Name	Acres	Common Habitat
Total		1.54	

Spurges Group: Treatment Key Recommendations (Methods and Considerations)

Treatment Method	Application Rate (lbs./acre)	Percent of Treatment Acres Expectation from 2018 EA	Percent of Treatment Acres Updated for 2023 IPMAHR EA	Treatment Considerations
Imazapyr	0.75	40%	50%	Non-selective with no residual soil activity. Appropriate where an extensive seed bank is present.
Glyphosate	(minimal)	25%	15%	Non-selective with no residual soil activity.
Mechanical control	NA	15%	5%	Mowing or weed whacking in conjunction with herbicide is effective control on infestations.
Dicamba + 2,4-D	1.00 + 0.95	9%	20%	Apply in spring at flower emergence or to fall regrowth.
Imazapic	0.13 to 0.19	5%	5%	Apply after summer dry period when plants begin to grow (fall / winter).
Glyphosate + 2,4-D	0.50 + 1.50	5%	5%	Apply as spring treatment before seed set. May take 3-5 years of repeated application.
Picloram + 2,4-D	0.50 + 0.95	<1%	<1%	Appropriate from rosette to flowering stage, where there are seed banks and where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse effects to desirable vegetation can be minimized. Three to five consecutive years of treatment needed.
Picloram	0.50 to 1.00	<1%	<1%	Appropriate from rosette to flowering stage, where there are seed banks and where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse effects to desirable vegetation can be minimized.
Targeted grazing (goats)	NA	1%	<1%	Targeted grazing by goats/ sheep in spring can control spurges. Toxic to cattle and horses.
No adequate control methods	NA	0%	0%	

Within the Northwest Oregon District boundary, the ODA releases and tracks biological control agents on leafy spurge infestations. See Table B-1, *Widespread biological control agents on the Northwest Oregon District*, for further information.

St. Johnswort Group: Locations (Species Acreage and Habitat)

Common Name	Scientific Name	Acres	Common Habitat
St. Johnswort	<i>Hypericum perforatum</i>	6,640.04	Roadside, fields, waste areas, disturbed openings
Total		6,640.04	

St. Johnswort Group: Treatment Key Recommendations (Methods and Considerations)

Treatment Method	Application Rate (lbs./acre)	Percent of Treatment Acres Expectation from 2018 EA	Percent of Treatment Acres Updated for 2023 IPMAHR EA	Treatment Considerations
Manual control	NA	20%	10%	Only for very small infestations. Not effective control.
Aminopyralid	0.08 to 0.11	35%	50%	Post-emergence to rapidly growing plants before bloom.
Glyphosate	2.00	30%	40%	Non-selective with no residual soil activity.
Metsulfuron methyl + 2,4-D	0.06 + 0.95	1%	<1%	Targets plants that are small or rapidly growing.
Picloram + 2,4-D	0.50 + 0.95	<1%	<1%	Appropriate from rosette to flowering stage, where there are seed banks and where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse effects to desirable vegetation can be minimized.
No adequate control methods	NA	0%	0%	

Within the Northwest Oregon District boundary, the ODA releases and tracks biological control agents on St. Johnswort infestations. See Table B-1, *Widespread biological control agents on the Northwest Oregon District*, for further information.

Sunflower Family Group: Locations (Species Acreage and Habitat)

Common Name	Scientific Name	Acres	Common Habitat
Bristly hawksbeard	<i>Crepis setosa</i>	2.26	Disturbed areas, lawns, gardens, meadows, roadsides, gravel pits, shrublands
Bristly oxtongue	<i>Picris echioides</i>	--	Roadsides, open areas, grasslands
Common sowthistle	<i>Sonchus oleraceus</i>	0.1	Hillsides, roadsides, streambanks, fields, disturbed areas
Field sowthistle	<i>Sonchus asper</i>	0.3	Open woods, meadows, hillsides, dunes, disturbed sites, streambanks
Hairy cat's ear	<i>Hypochaeris radicata</i>	49.43	Disturbed places, fields, grasslands, pastures, roadside
Japanese sweet coltsfoot	<i>Petasites japonicus</i>	0.002	Riparian, forests, woodlands, riverbanks, shorelines, grasslands
Oxeye daisy	<i>Leucanthemum vulgare</i>	163.49	Roadside, pastures, open woodlands, meadows

Common Name	Scientific Name	Acres	Common Habitat
Rush skeletonweed	<i>Chondrilla juncea</i>	--	Roadsides, riverbanks and disturbed areas
Smooth cat's ear	<i>Hypochaeris glabra</i>	44.24	Disturbed places, fields, grasslands, pastures, roadside
Smooth hawksbeard	<i>Crepis capillaris</i>	22.4	Disturbed areas, lawns, gardens, meadows, roadsides, shrublands, forests, clearcuts
Spiny sowthistle	<i>Sonchus asper</i>	--	Open woods, meadows, hillsides, dunes, disturbed sites, streambanks
Tansy ragwort	<i>Senecio jacobaea</i>	5,879.05	Roadsides, clearings
Total		6,161.27	

Sunflower Group: Treatment Key Recommendations (Methods and Considerations)

Treatment Method	Application Rate (lbs./acre)	Percent of Treatment Acres Expectation from 2018 EA	Percent of Treatment Acres Updated for 2023 IPMAHR EA	Treatment Considerations
Manual control	NA	10%	10%	Hand pulling and grubbing are effective on visible plants. These treatments stimulate the seed bank. Would only be used on small infestations and where retreatment is planned.
Mechanical control	NA	15%	8%	Target plants are suppressed with mowing or weed whackers before seed set, non- selectively removes growth of desirable species. May require multiple treatments per year for effective weed control.
Aminopyralid	0.05 to 0.11	45%	35%	Apply in spring at bud stage. Preferred treatment when desirable plants in susceptible families are not present. Longer soil residual than clopyralid.
Clopyralid	0.23 to 0.49	5%	20%	Apply at the rosette to bolting stage.
Dicamba + Diflufenzopyr	0.18 to 0.35	5%	<1%	Apply in spring to actively growing weeds. Use higher rates on perennials or large plants.
Metsulfuron methyl	0.02 to 0.04	5%	5%	Use where resistance to sulfonylureas is a concern or to prevent seed formation or set. Primarily on roadsides.
Dicamba + 2,4-D	(0.50 to 1.00) + 0.95	0%	12%	Apply in spring at flower emergence or to fall regrowth.
Picloram + 2,4-D	0.25 + 0.95	<1%	<1%	Appropriate from rosette to flowering stage, where there are seed banks and where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse effects to desirable vegetation can be minimized. Evaluate soil, slope, and proximity to water when considering this herbicide.
Glyphosate	3.00	13%	10%	Apply in spring to rapidly growing plants before flowering.

Treatment Method	Application Rate (lbs./acre)	Percent of Treatment Acres Expectation from 2018 EA	Percent of Treatment Acres Updated for 2023 IPMAHR EA	Treatment Considerations
Propane torch	NA	2%	<1%	Most effective on small plants.
No adequate control methods	NA	0%	0%	

Within the Northwest Oregon District boundary, the ODA releases and tracks biological control agents on tansy ragwort infestations. See Table B-1, *Widespread biological control agents on the Northwest Oregon District*, for further information.

Teasel Group: Locations (Species Acreage and Habitat)

Common Name	Scientific Name	Acres	Common Habitat
Cutleaf teasel	<i>Dipsacus laciniatus</i>	10.27	Ditches, waterways, roads, riparian, waste places and forests
Fuller's teasel	<i>Dipsacus fullonum</i>	96.26	Meadows, clearings, roadsides
Total		106.53	

Teasel Group: Treatment Key Recommendations (Methods and Considerations)

Treatment Method	Application Rate (lbs./acre)	Percent of Treatment Acres Expectation from 2018 EA	Percent of Treatment Acres Updated for 2023 IPMAHR EA	Treatment Considerations
Manual control	NA	10%	8%	With small infestation, digging or hand pulling before flowering are effective controls.
Aminopyralid	0.08 to <u>0.11</u>	40%	40%	Provides over 90 percent control when applied to rosettes. Long soil residual activity.
Glyphosate	3.00	20%	10%	Apply to rapidly growing plants from rosette to early bolting stage.
Imazapic	0.13 to <u>0.19</u>	10%	5%	Apply post-emergence to rosettes.
Chlorsulfuron	0.05	10%	10%	Apply post-emergence from rosette to bolting stage.
Fluroxypyr	0.24	2%	<1%	Post-emergence from rosette to beginning of bolting, or fall rosette stage. Safe for most grasses.
Metsulfuron methyl	0.02 to 0.04	2%	<1%	Apply post-emergence from rosette to bolting stage.
Clopyralid	0.23 to 0.49	2%	20%	Treatments effective for young plants.
Dicamba + Diflufenzopyr	0.18 to <u>0.35</u>	2%	<1%	Apply post-emergence to rapidly growing plants.

Treatment Method	Application Rate (lbs./acre)	Percent of Treatment Acres Expectation from 2018 EA	Percent of Treatment Acres Updated for 2023 IPMAHR EA	Treatment Considerations
Dicamba + 2,4-D	0.50 + 0.95	2%	7%	Apply to rosettes until bolting stage.
No adequate control methods	NA	0%	0%	

Woody Species Group: Locations (Species Acreage and Habitat)

Common Name	Scientific Name	Acres	Common Habitat
Cherry laurel	<i>Prunus laurocerasus</i>	--	Riparian, forests
Common gorse	<i>Ulex europaeus</i>	0.02	Forest, roadside, open disturbed sites
Common pear	<i>Pyrus communis</i>	28.66	Roadside, fields, meadows, woodlands
Cotoneaster spp.	<i>Cotoneaster</i>	0.23	Open areas
Cutleaf blackberry	<i>Rubus laciniatus</i>	3,286.31	Open forest, roadside, wet areas
English holly	<i>Ilex aquifolium</i>	19.47	Forests
English Ivy	<i>Hedera helix</i>	64.27	Forest, riparian, roadside, near residential areas, old home sites
French broom	<i>Genista monspessulana</i>	21.54	Forest, woodland, meadows
Himalayan blackberry	<i>Rubus armeniacus</i>	11,344.89	Open forest, roadside, wet areas
Multiflora rose	<i>Rosa multiflora</i>	20.89	Roadside, open areas
Old man's beard	<i>Clematis vitalba</i>	--	Woodland, urban, riparian
Oneseed hawthorn	<i>Crataegus monogyna</i>	42.54	Forest edges, meadows
Orange eye butterflybush	<i>Buddleja davidii</i>	0.33	Riparian, roadside
Scotch Broom	<i>Cytisus scoparius</i>	11,039.80	Open forest, roadside, woodland, grassland, clearings
Spanish broom	<i>Spartium junceum</i>	1.06	Roadsides, open disturbed habitats
Spurge laurel	<i>Daphne laureola</i>	--	Woodlands, shady areas, well drained soils
Striated broom	<i>Cytisus striatus</i>	--	Roadsides, forest openings, woodlands, meadows
Sweet cherry	<i>Prunus avium</i>	--	Fields, hardwood forests
Sweetbriar rose	<i>Rosa rubiginosa</i>	1.3	Roadsides, pastures and natural areas
Tree of Heaven	<i>Ailanthus altissima</i>	1.14	Forest, woodland, urban, riparian, residential areas
Total		25,872.45	

Woody Species Group: Treatment Key Recommendations (Methods and Considerations)

Treatment Method	Application Rate (lbs./acre)	Percent of Treatment Acres Expectation from 2018 EA	Percent of Treatment Acres Updated for 2023 IPMAHR EA	Treatment Considerations
Manual control	NA	5%	10%	Grubbing can effectively control small infestations.
Mechanical control	NA	10%	15%	Cut shrubs off at ground level. Can be combined with herbicide treatments or multiple treatments over a period of years.
Triclopyr	2.00	50%	30%	Used primarily as a cut stump treatment or drill and fill the stem of large mature plants. Use formulations labeled for aquatic use if treatments near water. Or Apply as a foliar treatment mid-summer to early fall to smaller plants.
Glyphosate	3.00	15%	15%	Apply as foliar or cut stump. Foliar treatments would be made in late summer. Aquatic formulations would be used near water.
Imazapyr	1.00 to 1.50	16%	10%	Apply late summer to early fall. May be injected, including via copper shell injection system.
Triclopyr + 2 4-D	2.00 + 0.95	1%	<1%	Apply when plants are actively growing.
Triclopyr + Aminopyralid	1.00 + 0.11	2%	20%	Apply before bud to early flowering.
Targeted grazing (goats)	NA	1%	<1%	Effective at defoliating blackberries but does not provide long-term control. Limited to areas without desirable plants or vehicle traffic.
Picloram	1.00	<1%	<1%	Appropriate from rosette to flowering stage, where there are seed banks and where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse effects to desirable vegetation can be minimized.
No adequate control methods	NA	0%	0%	

Within the Northwest Oregon District boundary, the ODA releases and tracks biological control agents on common gorse and Scotch and French broom infestations. See Table B-1, *Widespread biological control agents on the Northwest Oregon District*, for further information.

Appendix A Literature Cited

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Parendes and Jones 2000	Parendes, L.A. and J.A. Jones. 2000. Role of light availability and dispersal in exotic plant invasion along roads and streams in the H.J. Andrews Experimental Forest, Oregon. <i>Conservation Biology</i> 14: 64-75.
Pickering and Mount 2009	Pickering, C. and A. Mount. 2009. Do tourists disperse weed seed? A global review of unintentional human-mediated terrestrial seed dispersal on clothing, vehicles, and horses. <i>Journal of Sustainable Tourism</i> Vol. 18(2): 239-256.
USDA and USDI 2006	USDA Forest Service, USDI Bureau of Land Management and USDI Fish and Wildlife Service. 2006. Interagency Conservation Agreement for <i>Eucephalus vialis</i> (Wayside Aster). BLM Eugene, Roseburg, and Medford Districts, USFS Rogue River-Siskiyou National Forest, and USFWS, Roseburg Field Office, Eugene, Oregon. https://www.oregon.gov/oda/shared/Documents/Publications/PlantConservation/EucephalusVialisProfile.pdf .
USDI BLM 1992b	USDI Bureau of Land Management. 1992. Manual 9015. Integrated Weed Management. Release 9-321.
USDI BLM 2010a	USDI Bureau of Land Management. 2010. Vegetation Treatments Using Herbicides on BLM Lands in Oregon Final Environmental Impact Statement. https://eplanning.blm.gov/eplanning-ui/project/70730/510 .
USDI BLM 2016c	USDI Bureau of Land Management. 2016. Proposed Resource Management Plan / Final Environmental Impact Statement for Resource Management Plans for Western Oregon.
USDI BLM 2018b	USDI Bureau of Land Management. 2018. Integrated Invasive Plant Management for the Northwest Oregon District Environmental Assessment. https://eplanning.blm.gov/eplanning-ui/project/95247/510 .
USDI FWS 2010	USDI Fish and Wildlife Service. 2010. Recovery Plan for the Prairie Species of Western Oregon and Southwestern Oregon. Portland, OR. https://www.fws.gov/oregonfwo/Species/PrairieSpecies/Documents/PrairieSpeciesFinalRecoveryPlan.pdf
VMAP 2023	VMAP. Vegetation Management Action Portal. Data Type: File Geodatabase Feature Class, Internal Feature Classes: Infestations_Poly, Infestations_Point, Infestations_Line.

APPENDIX B – Integrated Invasive Plant Management

This appendix explains how the District integrates various methods programmatically to control invasive plants. Actions taken for prevention, education, and coordination are described as context and do not vary between alternatives. This appendix also describes treatment methods, which vary between alternatives in the amount and proportion of herbicide to non-herbicide treatment methods that would be implemented on an annual basis. Treatment methods include manual and mechanical treatment methods, competitive seeding and planting, solarization, prescribed fire, biological treatment methods (insects and targeted grazing), and herbicide application.

Prevention, Education, and Awareness

Prevention, education, and awareness are the highest priority for the management of invasive plants. The District has incorporated weed prevention into regular field work and project management practices. Examples of prevention practices include cleaning vehicles and equipment after working in areas infested by invasive species and helping with community invasive plant education events. The District has assigned specific responsibilities for keeping administrative sites free of invasive plants, reestablishing desirable vegetation on disturbed sites, inspecting gravel and other materials sites, and including invasive plant prevention measures in all planning documents, contracts, and leases. Other prevention activities include the continuing education of employees, contractors, and the public.

Additionally, BLM policy requires that planning for ground-disturbing projects, or projects that have the potential to alter plant communities, include an assessment of the risk of introducing or spreading noxious weeds (USDI BLM 1992b). District practice, however, is to include all invasive plant species in these project risk assessments. If there is a moderate or high risk of spread, BLM will implement actions to reduce the risk and will monitor the site (see Monitoring section below) to prevent establishment of new infestations (USDI BLM 1992b).

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

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

Coordination and Cooperation

Due to the size of the population centers and the amount of human development within the District, there are dozens of organizations working cooperatively to combat the spread of invasive plants. These organizations include other Federal entities like the U.S. Forest Service and the U.S. Army Corps of Engineers; state entities such as the Oregon Department of Agriculture (ODA), Oregon Department of Transportation (ODOT), Oregon Parks and Recreation, and Oregon Department of Forestry; as well as local cities, counties, Tribes, watershed councils, non-governmental organizations, and private landowners. District staff work in cooperation with the Western

Invasives Network, its associated Cooperative Weed Management Areas, and Soil and Water Conservation Districts. The District is also involved with the Northwest Oregon Restoration Partnership and the Clackamas River Invasive Species Partnership. Restoration partners with botanical expertise, such as the Institute for Applied Ecology (IAE) and ODA, implement treatments in areas on BLM-administered lands where Special Status plant species are threatened by invasive plants.

Coordination includes implementing prevention and education activities, sharing inventory and monitoring information, and developing and implementing annual treatment programs. The District works closely with its partners through interagency and cooperative agreements in which grant monies and BLM contributions help fund youth crews, volunteer “Let’s Pull Together” events, and other invasive plant treatments on BLM and adjacent lands.

Planning

Integrated invasive plant management includes a process to determine when and where to take management action. The Integrated Vegetation Management Handbook (USDI BLM 2008a:59) describes an adaptive management approach based on clearly identified outcomes (see Prioritizing Areas for Treatments, below), monitoring to determine if management actions are meeting outcomes (see Monitoring, below), and if not, facilitating management changes that will best ensure that outcomes are met or re-evaluated (see Table A-4, *Treatment key Recommendations*).

In general, the District’s strategy is to manage invasive plants while minimizing adverse effects to ecological function and economic values. This strategy requires District staff to set action thresholds and to evaluate sites to determine when the BLM has reached or exceeded those thresholds. Action thresholds are the levels of ecological or economic damage that invasive plant infestations cause before needing treatments, and these thresholds differ across sites, projects, and species. For example, for most invasive plant species, the action threshold would be different along a disturbed roadside than it would be next to a population of a rare plant species known to be intolerant of competition. For some invasive plant species (e.g., giant hogweed) the threshold may be a single plant, regardless of the site, while for other species (e.g., St. Johnswort) the threshold would rarely be reached except at extremely sensitive sites.

Prioritizing Areas for Treatment

The District recommends management action for invasive plant infestations that exceed action thresholds. The District prioritizes treatment sites because the number of invasive plant infestations requiring management action exceeds the District’s annual treatment capacity. Priorities are determined based on abundance of the target species (e.g., is it previously unknown on the District, or is it widespread?), location where the infestation is found, type and value of resources near the infestation, potential rate and severity of spread, and whether the treatment would be effective.

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

- Species included on District, cooperative weed management area, and state EDRR lists.

- Observations of non-native species spreading quickly (even if they are not already included on an EDRR list).
- Small outlier infestations of established invasive plant species.

The following factors help the District set treatment priorities:

- Whether the species or infestation is EDRR, new invader, or an established species.
- The proximity of the infestation to planned ground disturbing projects and sensitive resources (rare species, special management areas).³¹
- The proximity of the infestation to administrative sites and areas likely to serve as sources of spread (e.g., recreation sites, gravel stockpiles, roads, major rights-of-way).
- Whether the infestation is part of a partnered project (allowing for an opportunity to combine resources).
- Whether the species or infestation is currently causing or could potentially cause high ecological or economic impacts.
- It is generally a higher priority to retreat an infestation than to start treatment on a new infestation of the same or a similarly harmful invasive species, with the exception of new invaders.

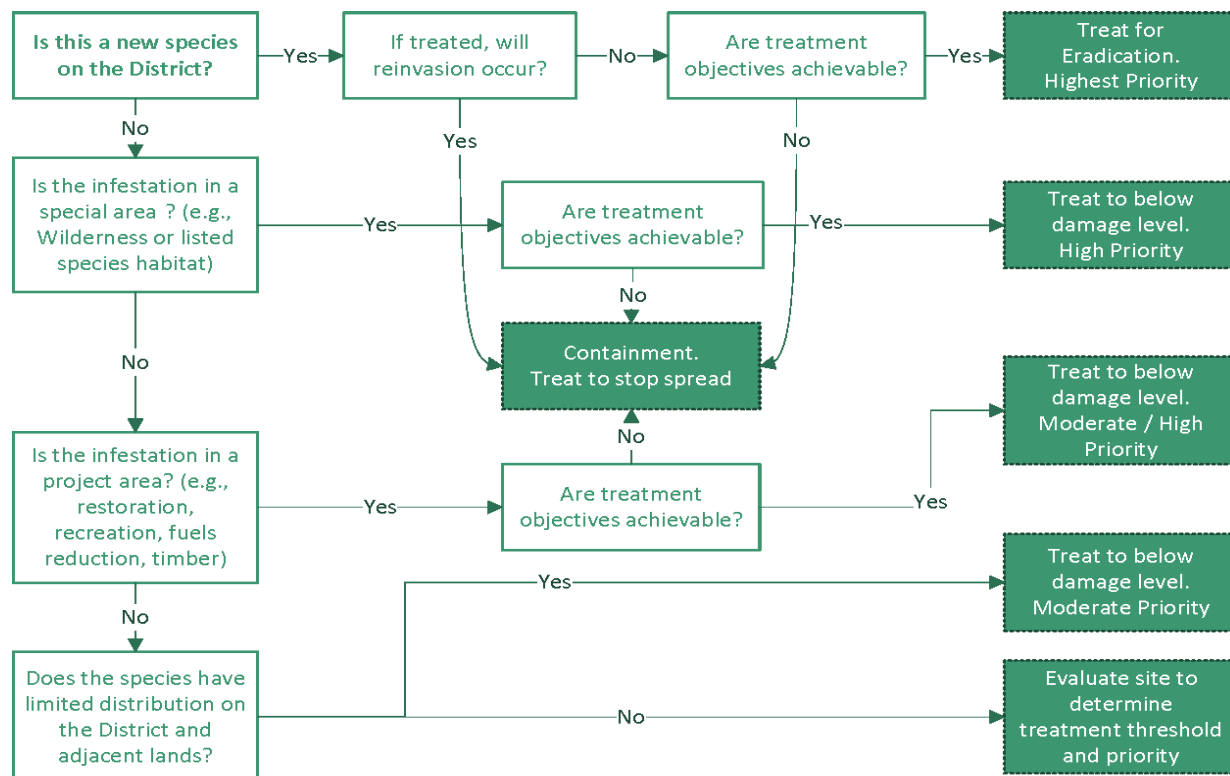
Treatment objectives for priority infestations are generally as follows:

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

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

³¹ These areas include Table Rock Wilderness Area, Little Sink Instant Study Area, Special Recreation Management Areas, Extensive Recreation Management Areas, ACECs, Special Status species habitat, and lands managed for their wilderness characteristics.

Figure B-1. Prioritizing areas for treatment



Monitoring

Many resources managed by the BLM require monitoring. Some of this monitoring, while not directly done as part of the invasive plant program, can reveal information about the program. For example, habitat quality monitoring at the West Eugene Wetlands for federally listed species has shown that invasive plant species are in all monitored sites (Gray and Bahm 2015). Directly related to the invasive plant program, BLM staff monitor many timber sales for invasive plant infestations for three to five years following harvest. BLM also requires implementation and effectiveness monitoring of invasive plant treatments (Integrated Vegetation Management Handbook, USDI BLM 2008a: 71). The District follows and adjusts the methods in these handbooks and manuals as necessary for different sites and objectives.

Implementation Monitoring

BLM policy and the EPA require monitoring where the BLM uses herbicide (USDI BLM 1992a). The District develops and the State Office approves Pesticide Use Proposals (PUPs) prior to application; PUPs identify sites, target species, herbicide (product and active ingredient) and application rate, adjuvants, and anticipated effects to non-target species and susceptible areas. Pesticide applicators fill out Pesticide Application Records within 24 hours of each application, documenting environmental conditions at the time of treatment, invasive plant species targeted, actual herbicide use, treatment method, applicator and license, and equipment used. Both documents have sufficient detail to determine if the BLM and the pesticide applicators met all

planning and application requirements. The District also documents non-herbicide treatment activities.

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

As required by existing Standard Operating Procedures, District staff would monitor targeted grazing activities to control the timing and intensity of the grazing, incorporating actions such as moving the animals off the site before the site is prone to erosion and compaction. The Oregon Department of Agriculture's Noxious Weed Control Program conducts the monitoring of traditional biological control agent populations in coordination with the BLM.

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

Effectiveness Monitoring

Monitoring integrated invasive plant treatments involves revisiting treated sites to assess how the infestation and associated plant community have changed over time. Observers look at factors such as the size and density of the invasive plant infestation; the amount of colonization by other nonnative plants; the amount of damage or mortality in non-target plants; the growth, vigor, and density of native vegetation; and the need for follow-up treatments. The District recommends follow-up treatments when an integrated invasive plant management treatment has not reduced the target invasive plant infestation to below an acceptable threshold or when sufficient native vegetation has not reoccupied the site. BLM records infestation and treatment data in BLM's corporate geospatial databases.

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 act. The *Integrated Vegetation Management Manual* (USDI BLM 2008a: 59) describes an adaptive management approach based on clearly identified outcomes, monitoring to determine if those outcomes are being met by management actions, and if not, changing management approaches to those that will better ensure that outcomes are met.

The *Planning* section (above) explains that the District manages invasive plants to minimize adverse effects to ecological function. The District primarily develops treatment priorities by evaluating the resources that would be adversely affected by invasive plants (such as habitats for Special Status species). For example, Canada thistle (and several other invasive plant species) occurs in an ACEC within proximity of a Special Status plant, the Umpqua swertia. The *Treatment Key Recommendations* for Canada thistle (Table A-4) shows potential treatment options for this infestation. Mowing of Canada thistle is effective when it is repeated every 3 to 4 weeks over

several growing seasons (DiTomaso et al. 2013) but can adversely affect desirable intermingled species. Under the action alternatives, aminopyralid and clopyralid would both be selective treatment methods for Canada thistle intermingled with the Umpqua swertia. In the first year, clopyralid could be used on Canada thistle, applied at the rosette stage. As described above, sites are revisited following treatments to assess how the infestation and associated plant community have changed over time. BLM would revisit sites several months after treatments; clopyralid begins to kill target plants within two weeks after contact but can take several weeks for complete control. Staff conducting the monitoring would evaluate factors such as the size and density of the Canada thistle infestation; the amount of colonization by nearby St. Johnswort; the amount of damage or mortality in neighboring native species as well as their growth, vigor, and population density; and the need for follow-up treatments. If the Umpqua swertia were unharmed by this treatment and were able to colonize the site (instead of the St. Johnswort) and the population of Canada thistle was reduced but not eliminated, another follow-up treatment would occur the following spring. However, spring rain accelerates seed growth, and in the spring, the Canada thistle seedbank may have begun to produce additional plants. In this case, BLM would use aminopyralid to control Canada thistle seedlings during the second year, as it has longer soil residual activity than clopyralid. If instead the original treatment eliminates the Canada thistle but St. Johnswort appears in the following spring, the St. Johnswort *Treatment Key Recommendations* (Table A-4) would direct BLM to use aminopyralid or glyphosate during the second year.

Direct Control Methods

Direct control methods vary by alternative. Selection of a treatment method considers what would be effective for each species and what is appropriate for the lands infested (including effects to nearby resources). For many species, BLM controls small infestations with manual or other non-herbicide treatments. Other species may require herbicides to obtain adequate control or minimize ground disturbance. The selection of a treatment method is guided by Department of the Interior policy which states, “Bureaus will accomplish pest management through cost-effective means that pose the least risk to humans, natural and cultural resources, and environment” and requires bureaus to “[e]stablish site management objectives and then choose the lowest risk, most effective approach that is feasible for each pest management project” (USDI 2007).

Manual Treatment Methods

Manual treatment methods (such as pulling, digging, chopping, girdling, cutting/lopping, weed wrenches, and grubbing) can provide adequate control for some invasive plant species, particularly if the infestation is relatively small. These techniques can be extremely target specific and the BLM often uses them to minimize damage to adjacent desirable plants. However, manual control methods can be labor and time intensive. Treatments must often be conducted several times annually to prevent the invasive plant from re-establishing, which makes manual treatments of invasive plants in remote locations impractical. The BLM uses manual techniques on small infestations and / or where a large pool of labor is available. The BLM frequently uses manual treatments in combination with other techniques. For example, shrubs can be pulled and cut, and re-sprouts and seedlings can be treated with herbicides several weeks or months later (Tu et al. 2001).

Land managers use manual treatment methods, including hand pulling, rakes, shovels, and bottom barriers/weed mats to control infestations of submerged and floating aquatic invasive plants. Weed mats placed on the bottom of an aquatic body and held in place with a heavy object (see Figure B-2) for up to a few years can eradicate some infestations. Rogue River-Siskiyou National Forest has successfully used bottom barriers to control yellow floatingheart at Squaw Lakes.

Figure B-2. Weed mats, held with sand bags (treating Eurasian watermilfoil in Michigan)



© Big Foot Media / The Nature Conservancy

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

Mechanical Treatment Methods

Mechanical treatment methods include tilling or disking, brush cutters, string trimmers, chainsaws, propane torches, and mowers. Some of these methods (e.g., chainsaws, brush cutter, and string trimmer) can be more target-specific than other methods. Land managers commonly use string trimmer and mowing methods in recreation, communication, storage, and administrative sites to prevent invasive plants from becoming a fire hazard and to maintain clear access. Propane torches can be used on invasive plants in the annual grasses, snapdragons, geraniums, and perennial peas

species groups (see **Appendix A**. Propane torches are used to heat plants to rupture invasive plant cells rather than to consume plants with fire.

For aquatic invasive plants, tractors or diver assisted suction harvest (DASH) can be used to remove large quantities of invasive plants more quickly than manual methods alone. A diver physically removes (hand-pulls) the targeted plant, being careful to remove the entire root system and to minimize fragmentation. A pump is located on the surface (on a boat or the bank of the waterbody), with a four-inch suction hose that the diver uses to transport the hand-pulled plant and any root fragments to the surface for collection and disposal. Water and sediment would flow through back into the lake or pond. The objective is not to remove the sediment but to remove only the target plants. Tractors can also be used to remove the entire root system of aquatic infestations. The District would not use aquatic weed harvesters to mow and remove aquatic vegetation.

Competitive Seeding and Planting

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

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

Decisions on which species to include in a planting prescription are based on an evaluation of the surrounding native plant community so that the planted site has similar species composition and structure, once established. Other factors that affect planting prescriptions include environmental conditions, availability and condition of native plant materials, and budget. Planting prescriptions can include a combination of plant functional groups including perennial grasses, annual forbs, and perennial forbs. Most of the seeding prescribed on the District calls for grass species. Prescriptions including annual and perennial forbs are usually associated with restoration projects. Shrubs and trees are included in some prescriptions.

Prescribed Fire

Prescribed fires used for invasive plant control are most effective in spring or in fall when conducted just before flower or seed set, or at the young seedling or sapling stage. The District may also use prescribed fire 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). Like other treatments, timing is critical and is dependent on characteristics of the invasive plant, presence of desirable plants, soil moisture, and environmental conditions. These prescribed fires could be broadcast fires (across monocultures or areas where all species are invasive) or machine or hand piled and burned (generally woody species). The District calculates treatment areas by infestation size; for example, if two acres of woody invasive plant species were collected into a 20 square foot pile, this would count as a two-acre treatment.

A description of the use of propane torches is provided above, in the *Mechanical Treatment Methods* section. The use of prescribed fire as a restoration tool for meadows with mostly native plant communities is expanded upon in **Issue 3 (Botany)** *What are the effects of prescribed fire, tree removal, and container plantings on desirable plant communities, including federally listed plants and Bureau Sensitive plants and fungi?* In Chapter 3.

Biological Treatment Methods

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

Biological Control Agents (Biocontrols)

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

primary factors for when and where to release additional biocontrols are infestation size and availability of effective agents for the specific site.

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

Table B-1. Widespread biological control agents on the Northwest Oregon District

Invasive plant (host)	Biocontrol	County											
		Benton	Clackamas	Clatsop	Columbia	Lane	Lincoln	Linn	Marion	Multnomah	Polk	Tillamook	Yamhill
Biennial thistles ¹	<i>Cheilosia corydon</i> (fly)					✓							
	<i>Rhinocyllus conicus</i> (weevil)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	<i>Urophora stylata</i> (fly)	✓	✓			✓		✓	✓	✓			
Broom species ¹	<i>Bruchidius villosus</i> (beetle)	✓	✓			✓	✓	✓	✓	✓	✓		✓
	<i>Exapion fuscirostre</i> (weevil)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	<i>Leucoptera spartifoliella</i> (twig miner)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Canada thistle	<i>Puccinia punctiformis</i> (rust fungus)		✓						✓			✓	
	<i>Urophora cardui</i> (fly)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Eurasian watermilfoil	<i>Euhrychiopsis lecontei</i> (weevil)									✓			
Field bindweed	<i>Tyta luctuosa</i> (moth)										✓		
	<i>Aceria malherbae</i> (gall mite)										✓		
Gorse	<i>Exapion ulicis</i> (weevil)		✓	✓		✓							

	<i>Tetranychus lintearius</i> (spider mite)		✓	✓		✓							
	<i>Sericothrips staphylinus</i> (thrips)					✓	✓						
Knapweed species ¹	<i>Bangasternus fausti</i> (weevil)								✓				
	<i>Chaetorellia acroloph</i> (peacock fly)					✓							
	<i>Cyphocleonus 162ntirrh</i> (weevil)								✓				
	<i>Larinus minutus</i> (weevil)					✓			✓				
	<i>Larinus obtusus</i> (weevil)	✓				✓		✓	✓	✓	✓		✓
	<i>Metzneria paucipunctella</i> (moth)		✓			✓							
	<i>Sphenoptera jugoslavica</i> (root borer)		✓						✓				
	<i>Terellia virens</i> (fly)					✓							
	<i>Urophora affinis</i> (gall fly)		✓			✓		✓	✓				
	<i>Urophora quadrifasciata</i> (fly)	✓	✓			✓		✓	✓	✓	✓	✓	✓
Purple loosestrife	<i>Galerucella</i> spp. (beetle)		✓	✓	✓		✓		✓	✓	✓	✓	✓
	<i>Hylobius transversovittatus</i> (weevil)								✓		✓		
	<i>Nanophyes marmoratus</i> (weevil)								✓	✓	✓		✓
Rush skeletonweed	<i>Aceria chondrillae</i> (gall mite)								✓				
	<i>Bradyrrhoa gilveolella</i> (moth)								✓				
	<i>Cystiphora schmidtii</i> (midge)								✓				

	<i>Puccinia chondrillina</i> (rust fungus)									✓			
St. Johnswort	<i>Agrilus 163ntirrhin</i> (root borer)					✓							
	<i>Aplocera plagiata</i> (inchworm)					✓		✓	✓	✓	✓		✓
	<i>Chrysolina 163ntirrhin</i> (beetle)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	<i>Chrysolina quadrigemina</i> (beetle)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Tansy ragwort	<i>Botanophila seneciella</i> (fly)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	<i>Longitarsus jacobaeae</i> (flea beetle)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	<i>Tyria jacobaeae</i> (cinnabar moth)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Toadflax species ¹	<i>Brachypterolus pulicarius</i> (beetle)								✓				
	<i>Rhinusa 163ntirrhinin</i> (weevil)								✓				
	<i>Mecinus janthiniformis</i> (beetle)									✓			

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

Targeted Grazing

Targeted grazing³² is the purposeful application of a specific species of livestock at a determined season, duration, and intensity, to accomplish defined vegetation or landscape objectives (ASI 2006). The basic goal of targeted grazing is to give the desired plants a competitive advantage over the target invasive plant or plants. In general, goats and sheep eat broadleaf plants. Grazing can be seasonally timed for when the target plant is most palatable to livestock and to minimize effects to non-target plants and surrounding resources. Typically, a full-time herder or fencing is required to keep the grazing focused on the target areas and species. Employing grazing prescriptions may be particularly useful in areas with limited access, steep slopes, or where the most effective herbicide for a particular plant species cannot be applied (e.g., a non-aquatic herbicide application near water). Although targeted grazing with livestock can reduce invasive plant abundance and vigor

³² Also referred to as directed grazing or livestock grazing.

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 BLM 2010a: 75).

Herbicide Treatment Methods

Herbicides used on BLM-administered lands must be approved by the BLM National Office, and must, by policy, be subject to detailed ecological and human health risk assessments (see **Appendix G – Herbicide Risk Assessment Summaries**) for wildland applications to help satisfy the requirements of NEPA (USDI BLM 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.³³ Approval to use an herbicide for research and demonstration is provided by the BLM National Office after an initial evaluation of *Federal Insecticide, Fungicide and Rodenticide Act* registration materials and associated risk assessments (USDI BLM 2010a: 478).³⁴ Herbicides analyzed in this EA are shown in Table B-2, *Herbicide information*, and Table B-3, *Herbicide characteristics*. Herbicides are utilized:

- On pure stands of a single invasive plant species where desirable and non-target plants are scarce or absent;
- For rhizomatous invasive plant species that would otherwise require repeated cutting or pulling for control;
- On plants whose characteristics make them difficult or unfeasible to remove with non-herbicide methods;³⁵
- In areas where non-herbicide methods are cost prohibitive;
- In areas where non-herbicide methods have unacceptable adverse effects to native plants;
- In areas where considerable soil disturbance is not acceptable;
- For species located in remote or limited access areas where non-herbicide methods are not feasible;
- In combination with other control treatments (for example, woody species like gorse can be controlled by cutting stems close to the ground in the fall and then spraying the cut stumps with an herbicide registered for this use).

BLM only applies herbicides to lands and uses for which they are labeled and only by certified or licensed applicators or persons working under their direct supervision (USDI BLM 2010a: 85). Applicators complete a Pesticide Application Record within 24 hours of the application to document environmental conditions at the time of treatment as well as actual herbicide use. This

³³ Not an annual limit. This 15-acre limit could only be exceeded by the issuance of ecological and human health Risk Assessments, done or adopted by the BLM, and results evaluated through programmatic NEPA analysis done at the National or State level.

³⁴ If research and demonstration results appear favorable, then the BLM further considers the herbicide for general approval after human health and ecological Risk Assessments are undertaken, and the results are evaluated through the NEPA process.

³⁵ For example, Canada thistle root fragments readily resprout and some plants can be injurious to workers attempting to manually remove them.

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 or trade names), as well as adjuvants (used to enhance the effectiveness of the herbicide) must be on the BLM lists of approved herbicides and adjuvants at the time of application. The current lists are included in **Appendix F – Herbicide Formulations and Adjuvants**. For applications with a potential to enter streams or other waterbodies, herbicides are limited to aquatic formulations. Applicators use aquatic-approved adjuvants³⁶ for applications with a potential to affect federally listed and Bureau Sensitive fish.

Herbicides are primarily applied to plant foliage, but some herbicides may be applied to soil (see Table B-2 for information about point of application by herbicide). Herbicide applications on the District are most often implemented with a backpack sprayer (see Figure B-3). Sprayers are generally non-motorized and are pressurized by a diaphragm or piston-style pump. Spot treatments can also be accomplished using hand-held sprayers attached to vehicle-mounted trucks, utility vehicles (UTVs), boats, or on horseback. In spot treatments, the hand-held sprayer targets specific plants, so that effects to non-target species can be kept to a minimum.

Broadcast treatments using a boom would also occur under the action alternatives, although this would happen rarely (less than five percent of the time) and would most often occur in the West Eugene Wetlands. Broadcast treatments would be implemented with selective herbicides that would not harm non-target plants or these treatments would happen on larger monocultures of invasive plants. All broadcast treatments would be specifically noted on the Annual Treatment Plan. Interdisciplinary review of Annual Treatment Plans with broadcast treatments would include natural resource specialists with expertise in soils and hydrology. The District has not and would not use aerial applications to control non-native invasive plants.

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

- Basal bark treatments (where herbicides are applied to the bark of woody plants with a backpack sprayer or handheld spray bottle).
- Frill or “hack and squirt” (where herbicides are applied to a continuous downward cut around a woody plant that extends into the sapwood).
- Wipers (where herbicides are wiped directly onto the plant or to cut stems and stumps).
- Injecting herbicides into the inner bark.

³⁶ Approved adjuvants shown in **Appendix F** are indicated in the ARBO II column of Table F-3. These adjuvants were analyzed in the U.S. Fish and Wildlife Service and National Marine Fisheries Service ARBO II (USDI FWS 2013a, NMFS 2013).

Figure B-3. Ground-based herbicide applications with backpack sprayer



Stressors such as imperfect growing conditions (too wet, too dry, or poor soil nutrients) may prevent the herbicide from acting optimally. In addition to the effects of the herbicides themselves, the application methods may have unintended adverse consequences. Similar to manual and mechanical treatments, personnel and equipment may trample vegetation and disturb soil, which can cause further spread of invasive plants. However, herbicide treatments are less likely to require numerous retreatments. In the 2010 Oregon FEIS, overall treatment efficacy was estimated at 30 percent if herbicides were not used.³⁷

³⁷ See Chapter 2 and Issues 1 and 2 in Chapter 3 for information treatment efficiency under each alternative.

Table B-2. Herbicide information

Herbicide: Representative Trade Names ¹ Common Targets	Selective to Plant Types Pre- / post-emergent Point of application	Areas Where Registered Use is Appropriate ³							Application Rate ⁴ (lbs. / acre / year)	
		Rangeland	Forest and Woodland	Riparian / Seasonal Wetland	Aquatic / Wetland	Oil, Gas, & Mineral Sites	Rights-of-Way	Recreation & Cultural Sites	Typical	Max ²
2, 4-D: Many, including Amine 4, HardBall, Unison, Saber, and Aqua-Kleen <i>Broadleaf plants</i>	Broadleaf Post Foliar	<i>Annual and Perennial Forbs and Grasses</i>							1	(2)
		Yes	Yes	Yes		Yes	Yes	Yes		
		<i>Woody Species / Floating and Emerged Aquatic Species</i>							2	(4)
Aminopyralid: Milestone <i>Starthistle, St. Johnswort, thistles, knapweeds</i>	Broadleaf Post Foliar	Yes	Yes	Yes		Yes	Yes	Yes	0.078	0.11
Chlorsulfuron: Telar XP <i>Perennial mustards, purple foxglove, houndstongue</i>	Broadleaf Pre and early post Foliar	Yes		Yes		Yes	Yes	Yes	0.047	0.141
Clopyralid: Transline, Stinger, Spur <i>Knapweed, hawkweed, biennial thistles, starthistles</i>	Broadleaf Post Foliar	Yes	Yes	Yes		Yes	Yes	Yes	0.35	0.5
Dicamba: Vanquish, Banvel, Diablo, Vision, Clarity <i>Perennial mustards, biennial thistles, field bindweed</i>	Broadleaf, woody plants Pre and post Foliar	Yes		Yes		Yes	Yes	Yes	0.3	2 ⁷
Diflufenzopyr + Dicamba: Overdrive, Distinct <i>Field bindweed, oxeye daisy, St. Johnswort</i> Dicamba Diflufenzopyr	Broadleaf Post Foliar	Yes				Yes	Yes	Yes	0.2625 0.1875 0.075	0.35 0.25 0.1
Fluridone: Avast!, Sonar AS <i>Aquatic plants</i>	Submerged plants Post Aquatic				Yes				0.15	(1.3)

Herbicide: Representative Trade Names ¹ Common Targets	Selective to Plant Types Pre- / post-emergent Point of application	Areas Where Registered Use is Appropriate ³							Application Rate ⁴ (lbs. / acre / year)	
		Rangeland	Forest and Woodland	Riparian / Seasonal Wetland	Aquatic / Wetland	Oil, Gas, & Mineral Sites	Rights-of-Way	Recreation & Cultural Sites	Typical	Max ²
Fluroxypyr: Comet Selective, Vista XRT <i>Mustards, spurge, blackberry</i>	Broadleaf Post Foliar	Yes	Yes	Yes		Yes	Yes	Yes	0.26	0.5
Glyphosate: Many, including Rodeo, Mirage, Roundup Original, Mad Dog Plus, and Honcho <i>Grasses, trees and shrubs, yellow flag iris</i>	Non-selective Post Foliar	Yes	Yes	Yes	Yes ³	Yes	Yes	Yes	2	7 ^{5,6}
Hexazinone: Velpar DF <i>Grasses</i>	Grasses, broadleaf, woody plants Pre and post Foliar	Yes	Yes			Yes	Yes	Yes	2	4 ⁶
Imazapic: Plateau, Panoramic 2SL <i>Annual grasses</i>	Some broadleaf and grasses Pre and post Soil	Yes	Yes	Yes		Yes	Yes	Yes	0.0313	0.1875
Imazapyr: Arsenal, Stalker, Habitat, Polaris <i>Trees and shrubs, yellow flag iris</i>	Non-selective Pre and post Foliar	Yes	Yes	Yes	Yes	Yes	Yes	Yes	0.45	1.50 ⁷
Metsulfuron methyl: Escort XP, Patriot, PureStand <i>Perennial mustards, St. Johnswort, biennial thistles</i>	Broadleaf Pre and post Foliar	Yes	Yes	Yes		Yes	Yes	Yes	0.03	0.15 ⁷
Picloram: Triumph 22K, OutPost 22K, Tordon 22K <i>Leafy spurge, field bindweed, knapweed, St. Johnswort, starthistles, biennial thistles</i>	Broadleaf, woody plants Pre and post Foliar	Yes	Yes			Yes	Yes	Yes	0.35	1
Rimsulfuron: Matrix SG <i>Annual grasses</i>	Annual grasses Pre and post Soil	Yes	Yes	Yes		Yes	Yes	Yes	0.0469	0.0625
Sulfometuron methyl: Oust XP, Spyder <i>Annual grasses</i>	Non-selective Pre and post Foliar		Yes	Yes		Yes	Yes	Yes	0.14	0.38

Herbicide: Representative Trade Names ¹ Common Targets	Selective to Plant Types Pre- / post-emergent Point of application	Areas Where Registered Use is Appropriate ³							Application Rate ⁴ (lbs. / acre / year)	
		Rangeland	Forest and Woodland	Riparian / Seasonal Wetland	Aquatic / Wetland	Oil, Gas, & Mineral Sites	Rights-of-Way	Recreation & Cultural Sites	Typical	Max ²
Triclopyr: Garlon 3A, Renovate 3, Element 4, Vastlan <i>Purple loosestrife, blackberry, trees and shrubs</i>	Broadleaf, woody plants Post Foliar	Yes	Yes	Yes	Yes ³	Yes	Yes	Yes	1	(10)
Fluazifop-P-butyl: Fusilade DX <i>Perennial grasses</i>	Grasses Post Foliar	Yes	Yes			Yes	Yes		Single app. 0.1 to 0.375. Maximum annual application 1.125 ⁸	Single app. 0.1 to 0.375. Maximum annual application 1.125 ⁸
Sethoxydim: Poast, Torpedo, Ultima, Vantage, Conclude, and Rezult <i>Perennial grasses</i>	Grasses Post Foliar					Yes	Yes	Yes	0.3 ⁹	0.375 ⁹

1. See Table F-2, *Herbicide formulations approved for use on BLM-administered lands*, in **Appendix F** for the full list of herbicide trade names approved for use on lands managed by the BLM in Oregon, including formulations with two or more active ingredients.
2. Maximums are determined by herbicide product label and information analyzed in Risk Assessments. In cases where these two rates differ, the lower of the two rates is the maximum that can be applied on BLM- administered lands. Parentheticals denote herbicides that are limited by PEIS Mitigation Measures to typical application rates where feasible.
3. Different registrations are listed on the herbicide product label. Some types of registration (e.g., aquatic) require extensive additional testing with the EPA; the lack of registration for an area may indicate that a product has not completed that registration, not that there would be a risk. Some herbicide products may not be registered for use in an area, even though the active ingredient may have registration (e.g., in aquatic habitats, only certain formulations of glyphosate, the amine formulation of 2,4-D, and the trimethylamine (TEA) salt formulation of triclopyr are registered for aquatic use).
4. Recommended application rates can be found in **Appendix A – Invasive Plants on the Northwest Oregon District and Treatment Key Recommendations**.
5. The 2011 glyphosate Risk Assessment (Syracuse Environmental Research Associates, Inc. (SERA) 2011a) analyzes a maximum rate of 7 lbs. / acre. Maximum rates on formulated product labels listed in Table G-2 (**Appendix G**) range from 7 lbs. / acre to 14 lbs. / acre.
6. PEIS Mitigation Measures include “where practical, limit glyphosate and hexazinone to spot applications in grazing land and wildlife habitat areas to avoid contamination of wildlife food items.”
7. Mitigation Measures adopted by the Oregon Record of Decision state, “where there is a potential for herbivore consumption of treated vegetation, apply dicamba, imazapyr, and metsulfuron methyl at the typical, rather than maximum, application rate to minimize risks.”
8. Information from SERA (2014). BLM maximum and typical rates have yet to be calculated.
9. As described in the sethoxydim Risk Assessment (SERA 2001). BLM maximum and typical rates have yet to be calculated.

Table B-3. Herbicide characteristics

<i>Herbicides analyzed for Research and Demonstration</i>	
Fluazifop-P-butyl	Fluazifop-P-butyl and sethoxydim are effective on annual and perennial grasses, but do not affect broadleaf plants.
Sethoxydim	
<i>Herbicides approved for use on BLM-administered lands</i>	
2,4-D	2,4-D is effective on a wide range of broadleaf invasive plants while not affecting most grasses. 2,4-D can help inhibit seed production, prevent herbicide resistance, and effectively treat multiple invasive plant species when a variety are encountered in a particular treatment area. While having additional herbicides available can allow for more target specific control, having one herbicide that controls a vast range of vegetation can be beneficial in areas dominated by a variety of invasive broadleaved plants. In addition, adding a small amount of an amine formulation of 2,4-D to a tank mix can often improve the effectiveness of the other herbicides and reduce the likelihood of a population developing herbicide resistance. The amount of 2,4-D used in combination with other herbicides would vary, based on these factors. 2,4-D is formulated as an amine or an ester. Esters have higher vapor pressures than amines, which results in increased volatilization. On the Northwest District, amine formulations would be preferred. The use of ester formulations is not anticipated and would not be permitted near surface water or conduits to surface water.
Aminopyralid	Aminopyralid is selective for broadleaf species, particularly members of the Asteraceae (sunflower) and Fabaceae (pea) families and is also effective on certain species in the Apiaceae (carrot), and Polygonaceae (knotweed) families. It is effective at controlling knapweed and various thistles (DiTomaso and Kyser 2006, Enloe et al. 2008, Bell et al. 2012). It is an alternative to other growth regulator herbicides that are commonly used on broadleaf invasive plants, such as picloram, clopyralid, 2,4-D, and dicamba. Studies have also found aminopyralid to be as or more effective than the currently approved growth regulator herbicides at lower application rates (Enloe et al. 2007, 2008; Bell et al. 2012). Aminopyralid has a higher specific activity than other growth regulator herbicides, so less of it needs to be used to achieve the same result (Iowa State University 2006). It is more effective than clopyralid on tough to control members of the Asteraceae family. In mixtures with other active ingredients like metsulfuron methyl, it can be used on hard-to-control species like poison hemlock (DiTomaso et al. 2013).
Chlorsulfuron	Chlorsulfuron is especially effective on broadleaf plants such as mustards, houndstongue, and thistles. It is often mixed with 2,4-D to reduce the likelihood of developing resistance and to deter seed production. Some grass species can be damaged by this herbicide, particularly wet meadow grass species.
Clopyralid	Clopyralid targets many of the same species as picloram but is more selective. It is particularly effective on knapweeds and Canada thistle, while minimizing risk to surrounding desirable brush, grass, and trees.
Dicamba	Dicamba provides control right up to seed set, which extends the treatment window. It is often used in a tank mix with 2,4-D amine. It is effective on invasive broadleaves but offers minimal residual control. It is an option where

	resistance to sulfonyleureas 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 sulfonyleureas is a concern. It is applied in the fall when native plants are dormant. Often used on roadsides.
Fluridone	Fluridone is an aquatic herbicide that requires prolonged plant contact, so it can only be used on aquatic plants in still water. It is used primarily post-emergent to control submerged aquatic vegetation. To achieve effective control a minimum of 45 days (up to 90) of herbicide contact is required.
Fluroxypyr	Fluroxypyr is effective on annual and biennial invasive plants. It would be used to manage teasel, shining geranium, or herb Robert. Fluroxypyr is an option for addressing invasive plants that are resistant to herbicides with different modes of action. Its uses would likely include administrative sites and rights-of-way where resistance to currently approved herbicides could be a problem.
Glyphosate	Glyphosate is used on broadleaf invasive plants and woody species; However, it is a non-selective herbicide and can harm desirable plants. The BLM does not use glyphosate formulated with polyoxyethyleneamine (POEA).
Imazapic	Imazapic is a broad-spectrum herbicide for broadleaf and grass species and is particularly effective on invasive annual grasses such as soft brome and medusahead. It is selective for these grasses at low rates, leaving the perennial herbaceous species critical for restoration unharmed. It is applied before plants have emerged or to small rapidly growing plants. If heavy thatch or leaf litter is present, herbicide effectiveness is reduced.
Imazapyr	Imazapyr is very effective on brushy and woody species such as brooms, blackberry, hawthorn, and tree-of-heaven. It is also used to treat perennial grasses and loosestrife. Imazapyr may be used for the control of aquatic invasive plants like parrot feather, flowering rush, hydrilla, and yellow flag iris in and around standing and flowing water, as well as in riparian/wetland settings.
Metsulfuron methyl	Metsulfuron methyl has similar targets and effects as chlorsulfuron. It could be used on the mustard family, as well as thistles. It can be used in combination with aminopyralid to treat species in the carnation, carrot, mustards, knapweed species groups (such as bladder campion, poison hemlock, garlic mustard and yellow starthistle).
Picloram	Picloram is effective on knapweeds, hawkweeds, leafy spurge, and thistles, and provides good residual control. Appropriate at sites where soils are not sandy or gravelly. Aminopyralid and clopyralid target many of the same species and are more selective. Picloram is a restricted use herbicide.
Rimsulfuron	Rimsulfuron is effective against annual grasses in the fall pre-emergence, or post-emergence in the fall or spring when soil temperature is cool and rainfall is available to activate the herbicide. It provides a longer window of control than imazapic, although it must be used at the highest label rates for effective spring applications. Rimsulfuron has a one-year grazing restriction. It would not be applied near water.

Sulfometuron methyl	Like imazapic, sulfometuron methyl is effective on medusahead and can be selective for annuals at low rates. It has a shorter half-life than imazapic, which speeds restoration efforts. At typical and maximum rates, sulfometuron methyl controls many annual and perennial grass and broadleaf species. At low rates, it is safe on perennial grasses while controlling forbs and annual grasses. Sulfometuron methyl has a one-year grazing restriction (although it is not registered for use in rangelands).
Triclopyr	Triclopyr is effective on woody plants, and would be used on blackberry, brooms, gorse, and other trees and shrubs. It may also be used on select broadleaf species such as annual peas, geraniums, and buttercups. The aquatic formulations are also the most effective herbicide for treatment of purple loosestrife and other aquatic species. Triclopyr BEE, the ester formulation (butoxyethyl ester), is more effective at smaller doses, but is more toxic to fish (and as a result, triclopyr BEE cannot be used in aquatic or riparian habitat). It is often used as a cut-stump treatment.

Resistance and Rotation

Herbicide resistance³⁸ 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 agricultural settings; however, resistance has been documented in wildland vegetation management settings and invasive plant programs (University of Idaho 2011). Resistance can result from repeated use of the same herbicides, or several herbicides with the same site or mode of action.³⁹

Using a variety of herbicide active ingredients and sites/modes of action would help prevent herbicide resistance. More effective rotation of herbicides (see Table B-4), 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 or sequential herbicide applications with different modes of action.

³⁸ 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.

³⁹ “Site of action” is defined as the specific process in plants that the herbicide disrupts to interfere with plant growth and development. “Mode of action” is defined as all herbicide interactions with the plant, from application to final effect. The mode of action involves absorption into the plant, translocation or movement in the plant, metabolism of the herbicide, and the physiological plant response.

Table B-4. Guide for herbicide rotation¹

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

1. Adapted from *Herbicide-Resistant Weeds and Their Management* (University of Idaho 2011), which did not include fluridone. However, plants have been shown to develop resistance to repeated fluridone use (ENSR 2005c).
2. 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.

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USDI BLM 2018b	USDI Bureau of Land Management. 2018. Integrated Invasive Plant Management for the Northwest Oregon District Environmental Assessment. https://eplanning.blm.gov/eplanning-ui/project/95247/510 .
USDI FWS 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).
VMAP 2023	VMAP. Vegetation Management Action Portal. Data Type: File Geodatabase Feature Class, Internal Feature Classes: Infestations_Poly, Infestations_Point, Infestations_Line.

APPENDIX C – Recovery Plan Species and Wayside Aster

Species described in the Recovery Plan for the Prairie Species of Western Oregon and Southwestern Washington (USDI FWS 2010) and the Interagency Conservation Agreement for *Eucephalus vialis* (Wayside Aster) (USDA & USDI 2006), are all federally threatened, federally endangered, or Bureau Sensitive. Threat analyses were conducted for federally listed plant species for listing determination and in development of the Recovery Plan. These analyses “showed that all of the listed species addressed in this plan have declined as their native prairie habitats have been destroyed, fragmented and degraded” (p. IV-1). Bureau Sensitive species are species that require special management to prevent the need for listing at the federal level. All of the species for which these management actions are proposed are species that need continued habitat management for conservation and recovery.

The following descriptions of Special Status plants and pollinators that would be affected by meadow restoration actions are excerpted from Chapter II and Appendix F of the 2010 Recovery Plan and from the Executive Summary of the 2006 Conservation Agreement, with relevant updates. Indented passages are direct quotes⁴⁰ and quoted references are from the source document.

Recovery Plan Butterflies

Fender’s blue butterfly (*Icaricia icarioides fenderi* Macy) – Federally Threatened

Fender’s blue butterfly was listed as Endangered on January 25, 2000 (65 FR 3875) and reclassified as Threatened with a Section 4(d) Rule on January 12, 2023 (88 FR 2006). Critical habitat was designated on October 31, 2006 (71 FR 63862).

This species belongs to the group of blue butterflies in the family Lycaenidae. Fender's blue butterfly is one of about a dozen subspecies of Boisduval's blue butterfly (*Icaricia icarioides*), which is found only in western North America. Fender's blue butterfly is endemic to the Willamette Valley (Schultz et al. 2003) and was originally described by Macy as *Plebejus maricopa fenderi* based on specimens collected in Yamhill County, Oregon, by K.P. Fender (Macy 1931). The species *maricopa* is currently considered to be a synonym of the species *icarioides*, which has been determined to be within the genus *Icaricia* rather than *Plebejus* (Miller and Brown 1981). For a time, the subspecies *fenderi* was considered a synonym of the pardalis blue butterfly (*I. icarioides pardalis*), an inhabitant of the central California Coast Range near San Francisco (Downey 1975, Miller and Brown 1981). More recently, however, Fender's blue butterfly has been considered a distinct taxon based on adult characteristics and geographic distribution (Dornfeld 1980, Hammond and Wilson 1993).

Fender's blue butterfly is a small butterfly with a wingspan of approximately 2.5 centimeters (1 inch). The upper wings of the males are brilliant iridescent blue, and the borders and basal areas are black. The upper wings of the females are reddish-brown. The

⁴⁰ For all species other than wayside aster, quoted content is from Chapter II and Appendix F of the Recovery Plan. For wayside aster, quoted content is from the Conservation Agreement.

undersides of the wings of both sexes are creamy tan with black spots surrounded with a fine white border or halo.

The historic distribution of Fender's blue butterfly is not precisely known due to the limited information collected on this species prior to its description in 1931. Although the type specimen for this butterfly was collected in 1929, few collections were made between the time of the subspecies' discovery and Macy's last observation of the Fender's blue on May 23, 1937, in Benton County, Oregon (Hammond and Wilson 1992). Uncertainty regarding the butterfly's host plant caused researchers to focus their survey efforts on common lupine species known to occur in the vicinity of Macy's collections.

Fender's blue butterfly was rediscovered in 1989 at the McDonald Research Forest, Benton County, Oregon. It was found to be associated primarily with *Lupinus sulphureus* ssp. *kincaidii*, a rare lupine, and occasionally *L. arbustus* or *L. albicaulis* (Hammond and Wilson 1993). Recent surveys have determined that Fender's blue butterfly is endemic to the Willamette Valley and persists in about 17 populations on remnant prairies in Yamhill, Polk, Benton, and Lane Counties (Figure II-1) (Hammond and Wilson 1993, Schultz et al. 2003, U.S. Fish and Wildlife Service unpublished data). Fender's blue butterfly populations occur on upland prairies historically characterized by native bunch grasses (*Festuca* spp.).

There are 44,762 potential acres of Fender's blue butterfly habitat within the planning area based on generalized vegetation information (e.g., BLM corporate vegetation data, special habitat mapping). Approximately 102 acres of occupied habitat occurs on BLM-administered lands in the NW Oregon District. Occupied habitat on BLM lands in the action area occurs in four locations (populations) on BLM-administered lands in the action area: Oak Basin ACEC (USDI BLM 2011: 2, 17-18), Kelly Creek (USDI BLM 2023), the Low Down timber sale (USDI BLM 2023), and the West Eugene Wetlands. West Eugene Wetlands has 60 acres of habitat with three stable Fender's blue butterfly populations and a less stable, stepping-stone population (Sally Villegas-Moore, West Eugene Wetlands Natural Resource Specialist, pers. comm.). All known locations have additional potential habitat surrounding the current extent of Fender's blue butterfly (when assessed based on the extent of Kincaid's lupine habitat).

Additionally, the BLM may work with and provide funding for habitat restoration projects on nearby state, local government, or private lands where the species is known or potentially present both outside CH and within unoccupied CH. The BLM involvement in activities on these nearby lands is the nexus to include these actions that may affect this species in this BA.

Habitat loss, encroachment into prairie habitats by shrubs and trees due to fire suppression, fragmentation, invasion by non-native plants and elimination of natural disturbance regimes all threaten the survival of Fender's blue butterfly. Few populations occur on protected lands; most occur on private lands which are not managed to maintain native prairie habitats. These populations are at high risk of loss to development or continuing habitat degradation (U.S. Fish and Wildlife Service 2000a). Prairie habitats have been invaded by tall non-native grasses that may be limiting the ability of the Fender's blue butterfly to find its host plant (Severns 2008). There is concern about the effects of pesticide application for agriculture, gypsy moth control, or mosquito control (Oregon Department of Human Services 2003, Oregon Department of Agriculture 2006).

Studies have shown that Fender's blue butterfly populations respond positively to habitat restoration. Mowing, burning and mechanical removal of weeds have all resulted in increasing Fender's blue butterfly populations. At two sites in the West Eugene Wetlands (The Nature Conservancy's Willow Creek Natural Area and the Bureau of Land Management's Fir Butte site), adult and larval Fender's blue butterflies have both increased in number following mowing to lower the stature of herbaceous non-native vegetation, although the response to habitat restoration is often complicated by other confounding factors, such as weather fluctuations (Schultz and Dlugosch 1999, Fitzpatrick 2005, Kaye and Benfield 2005a). Wilson and Clark (1997) conducted a study on the effects of fire and mowing on Fender's blue butterfly and its native upland prairie at Baskett Slough National Wildlife Refuge in the Willamette Valley. Although fire killed all larvae in burned patches, female Fender's blue butterflies from the nearby unburned source patch were able to colonize the entire burned area the following year, including lupine patches that were 107 meters (350 feet) from the unburned source plants. Fender's blue butterfly eggs were 10 to 14 times more abundant in plots that were mowed or burned compared to undisturbed, control plots. Woody plants were reduced 45 percent with burning and 66 percent with mowing. A study that modeled the effect of prescribed burning found that the best long-term population growth could be achieved by burning one-third of the habitat of a Fender's blue butterfly population each year (Schultz and Crone 1998).

Fender's blue butterfly population trends have been correlated with lupine vigor; abundant leaf growth appears to produce larger butterfly populations. At the U.S. Army Corps of Engineers' Fern Ridge Reservoir, the Fender's blue butterfly population has increased dramatically since fall mowing of lupine patches has been implemented. The abundance of Fender's blue butterfly eggs was found to be correlated with the abundance of Kincaid's lupine leaves at several study sites (Kaye and Cramer 2003); egg abundance increased substantially at sites which had been treated to control non-native weeds (Schultz et al. 2003).

Critical habitat for Fender's blue butterfly was designated on October 31, 2006 (71 FR 63862). There are 249.02 acres of critical habitat for the Fender's blue butterfly on the West Eugene Wetlands (USDI FWS 2014: 76) found in Unit FBB-10 (encompassing subunits FSS-10B and FBB-10C) and Unit FBB-11 (encompassing subunits FBB-11B, FBB-11C, FBB-11D, FBB-11F, FBB-11G, FBB-11H, and FBB-11I).

Subunits FBB-10A, 10B, and 10C collectively support two core metapopulations of Fender's blue butterfly and Kincaid's lupine that have been surveyed annually since 1993 (USFWS 2006: 63886). Unit FBB-10 includes one of the most extensive contiguous prairie remnants, which increases the potential for connectivity between these two core populations. This prairie remnant provides the foundation for reestablishing a large functioning metapopulation within the West Eugene Habitat Network (USDI FWS 2006: 63887).

Most of the lupine populations scattered across the prairie habitat within Unit FBB-11 are relatively small, but the habitat supporting them is important to the long-term viability of a larger functioning Fender's blue butterfly metapopulation in this southern portion of the species' range (USDI FWS 2006: 63887). The area included within this unit provides needed stepping-stone habitat between the BLM/Army Corp of Engineers metapopulation to the northwest and The

Nature Conservancy (TNC) metapopulations to the southeast (USDI FWS 2006: 63887). This unit provides the features essential for all life stages of this butterfly population because it includes habitat to reestablish connectivity between two of the largest remaining metapopulations and providing for a large, functioning metapopulation (USDI FWS 2006: 63887). It increases the viability of all populations in this portion of the species' range (ibid.).

Taylor's checkerspot butterfly

Taylor's checkerspot butterfly (*Euphydryas editha taylori*) was listed as endangered under the Endangered Species Act on October 3, 2013 (78 FR 61451) with critical habitat (78 FR 61505). It was discussed as a candidate for Federal listing in the Recovery Plan for Prairie Species (USDI FWS 2010: II-36 through II-39).

Taylor's checkerspots are medium-sized, colorfully checkered butterflies with a set of reduced brushy forelegs. They are orange with black and yellowish spot bands, giving a checkered appearance (Pyle 2002). Taylor's checkerspot is a subspecies of Edith's checkerspot (*Euphydryas editha*). It is one of a small group of rare Pacific coastal subspecies, including the Bay checkerspot (*E. e. bayensis*) from the San Francisco bay area and the Quino checkerspot (*E. e. quino*) from the San Diego region, both of which are Federally listed as endangered. Three other subspecies are known to occur in Washington: *E. e. beani* in the north Cascades, *E. e. edithana* in the foothills of the Columbia Basin, and *E. e. colonia* in the southern Cascades and northeast Olympic Peninsula.

Historically, Taylor's checkerspot was likely distributed throughout prairies in the Willamette Valley, Puget Sound, and south Vancouver Island. Historic range and abundance are not precisely known because extensive searches did not occur until recently. Northwest prairies were formerly more common, larger, and interconnected, and likely would have supported a greater distribution and abundance of Taylor's checkerspot than exist today. Before its decline, the checkerspot was documented at more than 70 sites in British Columbia, Washington, and Oregon (U.S. Fish and Wildlife Service 2009a). These sites included coastal and inland prairies on southern Vancouver Island and surrounding islands in British Columbia and the San Juan Island archipelago, as well as open prairies on post-glacial gravelly outwash and balds in Washington's Puget Trough and Oregon's Willamette Valley. In Oregon, there were 13 recorded sites from which this subspecies had been either collected or observed over the last century (U.S. Fish and Wildlife Service 2009a).

At present, populations remain in about nine sites in Washington (around the Puget Sound area and Olympic Peninsula) and two sites in British Columbia. There are two known extant populations in Oregon (Figure II-7), both in Benton County (Vaughan and Black 2002, U.S. Fish and Wildlife Service 2009a). One population occurs in a Bonneville Power Administration right-of-way and the other occurs in Benton County's Beazell Park. The combined population at these sites may exceed 1,000 individuals.

There are no known populations on the Northwest Oregon District, but the West Eugene Wetlands has habitat for this species.

Habitat requirements for the Taylor's checkerspot consist of open prairies and savannas where food plants for larvae and nectar sources for adults are available. Taylor's checkerspot larvae have been documented feeding on members of the figwort or snapdragon family (Scrophulariaceae), including paintbrush (*Castilleja hispida*) as well as native and non-native *Plantago* spp. in the plantain family (Plantaginaceae) (Dornfield 1980, U.S. Fish and Wildlife Service 2005). The last remaining populations in Oregon depend upon the non-native *Plantago lanceolata*.

The major limiting factors affecting this species are the significant loss of suitable habitat that is largely due to agricultural and urban development, encroachment of trees, and spread of invasive plants which threaten the native grasslands in which the species is found (Vaughan and Black 2002, U.S. Fish and Wildlife Service 2009a). Pesticide use and recreational activities pose a direct threat to the butterflies themselves. The impact of these threats has led to extirpation of many small populations. Most of the remaining checkerspot populations are a considerable distance from one another, likely well beyond dispersal distance. Natural re-colonization as colonies disappear is unlikely.

Critical habitat for Taylor's checkerspot butterfly was designated on October 3, 2013 (78 FR 61505). There is no critical habitat for the Taylor's checkerspot butterfly on the Northwest Oregon District.

Recovery Plan Plant Species

Bureau Sensitive species of *Delphinium* have undergone taxonomic revision since the 2010 Recovery Plan was written but names are conserved here, as per conventions of the local botanical community (Chambers 2018, Oregon Flora Project 2022, ISSSSP 2022). The BLM no longer considers Pale larkspur (*Delphinium leucophaeum*) and peacock larkspur (*D. pavonaceum*) Bureau Sensitive because they are not known to occur on BLM land. This project includes descriptions for these species because there are opportunities to enhance potential habitat for these species on BLM land. Additional opportunities may arise to restore occupied or potential habitat for these species on land owned or managed by NW Oregon BLM partners. Bradshaw's lomatium (*Lomatium bradshawii*) was recently de-listed at the federal level and is now Bureau Sensitive.

Willamette daisy (*Erigeron decumbens* var. *decumbens*) – Federally Endangered

Erigeron decumbens var. *decumbens* is a perennial herb that was listed as endangered, without critical habitat, on January 25, 2000 (U.S. Fish and Wildlife Service 2000a). *Erigeron decumbens* var. *decumbens* is endemic to the Willamette Valley of western Oregon. [It] is a taprooted perennial herb in the sunflower or daisy family (Asteraceae). It grows 15 to 60 centimeters (6 to 28 inches) tall, with erect to sometimes prostrate stems at the base. The basal leaves often wither prior to flowering and are mostly linear, 5 to 12 centimeters (2 to 5 inches) long and 3 to 4 millimeters (0.1 to 0.2 inch) wide. Flowering stems produce two to five heads, each of which is daisy-like, with pinkish to pale blue ray flowers and yellow disk flowers. Ray flowers often fade to white with age (Siddall and Chambers 1978)... As with many species in the family Asteraceae, *E. decumbens* var. *decumbens* produces large quantities of wind-dispersed seed. Flowering typically occurs in June and July with pollination carried out by syrphid flies and solitary bees. Seeds are released in July and August.

Erigeron decumbens var. *decumbens*... occurs as single plants or clumps of genetically identical ramets (Clark et al. 1993). It blooms in June and early July and produces seeds in late summer (Cronquist 1955). Seedlings emerge in late winter or early spring, and plants require two to four years in the wild to reach flowering size. Large plants appear to spread vegetatively, but this spread is localized around the established plant (Clark et al. 1995).

Population size can substantially affect reproductive success in this species. Populations of *E. decumbens* var. *decumbens* with fewer than 20 individuals appear to suffer a high rate of reproductive failure due to inbreeding depression and reduced probability of being pollinated by a compatible mate (Wise and Kaye 2006).

Critical habitat [for this species] was designated on October 31, 2006 (U.S. Fish and Wildlife Service 2006a). The primary constituent element of critical habitat is early seral upland prairie, wet prairie, or oak savanna habitat with a mosaic of low-growing grasses, forbs, and spaces to establish seedlings or new vegetative growth; an absence of dense canopy vegetation; and undisturbed subsoils.

Erigeron decumbens var. *decumbens* typically occurs where woody cover is nearly absent and where herbaceous vegetation is low in stature (Clark et al. 1993). It occurs in both wet prairie grasslands and drier upland prairie sites. The wet prairie grassland community is typically dominated by *Deschampsia cespitosa*, *Danthonia californica* and a number of Willamette Valley endemic forbs. It is a flat, open, seasonally wet prairie with bare soil between the pedestals created by the bunching *Deschampsia cespitosa* (Kagan and Yamamoto 1987). On drier upland prairie sites, associated species commonly include *Symphotrichum hallii*, *Festuca idahoensis* ssp. *roemerii* and *Toxicodendron diversilobum* (Meinke 1982, Clark et al. 1993). *Erigeron decumbens* var. *decumbens* prefers heavier soils.

Like many native species endemic to Willamette Valley prairies, *Erigeron decumbens* var. *decumbens* is threatened by habitat loss due to urban and agricultural development, successional encroachment into its habitat by trees and shrubs, competition with non-native weeds, and small population sizes (Kagan and Yamamoto 1987, Clark et al. 1993, Gisler 2004). The U.S. Fish and Wildlife Service (2000a) estimated that habitat loss is occurring at 80 percent of the remaining 84 remnants of native prairies occupied by *Erigeron decumbens* var. *decumbens* and *Lupinus sulphureus* ssp. *kincaidii* (now *Lupinus oregonus*).

Populations occurring on private lands are the most vulnerable to threats of development, because state and Federal plant protection laws have little effect on private lands, although publicly owned populations are not immune from other important limitations or threats to the species. For instance, Clark et al. (1993) identified four populations protected from development on public lands (Willow Creek, Basket Slough National Wildlife Refuge, Bald Hill Park, and Fisher Butte Research Natural Area), but stated that even these appear to be threatened by the proliferation of non-native weeds and successional encroachment of brush and trees.

The efficacy of mowing and burning as tools to restore habitat for *Erigeron decumbens* var. *decumbens* [was] under investigation [at the time of writing the 2010 Restoration

Strategy]. Preliminary findings indicate[d] that *Erigeron decumbens* var. *decumbens* responds negatively to both mowing and burning... (Thorpe and Kaye 2007).

A 2014 study by the Institute for Applied Ecology indicated that burning combined with the application of glyphosate increased plant size and reproduction of Willamette daisy (Giles and Bahm 2015).

Kincaid's lupine (*Lupinus sulphureus* ssp. *kincaidii*) – Federally Threatened

Lupinus sulphureus ssp. *kincaidii* is a perennial herb that was listed as threatened, without critical habitat, on January 25, 2000 (U.S. Fish and Wildlife Service 2000a). [It] is an herbaceous perennial in the legume family (Fabaceae) that forms a branched crown, usually with numerous unbranched stems 40 to 100 centimeters (16 to 39 inches) tall, with whitish or brownish stiff to silky pubescence. Basal leaves are usually persistent until after flowering, the lowermost petioles 3 to 5 times as long as the blades, the upper cauline leaves with petioles sometimes shorter than the blades. Leaflets usually number from 7 to 12, and are rather narrowly oblanceolate, usually acute, 2.5 to 5 centimeters (1 to 2 inches) long. The flowers are numerous but not crowded on the stem, and range in color from bluish or purple to yellowish or creamy white, fading to orange-brown. The banner is distinctively ruffled and not very reflexed, the upper calyx lip short, bidentate, and not concealed by the reflexed sides of the longclawed banner. The fruit pods are not hairy, are 3 to 4 centimeters (1 to 1.5 inches) long, with 1 to 6 pinkish-brown to black seeds. The species is distinguished from other relatives by its ruffled banner on light-colored flowers, its unbranched flowering stems, and its low growing habit (Hitchcock 1961, Kaye and Kuykendall 1993, Gisler 2004).

Flowering begins in April and extends through June. As the summer dry season arrives, *Lupinus sulphureus* ssp. *kincaidii* becomes dormant, and is completely senescent by mid-August (Wilson *et al.* 2003)... Insect pollination appears to be critical for successful seed production (Wilson *et al.* 2003).

Lupinus sulphureus ssp. *kincaidii* reproduces by seed and vegetative spread. It can spread extensively through underground growth. Individual clones can be several centuries old (Wilson *et al.* 2003), and become quite large with age, producing many flowering stems... As part of a genetic evaluation, collections taken from small populations of *Lupinus sulphureus* ssp. *kincaidii* at the Baskett Slough National Wildlife Refuge were found to be genetically identical, indicating that the population consists of one or a few large clones (Liston *et al.* 1995). Reproduction by seed is common in large populations where inbreeding depression is minimized and ample numbers of seeds are produced. In small populations, seed production is reduced and this appears to be due, at least in part, to inbreeding depression (Severns 2003).

Critical habitat was designated on October 6, 2006 (U.S. Fish and Wildlife Service 2006a). The primary constituent elements of critical habitat are:

1. early seral upland prairie or oak savanna habitat with a mosaic of low-growing grasses and forbs and spaces to establish seedlings or new vegetative growth, an absence of dense canopy vegetation, and undisturbed subsoils; and
2. the presence of insect outcrossing pollinators, such as... bumblebees, with unrestricted movement between existing lupine patches.

Lupinus sulphureus ssp. *kincaidii* is found in dry upland prairies... [with] most of the known and historical populations... in the Willamette Valley. Before Euro-American settlement of the region, *Lupinus sulphureus* ssp. *kincaidii* was likely well distributed throughout the prairies of western Oregon and southwestern Washington; today, habitat fragmentation has resulted in existing populations that are widely separated by expanses of unsuitable habitat.

In the Willamette Valley... *Lupinus sulphureus* ssp. *kincaidii* is found on upland prairie remnants where the species occurs in small populations at widely scattered sites. A number of populations are found in road rights-of-way, between the road shoulder and adjacent fence line, where they have survived because of a lack of agricultural disturbance... Common native species typically associated with *Lupinus sulphureus* ssp. *kincaidii* include: *Festuca idahoensis* ssp. *roemerii*, *Danthonia californica*, *Calochortus tolmiei*, *Eriophyllum lanatum*, and *Fragaria virginiana*. The species appears to prefer heavier, generally well-drained soils (Wilson *et al.* 2003).

In contrast to historical ecosystem composition, invasive non-native species are a significant component of *Lupinus sulphureus* ssp. *kincaidii* habitat today. Common invasives include: *Arrhenatherum elatius*, *Brachypodium sylvaticum*, *Dactylis glomerata*, *Festuca arundinacea*, *Rubus armeniacus* and *Cytisus scoparius* (Wilson *et al.* 2003). In the absence of fire, some native species, such as *Toxicodendron diversilobum* and *Pteridium aquilinum*, invade prairies and compete with *Lupinus sulphureus* ssp. *kincaidii*.

The three major threats to *Lupinus sulphureus* ssp. *kincaidii* populations are habitat loss, competition from non-native plants and elimination of historical disturbance regimes (Wilson *et al.* 2003)... Land development and alteration in the prairies of western Oregon and southwestern Washington have been so extensive that the remaining populations are essentially relegated to small, isolated patches of habitat...Habitat fragmentation and isolation of small populations may be causing inbreeding depression in *Lupinus sulphureus* ssp. *kincaidii*..., which may result in lower seed set (Severns 2003).

Before settlement by Euro-Americans, the regular occurrence of fire maintained the open prairie habitats essential to *Lupinus sulphureus* ssp. *kincaidii*. The loss of a regular disturbance regime, primarily fire, has resulted in the decline of prairie habitats through succession to native trees and shrubs, and has allowed the establishment of numerous nonnative grasses and forbs. Some aggressive non-native plants form dense monocultures, which compete for space, water and nutrients with the native prairie species, and ultimately inhibit the growth and reproduction of *Lupinus sulphureus* ssp. *kincaidii* by shading out the plants (Wilson *et al.* 2003). When *Lupinus sulphureus* ssp. *kincaidii* was listed, [FWS]

estimated that 83 percent of upland prairie sites within its range were succeeding to forest (U.S. Fish and Wildlife Service 2000a).

Active research efforts have focused on restoring the essential components of *Lupinus sulphureus* ssp. *kincaidii* habitat by mimicking the historical disturbance regime with the application of prescribed fire, mowing and manual removal of weeds. Research and habitat management programs for *Lupinus sulphureus* ssp. *kincaidii* have been implemented at several sites, including Baskett Slough National Wildlife Refuge, Bureau of Land Management's Fir Butte site and The Nature Conservancy's Willow Creek Preserve (Wilson *et al.* 2003, Kaye and Benfield 2005a). Prescribed fire and mowing before or after the growing season have been effective in reducing the cover of invasive non-native plants; following treatments, *Lupinus sulphureus* ssp. *kincaidii* has responded with increased leaf and flower production (Wilson *et al.* 2003).

Nelson's checkermallow (*Sidalcea nelsoniana*) – Federally Threatened

Sidalcea nelsoniana is a perennial herb that was listed as threatened, without critical habitat, on February 12, 1993 (U.S. Fish and Wildlife Service 1993b). *Sidalcea nelsoniana* is an herbaceous perennial plant in the mallow family (Malvaceae). It produces numerous elongate, branched inflorescences 50 to 150 centimeters (20 to 60 inches) tall, consisting of a vertical stem with 30 to 100 lavender to deep pink flowers clustered in spike-like racemes. Like many of the members of this genus, *Sidalcea nelsoniana* has a breeding system in which mature plants produce either exclusively female flowers or perfect flowers. Although the two types of plants exhibit no perceptible vegetative differences, female flowers are generally smaller than perfect flowers, and bear only vestigial, non-functional anthers. As is characteristic of the mallow family, *Sidalcea nelsoniana* stamens are fused at the base to form a tube around the style. Basal leaves are palmately lobed, upper stem leaves are deeply divided, and stems are variably pubescent with simple hairs. The ring-shaped fruits separate at maturity into 7 to 9 single-seeded, lightly reticulate, beaked carpels. Plants produce short, thick, twisted rhizomes, as well as a system of fine roots extending from a stout taproot (Hitchcock 1957, Peck 1961, Hitchcock and Cronquist 1973, Halse *et al.* 1989).

In the Willamette Valley, *Sidalcea nelsoniana* begins flowering as early as mid-May, and continues through August to early September, depending upon the moisture and climatic conditions of each site. Coast Range populations experience a shorter growing season and generally flower later and senesce earlier. *Sidalcea nelsoniana* inflorescences are indeterminate, and often simultaneously exhibit fruits, open flowers, and unopened buds. Seeds are deposited locally at or near the base of the parent plant and may be shed immediately or persist into winter within the dry flower parts that remain attached to the dead stems. Above-ground portions of the plant die back in the fall, usually followed by some degree of regrowth at the base, with the emergence of small, new leaves that persist through the winter directly above the root crown. It is not uncommon for some plants to continue producing some flowers into the fall and early winter, although this is usually limited to one or two small stems per plant, consequently with little seed production (U.S. Fish and Wildlife Service 1998).

Perfect-flowered *Sidalcea nelsoniana* [have] complete temporal separation of male and female phases in individual flowers (Gisler and Meinke 1998). This... combined with the bottom-to-top foraging observed among most bee visitors... [reduces self-fertilization]. Outcrossing is encouraged because pollinators leave male-phase flowers at the top of one raceme and then fly to female phase flowers on the bottom of the next raceme. Some selfing will still occur in perfect-flowered plants, however, due to within-plant, between-raceme foraging. Female plants, which lack male flowers, are obligately outcrossed (Gisler and Meinke 1998). In most Willamette Valley (but not Coast Range) populations, female (male- sterile) *Sidalcea nelsoniana* plants vastly outnumber perfect plants. *Sidalcea nelsoniana* is also capable of vegetative expansion via rhizomes or laterally spreading root systems that form multiple crowns bearing distinct clusters of flowering stems (CH2MHill 1986, Glad *et al.* 1994).

Sidalcea nelsoniana is pollinated by a variety of insects, including at least 17 species of bees, 3 species of wasps, 9 species of flies, 6 species of beetles, and 5 species of [butterflies and moths] (Gisler 2003). Three species of bumblebees... were the most common and active pollinators (Gisler 2003).

[In NW Oregon,] *Sidalcea nelsoniana* is... distributed from southern Benton County, Oregon, northward through the central and western Willamette Valley (CH2MHill 1997, U.S. Fish and Wildlife Service 1998). This species also occurs in several higher elevation west slope Coast Range meadows that flank the western Willamette Valley in Yamhill, Washington and Tillamook Counties, Oregon. Known populations range in elevation from 45 to 600 meters (150 to 1,970 feet). In the Willamette Valley, populations of *Sidalcea nelsoniana* occur at low elevations (below 200 meters [650 feet]) within a mosaic of urban and agricultural areas, with concentrations around the cities of Corvallis and Salem. In the Coast Range, *Sidalcea nelsoniana* populations range in elevation from 490 to 600 meters (1,610 to 1,970 feet), and occur in open, grassy meadows within a larger matrix of coniferous forest.

In the Willamette Valley, *Sidalcea nelsoniana* is known from wet prairies and stream sides. Although occasionally occurring in the understory of *Fraxinus latifolia* (Oregon ash) woodlands or among woody shrubs, Willamette Valley *Sidalcea nelsoniana* populations usually occupy open habitats supporting early seral plant species. These native prairie remnants are frequently found at the margins of sloughs, ditches, and streams; roadsides; fence rows; drainage swales; and fallow fields. Soil textures of the occupied sites vary from gravelly, well drained loams to poorly drained, hydric clay soils (CH2MHill 1986, Glad *et al.* 1994).

Some of the native plants commonly associated with *Sidalcea nelsoniana* in the Willamette Valley include: *Achillea millefolium* (yarrow), *Juncus effusus* (common rush), *Carex* spp. (sedge), *Spiraea douglasii* (western spiraea), *Crataegus douglasii* (Douglas' hawthorn), *Geum macrophyllum* (large-leaved avens), and *Fraxinus latifolia* (Oregon Department of Agriculture 1995). Most sites have been densely colonized by invasive weeds, especially introduced forage grasses. Common non-native species found with *Sidalcea nelsoniana* include *Festuca arundinacea*, *Rosa* spp. (rose), *Cirsium arvense* (Canada thistle),

Hypericum perforatum (common St. John's wort), *Rubus* spp. (blackberry), *Phleum pratense* (timothy), *Holcus lanatus* (velvet grass), *Vicia* spp., *Chrysanthemum leucanthemum* (oxeye-daisy), *Agrostis capillaris*, *Alopecurus pratensis*, *Phalaris arundinacea*, *Geranium* spp. (geranium), *Lotus corniculatus* (bird's-foot trefoil) and *Daucus carota* (Oregon Department of Agriculture 1995).

Coast Range *Sidalcea nelsoniana* populations typically occur in open, wet to dry meadows, intermittent stream channels, and along margins of coniferous forests, with clay to loam soil textures (Glad *et al.* 1987). These areas generally support more native vegetation than Willamette Valley sites. Native plants commonly associated with *Sidalcea nelsoniana* in the Coast Range include *Senecio triangularis* (spear-head senecio), *Fragaria virginiana*, *Juncus* spp., *Carex* spp., and *Achillea millefolium*; non-native associated species often include *Senecio jacobaea* (tansy ragwort), *Holcus lanatus*, and *Phleum pratense*.

As with the other rare prairie plants addressed in this plan, *Sidalcea nelsoniana* is threatened by urban and agricultural development, ecological succession that results in shrub and tree encroachment of open prairie habitats, and competition with invasive weeds (U.S. Fish and Wildlife Service 1993b).

At many Willamette Valley sites, seedling establishment is inhibited by the dense thatch layer of non-native grasses (Gisler 2004). Other factors specific to *Sidalcea nelsoniana* include pre-dispersal seed predation by weevils (Gisler and Meinke 1998), the potential threat of inbreeding depression due to small population sizes, and habitat fragmentation (Gisler 2003).

There is a strong potential for interspecific hybridization among *Sidalcea nelsoniana* and its congeners in the region, although there are some ecological and genetic reproductive barriers to prevent it from occurring (Gisler 2003, 2004). *Sidalcea nelsoniana* flowers later in the year than... [spatially overlapping] populations of *Sidalcea malviflora* ssp. *virgata* (rose checkermallow), but [spatially distinct] populations sometimes overlap in flowering periods. The two species are sexually compatible, thus human-mediated movement of the plants could result in formation of hybrids. *Sidalcea nelsoniana* and *S. cusickii* (Cusick's checker-mallow) are also fully compatible, and they also share pollinators and flowering times, but their geographic ranges are... narrowly separated by less than a mile at the south end of Finley National Wildlife Refuge (Gisler 2004). If these species come into contact through human-mediated dispersal, hybridization could easily occur... managers should be aware of the potential for hybridization as plants are moved around within the region.

Extensive research has been conducted on the ecology and population biology of *Sidalcea nelsoniana*, methods of seed predator control, and propagation and reintroduction techniques (Gisler and Meinke 1998, 2001; Bartels and Wilson 2001; Gisler and Meinke 2001; Gisler 2003; Wilson 2004). The results of these studies have been used to direct the management of the species at sites managed for wet prairies.

Sidalcea nelsoniana has a highly complex breeding system that facilitates both outcrossing and selfing. Control of seed predation by native weevils may be needed to enhance reproductive success at some populations which are heavily infested with weevils (Gisler

and Meinke 1998). Research into habitat management techniques indicates that burning may not be directly beneficial to *Sidalcea nelsoniana*, and that caution should be used in management of native prairie fragments with populations of *Sidalcea nelsoniana* (Bartels and Wilson 2001, Wilson 2004).

There have not been additional studies that indicate prescribed burning would be beneficial to *Sidalcea nelsoniana*; however, because it is a Willamette Valley prairie species that evolved under the same conditions as other Recovery Plan plant species, it would be expected to tolerate prescribed fire and would not be negatively impacted by prescribed fire treatments (Tom Kaye, pers. comm. 2023).

Golden paintbrush (*Castilleja levisecta*) – Bureau Sensitive (recently delisted)

Castilleja levisecta is listed by the Oregon Biodiversity Information Center (ORBIC) as a List 1-ex species. “List 1 contains taxa that are threatened with extinction or presumed to be extinct throughout their entire range. These are the taxa most at risk, and should be the highest priority for conservation action. Includes many rare Oregon endemic species.” List 1-ex includes species that have been extirpated in Oregon. The last wild site record of *C. levisecta* in Oregon was from 1938 in Linn County (Oregon Flora Project 2022). From 2005, plant materials sourced from Washington have been grown in nurseries and common gardens in Oregon. Seed or plugs have since been outplanted at 12-15 locations in the Willamette Valley (St. Clair et. al 2020, Lawrence & Kaye 2011). Prior to the 2023 field season, *C. levisecta* was suspected, but not documented in BLM databases, on BLM-managed lands on the District. An employee of the Institute of Applied Ecology alerted the BLM to IAE field notes of a single plant that was documented on the District in June of 2017 where restoration efforts are ongoing for Hitchcock’s blue-eyed grass. The site is threatened by invasive blackberry as well as encroachment by native species. A field visit in June of 2023 confirms the presence of a single plant on BLM.

Castilleja levisecta... was listed as threatened, without critical habitat, on June 11, 1997 (U.S. Fish and Wildlife Service 1997). *Castilleja levisecta* is a [short-lived] perennial herb in the figwort or snapdragon family (Scrophulariaceae). [It] often has 5 to 15 unbranched stems. The stems may be erect or spreading... Plants are up to 30 centimeters (12 inches) tall and are covered with soft, somewhat sticky hairs. The lower leaves are broader, with one to three pairs of short lateral lobes near the terminal third. The showy bracts are about the same width as the upper leaves, softly hairy and sticky, and are golden yellow. The bracts effectively hide the flowers (U.S. Fish and Wildlife Service 2000b). Individual plants generally survive 5 to 6 years or longer. This species apparently reproduces exclusively by seed; vegetative spread has never been reported. Plants may flower as early as February, and flowers are observed into summer. The fruit is a capsule, which matures in August; by mid-summer, the plants senesce, although some plants produce shoots in the fall that overwinter. Capsules persist on the plants well into winter.

The genus *Castilleja*, like many others in the figwort family, is hemi-parasitic (Center for Plant Conservation 2005). Roots of paintbrushes are capable of forming parasitic connections to roots of other plants. Paintbrush plants are probably not host-specific (Mills and Kummerow 1988). It has been clearly shown that golden paintbrush grows well independently of a host plant and that they do not necessarily require a host to survive.

This evidence suggests that this species of *Castilleja* is a facultative root parasite. The breeding system of *Castilleja levisecta* has not been thoroughly documented. Evans *et al.* (1984) reported that a species of bumblebee, *Bombus californicus*, was observed visiting *Castilleja levisecta*. Pollinator exclusion experiments showed that fruits can be produced in the absence of pollinator visitation, but fruit set was almost five times greater in unbagged inflorescences compared to inflorescences bagged to prevent visits from pollinators (Wentworth 1994). Although seed dispersal has not been directly observed, the seeds are probably shaken from the seed capsules and fall a short distance from the parent plant. The seeds are light and could be dispersed short distances by the wind.

In Oregon, *Castilleja levisecta* historically occurred in the grasslands and prairies of the Willamette Valley... the species [was extirpated here] as the habitat has been changed or modified by urbanization or agriculture.

Habitat descriptions for *Castilleja levisecta* are based on those extant populations in Washington and British Columbia; absent comparable habitat information for Oregon, we assume that the habitat of the extirpated populations in the Willamette Valley was similar. *Castilleja levisecta* occurs in upland prairies, on generally flat grasslands, including some that are characterized by mounded topography. Low deciduous shrubs are commonly present as small to large thickets. In the absence of fire, some of the sites have been colonized by trees, primarily *Pseudotsuga menziesii*, and shrubs, including *Rosa nutkana* (wild rose) and *Cytisus scoparius*, an aggressive non-native shrub.

The mainland population in Washington occurs in a gravelly, glacial outwash prairie. Most of the extant populations are on loamy sand or sandy loam soils derived from glacial origins; at the southern end of its historic range, populations occurred on clayey alluvial soils, in association with *Quercus garryana* (Oregon white oak) woodlands (Caplow 2004).

[A]nalyzes of likely sites for reintroduction of *Castilleja levisecta* in Oregon found that habitats are dominated by non-native annuals, and will require management before successful reintroductions can be expected (Lawrence 2005).

Threats to *Castilleja levisecta* include habitat modification as succession changes prairies and grasslands to shrub and forest lands; development for commercial, residential, and agricultural use; low potential for expansion of *Castilleja levisecta* populations and their refugia because existing habitat is constricted; recreational picking; and herbivory (U.S. Fish and Wildlife Service 1997).

“Field observations suggest that *C. levisecta* is a poor competitor, intolerant of shade cast by tall exotic species and accumulated litter in fire suppressed prairies” (Lawrence and Kaye 2005).

Widespread successful restoration efforts in Washington have resulted in the need to develop strategies to prevent hybridization between federally threatened *C. levisecta* and its more common relative *C. hispida*, harsh Indian paintbrush (Gray 2022). Research investigating inbreeding depression and genetic diversity in the context of source population site characteristics to help determine appropriate sites for future augmentation efforts is ongoing (St. Clair *et al.* 2020, Gray 2022, Sandlin 2018).

Pale larkspur (*Delphinium leucophaeum*) – no BLM special status

Delphinium leucophaeum is listed by the Oregon Biodiversity Information Center (ORBIC) as a List 1 species. “List 1 contains taxa that are threatened with extinction or presumed to be extinct throughout their entire range. These are the taxa most at risk, and should be the highest priority for conservation action. Includes many rare Oregon endemic species.”

Delphinium leucophaeum is a... slender perennial in the buttercup family (Ranunculaceae) [that] forms clusters of tubers and usually grows from 20 to 60 centimeters (8 to 24 inches) tall. The numerous leaves are evenly distributed on the stem and have long petioles with lobed leaf blades. The inflorescence is a raceme with 6 to 30 flowers. The sepals are white to cream, sometimes slightly greenish-blue on the back. Lower petals are white or faintly bluish tinged and the upper petals are bluish to lavender tipped. The fruit is a follicle 8 to 12 millimeters (0.3 to 0.5 inch) long. *Delphinium leucophaeum* may be distinguished from *Delphinium pavonaceum* (peacock larkspur), the only other white larkspur west of the Cascades, by the orientation of the sepals (forward cupped for *D. leucophaeum*, reflexed for *D. pavonaceum*) and the hairiness of the lower petals (more and longer hairs for *D. leucophaeum*) (Chambers 2000).

Delphinium leucophaeum flowers in May and June and produces fruits through August. Seedlings germinate in the winter, and may take five years to first flowering (Washington Natural Heritage Program 2008). This species does not reproduce vegetatively in the wild (Darr 1980). The species' hermaphroditic flowers are pollinated by bumblebees (*Bombus californicus*) (Goodrich 1983). *Delphinium leucophaeum* is able to hybridize with other *Delphinium* species, including... *Delphinium pavonaceum* (Meinke 1982, Goodrich 1983).

Delphinium leucophaeum is found primarily in the northern Willamette Valley... The species has been found at elevations from 40 to 150 meters (125 to 500 feet). [It] occurs in a variety of habitat types, including edges of oak woodlands, dry roadside ditches, basalt cliffs, along river banks and on bluffs, on moist rocky slopes, lowland meadows and in the shade of oak and mixed oak/conifer stands (Darr 1980; Goodrich 1983; Keith Karoly, Reed College, *in litt.* 2006). Soils in most occupied habitats were high in organic matter, loose, and very shallow (5 to 7 centimeters [2 to 3 inches]) (Goodrich 1983). Associated species include *Quercus garryana*, *Holodiscus discolor* (ocean spray), *Polypodium glycorriza* (licorice fern), *Festuca rubra* (red fescue), *Elymus glaucus* and *Symphoricarpos albus* (snowberry) (Washington Natural Heritage Program 2008).

Habitat loss, alteration of disturbance regimes, and habitat invasion by trees and shrubs put this species at risk of continued declines (Gisler 2004). The species is known from very few, small populations, which puts the species at risk of extinction from random demographic and stochastic events.

Willamette Valley larkspur (*Delphinium oreganum*) – Bureau Sensitive

Delphinium oreganum is listed by the Oregon Biodiversity Information Center (ORBIC) as a List 1 species. “List 1 contains taxa that are threatened with extinction or presumed to be extinct

throughout their entire range. These are the taxa most at risk, and should be the highest priority for conservation action. Includes many rare Oregon endemic species.”

Delphinium oreganum is a member of the buttercup family (Ranunculaceae). [It] is a slender perennial arising from short, fleshy, tuber-like roots. The plant grows to 80 centimeters (31 inches) tall as a single stem. The few leaves are evenly distributed along the stem below a 6- to 30-flowered raceme. The flowers have inconspicuous petals with showy dark blue sepals. The lower petals are short with hairs distributed evenly over most of blade (broadly obovate) and the upper petals are bluish-tipped.

The blooming period is from late May to late June although blooms can be found earlier or later due to various factors such as elevation, moisture level, and age of individuals (Boyer 1999).

Delphinium oreganum is endemic to the Willamette Valley and high elevation peaks in the northern Coast Range... [It] is usually found growing along roadsides and well drained grassy areas (Boyer 1999). Sites are located at low elevations in the Willamette Valley and most commonly in wet prairies with shrub or *Fraxinus latifolia* overstory. The Saddle Mountain site is the only known Coast Range site and it is at a much higher elevation (700-975 meters [2,300-3,200 feet]) than the Willamette Valley populations (45-425 meters [150-1,400 feet]). The Saddle Mountain population is found on open, moderately moist slopes.

The species is threatened by continued loss of habitat to urban, industrial and agricultural development, herbicides, disturbance associated with road maintenance, successional encroachment and habitat invasion by exotic species.

Peacock larkspur (*Delphinium pavonaceum*) – no BLM special status

Delphinium pavonaceum is listed by the Oregon Biodiversity Information Center (ORBIC) as a List 1 species. “List 1 contains taxa that are threatened with extinction or presumed to be extinct throughout their entire range. These are the taxa most at risk, and should be the highest priority for conservation action. Includes many rare Oregon endemic species.”

Delphinium pavonaceum is a perennial herb that... is endemic to the Willamette Valley. This tall perennial in the buttercup family (Ranunculaceae) has showy cream and purple flowers. It rises from clusters of globose tubers, and grows from 30 to 90 centimeters (12 to 35 inches) tall. Flowering stems are erect, with soft to hirsute pubescence. The leaves are palmate and deeply cleft. The inflorescence is a raceme with many flowers and has glandular hairs. Sepals are white or faintly yellowish tinged, upper petals dark blue distally, the lower only blue toward the base, and otherwise creamy white. The fruit is a follicle 16 to 20 millimeters (0.6 to 0.8 inch) long.

Delphinium pavonaceum typically flowers from April to June. The plant does not spread vegetatively and reproduces only by seed; seedlings germinate in the winter and may take at least three years before flowering (Goodrich 1983). Flowers are pollinated by insects; bumblebees... and unidentified moths have been observed pollinating the flowers

(Goodrich 1983, McKernan 2004). Infrequent fires appear to benefit the species (McKernan 2004).

[P]opulations of *Delphinium pavonaceum*... are found generally in the southern Willamette Valley (Gisler 2004, Chambers 2018). The species occurs at elevations from 45 to 120 meters (150 to 400 feet) (Darr 1980, Gisler 2004). *D. pavonaceum* is found in native wet prairie habitats, on the edges of *Fraxinus latifolia* and *Quercus garryana* woodlands, and along roadsides and fence rows, in soils that are generally moist heavy clay loams or dry, well drained heavy clays (Darr 1980, Meinke 1982, Gisler 2004).

The largest extant populations of *Delphinium pavonaceum* occur on William L. Finley National Wildlife Refuge; active management at the refuge has focused on restoring native prairie habitats (McKernan 2004) (see **Appendix C**). Some work has been done to evaluate methods for growing plants from seed in controlled conditions for later reintroduction to the wild (Goodrich 1983).

The species is threatened by continued loss of habitat to urban and agricultural development, herbicides, road maintenance, successional encroachment and habitat invasion by exotic species (Gisler 2004).

Shaggy horkelia (*Horkelia congesta* ssp. *congesta*) – Bureau Sensitive

Horkelia congesta ssp. *congesta* is listed by the Oregon Biodiversity Information Center (ORBIC) as a List 1 species. “List 1 contains taxa that are threatened with extinction or presumed to be extinct throughout their entire range. These are the taxa most at risk, and should be the highest priority for conservation action. Includes many rare Oregon endemic species.”

Horkelia congesta ssp. *congesta* is a perennial herb that...is endemic to the Willamette and Umpqua Valleys of western Oregon. This perennial herb is a member of the rose family (Rosaceae). The plant arises from a multi-capital root caudex with 1 to 3 crowns and has erect flowering stems that are 10 to 40 centimeters (4 to 16 inches) tall arising from few-leaved rosettes; the leaves are pinnately dissected into 11 to 17 leaflets. The flowering heads are cymes, which are congested and capitate, terminating the mostly simple or sparingly branched stems. Flowers are made up of 5 creamy white petals that are 4 to 5 millimeters (0.16 to 0.2 inch) long. The fruit is an achene. *H. congesta* ssp. *congesta* blooms from April to June and reproduces by seed. Plants form rosettes of basal leaves and eventually produce one or more flowering stems. Occasionally, the root caudex splits beneath the soil surface, thus producing rosettes that appear separate but are connected underground. *H. congesta* ssp. *congesta* does not appear capable of vegetative reproduction, and reproduces solely by seeds (Gisler 2004). No field studies have been conducted on the breeding system of the species. Solitary bees..., syrphid flies, and muscid flies have been observed pollinating flowers in the wild (Gisler 2004).

Horkelia congesta ssp. *congesta* occurs in prairie and oak savanna remnants in the Willamette Valley and on grassy balds in the Umpqua Valley. In the Willamette Valley, the species occurs on slightly elevated sites in wet prairies, dry uplands, open areas and even the shady understory of oak and fir woodlands (Gisler 2004). Extant populations

range in elevations from 80 to 450 meters (275 to 1,500 feet), with the higher elevation sites located in the southern portion of the range (Gisler 2004). The taxon has been found on clay loam, cobbly silty clay, cobbly loam, gravelly loam, silt clay loam, and silty clay loam.

Associated species include *Linanthus bicolor* (bicolored linanthus), *Lomatium bradshawii*, *Danthonia californica*, *Eriophyllum lanatum*, *Habenaria elegans* (elegant rein orchid), *Lomatium utriculatum* (fine-leaved desert parsley), *Carex tumulicola* (foot-hill sedge), *Camassia leichtlinii* (great camas), *Montia howellii* (Howell's montia), *Sidalcea campestris*, *Microcala quadrangularis* (microcala), *Lomatium nudicaule* (naked desert parsley), *Wyethia angustifolia* (narrow-leaved dwarf sunflower), *Orthocarpus attenuatus* (narrow-leaved orthocarpus), *Iris tenax*, *Sanicula crassicaulis tripartita* (Pacific black snakeroot), *Luzula comosa*, *Festuca rubra*, *Sidalcea malviflora* ssp. *virgata*, *Potentilla gracilis*, *Lupinus micranthus* (small-flowered lupine), *Lotus micranthus* (smallflowered trefoil), *Ranunculus occidentalis* (western buttercup), *Fragaria virginiana*, *Erigeron decumbens* var. *decumbens* and *Achillea millefolium* (Alverson 1990).

The species is threatened by the continued loss of native prairie habitat, invasive weeds and successional changes to its grassland habitat (Gisler 2004). Grazing by deer is also a potential threat to small populations (Kaye 2002).

Horkelia congesta ssp. *congesta* has been the subject of several research and conservation projects. Long-term monitoring has been conducted at the Bureau of Land Management's Long Tom Area of Critical Environmental Concern (Kaye 2002, Gisler 2004), and studies have examined the feasibility of propagation as a tool for population augmentation or reintroduction (Kaye and Brandt 2005). Direct seeding can be an effective method of establishing plants at new sites or augmenting existing populations, and outplanting of container-grown plants from seed has a very high success rate (Kaye and Brandt 2005).

Bradshaw's lomatium (*Lomatium bradshawii*) – Bureau Sensitive (recently delisted)

Lomatium bradshawii is listed by the Oregon Biodiversity Information Center (ORBIC) as a List 1 species. "List 1 contains taxa that are threatened with extinction or presumed to be extinct throughout their entire range. These are the taxa most at risk, and should be the highest priority for conservation action. Includes many rare Oregon endemic species."

Lomatium bradshawii is a member of the Apiaceae (Umbelliferae), the umbel or parsley family. The genus is composed of taprooted or tuberous perennial herbs with large, winged fruits. *L. bradshawii* is a low, erect perennial arising from a long slender taproot. Overall, the plant is glabrous and has leaves 10 to 30 centimeters (4 to 12 inches) long which are dissected into linear or filiform segments. *Lomatium bradshawii* has small light yellow flowers that occur in compound umbels composed of umbellets, which are rarely larger than 1 centimeter (0.4 inch) across. Generally, only 2 to 5 flowers in each umbel are actually fertile. The fruit is oblong, 0.6 to 1.2 centimeters (0.25 to 0.5 inch) long and glabrous with thickened, corky wings and inconspicuous dorsal ribs (Hitchcock et al. 1961).

Lomatium bradshawii blooms in the spring, usually in April and early May. The flowers have a spatial and temporal separation of sexual phases, presumably to promote outcrossing, resulting in protandry on a whole plant basis, and protogyny within the flowers. A typical population is composed of many more vegetative plants than reproductive plants. The plant is pollinated by insects. Over 30 species of solitary bees, flies, wasps and beetles have been observed visiting the flowers (Kaye and Kirkland 1994, Jackson 1996). The very general nature of the insect pollinators probably buffers *Lomatium bradshawii* from the population swings of any one pollinator (Kaye 1992).

Lomatium bradshawii does not spread vegetatively and depends exclusively on seeds for reproduction (Kaye 1992). The large fruits have corky thickened wings, and usually fall to the ground fairly close to the parent. Fruits appear to float somewhat, and may be distributed by water. The fine-scale population patterns at a given site appear to follow seasonal microchannels in the tufted hairgrass prairies, but whether this is due to dispersal, habitat preference, or both, is not clear (Kaye 1992, Kaye and Kirkland 1994).

Lomatium bradshawii is restricted to wet prairie habitats. These sites have heavy, sticky clay soils or a dense clay layer below the surface that results in seasonal hydric soils. Most of the known *Lomatium bradshawii* populations occur on seasonally saturated or flooded prairies, which are found near creeks and small rivers in the southern Willamette Valley (Kagan 1980). The soils at these sites are dense, heavy clays with a slowly permeable clay layer located between 15 and 30 centimeters (6 and 12 inches) below the surface. This slowly permeable clay layer, which results in a perched water table in winter and spring, allows soils to be saturated to the surface or slightly inundated during the wet season. The soils include Dayton silt loams, Natroy silty clay loams or Bashaw clays; other soils on which the species has been found include Amity, Awbrig, Coburg, Conser, Courtney, Cove, Hazelair, Linslaw, Oxley, Panther, Pengra, Salem, Willamette, and Witzel.

Less frequently, *Lomatium bradshawii* populations are found on shallow, basalt areas in Marion and Linn County near the Santiam River. The soil type is characterized as Stayton Silt Loam; it is described as well drained, in alluvium underlain by basalt (Kaye and Kirkland 1994). The shallow depth to bedrock, 50 centimeters (20 inches) or less, results in sites which are poorly suited to agriculture. This soil type occurs at scattered locations in sites with deeper soils belonging to the Nekia-Jory association, which were originally vegetated by grassland and oak savanna (Alverson 1990). *Lomatium bradshawii* at these sites occurs in areas with very shallow soil, usually in vernal wetlands or along stream channels.

Lomatium bradshawii is often associated with *Deschampsia cespitosa*, and frequently occurs on and around the small mounds created by senescent *Deschampsia cespitosa* plants. In wetter areas, *Lomatium bradshawii* occurs on the edges of *Deschampsia cespitosa* or sedge bunches in patches of bare or open soil. In drier areas, it is found in low areas, such as small depressions, trails or seasonal channels, with open, exposed soils. The grassland habitat of *Lomatium bradshawii* frequently includes these species: *Carex* spp., *Danthonia californica*, *Eryngium petiolatum*, *Galium cymosum* (bedstraw), *Grindelia integrifolia* (Willamette Valley gumweed), *Hordeum brachyantherum*, *Juncus* spp., *Luzula*

comosa (Pacific woodrush), *Microseris laciniata* (cut-leaved microseris), and *Perideridia* sp. (yampah) (Kagan 1980). In most sites, introduced pasture grasses (*Anthoxanthum odoratum*, *Holcus lanatus*, *Poa pratensis* [Kentucky bluegrass], *Agrostis capillaris* [colonial bentgrass], *Dactylis glomerata* and *Festuca arundinacea*) are present. Invasive bentgrasses, including *Agrostis stolonifera*, have been found at many protected sites with *Lomatium bradshawii* populations, including The Nature Conservancy's Willow Creek Preserve and William L. Finley National Wildlife Refuge (Kate Norman, pers. comm., 2009).

For many years *Lomatium bradshawii* was considered an Oregon endemic... However, in 1994, two populations of the species were discovered in Clark County, Washington. The Washington populations, though few in number, are large in population size... Some populations that were large when discovered have since declined in size substantially. A large population at Buford Park near Eugene, Oregon, dropped from about 23,000 plants in 1993 to just over 3,000 plants in 1994 (Greenlee and Kaye 1995), recovered to 20,000 plants in 2000, and declined to about 200 plants in 2007 (Kate Norman, U.S. Fish and Wildlife Service, Portland, Oregon, 2010a). Herbivory by a booming vole population was suspected to be the cause of the decline.

Expanding urban development, pesticides, encroachment of woody and invasive species, herbivory and grazing are threats to remaining *Lomatium bradshawii* populations (U.S. Fish and Wildlife Service 1988). Populations occurring on roadsides are at risk from maintenance activities, and from adverse effects of management on adjacent lands. Pesticide use on agricultural fields and herbicide application adjacent to roads may harm *Lomatium bradshawii* populations across its range. There is concern that pesticides kill the pollinators necessary for plant reproduction; *Lomatium bradshawii* does not form a seed bank, therefore, any loss of pollinators (and subsequent lack of successful reproduction) could have an immediate effect on population numbers (Kaye and Kirkland 1994)...

Studies of the effects of cattle grazing on *Lomatium bradshawii* populations show mixed results. Grazing in the springtime, when the plants are growing and reproducing, can harm the plants by biomass removal, trampling and soil disturbance; however, late-season livestock grazing, after fruit maturation, has been observed to lead to an increase in emergence of new plants, and the density of plants with multiple umbels, although it did not alter survival rates or population structure (Drew 2000). Observed increases in seedlings may be due to small disturbances in the soil, a reduction of shading by nearby plants, and reduced herbivory by small mammals.

The species generally responds positively to disturbance. Low intensity fire appears to stimulate population growth of *Lomatium bradshawii*. The density and abundance of reproductive plants increased following fires (Pendergrass et al. 1999), although monitoring showed the effects to be temporary, dissipating after one to three years. Frequent burns may be required to sustain population growth, as determined from population models (Caswell and Kaye 2001, Kaye et al. 2001).

Extensive research has been conducted on the ecology and population biology of *Lomatium bradshawii*, effective methods for habitat enhancement, and propagation and reintroduction techniques (Kagan 1980, Kaye 1992, Kaye and Kirkland 1994, Kaye and Meinke 1996, Caswell and Kaye 2001, Kaye and Kuykendall 2001b, Kaye et al. 2003b). The results of these studies have been used to direct the management of the species at sites managed for wet prairies.

Propagation studies have found that long-term (8 weeks) cold stratification was necessary to fully break dormancy in this species (Kaye et al. 2003b). *Lomatium bradshawii* plants can be grown from seed in a greenhouse environment (Kaye et al. 2003b). Plants may be successfully established at existing populations or new locations through out-planting of greenhouse-grown plants. Fertilizing transplants may have a negative effect on survival in some cases. Direct seeding has a relatively high success rate (17 to 38 percent), and is improved by removal of competing vegetation (Kaye and Kuykendall 2001b, Kaye et al. 2003b).

White-topped aster (*Sericocarpus rigidus*) – Bureau Sensitive

Sericocarpus rigidus is listed by the Oregon Biodiversity Information Center (ORBIC) as a List 1 species. “List 1 contains taxa that are threatened with extinction or presumed to be extinct throughout their entire range. These are the taxa most at risk, and should be the highest priority for conservation action. Includes many rare Oregon endemic species.”

Sericocarpus rigidus is a perennial herb in the sunflower or daisy family (Asteraceae), with slender creeping rhizomes and generally unbranched stems, topped by terminal clusters of flowering heads. Flowering stems are 10 to 30 centimeters (4 to 12 inches) tall; nonflowering stems are about half as tall. Leaves are alternate and evenly distributed along the stem, oblanceolate and tapering to an essentially sessile base, the lowermost leaves reduced and the largest leaves (2.5 to 3.5 centimeters [1 to 1.5 inches] long) occurring along the center third of the stem. Flowers are inconspicuous, occurring in compact clusters of 5 to 20 small heads. Ray flowers are typically two, 1 to 3 millimeters (0.04 to 0.12 inch) long, and shorter than the pappus; disk flowers are pale yellow with purple anthers. Involucres are 7 to 9 millimeters (0.3 to 0.4 inch) high, narrow, the bracts imbricate in several series, with a strong midrib or slight keel, chartaceous below and with spreading light green herbaceous tips (Hitchcock *et al.* 1955, Gamon and Salstrom 1992).

Populations of *Sericocarpus rigidus* consist of one to many clones of 50 to 1000 ramets; shoots emerge from creeping rhizomes in April, and flowering occurs in July and August (Gamon and Salstrom 1992). Reproduction probably occurs primarily through vegetative means; seedlings have only rarely been observed in the wild (Gamon and Salstrom 1992). The species is pollinated by insects; one butterfly and several types of bees have been observed visiting the flower (Gamon and Salstrom 1992). Populations in Washington are generally not limited by pollinators (Bigger 1999). Although some seed production results when pollinations occur within patches, seed set increases when pollen is moved among patches of plants (Giblin and Hamilton 1999), suggesting that inbreeding depression can limit sexual reproduction in this species.

Sericocarpus rigidus is found from the Willamette Valley in Oregon, northwards through the Puget Trough region of western Washington and into Canada on Vancouver Island, British Columbia... The West Eugene Wetlands in Lane County has at least 16 sites with populations of *Sericocarpus rigidus*... The largest known population in the Willamette Valley [occurs] on land managed by the U.S. Army Corps of Engineers near Fern Ridge Reservoir in Lane County.

Over most of its range, *Sericocarpus rigidus* is found in well-drained upland prairies, oak savannas and woodlands, but also occurs in wet prairie in Lane County (Alverson 1991). Populations are found at elevations of 30 to 175 meters (100 to 575 feet) above sea level, generally on clayey soils (Gamon and Salstrom 1992, Gisler 2004). The taxon has been found on very cobbly loam, very stony silt loam, silt loams, and silty clay loams and gravelly outwash soils (Gamon and Salstrom 1992)... Associated species include *Viola adunca* (western violet), *Potentilla* sp. (cinquefoil), *Prunella vulgaris* var. *lanceolata* (heal-all), *Deschampsia cespitosa*, *Symphotrichum hallii*, and *Lomatium bradshawii* (Meinke 1982).

As with all of the other species addressed in this recovery plan, habitat loss, alteration of disturbance regimes, and habitat invasion by trees, shrubs, and non-native weeds put this species at risk of continued declines (Gisler 2004).

Sericocarpus rigidus has been successfully propagated from seed and from rhizome cuttings (Gisler 2004). Attempts to transplant young plants into natural habitats have been most successful using rhizome cuttings (Kaye and Brandt 2005); in some studies, establishing new populations from seed has shown a low success rate (Clark *et al.* 2001, Kaye and Kuykendall 2001b).

Hitchcock's blue-eyed grass (*Sisyrinchium hitchcockii*) – Bureau Sensitive

Sisyrinchium hitchcockii is listed by the Oregon Biodiversity Information Center (ORBIC) as a List 1 species. "List 1 contains taxa that are threatened with extinction or presumed to be extinct throughout their entire range. These are the taxa most at risk, and should be the highest priority for conservation action. Includes many rare Oregon endemic species."

Sisyrinchium hitchcockii is in the iris family (Iridaceae)... Genetically isolated from all other northwestern blue-eyed grasses, *S. hitchcockii* is the most striking and morphologically distinctive member of the genus in the western states. While *S. hitchcockii* has an elongate rhizome and usually with only one or two stems, the other Pacific Northwest blue-eyed grasses have very compact rhizomes producing single to numerous stems. Additionally, *S. hitchcockii* is the only Pacific Northwest blue-eyed grass that is self-incompatible (Henderson 1976). This species has the largest flowers (up to 20 millimeters [0.8 inch]) and the widest leaves and stems of the genus. The six tepals are approximately 1.2 centimeters (0.5 inch) long, reddish-purple in color with dark purple veins and sometimes yellow at the base. The plant ranges from 35 to 45 centimeters (14 to 18 inches) tall and is usually erect or somewhat recumbent. The basal leaves, approximately 6 millimeters (0.25 inch) wide, are about two-thirds the height of the stem

(Eastman 1990)... *Sisyrinchium hitchcockii* blooms mid-May into July. The species is pollinated by solitary bees... (Henderson 1976).

There are few occurrence records... Information is very sparse and of limited use in gauging population trends. Since potential habitat is declining, it is very likely that the plant species is also declining.

Sisyrinchium hitchcockii has been documented in valley grassland and oak savannas from Humboldt County in northern California to the Willamette Valley, Oregon (Henderson 1976).

Willamette Valley and Umpqua Valley prairies and oak savannas, which are presumed to provide habitat for the species, are threatened by development (residential, industrial and agricultural).

Wayside aster (*Eucephalus vialis*) – Bureau Sensitive

Eucephalus vialis is a 20 to 60 cm (7.8 to 23.6 in.) tall herbaceous perennial rising from a thickened woody stem (caudex) and forming rhizomes. The plant has sessile, lanceolate leaves with irregular teeth. The inflorescence is composed of yellow disk flowers and lacks ray flowers. Flowering usually occurs from mid-July to September. Seedling recruitment appears limited to nonexistent within certain populations. Vegetative reproduction is common within populations making it often difficult to differentiate between individuals.

Eucephalus vialis inhabits coniferous forests at elevations of approximately 152 m (500 ft.) to 2,006 m (6,600 ft.). The species typically occurs on dry upland sites dominated by *Pseudotsuga menziesii* (Douglas-fir) and is usually accompanied by hardwoods of drier forests such as *Arbutus menziesii* (Pacific madrone), *Chrysolepsis chrysophylla* (golden chinquapin), and *Quercus garryana* (Oregon white oak) (Alverson and Kuykendall 1989). It is often found in open forest, forest edge, or small openings.

While current populations of *Eucephalus vialis* occur in sites representative of all stages of succession from recent clear-cuts to mature forest, the species' preferred habitat is thought to have been historically sustained by frequent fire return intervals that create open forest conditions with widely spaced conifers. Particularly important to *Eucephalus vialis* are gaps in the canopy where high light levels allow *Eucephalus vialis* to flower (Alverson and Kuykendall 1989).

There are no additional federally listed plant species known or suspected to occur on the District. A complete list of Bureau Sensitive plants known or suspected on the District is included in **Appendix D**.

Appendix C Literature Cited

USDA and USDI 2006	USDA Forest Service, USDI Bureau of Land Management and USDI Fish and Wildlife Service. 2006. Interagency Conservation Agreement for <i>Eucephalus vialis</i> (Wayside Aster). BLM Eugene, Roseburg, and Medford Districts, USFS Rogue River-Siskiyou National Forest, and USFWS, Roseburg Field Office, Eugene, Oregon. https://www.oregon.gov/oda/shared/Documents/Publications/PlantConservation/EucephalusVialisProfile.pdf .
GeoBO B 2023a	GeoBOB. Geographic Biotic Observations. Data Type: File Geodatabase Feature Class, Internal Database. Feature Class: Fauna_Obs_Poly
GeoBO B 2023b	GeoBOB. Geographic Biotic Observations. Data Type: File Geodatabase Feature Class, Internal Database. Feature Class: Flora_Site_Poly
USDI BLM 2011	Oak Basin Restoration/RAC Project Upper Willamette Resource Area BLM Eugene District Environmental Assessment. DOI-BLM-OR-E060-2011-0005-EA.
USDI FWS 2006	Endangered and threatened wildlife and plants: Designation of critical habitat for the Fender's blue butterfly (<i>Icaricia icarioides fenderi</i>), <i>Lupinus sulphureus</i> ssp. <i>kincaidii</i> (Kincaid's lupine), and <i>Erigeron decumbens</i> var. <i>decumbens</i> (Willamette daisy); final rule. Federal Register 71:63862-63977. October 31, 2006.
USDI FWS 2010	USDI Fish and Wildlife Service. 2010. Recovery Plan for the Prairie Species of Western Oregon and Southwestern Oregon. Portland, OR. https://www.fws.gov/oregonfwo/Species/PrairieSpecies/Documents/PrairieSpeciesFinalRecoveryPlan.pdf
USDI FWS 2014	Biological Opinion on the Resource Management Plan for the West Eugene Wetlands. FWS reference: 01EOFW00-2014-F-0139.

APPENDIX D – Bureau Sensitive Plants on the Northwest Oregon District

Species	Type of Organism ¹	Occurrence on NWO District ²	Habitat
<i>Abronia umbellata</i> ssp. <i>breviflora</i>	VA	D	Coastal dunes and scrub
<i>Agoseris elata</i>	VA	S	Mesic meadow, dry meadow
<i>Agrostis howellii</i>	VA	S	Moist, shady cliffs, canyon walls, talus, swale benches
<i>Albatrellus avellaneus</i>	FU	S	Western hemlock and Sitka spruce forests, on litter/wood
<i>Andreaea schofieldiana</i>	BR	D	Rock outcrop
<i>Anemone oregana</i> var. <i>felix</i>	VA	D	Sphagnum bogs and marshes
<i>Blepharostoma arachnoideum</i>	BR	D	Conifer forest
<i>Botrychium montanum</i>	VA	S	Conifer forest, riparian zone
<i>Brodiaea terrestris</i>	VA	S	Coastal grasslands and woodlands
<i>Bruchia flexuosa</i>	BR	D	Moist soil, fields, grasses
<i>Bryoglossum gracile</i>	FU	S	NW Conifer forests, western hemlock forests
<i>Bryoria bicolor</i>	LI	D	Bark of western red cedar
<i>Bryum calobryoides</i>	BR	S	Rock outcrop, alpine
<i>Calamagrostis breweri</i>	VA	S	Alpine and subalpine meadows
<i>Calicium adspersum</i>	LI	D	Bark of living grand fir, Douglas-fir, white oak, coastal redwood, and red cedar below 2,000 feet elevation
<i>Calypogeia sphagnicola</i>	BR	D	Wet meadow
<i>Cardamine pattersonii</i>	VA	S	Moist mossy cliffs, rocky slopes, banks
<i>Carex brevicaulis</i>	VA	S	Coastal dunes, headlands, rocky or sandy soil
<i>Carex comosa</i>	VA	S	Marshes, lake margins, wet meadows, bogs
<i>Carex livida</i>	VA	S	Wet meadow
<i>Carex macrocephala</i>	VA	D	Coastal sand dunes
<i>Carex retrorsa</i>	VA	S	Floodplain forests, lake shores, swamps, streamsides
<i>Castilleja levisecta</i>	VA	D	Upland prairies; flat and mounded grasslands
<i>Cephaloziella spinigera</i>	BR	S	Wet meadow
<i>Chamonixia caespitosa</i>	FU	D	subalpine coniferous forest
<i>Choiromyces venosus</i>	FU	D	Conifer forest
<i>Cicendia quadrangularis</i>	VA	D	Rock outcrop
<i>Cladidium bolanderi</i>	LI	S	Coastal, ultramafic rock, seashore

Species	Type of Organism ¹	Occurrence on NWO District ²	Habitat
<i>Coptis trifolia</i>	VA	S	Conifer forest
<i>Cortinarius barlowensis</i>	FU	D	Conifer forest
<i>Cortinarius pavelekii</i>	FU	S	Coastal, very narrow range, breaks in soil/duff
<i>Corydalis aquae-gelidae</i>	VA	D	Conifer forest, riparian zone
<i>Cryptogramma stelleri</i>	VA	S	Sheltered cliff crevices and rock ledges in conifer forest
<i>Cyperus acuminatus</i>	VA	S	Disturbed seasonal wetlands
<i>Delphinium nuttallii</i>	VA	S	East side forest, meadow
<i>Delphinium oreganum</i>	VA	D	Will. Valley wet prairies with shrubby ash overstories, roadsides, fencerows
<i>Diphasiastrum complanatum</i>	VA	S	Moist coniferous woods
<i>Diplacus tricolor</i>	VA	S	Wetlands, foothill woodland, valley grassland
<i>Dodecatheon austrofrigidum</i>	VA	D	Basalt cliffs near streams and waterfalls, rotting wood
<i>Encalypta brevipes</i>	BR	S	Rock outcrop
<i>Entoloma occidentale</i>	FU	S	Low elevation mixed conifer-hardwood stands
<i>Entosthodon fascicularis</i>	BR	D	Conifer forest, riparian zone
<i>Ephemerum crassinervium</i>	BR	D	Riparian, forest, meadow
<i>Ephemerum serratum</i>	BR	D	Fine grained soil, mud at margins of reservoirs and rivers, arable fields
<i>Erigeron howellii</i>	VA	S	Steep, north-facing slopes, rock faces, cliff bases and ledges
<i>Eriophorum chamissonis</i>	VA	S	Swamps, wet places west of Cascades crest at mid-elevations
<i>Erythronium elegans</i>	VA	D	Rocky slopes and cliffs in Cascades
<i>Eucephalus gormanii</i>	VA	D	Rock outcrop
<i>Eucephalus vialis</i>	VA	D	Conifer forest, mixed woodland, oak woodland
<i>Filipendula occidentalis</i>	VA	D	Coast, Bedrock crevices, seeps over rocks
<i>Frasera umpquaensis</i>	VA	D	Mesic meadow
<i>Fritillaria camschatcensis</i>	VA	D	Moist tide flats, meadows, open forests, along coast and inland
<i>Gymnomitrion concinnatum</i>	BR	S	Rock outcrop
<i>Gymnomyces fragrans</i>	FU	D	Conifer forest
<i>Gymnomyces nondistincta</i>	FU	S	Mountainous western Oregon

Species	Type of Organism ¹	Occurrence on NWO District ²	Habitat
<i>Haplomitrium hookeri</i>	BR	S	Damp, open ground in full sun
<i>Helvella crassitunicata</i>	FU	S	Conifer forest
<i>Herbertus aduncus</i>	BR	S	Rock outcrop
<i>Heterodermia japonica</i>	LI	D	Coastal grasslands to mossy tree trunks
<i>Heterodermia sitchensis</i>	LI	S	Oregon coast with mountain hemlock and Sitka spruce
<i>Horkelia congesta</i> ssp. <i>congesta</i>	VA	D	Will. Valley meadows and open woods at low elevations
<i>Howellia aquatilis</i>	VA	S	Shallow water at edges of ponds with deciduous trees, incl. cottonwoods
<i>Hydrocotyle verticillata</i>	VA	S	Lake margins, bogs, marshes, seeps
<i>Hydopus marginellus</i>	FU	D	Abies, Pinus, logs
<i>Hypogymnia pulverata</i>	LI	D	Coastal, rivers
<i>Hypotrachyna riparia</i>	LI	D	Near coastal. 1500 feet elevation, headlands, ridges, estuaries, dunes
<i>Iris tenax</i> var. <i>gormanii</i>	VA	D	Moist forest openings, grasslands, roadsides
<i>Juncus kelloggii</i>	VA	D	Wetlands, valley grasslands, foothill woodlands
<i>Kurzia makinoana</i>	BR	S	Stream terraces, flood plains on rotten wood and humic soil
<i>Lathyrus holochlorus</i>	VA	D	Remnant prairies, roadsides, grasslands
<i>Leioderma soledatum</i>	LI	D	Dune woodlands, deflation plains
<i>Lewisia columbiana</i> var. <i>columbiana</i>	VA	S	Rocky slopes, scree
<i>Limbella fryei</i>	BR	S	Coastal wetlands, shrub-swamps
<i>Lobaria linita</i>	LI	D	Conifer forest, rock outcrop
<i>Lomatium bradshawii</i>	VA	D	Prairies, wetlands, oak-grasslands
<i>Lophozia gillmanii</i>	BR	S	Drying pool edges, creeks
<i>Lophozia laxa</i>	BR	S	Bog
<i>Lycopodiella inundata</i>	VA	D	Wet meadow
<i>Marsupella emarginata</i> var. <i>aquatica</i>	BR	S	Riparian zone, aquatic
<i>Meconella oregana</i>	VA	S	Open grassland, forest mosaic
<i>Microcalicium arenarium</i>	LI	D	Conifer forest
<i>Mythicomyces corneipes</i>	FU	S	Conifer forest
<i>Navarretia willamettensis</i>	VA	D	Palustrine, herbaceous wetland, temporary pool
<i>Niebla cephalota</i>	LI	S	Exposed coastal trees
<i>Ophioglossum pusillum</i>	VA	S	Wet meadow

Species	Type of Organism ¹	Occurrence on NWO District ²	Habitat
<i>Orthotrichum hallii</i>	BR	D	Open Doug fir, rocky outcrops
<i>Otidea smithii</i>	FU	D	Coastal, exposed soil, Doug-fir and Hemlock
<i>Pannaria rubiginella</i> *	LI	D	Bark and wood of most habitats along coast
<i>Pannaria rubiginosa</i> *	LI	D	Coastal shrub thickets, wet deflation plains, mature Doug-fir/Hemlock
<i>Pellaea andromedifolia</i>	VA	S	Rock outcrop
<i>Phaeoclavulina abietina</i>	FU	D	Conifer debris in old growth and young forests
<i>Phaeocollybia gregaria</i>	FU	D	Coniferous hosts in Coastal lowlands, valley fringe
<i>Phaeocollybia oregonensis</i>	FU	D	Old-growth conifer forests of silver fir and Doug-fir
<i>Phymatoceros phymatodes</i>	BR	S	Forest/Woodland, grassland, forest edge, thin soils, mid-successional forests
<i>Pilophorus nigricaulis</i>	LI	D	Rock outcrop
<i>Polystichum californicum</i>	VA	S	Conifer forest
<i>Polytrichum strictum</i>	BR	S	Bog
<i>Porella bolanderi</i>	BR	D	Canyons, rocks, and bark of living trees
<i>Preissia quadrata</i>	BR	S	Most mountain and subalpine ledges of limestone
<i>Pseudephemerum nitidum</i>	BR	D	Field edges
<i>Pseudognaphalium californicum</i>	VA	D	Disturbed coastal shrub, chaparral, or woodlands along creekbeds
<i>Pyrrocoma racemosa</i> var. <i>racemosa</i>	VA	D	Alkaline flats and saline meadows
<i>Ramalina labiosorediata</i>	LI	S	Coniferous twigs in Cascades
<i>Rhizopogon alexsmithii</i>	FU	S	Mid to high elevation old growth Tsuga forests
<i>Rhizopogon chamaleontinus</i>	FU	S	High Elevation Hemlock
<i>Rhizopogon clavitisporus</i>	FU	S	Western coniferous forests
<i>Rhizopogon ellipsosporus</i>	FU	S	Doug fir, Ponderosa and downed wood sites
<i>Rhizopogon exiguus</i>	FU	S	Conifer forest following disturbance, seedlings
<i>Rhizopogon inquinatus</i>	FU	S	Conifer forest
<i>Rhizopogon masoniae</i>	FU	S	Conifer forests
<i>Rhynchospora alba</i>	VA	S	Wet meadow

Species	Type of Organism ¹	Occurrence on NWO District ²	Habitat
<i>Ribes laxiflorum</i>	VA	D	Coastal woodlands to mountain slopes
<i>Rivulariella gemmipara</i>	BR	S	Aquatic
<i>Romanzoffia thompsonii</i>	VA	D	Moist rock garden
<i>Rotala ramosior</i>	VA	S	Riparian zone, wet meadow
<i>Russula idahoensis</i>	FU	S	Upper elevation Abies forest, surrounding Will. Valley
<i>Sarcodon fuscoindicus</i>	FU	D	Occurs in moss near western hemlocks
<i>Scapania obscura</i>	BR	S	Peaty soil close to streams below cold-water springs, snow melt
<i>Scheuchzeria palustris</i> ssp. <i>americana</i>	VA	D	Wet meadow
<i>Schoenoplectus subterminalis</i>	VA	S	Pond
<i>Scirpus pendulus</i>	VA	S	Wet ditches, meadows, and swamp margins
<i>Sericocarpus rigidus</i>	VA	D	Prairies and open areas at low elevations
<i>Sidalcea hirtipes</i>	VA	D	Coastal mountains to bluffs along ocean
<i>Sisyrinchium hitchcockii</i>	VA	D	Grassy, vernal moist areas
<i>Sisyrinchium sarmentosum</i>	VA	S	Mesic meadow
<i>Stagnicola perplexa</i>	FU	S	Conifer forest
<i>Stereocaulon spathuliferum</i>	LI	D	Rock pile, shaded rock outcrop
<i>Streptopus streptopoides</i>	VA	S	Dense, damp conifer forests, from mid-elevation to alpine
<i>Sullivantia oregana</i>	VA	S	Moist cliffs, near waterfalls and lower Willamette Valley
<i>Tauschia stricklandii</i>	VA	S	Moist meadows, forest openings and edge at mid-elevations
<i>Teloschistes flavicans</i>	LI	D	Lower end of decay class 3,4, and 5 rotten logs or stumps
<i>Tetraphis geniculata</i>	BR	D	Conifer forest
<i>Tholurna dissimilis</i>	LI	D	Wetland, Meadow
<i>Trematodon asanoi</i>	BR	S	Alpine to sub-alpine, Cascades
<i>Usnea nidulans</i>	LI	S	Coastal, deciduous trees
<i>Utricularia gibba</i>	VA	D	Ponds lakes, shallow water, pools, bogs, marshes
<i>Utricularia ochroleuca</i>	VA	S	Wetland
<i>Wolffia borealis</i>	VA	D	Standing water
<i>Wolffia columbiana</i>	VA	D	Standing water

¹ Type of Organism

NOD IPM-HR EA

DOI-BLM-ORWA-N000-2022-0003-EA

BR = Bryophyte
FU = Fungus
LI = Lichen
VA = Vascular Plant

² Occurrence

D = Documented on Northwest Oregon District
S = Suspected on Northwest Oregon District

APPENDIX E – Protection Measures

Project Design Features (PDFs) applicable to integrated invasive plant management and habitat restoration on the Northwest Oregon District include applicable Standard Operating Procedures, Mitigation Measures, Conservation Measures, and Project Design Criteria originally presented in:

- The 2007 Vegetation Treatments Using Herbicides on BLM Lands in 17 Western States PEIS (USDI BLM 2007a), Record of Decision (USDI BLM 2007b), and Biological Assessment (USDI BLM 2007c)
- The 2007 Vegetation Treatments on BLM Lands in 17 Western States Programmatic Environmental Report (USDI BLM 2007d)
- The 2010 Vegetation Treatments on BLM Lands in Oregon FEIS (USDI BLM 2010a) and Record of Decision (USDI BLM 2010b)
- The 2016 Vegetation Treatments Using Aminopyralid, Fluroxypyr, and Rimsulfuron PEIS (USDI BLM 2016a), Record of Decision (USDI BLM 2016b), and Biological Assessment (USDI BLM 2015d)
- The 2013 National Marine Fisheries Service’s Aquatic Restoration Biological Opinion II (NMFS 2013)
- The 2013 U.S. Fish and Wildlife Service’s Aquatic Restoration Biological Opinion II (USDI FWS 2013a)
- The 2019 U.S. Fish and Wildlife Service’s Biological Opinion for the Integrated Invasive Plant Management, Northwest Oregon District BLM Environmental Analysis (USDI FWS 2019a)

The BLM includes additional Project Design Features applicable to habitat restoration actions for Recovery Plan species and wayside aster, as well as Management Recommendations for potential projects that may occur on BLM-managed land adjacent to occupied and potential habitat for Recovery Plan species and wayside aster.

BLM is predicated the effects described in this EA on application of the Project Design Features unless BLM makes a site-specific determination that their application is unnecessary to achieve their intended purpose or protection, or if the parent handbook or policy direction evolves the new direction would continue to provide the appropriate environmental protections.

Project Design Features

The District would adopt the following Project Design Features during implementation to reduce effects of the action alternatives (unless otherwise noted, Project Design Features are applicable to both Alternatives 2 and 3):

General

Fire Use

- Prepare fire management plan.
- Use trained personnel with adequate equipment.

- Minimize frequent burning in arid environments.
- Minimize 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 prior to working in the project area and prior to moving from weed-infested areas into other areas, to limit movement of weed propagules and avoid infesting 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 herbicides applied by licensed or certified applicators or State-licensed “trainees,” or 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.
- 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.

Land Use

Fire Use

- Carefully plan fires in the wildland urban interface (WUI) to avoid or minimize loss of structures and property.
- Notify nearby residents and landowners when smoke intrusions or other fire effects may affect them.

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 when biological control agents may affect them.

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

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.
- 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

General

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

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 waterbodies.

Mechanical

- Minimize removal of desirable vegetation near residential and domestic water sources.
- Do not wash equipment or vehicles in waterbodies.
- 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 waterbodies.

Biological

- Minimize use of domestic animals near residential or domestic water sources.
- Targeted grazing will occur a minimum of 10m from perennial streams and 10m from intermittent streams if water is present.

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 waterbodies.
- 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 [aquatic] species/populations (see Table E-2 in the Vegetation section).
- Evaluate areas with potential for groundwater for domestic or municipal use through the appropriate, validated model(s) to estimate vulnerability to potential groundwater contamination. Develop appropriate mitigation measures if such an area requires the application of herbicides and cannot otherwise be treated with non-herbicide methods.
- 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 waterbodies. Develop buffer widths based on herbicide and site-specific conditions to minimize impacts to waterbodies.
- 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 the user or owner grants a written waiver.
- 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.
- Buffer intermittent stream channels when there is a prediction of rain (including thunderstorms) within 48 hours.
- Proposals to boom spray herbicides within 200 feet of streams that are within 1,000 feet upstream from a public water supply intake, or proposals to spot apply herbicides within 100 feet of streams that are within 500 feet upstream from a public water supply intake, will include coordination with the Oregon Department of Environmental Quality and the municipality to whom the intake belongs.

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

See also Project Design Features for Water Resources, Vegetation, and Fish

- 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.

Special Status Species⁴¹

See also Project Design Features for Special Status Plants, Special Status Wildlife, and Special Status Fish and Other Aquatic Species subsections of the Vegetation, Wildlife, and Fish and Other Aquatic Species sections

Fire Use

- Survey for Special Status species if project may impact federally listed or Bureau Sensitive species.

⁴¹ Special Status species include species that are federally listed as threatened, endangered, or proposed for listing, as well as Bureau Sensitive species (species that are rare, but are not federally listed or proposed for listing).

- 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.
- Survey for Special Status species if project could impact these species.
- Use temporary roads when long-term access is not required.

Manual

- Survey for Special Status species if project could impact these species.

Biological

- Survey for Special Status species if project could impact these species.

Chemical

- Conduct pre-treatment 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 species when designing herbicide treatment programs.
- Use a selective herbicide whenever possible, 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.

Threatened and Endangered Species

The following Project Design Features would further reduce effects on federally listed plants and animals in the West Eugene Wetlands:

- On BLM-administered lands in the West Eugene Wetlands, follow all Management Standards (Management Directions) outlined in the Biological Opinion for the Resource Management Plan for the West Eugene Wetlands in Lane County, Oregon (USDI FWS 2014).

The following general Project Design Features are applicable in federally listed plant, bird, and butterfly habitat:

- The unit wildlife biologist or botanist is responsible for ensuring that the correct effects determination is made for each project. The unit wildlife biologist may increase or decrease disturbance distances according to the best available scientific information and site-specific conditions. For instance, if a known spotted owl site is surveyed to protocol and the owls are determined to be non-nesting, the unit biologist may determine that no disturbance or

disruption would occur and lift the associated restrictions on activities within disruption distances during the year of survey. The unit botanist may likewise increase or decrease buffer distances for federally listed plant species according to site-specific conditions.

- Before removing spotted owl habitat, consult with the Field Office wildlife biologist who would determine whether spotted owl surveys should be conducted prior to removal to avoid incidental take. The wildlife biologist would consider such things as the type of spotted owl habitat to be removed, time of year during which removal would occur, distance to known nest patch or nest tree, etc. If spotted owl surveys are required, they would occur in the 2 years prior to habitat removal. In spotted owl habitat, cutting of trees greater than one acre results in habitat removal regardless of whether the trees are removed from the site or left on the site.
- Integration of Project Design Criteria (PDC) and Conservation Measures into Project Design and Contract Language – The BLM shall incorporate relevant aquatic and terrestrial conservation measures along with PDCs listed in the BA/BO into environmental analyses, contract language, and all appropriate implementation plans. All activities covered under the *Invasive Plant Management and Habitat Restoration Environmental Analysis* consultation must be designed and implemented consistent with the assumptions and limits found in the description of the proposed action, definitions, and PDCs.
- Technical Skill and Planning Requirements
 - Ensure that an experienced wildlife biologist (if ESA-listed wildlife species are affected) and/or botanist (if ESA-listed plants are affected) is involved in the design of all projects covered by the *Invasive Plant Management and Habitat Restoration EA* BA/ BO. The experience should be commensurate with technical requirements of a project. All covered activities must have the unit's botanist and/or terrestrial wildlife biologist input/analysis of the project design and their site-specific species assessment to proceed.
 - Planning and design includes field evaluations and site-specific surveys as needed to ensure the correct effects determinations are made. Planning and design involve appropriate expertise from staff or experienced technicians (e.g., fisheries biologist, hydrologist, geomorphologist, wildlife biologist, botanist, engineer, silviculturist, forester, fire/fuels specialists, logging systems, and/or civil engineers).
 - The project wildlife biologist/botanist will ensure the incorporation of all project design criteria into environmental analyses, implementation contracts, and on-the-ground execution of projects. If a contractor is implementing treatments, a biologist or botanist must regularly coordinate with the project Contracting Officer Representative to ensure the project design criteria and conservation measures are being followed.
- Conformance with Management Plans – Projects must be in conformance with the applicable management direction and guidance of the resource management plan (BLM 2016d, BLM 2015a) under which they are planned.
- Timing of Mowing and Burning – Where federally listed species are present, timing of mowing and prescribed fire when listed species are present will be consistent with Table E-1, below.

Table E-1. Species-specific timing for mowing and prescribed fire for habitat improvement at project sites occupied by federally listed and recently de-listed plant and pollinator species

Listed Species	Prescribed burns (Calendar Timing)	Mechanical Mowing – Timing [Mower Deck Height]	Spring Mowing Allowed?
Bradshaw’s lomatium ¹	Fall burns after August 15	Fall mowing after August 15 [15 cm (6 inches)]	Yes, with restrictions
Golden paintbrush ²	Fall burns after August 15	Late winter (Feb. to March 15) mowing okay, then mow again after Sept. 15 if site not burned.	Yes, with restrictions. Complete by mid- March
Kincaid’s lupine	Fall burns after August 15	Fall mowing after August 15 [15 cm (6 inches)]	Yes, with restrictions
Nelson’s checkermallow	Fall burns after August 15; up to 50% of an occupied area	Fall mowing after August 15 [15 cm (6 inches)]	Yes, with restrictions
Water howellia ³	Not proposed	Not allowed	No
Willamette daisy	Fall burns after August 15	Fall mowing after August 15 [15 cm (6 inches)]	Yes, with restrictions
Fender’s blue butterfly	Burning okay on 25-33% of an occupied area ⁴ from August 15 – Nov. 15	Fall mowing after August 15 to March 1 [15 cm (6 inches)]	No
Oregon silverspot butterfly	Burning okay on 25-33% of an occupied area ³ from Oct. 1 – mid-July	Oct 1 to mid-May. No more than 75% of an occupied area	Yes, complete by May 15
Taylor’s checkerspot butterfly	Burning okay on 25-33% of an occupied area ³ during diapause only (Sept. 10 – Feb. 15)	Mowing okay during diapause (Sept. 10 – Feb. 15)	No

1. De-listed April 7, 2021

2. De-listed July 19, 2023

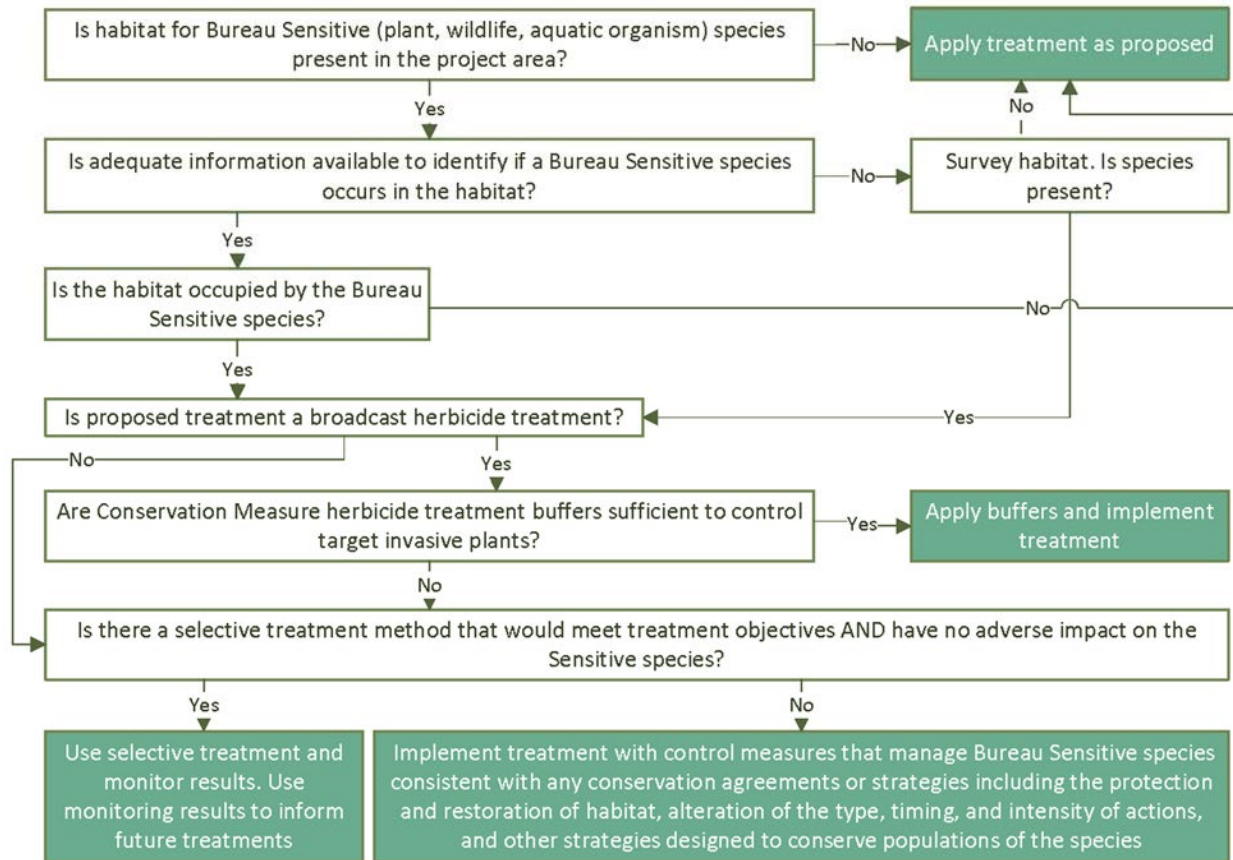
3. De-listed July 16, 2021

4. Prescribed fire would be implemented on 25% of occupied site with fewer than 100 individuals and 33% of occupied sites with 100 or more individuals.

Bureau Sensitive Species

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

Figure E-1. Bureau Sensitive Species Treatment Conditions



Source: 2018 IIPM EA.

Vegetation

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, or as directed by the unit botanist, 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, or as directed by the unit botanist, 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, or as directed by the unit botanist, 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, or as directed by the unit botanist, 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.
- Establish appropriate (herbicide-specific) buffer zones (Tables E-2 and E-3) around downstream waterbodies, 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.

Table E-2. Buffer distances to minimize risk to vegetation from off-Site drift of BLM-evaluated herbicides

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

1. Low boom is 20 inches above ground.

Note: 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 E-3. Buffer distances to minimize risk to vegetation from off-site drift of Forest Service-evaluated herbicides

Application Scenario	Dicamba	Clopyralid	Glyphosate	Hexazinone	Imazapyr	Metsulfuron methyl	Picloram	Triclopyr
Buffer Distance (feet) from Susceptible Plants¹								
Typical Rate - Low Boom	300	900	50	NE	900	900	>900	300
Maximum Rate - Low Boom	900	1 000	300	NE	>900	>900	>900	>900
Buffer Distance (feet) from Tolerant Terrestrial Plants								
Typical Rate - Low Boom	0	0	25	0	25	25	25	NE
Maximum Rate - Low Boom	0	25	25	100	50	25	25	NE

1. Project Design Features for Bureau Sensitive or federally listed species use these buffer distances.

Notes: 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.

NE = Not evaluated.

- Use Table E-4 to establish herbicide-specific buffer zones around downstream waterbodies 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.

Table E-4. Buffer distances (in feet) to minimize risk to non-target vegetation from off-site drift

Application Scenario	Aminopyralid	Fluroxypyr	Rimsulfuron
Buffer Distance (feet) from Non-Target Terrestrial Plants			
Typical Rate - Low Boom ¹	25	100	100
Maximum Rate - Low Boom	100	400	400
Buffer Distance (feet) from Terrestrial Threatened, Endangered, and Sensitive Plants			
Typical Rate - Low Boom	100	100	100
Maximum Rate - Low Boom	400	600	400
Buffer Distance (feet) from Non-Target Aquatic Plants²			
Typical Rate - Low Boom	NA	NA	100
Maximum Rate - Low Boom	NA	NA	100

1. 20 inches above ground.

2. Aquatic plants in ponds and streams were considered in the Ecological Risk Assessments. This table presents the largest buffer distances.

Notes: Buffer distances are the smallest modeled distance at which no risk was predicted. In some cases, buffer distances were extrapolated if the largest distance modeled still resulted in risk, or interpolated if greater precision was required.

NA means that no buffers are required, since direct spray of plants was not predicted to result in adverse effects. However, a direct spray into an aquatic habitat is not an approved use of these herbicides.

Special Status Plants

See also Project Design Features for Special Status Species.

Threatened and Endangered Plants

- 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. Some possible examples could include:
 - Not applying shade cloth, solarization, tilling/disking closer than 6 feet to listed plant species.

- Not operating heavy machinery within 6 feet of federally listed plants during their growing season (generally February to August).
 - Avoiding using heavy machinery in areas wet enough that the machinery causes permanent rutting/changes to hydrology at the site.
- Collection of baseline information on the existing condition of Threatened, Endangered, and Proposed for listing (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.
- 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.
- Do not conduct herbicide treatments in areas where TEP plant species may be subject to direct spray by herbicides during treatments.
 - Examples of methods to avoid direct spray by herbicides could include distance buffers, baffling systems, physical barriers, or other methods to prevent listed plants from coming into contact with herbicides.
- 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).
- Establish suitable buffer zones between treatment sites and populations (confirmed or suspected) of TEP plant species and take site-specific precautions (refer to the guidance provided below) to avoid negative effects to TEP plant species from off-site drift, surface runoff, and/or wind erosion.
- Within patches of listed plants, application of non-selective herbicides would occur in fall when listed plants are dormant. Occasional within-patch treatments could occur anytime, but listed plants would be protected as described in the previous Project Design Feature.
- 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 increase the likelihood of spray drift or surface runoff.
- For lands managed under the RMP, manage habitat to maintain populations of ESA-listed,

proposed, and candidate plant species (USDI BLM 2016d:87). See Table E-1 for a list of federally threatened and endangered plant species that this consultation considers.

- For lands managed under the RMP, prior to implementing actions (other than fire management operations in response to unplanned ignitions or escaped prescribed fires) that could result in habitat modification or species disturbance in the suitable habitat of any ESA-listed, proposed, or candidate plant species, or Bureau Sensitive plant species, conduct surveys to determine species presence. Utilize information on known sites of ESA-listed plants when conducting fire management operations that could result in habitat modification or species disturbance. In addition to pre-project surveys, conduct additional surveys on BLM-administered lands for ESA-listed, proposed, and candidate plant species within suitable habitat as needed to find new populations (RMP:87).
- 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 one-quarter 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. The unit botanist will conduct this visit and survey 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 E-5).

Table E-5. Survey times for flowering periods of federally listed and recently delisted plants in Oregon

Species	Optimal Survey Time Period*
Bradshaw's lomatium (delisted April 4, 2021)	April to mid-May
Golden paintbrush	April to September
Kincaid's lupine	May through June
Nelson's checkermallow	Late May to mid-July
Water howellia (delisted July 16, 2021)	June through August
Willamette daisy	Mid-June to early July

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

- Wash vehicles and equipment prior to working in the project area and prior to moving from weed-infested areas into other areas, to limit movement of weed propagules and avoid infesting weed-free areas.
- Seed with native species to meet diversity recovery targets, especially after ground-disturbing activities.
- On sites with federally listed plants, generally mow in the late summer, fall, and winter, after listed plants have senesced for the season (generally after August 15 through February). Mowing height will be sufficiently high to avoid soil gouging or displacement (generally 6 inches on deck-set mowers).
- When feasible, prescribed fire for sites with listed plants, butterflies, and remnant prairie vegetation should be of low intensity, and take place on cool, cloudy days later in the dry season. Woody vegetation may be removed from the treatment area prior to burning.

Bureau Sensitive Plants

General and Non-Chemical

- Required treatment 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 Bureau Sensitive plant species and their habitats in the proposed project area.
 - Establishment of pre-treatment monitoring programs to track the size and vigor of Bureau Sensitive populations and the state of their habitats. These monitoring programs would help in anticipating the future effects of vegetation treatments on Bureau Sensitive plant species.
 - Assessment of the need for site revegetation post treatment to minimize the opportunity for noxious weed invasion and establishment.
- Given the high risk for damage to Bureau Sensitive 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 Bureau Sensitive 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 Bureau Sensitive 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 Bureau Sensitive species made.
- Conduct post-treatment monitoring to determine the effectiveness of the project.
- 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 Bureau Sensitive species, non-native species should not be used for revegetation.
- Use certified noxious weed free seed in suitable habitat and give preference 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.

Chemical

- Herbicide treatments should not be conducted in areas where Bureau Sensitive plant species may be subject to direct spray by herbicides during treatments.
- Applicators should review, understand, and conform to the “Environmental Hazards” section on herbicide labels (this section warns of known pesticide risks and provides practical ways to avoid harm to organisms or the environment).
- To avoid negative effects to Bureau Sensitive 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 Bureau Sensitive plant species, and site-specific precautions should be taken (refer to the guidance provided below).
- All instructions should be followed to avoid spill and direct spray scenarios into aquatic habitats that support Bureau Sensitive plant species.
- All BLM operating procedures should be followed for avoiding herbicide treatments during climatic conditions that would increase the likelihood of spray drift or surface runoff.

The following Project Design Features 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/botanists that this method of herbicide application would not pose risks to Bureau Sensitive plant species in the vicinity.

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 Bureau Sensitive aquatic plant species occur.
- Do not use aquatic formulations in aquatic habitats where Bureau Sensitive aquatic plant species occur.
- Assess local site conditions when evaluating the risks from surface water runoff to Bureau Sensitive plants located within ½-mile downgradient from the treatment area.
- In areas where wind erosion is likely, do not apply within ½ mile of Bureau Sensitive plant species.

Aminopyralid

- If using a low boom at the typical application rate, do not apply within 100

feet of Bureau Sensitive terrestrial plants.⁴²

- If using a low boom at the maximum application rate, do not apply within 400 feet of Bureau Sensitive terrestrial plants.
- In areas where wind erosion is likely, do not apply within 1.2 miles of Bureau Sensitive 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 Bureau Sensitive species.
- Do not apply by ground methods within 25 feet of aquatic habitats where Bureau Sensitive plant species occur.
- In areas where wind erosion is likely, do not apply within ½ mile of Bureau Sensitive plant species.

Clopyralid

- Use only a low boom during ground applications of this herbicide within ½ mile of terrestrial Bureau Sensitive plant species or aquatic habitats in which Bureau Sensitive plant species occur.
- Do not apply by ground methods at the typical application rate within 900 feet of terrestrial Bureau Sensitive species.
- Do not apply by ground methods at the maximum application rate within ½ mile of terrestrial Bureau Sensitive species.
- In areas where wind erosion is likely, do not apply within ½ mile of Bureau Sensitive plant species.

Dicamba

- If using a low boom at the typical application rate, do not apply within 1,050 feet of terrestrial Bureau Sensitive plant species.
- If using a low boom at the maximum application rate, do not apply within 1,050 feet of terrestrial Bureau Sensitive plant species.
- Do not apply within 25 feet of aquatic habitats where Bureau Sensitive plant species occur.
- In areas where wind erosion is likely, do not apply within ½ mile of Bureau Sensitive plant species.

Diflufenzopyr

- If using a low boom at the typical application rate, do not apply within 100 feet of terrestrial Bureau Sensitive plant species.
- If using a low boom at the maximum application rate, do not apply within 900 feet of terrestrial Bureau Sensitive plant species.
- Do not apply within 25 feet of aquatic habitats where Bureau Sensitive plant species occur.

⁴² 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 Bureau Sensitive plant species.

Fluroxypyr

- If using a low boom at the typical application rate, do not apply within 100 feet of Bureau Sensitive terrestrial plants.
- If using a low boom at the maximum application rate, do not apply within 600 feet of Bureau Sensitive terrestrial plants.
- In areas where wind erosion is likely, do not apply within 1.2 miles of Bureau Sensitive plant species (an alternative suitable buffer may be developed at the local level based on an analysis of site conditions).

Glyphosate

- Use only a low boom during ground applications of this herbicide within ½ mile of terrestrial Bureau Sensitive plant species.
- Do not apply by ground methods at the typical application rate within 50 feet of terrestrial Bureau Sensitive plant species.
- Do not apply by ground methods at the maximum application rate within 300 feet of terrestrial Bureau Sensitive plant species.

Hexazinone

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

Imazapic

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

Imazapyr

- Use only a low boom for ground applications of this herbicide within ½ mile of terrestrial Bureau Sensitive plant species or aquatic habitats in which Bureau Sensitive plant species occur.
- Do not apply at the typical application rate within 900 feet of terrestrial Bureau Sensitive plantspecies or aquatic habitats in which aquatic Bureau Sensitive species occur.
- Do not apply at the maximum application rate within ½ mile of terrestrial Bureau Sensitive plantspecies or aquatic habitats in which aquatic Bureau

Sensitive species occur.

- Do not use aquatic formulations in aquatic habitats where Bureau Sensitive aquatic plant species occur.
- In areas where wind erosion is likely, do not apply within ½ mile of Bureau Sensitive plant species.

Metsulfuron Methyl

- Use only a low boom for ground applications of this herbicide within ½ mile of terrestrial Bureau Sensitive plant species or aquatic habitats in which Bureau Sensitive plant species occur.
- Do not apply at the typical application rate within 900 feet of terrestrial Bureau Sensitive plant species or aquatic habitats in which aquatic Bureau Sensitive species occur.
- Do not apply at the maximum application rate within ½ mile of terrestrial Bureau Sensitive plant species or aquatic habitats in which aquatic Bureau Sensitive species occur.
- In areas where wind erosion is likely, do not apply within ½ mile of Bureau Sensitive plant species.

Di flufenzopyr + dicamba

- If using a low boom at the typical application rate, do not apply within 100 feet of terrestrial Bureau Sensitive plant species.
- If using a low boom at the maximum application rate, do not apply within 900 feet of terrestrial Bureau Sensitive plant species.
- Do not apply within 25 feet of aquatic habitats where Bureau Sensitive plant species occur.
- In areas where wind erosion is likely, do not apply within ½ mile of Bureau Sensitive plant species.

Picloram

- Do not apply by ground methods, at any application rate, within ½ mile of terrestrial Bureau Sensitive plant species.
- Assess local site conditions when evaluating the risks from surface water runoff to Bureau Sensitive plants located within ½-mile downgradient from the treatment area.
- In areas where wind erosion is likely, do not apply within ½ mile of Bureau Sensitive plant species.

Rimsulfuron

- If using a low boom at the typical application rate, do not apply within 200 feet of Bureau Sensitive terrestrial plants.
- If using a low boom at the maximum application rate, do not apply within 400 feet of Bureau Sensitive terrestrial plants.
- In areas where wind erosion is likely, do not apply within 1.2 miles of Bureau Sensitive 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 Bureau Sensitive plant species from surface runoff.

Sulfometuron Methyl

- Do not apply by ground methods within 1,500 feet of terrestrial Bureau Sensitive species.
- Do not apply by ground methods within 900 feet of aquatic habitats where Bureau Sensitive plant species occur.
- In areas where wind erosion is likely, do not apply within ½ mile of Bureau Sensitive plant species.

Triclopyr Acid

- Use only a low boom during ground applications of this herbicide within ½ mile of terrestrial Bureau Sensitive plant species.
- Use only a low boom during ground applications at the maximum application rate of this herbicide within ½ mile of aquatic habitats in which Bureau Sensitive plant species occur.
- Do not apply by ground methods at the typical application rate within 300 feet of terrestrial Bureau Sensitive plant species.
- Do not apply by ground methods at the maximum application rate within ½ mile of terrestrial Bureau Sensitive plant species or aquatic habitats in which Bureau Sensitive plant species occur.
- If applying to aquatic habitats in which aquatic Bureau Sensitive 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 Bureau Sensitive plant species.

Triclopyr BEE

- Use only a low boom for ground applications of this herbicide within ½ mile of terrestrial Bureau Sensitive plant species or aquatic habitats in which Bureau Sensitive plant species occur.
- Do not apply by ground methods at the typical application rate within 300 feet of terrestrial Bureau Sensitive plant species or aquatic habitats in which Bureau Sensitive plant species occur.
- Do not apply by at the maximum application rate within ½ mile of terrestrial Bureau Sensitive plant species or aquatic habitats in which Bureau Sensitive plant species occur.
- Do not use aquatic formulations in aquatic habitats where Bureau Sensitive aquatic plant species occur.
- In areas where wind erosion is likely, do not apply within ½ mile of Bureau Sensitive 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 Bureau Sensitive species must be made with the assumption that effects of the herbicides are at a minimum additive.

Wildlife Resources

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.
- Minimize the size of application areas, where practical, when applying 2,4-D and Overdrive®⁴³ to limit impacts to wildlife, particularly through contamination of food items.
- Where practical, limit glyphosate and hexazinone to spot applications in grazing land and wildlife habitat areas to avoid contamination of wildlife food items.
- Do not use the adjuvant R-11.
- Reduce impacts to wildlife from herbicide applications by treating habitat during times when

⁴³ Overdrive is a trade name for a formulation of diflufenzopyr + dicamba.

the animals are not present or are not breeding, migrating, or confined to localized areas (such as crucial winter range).

- When treating native plants in areas where herbivores are likely to congregate, choose herbicides with lower risks due to ingestion. This Project Design Feature 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.
- 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.
- 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.
- Use of adjuvants with limited toxicity and low volumes is recommended for applications near aquatic habitats.

Chemical Use in Pollinator Habitat

- 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 that pollinator species' habitats.

Special Status Wildlife

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

(See also Project Design Features for *Special Status Species*.)

Threatened and Endangered Wildlife

Northern Spotted Owl

- To reduce adverse effects to spotted owl, projects will not generally occur during the

critical breeding period⁴⁴ within the disruption distances of known owl sites with detections in the year of herbicide application, if protocol surveys have been conducted. If protocol surveys have not been conducted in the year of herbicide application and application occurs in or within disruption distance of suitable habitat, projects should be delayed until after the critical breeding season or until it is determined that young are not present.

- The unit wildlife biologist may extend the restricted season based on site-specific information (such as a late or recycle nesting attempt).
- Disturbing activities (i.e., use of chainsaws, weed whackers, brush hogs, or other loud equipment) that persist for more than one day in duration may not occur during the critical breeding period within 65 yards of the nest tree (or from the edge of the nest patch if the nest tree is not known) of an occupied site or unsurveyed nesting/roosting habitat with the potential to have breeding spotted owls (as determined by the unit wildlife biologist).
- No activity within the treatment area will cause adverse effects to spotted owl critical habitat as determined by the unit wildlife biologist.

Marbled Murrelet

- Disturbing activities (i.e., use of chainsaws, weed whackers, brush hogs, or other loud equipment) that persist for more than one day in duration may not occur during the critical breeding season (April 1 through September 15) within one-quarter mile of occupied suitable murrelet habitat or unsurveyed suitable habitat. Said activities may occur as close as 110 yards from said habitat between August 6 to September 15, as long as they do not begin until 2 hours after sunrise and end 2 hours before sunset.
- No suitable, potential, or critical marbled murrelet habitat is to be removed or downgraded as part of this action.
- Secure or remove garbage containing food and food trash generated by workers in project areas to minimize attraction of corvids, which have been identified as predators of murrelet eggs and young.

Fender's Blue Butterfly, Oregon Silverspot Butterfly, Taylor's Checkerspot Butterfly, Streaked Horned Lark

The West Eugene Wetlands biological opinion included the following Project Design Features (USDI FWS 2015a). BLM includes them here as they are also applicable for butterfly and lark habitat outside of the West Eugene Wetlands.

- Prior to implementing actions that could result in habitat modification or species disturbance in habitat for the Fender's blue butterfly, Oregon silverspot butterfly, Taylor's checkerspot butterfly, or streaked horned lark, conduct surveys to determine species presence.
- Manage Fender's blue butterfly, Oregon silverspot butterfly, Taylor's checkerspot butterfly, and streaked horned lark consistent with recovery plans, conservation

⁴⁴ North Coast Physiographic Province (Tillamook, Marys Peak, Siuslaw FOs): March 1 through July 7; West Cascades Physiographic Province (Cascades, Upper Willamette FOs): March 1 through July 15.

agreements, designated critical habitat, and species-specific and project-specific conservation measures developed with the FWS.

- Manage designated critical habitat for Fender's blue butterfly, Oregon silverspot butterfly, and Taylor's checkerspot butterfly, consistent with recovery plans, conservation agreements, designated critical habitat, and species-specific and project-specific conservation measures developed with the FWS.
- On sites with listed butterflies, do not mow with tractor mowers in the spring. Mowing with hand-held mowers may be implemented during the butterfly flight season (generally May 1 to June 30) as long as a buffer of at least 25 feet is maintained between the mower and any host plant species. After the butterfly flight season, but before host plant senescence (generally June 30 through August 15), mowing may occur no closer than 6 feet from the nearest host plants. Tractor mowing may be conducted throughout sites with Fender's blue butterflies after host plant senescence and before host plant re-emergence (generally August 15 through March 1). Set tractor mower decks at least 6 inches above the ground to reduce impacts to butterfly larvae.
- At sites with 100 or more listed butterflies, use prescribed fire and/or rake no more than one-third of the occupied habitat actively used by butterflies annually. At sites with less than 100 individuals, burn and/or rake no more than one-quarter of the occupied habitat actively used by butterflies annually.
- Do not mow within ground-nesting and other key bird breeding areas during the nesting season (generally April 15 through July 15). If streaked horned larks are found to be nesting, a buffer will be created around breeding pairs until August 10.
- Do not use 2,4-D in the habitat of federally listed butterfly species.
- When conducting herbicide treatments in or near habitat used by federally listed butterflies, 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 federally listed butterfly habitat, use the typical, rather than the maximum, application rate.

Gray Wolf

From USDI FWS 2023, pp. 63-64:

1. For projects located within established Areas of Known Wolf Activity (AKWA):
 - a. If the den and/or rendezvous site(s) are known, apply the following: All activities that may affect wolf breeding due to habitat modification or disruption, including noise and smoke generating activities, will be restricted within one mile of a known den or rendezvous site from April 1 through July 15. BLM wildlife biologists will maintain knowledge of wolf presence through coordination with the FWS and ODFW (Oregon Department of Fish and Wildlife).
 - b. If the den and/or rendezvous site(s) are not known, before project implementation, BLM will seek technical assistance from the FWS to determine any next steps, including any need for formal consultation.

2. For projects located outside established AKWAs:

- a. If there is no evidence of wolf presence within one mile of the project, implement project (NLAA outcome). Wolf presence includes any information on wolves within at least one mile of the project area (including potential dispersing individuals). Coordinate with the FWS Level 1 team member regarding lesser or greater distances that could apply based on site specific information.
- b. If there is evidence of wolf presence within one mile of the project, before project implementation, BLM will seek technical assistance from the FWS to determine any next steps, including any need for formal consultation.

From USDI BLM 2007c (Biological Assessment):

- Avoid human disturbance and/or associated activities within 1 mile of a den site during the breeding period (as determined by a qualified biologist).
- Avoid human disturbance and/or associated activities within 1 mile of a rendezvous site during the breeding period (as determined by a qualified biologist).
- Do not use 2,4-D in areas where gray wolves are known to occur; do not broadcast spray within ¼ mile of areas where gray wolves are known to occur.
- Where feasible, avoid use of the following herbicides in gray wolf habitat: bromacil, clopyralid, diquat, diuron, glyphosate, hexazinone, imazapyr, metsulfuron methyl, picloram, and triclopyr.
- Do not broadcast spray clopyralid, diuron, glyphosate, hexazinone, picloram, or triclopyr in gray wolf habitat; do not broadcast spray these herbicides in areas adjacent to gray wolf habitat under conditions when spray drift onto the habitat is likely.
- If broadcast spraying bromacil, diquat, imazapyr, or metsulfuron methyl in or near gray wolf habitat, apply at the typical, rather than the maximum, application rate.
- If conducting manual spot applications of glyphosate, hexazinone, or triclopyr to vegetation in gray wolf habitat, utilize the typical, rather than the maximum, application rate.

Bureau Sensitive Species - Wildlife

- Survey for western pond turtles and painted turtles before applying bottom barriers/weed mats or diver- assisted suction harvest/tractors in the habitat of these species⁴⁵ (e.g., ponds and streams/rivers with pools and/or coves). If either species is present, restrict these types of treatments to occur only between May 7 and July 15 or between August 15 and September 15.
- Survey for foothill yellow-legged frog and Harlequin duck if applying aquatic treatments in the habitat of these species.
- If surveys are not feasible and Bureau Sensitive Species habitat is present, assume occupancy and implement conservation measures to minimize effects to Bureau

⁴⁵ This can be identified during the interdisciplinary team review of the Annual Treatment Plan.

Sensitive Species in unsurveyed habitat. Conservation measures include altering the type, timing, location, and intensity of management actions (USDI BLM 2016d).

- Apply Project Design Features applicable to butterflies and moths, as appropriate, for other Bureau Sensitive terrestrial invertebrates.
- Use an integrated pest management approach when designing programs for managing pest outbreaks.
- Bureau Sensitive Species - Moths and Butterflies
- Survey treatment areas for Bureau Sensitive butterflies/moths and their host/nectar plants (suitable habitat) at the appropriate times of year.
- If surveys are not feasible and Bureau Sensitive Species habitat is present, assume occupancy and implement conservation measures to minimize effects to Bureau Sensitive Species in unsurveyed habitat. Conservation measures include altering the type, timing, location, and intensity of management actions (USDI BLM 2016d).
- Minimize the disturbance area with a pre-treatment survey to determine the best access routes. Avoid areas with butterfly/moth host plants and/or nectar plants.
- Minimize mechanical treatments and off-highway vehicle activities on sites that support host and/or nectar plants.
- Carry out vegetation removal in small areas, creating openings of five acres or less in size.
- Avoid burning all of a species' habitat in any one 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 two-year recovery period before burning an adjacent parcel.
- Where feasible, mow or wet around patches of larval host plants within the burn unit to reduce impacts to larvae.
- In Bureau Sensitive 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 bringing it 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 Project Design Features for Bureau Sensitive 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 Bureau Sensitive butterflies or moths; do not broadcast spray herbicides in areas adjacent to Bureau Sensitive butterfly/moth habitat under conditions when spray drift onto the habitat is likely.
- Do not use 2,4-D in Bureau Sensitive butterfly/moth habitat.
- When conducting herbicide treatments in or near habitat used by Bureau Sensitive 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 Bureau Sensitive butterfly or moth habitat, utilize the typical, rather than the maximum, application rate.

Fish and Other Aquatic Species

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 waterbodies 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 waterbodies 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 waterbodies to minimize sediments entering water and potential for damage to fish habitat.

Chemical

- Outside of BLM-administered land at the West Eugene Wetlands, confine the use of fluazifop-p-butyl to flat, dry ground located greater than 300 feet from any surface water connected to a stream network to prevent herbicide mobilization.
- Delay aquatic herbicide treatments in side channels and connected backwaters until they are disconnected from the mainstem river or during the period of lowest flow.
- When using aquatic 2,4-D, glyphosate, imazapyr, or triclopyr in closed aquatic systems, implement a phased treatment (treating less than 50 percent of the surface area of the pond at a time) to reduce the likelihood of all of the aquatic plants dying at the same time, which would result in a rapid depletion of dissolved oxygen.
- Use appropriate buffer zones based on label and Risk Assessment guidance.
- Minimize treatments near fish-bearing waterbodies 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/methods near waterbodies if the potential for off-site drift exists.
- Refill herbicide application tanks a minimum of 150 ft from water sources to minimize

accidental spill into water bodies.

- 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.
- Establish appropriate herbicide-specific buffer zones for waterbodies, habitats, or fish or other aquatic species of interest (Table E-6 and recommendations in individual Ecological Risk Assessments).

Table E-6. Buffer distances to minimize risk to fish and aquatic invertebrates from off-site drift of BLM-evaluated herbicides

Application Scenario	Chlorsulfuron	Imazapic	Diflufenzopyr +Dicamba	Sulfometuron methyl
Typical Rate - Low Boom	0	0	0	0
Maximum Rate - Low Boom	0	0	0	0

Notes: See Table E-7 for buffer distances for Special Status fish and aquatic species.

Boom height= The Tier I ground application model allows selection of a low (20 inches) or a high (50 inches) boom height.

- 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.
- At the local level, consider effects to Special Status fish and other aquatic organisms when designing treatment programs.
- Use of adjuvants with limited toxicity and low volumes is recommended for applications near aquatic habitats.

Special Status Fish and Other Aquatic Species

(See also Project Design Features for *Special Status Species*.)

Threatened and Endangered Fish

- For treatments within the same watershed as listed resident fish habitat follow all Project Design Criteria outlined in the Fish and Wildlife Service's ARBO II (USDI FWS 2013a) except where updated through additional consultation with NMFS.
- Delay treating side channels and connected backwaters until they are disconnected from the mainstem river or during the period of lowest flow.
- When using aquatic 2,4-D, glyphosate, imazapyr, or triclopyr in closed aquatic systems, implement a phased treatment (treating less than 50 percent of the surface area of the pond at a time) to reduce the likelihood of all of the aquatic plants dying at the same time, which would result in a rapid depletion of dissolved oxygen.

Additional Project Design Features for federally listed anadromous fish were taken from ARBO II (NMFS 2013) and presented below as originally presented in ARBO II. Bracketed text was added for clarification purposes.

Proposed Action

Program Administration

Non-native Invasive Plant Control includes manual, mechanical, biological, and chemical methods to remove invasive non-native 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** – Non-native invasive plant control projects will not exceed 10% of acres within a Riparian Reserve under the Northwest Forest Plan (USDA and USDI 1994a) or RHCA under PACFISH/INFISH (USDA Forest Service 1995; USDA and USDI 1994b) within a 6th HUC/year.
- b) **Manual Methods** – Manual treatments are those done with hand tools or hand-held motorized equipment. These treatments typically involve a small group of people in a localized area. Vegetation disturbance varies from cutting or mowing to temporarily reduce the size and vigor of plants to removal of entire plants. Soil disturbance is minimized by managing group size and targeting individual plants.
- c) **Mechanical Methods** – Mechanical treatments involve the use of motorized equipment and vary in intensity and impact from mowing to total vegetation removal and soil turnover (plowing and seed bed preparation). Mechanical treatments reduce the number of people treating vegetation. Impacts could be lessened by minimizing the use of heavy equipment in riparian areas, avoiding treatments that create bare soil in large or extensive areas, reseeding and mulching following treatments, and avoiding work when soils are wet and subject to compaction.
- d) **Biological Methods** – Release of traditional host-specific biological control agents (insects and pathogens) consists of one or two people depositing agents on target vegetation. This results in minimal impact to soils and vegetation from the actual release. Over time, successful biological control agents will reduce the size and vigor of host noxious weeds with minimal or no impact to other plant species.
- e) **Chemical Methods** – Invasive plants, including State-listed noxious weeds, are particularly aggressive and difficult to control and may require the use of herbicides for successful control and restoration of riparian and upland areas.

Herbicide treatments vary in impact to vegetation from complete removal to reduced vigor of specific plants. Minimal impacts to soil from compaction and erosion are expected.

i. General Guidance

1. Use herbicides only in an integrated weed or vegetation management context where all treatments are considered, and various methods are used individually or in concert to maximize the benefits while reducing undesirable effects.
2. Carefully consider herbicide impacts to fish, wildlife, non-target native plants, and other resources when making herbicide choices.
3. Treat only the minimum area necessary for effective control.
4. Herbicides may be applied by selective, hand-held, backpack, or broadcast equipment in accordance with State and Federal law and only by certified and licensed applicators to specifically target invasive plant species.
5. Herbicide application rates will follow label direction, unless site-specific analysis determines a lower maximum rate is needed to reduce non-target impacts.
6. An herbicide safety/spill response plan is required for all projects to reduce the likelihood of spills, misapplication, reduce potential for unsafe practices, and to take remedial actions in the event of spills. Spill plan contents will follow agency direction.
7. Pesticide applicator reports must be completed within 24 hours of application.

ii. **Herbicide Active Ingredients** – Active ingredients are restricted to the following (some common trade names are shown in parentheses; use of trade names does not imply endorsement by the US government):⁴⁶

1. 2,4-D (e.g., aquatic: 2,4-D Amine, Clean Amine; terrestrial: Weedone, Hi-Dep)
2. aminopyralid (e.g., terrestrial: Milestone VM)
3. chlorsulfuron (e.g., terrestrial: Telar, Glean, Corsair) (c)
4. clopyralid (e.g., terrestrial: Transline)
5. dicamba (e.g., terrestrial: Vanquish, Banvel)
6. diflufenzopyr + dicamba (e.g., terrestrial: Overdrive)
7. glyphosate (e.g., aquatic: Aquamaster, AquaPro, Rodeo, Accord) (g) imazapic (e.g., terrestrial: Plateau)
8. imazapic (e.g., terrestrial: Plateau)
9. imazapyr (e.g., aquatic: Habitat; terrestrial: Arsenal, Chopper)
10. metsulfuron methyl (e.g., terrestrial: Escort)
11. picloram (e.g., terrestrial: Tordon, Outpost 22K)
12. sethoxydim (e.g., terrestrial: Poast, Vantage)
13. sulfometuron methyl (e.g., terrestrial: Oust, Oust XP)

⁴⁶ 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.

14. triclopyr (e.g., aquatic: Garlon 3A, Tahoe 3A, Renovate 3, Element 3A; terrestrial: Garlon 4A, Tahoe 4E, Pathfinder II)
- iii. **Herbicide Adjuvants** – When recommended by the label, an approved aquatic surfactant would be used to improve uptake. When aquatic herbicides are required, the only surfactants and adjuvants permitted are those allowed for use on aquatic sites, as listed by the Washington State Department of Ecology: <http://www.ecy.wa.gov/programs/wq/pesticides/regpesticides.html>. (Oregon Department of Agriculture also often recommends this list for aquatic site applications). The surfactants R-11, Polyethoxylated tallow amine (POEA), and herbicides that contain POEA (e.g., Roundup) will not be used.
- iv. **Herbicide Carriers** – Herbicide carriers (solvents) are limited to water or specifically labeled vegetable oil.
- v. **Herbicide Mixing** – Herbicides will be mixed more than 150 feet from any natural waterbody to minimize the risk of an accidental discharge. Impervious material will be placed beneath mixing areas in such a manner as to contain any spills associated with mixing/refilling. Spray tanks shall be washed further than 300 feet away from surface water. All hauling and application equipment shall be free from leaks and operating as intended.
- vi. **Herbicide Application Methods** – Liquid forms of herbicides will be applied as follows:
1. Broadcast spraying using booms mounted on ground-based vehicles (this consultation does not include aerial applications).
 2. Spot spraying with hand-held nozzles attached to backpack 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 mph 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. 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- to 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 the label is followed. Do not conduct any applications during periods of heavy rainfall.
- viii. **Minimization of Herbicide Drift and Leaching** – Herbicide drift and leaching will be minimized as follows:
1. Do not spray when wind speeds exceed 10 mph 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. 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- to 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 the label is followed. Do not conduct any applications during periods of heavy rainfall.
- ix. **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 E-7). Herbicide applications based on a combination of approved herbicides will use the most conservative buffer for any herbicide included. Buffer widths are measured as map distance perpendicular to the bankfull for streams, the upland boundary for wetlands, or the upper bank for roadside ditches.

Table E-7. No-application buffer widths in feet for herbicide application, by stream types and application methods⁴⁷

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 ⁱ	Spot Spraying	Hand Selective	Broadcast Spraying ⁱ	Spot Spraying	Hand Selective
Labeled for Aquatic Use						
Aquatic Glyphosate	100	waterline	waterline and on emergent or floating vegetation	50	0	0
Aquatic Imazapyr	100	waterline	waterline and on emergent or floating vegetation	50	0	0
Aquatic Triclopyr-TEA	Not Allowed	15	waterline and on emergent or floating vegetation	Not Allowed	0	0
Aquatic 2,4-D (amine)	100	waterline	waterline and on emergent or floating vegetation	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

⁴⁷ This table has been updated with aquatic applications methods using the 2018 consultation with NMFS.

Chlorsulfuron	100	50	bankfull elevation	50	15	bankfull elevation
High Risk to Aquatic Organisms						
Triclopyr-BEE	Not Allowed	150	150	Not Allowed	150	150
Picloram	100	50	50	100	50	50
Sethoxydim	100	50	50	100	50	50
2,4-D (ester)	100	50	50	100	50	50

¹ Including broadcast spraying with a backpack sprayer or other hand-held sprayers.

Bureau Sensitive Fish and Other Aquatic Species

Project Design Features for Site Access and Fueling/Equipment Maintenance

For treatments occurring in watersheds with Bureau Sensitive species:

- 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 Bureau Sensitive aquatic species occur, consider ground-disturbing activities on a case-by-case basis, and implement 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.

Project Design Features 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.

Project Design Features Related to Herbicide Treatments

- Apply the aquatic no-herbicide application buffers specified in Table E-7 to all waterbodies with known or suitable habitat for Bureau Sensitive fish and other Bureau Sensitive aquatic species.
- Maintain equipment used for transportation, storage, or application of chemicals in a leakproof 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 Bureau Sensitive aquatic species. Appropriate buffer distances should be determined at the local level to ensure that overhanging vegetation that provides habitat for Bureau Sensitive species is not removed from the site. Buffer distances provided as Project Design Features in the assessment of effects to plants and fish and aquatic invertebrates should be consulted as guidance. (Note: The Forest Service did not determine appropriate buffer distances for Bureau Sensitive fish and aquatic invertebrates when evaluating herbicides in Forest Service Ecological Risk Assessments; buffer distances were only determined for non-Bureau Sensitive species.)
- Do not use terrestrial formulations of glyphosate, or triclopyr BEE, to treat aquatic vegetation in habitats where aquatic Bureau Sensitive species occur or may potentially occur.
- Follow all instructions to avoid spill and direct spray scenarios into aquatic habitats. Take special care 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 Bureau Sensitive species under conditions that would likely result in off-site drift.
- In watersheds that support Bureau Sensitive species or their habitat, do not apply triclopyr BEE in upland habitats within ½ mile upslope of aquatic habitats that support aquatic Bureau Sensitive species under conditions that would likely result in surface runoff.

Project Design Features Related to Prescribed Fire

Within riparian areas, in watersheds with Bureau Sensitive 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 Bureau Sensitive 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 Bureau Sensitive species.
- Do not allow helicopter dipping from waters occupied by Bureau Sensitive 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 Bureau Sensitive species.

Project Design Features Related to Mechanical Treatments

Within riparian areas in watersheds with Bureau Sensitive species:

- Do not use vehicles or heavy equipment, except when crossing at established crossings.
- Do not conduct ground disturbing activities (e.g., disking, drilling, chaining, and plowing).
- Ensure that all mowing follows guidance to avoid negative effects to streambanks and riparian vegetation and major effects to streamside shade.
- Do not use equipment in perennial channels or in intermittent channels with water, except at crossings that already exist.
- Leave suitable quantities (to be determined at the local level) of excess vegetation and slash on site.
- Do not completely remove trees and shrubs.

Project Design Features Related to Biological Control Treatments Using Livestock

For treatments occurring in watersheds that support Bureau Sensitive species:

- 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 judicious placement of saltblocks, troughs, and fencing, to prevent damage to riparian areas but increase weed control.
- Equip each watering trough with a float valve.

Riparian areas within these watersheds require more protective measures:

- 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 Bureau Sensitive species, unless their placement will enhance weed-control effectiveness without damaging the riparian system.

Project Design Features for Essential Fish Habitat

General Measures

- Establish riparian, estuarine, and coastal buffer strips adjacent to salmonid,

groundfish and pelagic fish, and scallop habitats to reduce direct impacts to the various life stages of these species. Buffer 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 measures 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 Fire Treatments

- Where feasible, avoid ignition of fires within buffer strips.

Mechanical Treatments

- Minimize the use of mechanical treatment methods (including timber harvest and timber salvage) within buffer strips.
- To avoid damaging potential spawning areas, do not use mechanical equipment in perennial channels, or in intermittent channels with water, except at crossings that already exist. Do not use mechanical equipment in estuaries.

Herbicide Treatments

- Where feasible, minimize spray operations around aquatic habitats on days when winds are greater than 10 mph for ground applications, to avoid wind drift or direct application of herbicides into these habitats.
- Where feasible, minimize the use of terrestrial herbicides in watersheds with downgradient ponds and streams if potential impacts to salmonids are of concern.
- Time herbicide applications near salmonid-bearing streams and estuaries and coastal/marine habitats used by salmon and FMP (Fishery Management Plan) species so that they do not overlap with sensitive life-history stages of these fish (would vary at the local level).

Biological Treatments

- In watersheds that support salmonids or that flow into watersheds where salmonids occur, to minimize the cumulative effect of grazing in areas that have been burned, do not conduct weed control by domestic animals in burned areas until they have recovered enough to control ash and sediment produced by the treatment.
- Prohibit livestock grazing in estuaries.

Cultural Resources

See also:

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

General

- At least one month prior to beginning treatments, the District will provide to potentially affected Tribes updated maps on BLM's National NEPA Register (ePlanning) showing planned treatments and treatment areas. If these Tribes request coordination or consultation regarding proposed treatments, the BLM would seek to avoid conflict with Tribal resource use by modifying the timing of treatments or posting signs to allow Tribal members to avoid treated areas. These proposed modifications would be determined in coordination with the Tribes and are not limited to those stated above. Additionally, modification to Annual Treatment Plans may be requested in order to avoid adverse effects to cultural features. Ultimately, a line officer will make an informed decision regarding the level of modification appropriate through Tribal coordination or consultation.
- 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.

Paleontological Resources

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

- BLM or its contractor will monitor significant paleontological and cultural resources for potential looting of materials exposed by fire.

Visual Resources

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.⁴⁸

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.

⁴⁸ These are referred to as visual resource management areas in the *Northwestern and Coastal Oregon Resource Management Plan* (USDI BLM 2016d).

- When restoring treated areas, design activities to repeat the form, line, color, and texture of the natural landscape character conditions to meet established Visual Resource Management (VRM) objectives.

Wilderness and Wilderness Study Areas

General

- Encourage backcountry pack and saddle stock users to feed their livestock only weed-free feed for several days before entering a Wilderness Area, and to bring only weed-free hay and straw⁴⁹ onto BLM lands.
 - Encourage stock users to tie and/or hold stock in such a way as to minimize soil disturbance and loss of native vegetation.
 - Revegetate disturbed sites with native species if there is no reasonable expectation of natural regeneration.
 - Provide educational materials at trailheads and other Wilderness entry points to educate the public on the need to prevent the spread of weeds.
- Use the least intrusive methods possible to achieve objectives. Use non-motorized and non-mechanized equipment in Wilderness and off existing motorized routes in Wilderness Study Areas, and where possible in other areas.
- Address Wilderness and special areas in management plans.

Fire Use

- Minimize soil-disturbing activities during fire control or prescribed fire activities.
- Revegetate sites with native species if there is no reasonable expectation of natural regeneration.

Mechanical

- If mechanized equipment is required, use the minimum amount of equipment needed.
- Time the work for weekdays or off-season.
- Require shutdown of work before evening if work is located near campsites.
- Revegetate sites with native species if there is no reasonable expectation of natural regeneration.

Manual

- Revegetate sites with native species if there is no reasonable expectation of natural regeneration.

Chemical

- Use the “minimum tool” to treat noxious weeds and other invasive plants, relying primarily

⁴⁹ By policy, weed-free hay and straw is required on all BLM-administered lands in Oregon and Washington (USDI 2017).

on the use of ground-based tools, including backpack pumps, hand sprayers, and pumps mounted on pack and saddle stock.

- Use herbicides only when they are the minimum treatment method necessary to control weeds that are spreading within the Wilderness or threaten lands outside the Wilderness.
- Give preference to herbicides that have the least impact on non-target species and the wilderness environment.
- Implement herbicide treatments during periods of low human use, where feasible. Project Design Features that may apply to Wilderness and other special area resources are associated with human and ecological health and recreation (see Project Design Features for *Vegetation, Fish and Aquatic Organisms, Wildlife Resources, Recreation, and Human Health*).

Wild and Scenic River Corridors⁵⁰

General

- Revegetate disturbed sites with native species if there is no reasonable expectation of natural regeneration. When appropriate for the habitat type, replant the treatment area with a diverse selection of native species.
- Use the least intrusive methods possible to achieve objectives.
- Do not use aquatic weed mat, diver assisted suction harvest, or tractor treatment methods in WSRs.
- Within WSR corridors with a wildlife ORV, the wildlife biologist and WSR specialist must review proposed treatment sites to determine whether species or habitat relevant to the wildlife ORV are present in the area. If so, apply wildlife PDFs as necessary for their protection, even if the ORV-related species are not T&E or Bureau sensitive species.
- Within WSR corridors with a recreation ORV, the recreation specialist and WSR specialist must review proposed treatment sites to determine whether the recreation ORV is present in the area. If so, apply recreation PDFs as necessary to protect the recreation ORV, even if the treatment area is outside a recreation management area.

Fire Use

- Minimize soil-disturbing activities during fire control or prescribed fire activities.

Mechanical

- Require shut down of work before evening if work is located near a campground or occupied dispersed campsite.

Chemical

- Implement herbicide treatments during periods of low human use, where feasible.

⁵⁰ Includes treatment activities within Designated, Suitable, and Eligible WSR Corridors.

Wild and Scenic River Corridors with Scenic ORV

Within WSR corridors with a scenic ORV, the visual resources specialist and WSR specialist must review proposed treatment sites to determine whether the scenic ORV could be affected by the treatment. If so, apply the following PDFs as necessary to protect the scenic ORV regardless of VRM class:

General

- Leave sufficient vegetation in place, where possible, to screen views of vegetation treatments.
- Ensure that the change to the scenic ORV is low and does not attract attention.
- Lessen visual impacts by designing projects to blend in with topographic forms; leaving some low-growing trees or planting some low-growing tree seedlings adjacent to the treatment area to screen short-term effects.
- When restoring treated areas, design activities to repeat the form, line, color, and texture of the natural landscape character conditions.

Fire Use

- Minimize use of fire in sensitive watersheds to reduce the creation of large areas of browned vegetation.

Mechanical

- Minimize dust drift.
- Minimize loss of desirable vegetation.
- Minimize earthwork and locate away from prominent topographic features.

Manual

- Minimize dust drift.
- Minimize loss of desirable vegetation.

Chemical

- Use SOPs that 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; and establish appropriate buffer widths between treatment areas and residences to contain visual changes to the intended treatment area.
- Minimize the use of broadcast foliar applications in sensitive watersheds to avoid creating large areas of browned vegetation.

Clackamas WSR corridor

General

- Within the Clackamas WSR corridor, conduct site-specific surveys for unique, sensitive, threatened or endangered plant species and their habitats.

Salmon WSR corridor

General

- Within the Salmon WSR corridor, all vegetative management actions shall emphasize cooperative interpretation and environmental education efforts.

Herbicide

- Within the Salmon WSR corridor, chemical management of vegetation in upland areas is allowed only when no other vegetation management tools are appropriate.

Cultural

- No grazing on public lands within the Salmon WSR corridor.

Sandy WSR corridor

General

- Within the designated Sandy WSR corridor, all vegetative management actions shall emphasize cooperative interpretation and environmental education efforts.
- When revegetation is necessary within the designated Sandy WSR corridor, use native species from onsite sources if feasible.

Herbicide

- Within the designated Sandy WSR corridor, chemical management of vegetation in upland areas is allowed only when no other vegetation management tools are appropriate.

Cultural

- No grazing on public lands within the Sandy WSR corridor.

Recreation

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 the 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 considering 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.
- Project Design Features that may apply to recreational resources are associated with human and ecological health (see Project Design Features for Vegetation, Fish and Other Aquatic Species, Wildlife Resources, and Human Health and Safety).

Social and Economic Values

General

- Post treatment areas.
- Notify adjacent landowners, grazing permittees, the public, and emergency personnel of treatments.
- Control public access to treatment areas.
- Consult with Native American Tribes and Alaska Natives whose health and economies might be affected by the project.

- To the extent feasible, hire local contractors and purchase supplies locally.

Chemical

- Post treated areas and specify reentry or rest times, if appropriate.
 - Notify the public of the project to improve coordination and avoid potential conflicts and safety concerns during implementation of the treatment.
 - Control public access until potential treatment hazards no longer exist, per herbicide product label instructions.
 - Observe restricted entry intervals specified by the herbicide product label.
 - Notify local emergency personnel of proposed treatments.
- Use spot applications or low-boom broadcast applications where possible to limit the probability of contaminating non-target food and water sources.
- Consult with Native American Tribes to locate any areas of vegetation that are of significance to the Tribes and Native groups and that might be affected by herbicide treatments.
- To the degree possible within the law, hire local contractors and workers to assist with herbicide application projects and purchase materials and supplies for herbicide treatment projects (including the herbicides) through local suppliers.
- To minimize fears based on lack of information, provide public educational information on the need for vegetation treatments and the use of herbicides in an integrated vegetation management program for projects proposing local use of herbicides.
- For herbicides with label-specified re-entry intervals, post information at access points to recreation sites or other designated public use or product collection areas notifying the public of planned herbicide treatments in languages known to be used by persons likely to be using the area to be treated. Posting should include the date(s) of treatment, the herbicide to be used, the date or time the posting expires, and a name and phone number of who to call for more information.
- Consider the potential for treatments to affect communities from herbicide-contaminated resources originating from the BLM, such as subsistence resources or water used downstream for human or agricultural uses.
- Coordinate with and/or notify neighboring landowners who may want to treat, or are already treating, adjacent lands.
- 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.

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 power lines to avoid negative impacts to the power line.

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 power lines.

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.
- Limit application of chlorsulfuron via ground broadcast applications at the maximum application rate.
- Do not apply hexazinone with an over-the-shoulder broadcast applicator (backpack sprayer).
- Consideration should be given to herbicides other than 2,4-D; limit use of 2,4-D to situations where other herbicides are ineffective or in situations where mitigation of the risks posed by 2,4-D is possible.

Meadow Restoration Project Design Features

Table E-8. Species-specific timing and spatial restrictions for prescribed burns at sites occupied by Special Status and Recovery Plan species known to occur in meadow habitats

Special Status Species	Prescribed Fire
Golden paintbrush	Implementation after August 15
Kincaid's lupine	Implementation after August 15
Nelson's checkermallow	Implementation after August 15; up to 50% an occupied area
Willamette daisy	Implementation after August 15
Pale larkspur	Implementation after August 15
Willamette Valley larkspur	Implementation after August 15
Peacock larkspur	Implementation after August 15
Shaggy horkelia	Implementation after August 15
White-topped aster	Implementation after August 15
Hitchcock's blue-eyed grass	Implementation after August 15
Bradshaw's lomatium	Implementation after August 15

Special Status Species	Prescribed Fire
Wayside aster	Implementation after August 15
Thinleaf peavine	Implementation after August 15
Fender's blue butterfly	Implementation on 25-33% of an occupied area** from August 15-November 15
Oregon silverspot butterfly	Implementation on 25-33% of an occupied area** from October 1-July 15
Taylor's checkerspot butterfly	Implementation on 25-33% of an occupied area** during diapause only September 10-February 15

- Prescribed fire will be subject to timing and spatial restrictions in Table E-8 for Special Status and Recovery Plan plant and wildlife species known to occur in meadow habitats.
- Prescribed fire would be designed to burn at low intensities.
- Invasive plants will be treated as part of restoration activities.
- A botanist should review all meadows proposed for restoration. All meadows where ground-disturbing restoration activities and potential habitat are present need to be surveyed for rare botanical species. Any new sites of rare botanical species will be documented and protected.
- Where meadow restoration actions will be implemented to improve habitat for sensitive plant species, ensure that any proposed action will not adversely affect known locations by flagging known sites so it is clear where to avoid when conducting restoration activities.
- Any revegetation or restoration materials (seed, straw, containerized or bare root plants) shall be weed-free and genetically local in origin.
- Directionally fell encroaching conifers away from special habitats including meadows, prairie remnants, oak woodlands, and canopy gaps supporting wayside aster habitat. Do not yard through special habitats.
- Avoid ground disturbance and planting conifers in special habitats including meadows, prairie remnants, oak woodlands, and canopy gaps supporting wayside aster habitat.
- Individual Tree Removal (ITR) of trees in northern spotted owl nesting/roosting habitat may occur without surveys when removal of trees with northern spotted owl nesting structure would only occur outside the critical breeding period and trees with nesting structure are not limited in the stand (as determined by the unit biologist). Otherwise, seasonal restrictions would be applied.
- No activity will impair the functionality of an occupied northern spotted owl site.

Management Recommendations for Actions Adjacent to Occupied and Potential Habitat for Recovery Plan Species and Wayside Aster

- Do not construct roads or place gaps within 100' of meadow habitats to reduce risk of weed infestation.
- Implement no-harvest buffers to protect microclimates of wet and moist special habitats unless otherwise prescribed by a qualified botanist: 200' no-harvest buffers for bogs, 150' no-harvest buffers for wetlands greater than ¼ acre, 100' no-harvest buffers for mesic meadows and moist rock gardens.
- Avoid planting conifers within site potential tree height of special habitats including

meadows, prairie remnants, oak woodlands, and canopy gaps supporting wayside aster habitat to avoid shading and contributing seed to natural plant communities that rely on open canopies to persist.

APPENDIX F – Herbicide Formulations and Adjuvants

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

Herbicides are categorized as selective or non-selective (see Table B-2). Selective herbicides kill only a specific type of plant. For example, an herbicide selective for broadleaved plants can be used to manage such species while maintaining desirable grass species in rangeland communities. Non-selective herbicides kill all types of plants and 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) (see Table B-2).

EPA classifies herbicides as either “general use” or “restricted use.” Restricted use means that a product, or its uses, may have higher risks of adverse effects and thus EPA only allows its use by a certified pesticide applicator with the appropriate training or under the direct supervision of a certified applicator (defined in 40 C.F.R. 152.175). EPA requires a license to purchase and apply the product and the label on the herbicide must clearly state that it is a “Restricted Use Pesticide.” Picloram is the only restricted use herbicide analyzed in this EA. 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. The public can purchase and use general use pesticides.

Table F-2, *Herbicide formulations approved for use on BLM-administered lands*, displays the BLM National list of approved herbicides, which the BLM reviews and updates annually. This list identifies herbicides that are known to be consistent with the formulations analyzed in the Risk Assessments (**Appendix G**) and otherwise suitable for wildland use.

Table F-3, *Adjuvants approved for use on BLM-administered lands*, displays the adjuvants approved for use on BLM-administered lands nationally. BLM also reviews this list annually. This list identifies adjuvants that are known to be consistent with the formulations analyzed in the Risk Assessments (**Appendix G**) and are known not to contain R-11, POEA, petroleum, and other products prohibited by Mitigation Measures (see **Appendix E**), or that are otherwise considered unsuitable for wildland use. Table F-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 FWS 2013a, NMFS 2013) as appropriate for use near streams with listed fish. In Table F-3 these adjuvants are under the column titled “ARBO II,” the acronym for the second programmatic Aquatic Restoration Biological Opinion.

Table F-1. General constraints from herbicide labels

Herbicide	General Constraints from Labels (<i>follow all label requirements</i>)
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

Herbicide	General Constraints from Labels (follow all label requirements)
	compacted surfaces in areas with high potential for groundwater contamination. Groundwater contamination may occur in areas where soils are permeable or coarse and groundwater is near the surface.
Dicamba + Diflufenzopyr	• Do not load, mix, or apply within 50 feet of wells. • Do not apply directly to water, where surface water is present, or to intertidal areas. Do not contaminate water when disposing of equipment washwaters. • Do not apply to impervious substrates or under conditions that favor runoff. Do not apply to soils that classify as sand. • Be cognizant of leaching where soils are permeable or where water table is shallow.
Fluridone	• Do not apply in tidewater / brackish water.
Fluroxypyr	• Do not apply directly to water, to areas where surface water is present or to intertidal areas below the mean high water mark. • Do not contaminate water when cleaning equipment or disposing of equipment washwaters. • Do not apply where drift may be a problem due to proximity to susceptible crops or other non-target broadleaf plants.
Glyphosate	• Only use approved aquatic formulations for aquatic applications. • Do not contaminate water when cleaning equipment or disposing of equipment washwaters. • 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

Herbicide	General Constraints from Labels (follow all label requirements)
	and run-off.
Picloram	• Do not use manure from animals grazing treated areas or feeding on treated hay on land used for growing broadleaf crops, ornamentals, orchards or other susceptible, desirable plants. Manure may contain enough picloram to cause injury to susceptible plants. • Do not use grass or hay from treated areas for composting or mulching of susceptible broadleaf plants or crops. • Do not transfer livestock from treated grazing areas (or feeding of treated hay) onto sensitive broadleaf crop areas without first allowing 7 days of grazing on an untreated grass pasture (or feeding of untreated hay). Otherwise, urine and manure may contain enough picloram to cause injury to sensitive broadleaf plants. • Restricted use. May injure susceptible, non-target plants. This herbicide is injurious to plants at extremely low concentrations. Non-target plants may be adversely affected from drift and run-off. • Do not apply directly to water, or to areas where surface water is present, or to intertidal areas below the mean high water mark. • Do not make application when circumstances favor movement from treatment site. Do not contaminate water or water sources when mixing, loading, or disposing of equipment wash-water. • May leach thru soil and contaminate groundwater where soils are permeable, particularly where water table is shallow. • Do not apply within the root zone of desirable trees unless such injury can be tolerated.
Rimsulfuron	• Do not graze treated sites or cut for forage or hay for a minimum of 1 year after application in order to allow newly emerged grasses sufficient time to become established. • Do not apply directly to water, or to areas where surface water is present, or to intertidal areas below the mean high water mark. • Do not contaminate water by cleaning of equipment or disposal of equipment washwaters or rinsate. • Rainfall or irrigation is needed for herbicide activation.
Sulfometuronmethyl	• 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

Herbicides	General Constraints from Labels (follow all label requirements)
Fluazifop-P-butyl	• This product is toxic to fish and aquatic invertebrates. Do not apply to areas where runoff into water bodies is expected. • Do not apply when weather conditions favor drift from target areas. • Do not apply directly to water, to areas where surface water is present, or to intertidal areas below the mean high water mark. • Fluazifop-P-butyl is known to leach through soil into groundwater under certain conditions as a result of label use. This chemical may leach into groundwater if used in areas where soils are permeable, particularly where the water table is shallow. • This product may impact surface water quality due to runoff of rain water. This is especially true for poorly draining soils and soils with shallow groundwater. • This product is classified as having high potential for reaching surface water via runoff for several months or more after application. A level, well-maintained vegetative buffer strip between areas to which this product is applied and surface water features such as ponds, streams, and springs will reduce the potential loading of fluazifop-P-butyl from runoff water and sediment. Runoff of this product will be reduced by avoiding applications when rainfall is forecasted to occur within 48 hours. • Do not treat areas while unprotected humans or domestic animals are present in the treatment areas. Do not allow entry into treated areas without protective clothing until sprays have dried. • Do not apply if rainfall is expected within 1 hour. • Do not use flood type or other spray nozzle tips that deliver coarse, large droplet sprays.
Sethoxydim	• Avoid all direct or indirect contact with any desired grass crop (e.g., corn, rice, small grains, sorghum, and ornamental grasses and turfgrass). • Do not apply to grass weeds or crops under stress because of lack of moisture, hail damage, flooding, herbicide injury, or widely fluctuating temperatures. Unsatisfactory control may result. In irrigated areas, it may be necessary to irrigate before application to ensure active grass weed growth. • A minimum of 14 days is required between sequential applications. • Do not use selective application equipment such as recirculating sprayers, wiper applicators or shielded applicators. • Do not apply through any type of irrigation equipment. • Is rainfast 1 hour after application.

Table F-2. Herbicide formulations approved for use on BLM-administered lands, as of April 24, 2023

Active Ingredient	Trade Name	Manufacturer	EPA Registration Number
Aminopyralid	Milestone	Corteva Agriscience	62719-519
Aminopyralid	Whetstone	Alligare, LLC	81927-82
Aminopyralid + 2,4-D	ForeFront HL	Corteva Agriscience	62719-630
Aminopyralid + 2,4-D	GrazonNext HL	Corteva Agriscience	62719-628
Aminopyralid + 2,4-D	Gunslinger AMP	Alligare, LLC	81927-81
Aminopyralid + Clopyralid	Sendero	Corteva Agriscience	62719-645
Aminopyralid + Metsulfuron methyl	Chaparral	Corteva Agriscience	62719-597
Aminopyralid + Metsulfuron methyl	Opensight	Corteva Agriscience	62719-597
Aminopyralid + Triclopyr	Capstone	Corteva Agriscience	62719-572
Bromacil	Alligare Bromacil 80	Alligare, LLC	81927-4
Bromacil	Alligare Hyvar X IVM	Alligare, LLC	81927-4
Bromacil	Alligare Hyvar X-L IVM	Alligare, LLC	81927-77
Bromacil	Ceannard Bromacil 80DF	Ceannard, Inc.	58035-19
Bromacil	Hyvar X	Bayer Environmental Science	432-1546
Bromacil	Hyvar X Crop	AMVAC Chemical Corporation	5481-632
Bromacil	Hyvar X-L	Bayer Environmental Science	432-1548
Bromacil + Diuron	Alligare Bromacil/Diuron 40/40	Alligare, LLC	81927-3
Bromacil + Diuron	Alligare Krovar IVM	Alligare, LLC	81927-3
Bromacil + Diuron	Ceannard Diuron/Bromacil 80 DF	Ceannard, Inc.	58035-18
Bromacil + Diuron	DiBro 2+2	Nufarm Americas Inc.	228-227
Bromacil + Diuron	DiBro 4+2	Nufarm Americas Inc.	228-386
Bromacil + Diuron	Krovar DF	AMVAC Chemical Corporation	5481-635
Bromacil + Diuron	Krovar I DF	Bayer Environmental Science	432-1551
Bromacil + Diuron	Weed Blast 4G	SSI Maxim	34913-19
Bromacil + Diuron	Weed Blast Res. Weed Cont.	Loveland Products Inc.	34704-576
Chlorsulfuron	Alligare Chlorsulfuron 75	Alligare, LLC	81927-43
Chlorsulfuron	Telar XP	Bayer Environmental Science	432-1561
Chlorsulfuron	Telar XP	Environmental Science, LLC (Envu)	101563-176
Clopyralid	Alligare Clopyralid 3	Alligare, LLC	81927-14

Active Ingredient	Trade Name	Manufacturer	EPA Registration Number
Clopyralid	CleanSlate	Nufarm Americas Inc.	228-491
Clopyralid	Reclaim	Corteva Agriscience	62719-83
Clopyralid	Sonora	Alligare, LLC	81927-69
Clopyralid	Spur	Albaugh, LLC	42750-89
Clopyralid	Stigmata	Atticus, LLC	91234-60
Clopyralid	Stinger	Corteva Agriscience	62719-73
Clopyralid	Transline	Corteva Agriscience	62719-259
Clopyralid + 2, 4-D	Alligare Cody Herbicide	Alligare, LLC	81927-28
Clopyralid + 2, 4-D	Curtail	Corteva Agriscience	62719-48
2,4-D	2,4-D 4# Amine Weed Killer	Loveland Products, Inc.	34704-120
2,4-D	2,4-D Amine	Helena Agri-Enterprises, LLC	5905-72
2,4-D	2,4-D Amine 4	Helena Agri-Enterprises, LLC	42750-19-5905
2,4-D	2,4-D LV4	Helena Agri-Enterprises, LLC	5905-90
2,4-D	2,4-D LV6	Helena Agri-Enterprises, LLC	42750-20-5905
2,4-D	2,4-D LV6	Helena Agri-Enterprises, LLC	5905-93
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	Albaugh, LLC	42750-19
2,4-D	Barrage HF	Helena Agri-Enterprises, LLC	5905-529
2,4-D	Barrage LV Ester	Helena Agri-Enterprises, LLC	5905-504
2,4-D	Base Camp Amine 4	Wilbur-Ellis Co., LLC	71368-1-2935
2,4-D	Base Camp LV6	Wilbur-Ellis Co., LLC	2935-553
2,4-D	Broadrange 55	Wilbur-Ellis Co., LLC	2217-813-2935
2,4-D	Clean Amine	Loveland Products, Inc.	34704-120
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, LLC	42750-36
2,4-D	Formula 40	Nufarm Americas Inc.	228-357
2,4-D	Freelexx	Corteva Agriscience	62719-634
2,4-D	HardBall	Helena Agri-Enterprises, LLC	5905-549

Active Ingredient	Trade Name	Manufacturer	EPA Registration Number
2,4-D	Hi-Dep	PBI/Gordon Corporation	2217-703
2,4-D	Low Vol 4 Ester Weed Killer	Loveland Products, Inc.	34704-124
2,4-D	Low Vol 6 Ester Weed Killer	Loveland Products, Inc.	34704-125
2,4-D	LV 4	Albaugh, LLC	42750-15
2,4-D	LV6	Albaugh, LLC	42750-20
2,4-D	Opti-Amine	Helena Agri-Enterprises, LLC	5905-501
2,4-D	Phenoxy 088	WinField-United	42750-36-9779
2,4-D	Platoon	Nufarm Americas Inc.	228-145
2,4-D	Rugged	WinField-United	1381-247
2,4-D	Saber	Loveland Products, Inc.	34704-803
2,4-D	Salvo	Loveland Products, Inc.	34704-609
2,4-D	Savage DS	Loveland Products, Inc.	34704-606
2,4-D	Shredder 2,4-D LV4	WinField-United	1381-102
2,4-D	Shredder Amine 4	WinField-United	1381-103
2,4-D	Shredder E-99	WinField-United	1381-195
2,4-D	Solve 2,4-D	Albaugh, LLC	42750-22
2,4-D	Unison	Helena Agri-Enterprises, LLC	5905-542
2,4-D	Weedar 64	Nufarm Americas Inc.	71368-1
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
Dicamba	Alligare Cruise Control	Alligare, LLC	42750-40-81927
Dicamba	Alligare Dicamba 4 Herbicide	Alligare, LLC	81927-55
Dicamba	Banvel	Arysta LifeScience N.A. Corp.	66330-276
Dicamba	Clarity	BASF Corporation	7969-137
Dicamba	Clash	Nufarm Americas Inc.	228-615
Dicamba	Diablo	Nufarm Americas Inc.	228-379
Dicamba	Dicamba DMA	Albaugh, LLC	42750-40
Dicamba	Dicamba DMA Salt 5	Albaugh, LLC	45002-38
Dicamba	Dicamba HD	Albaugh, LLC	42750-209
Dicamba	Dicamba HD 5	Albaugh, LLC	45002-39

Active Ingredient	Trade Name	Manufacturer	EPA Registration Number
Dicamba	Doleac DMA	Atticus, LLC	91234-148
Dicamba	Dolerity DGA	Atticus, LLC	91234-193
Dicamba	Kam-Ba	Drexel Chemical Company	19713-624
Dicamba	Rifle	Loveland Products, Inc.	34704-861
Dicamba	Sterling Blue	WinField-United	7969-137-1381
Dicamba	Topeka	Albaugh, LLC (Rotam)	83100-34-83979
Dicamba	Topeka	Rotam North America, Inc.	83100-34-83979
Dicamba	Vanquish	Syngenta Crop Protection, LLC.	100-884
Dicamba	Vision	Helena Agri-Enterprises, LLC	5905-576
Dicamba + 2, 4-D	Alligare Dicamba + 2,4-D DMA	Alligare, LLC	81927-42
Dicamba + 2, 4-D	Brash	WinField-United	1381-202
Dicamba + 2, 4-D	Brush-Rhap	Helena Agri-Enterprises, LLC	5905-568
Dicamba + 2, 4-D	Cimarron MAX - Part B	Bayer Environmental Science	432-1555
Dicamba + 2, 4-D	Cimarron MAX - Part B	Environmental Science, LLC (Envu)	101563-170
Dicamba + 2, 4-D	Latigo	Helena Agri-Enterprises, LLC	5905-564
Dicamba + 2, 4-D	Outlaw	Helena Agri-Enterprises, LLC	5905-574
Dicamba + 2, 4-D	Range Star	Albaugh, LLC	42750-55
Dicamba + 2,4-D	Range Star XRT	Albaugh, LLC	42750-286
Dicamba + 2, 4-D	Rifle-D	Loveland Products, Inc.	34704-869
Dicamba + 2, 4-D	Veteran 720	Nufarm Americas Inc.	228-295
Dicamba + 2, 4-D	Weedmaster	Nufarm Americas Inc.	71368-34
Dicamba + Diflufenzopyr	Distinct	BASF Corporation	7969-150
Dicamba + Diflufenzopyr	Overdrive	BASF Corporation	7969-150
Diquat	Alligare Diquat Herbicide	Alligare, LLC	81927-35
Diquat	Diquat SPC 2L Herbicide	Nufarm Americas Inc.	228-675
Diquat	Reward	Syngenta Professional Products	100-1091
Diuron	Alligare Diuron 4L	Alligare, LLC	81927-44
Diuron	Alligare Diuron 80DF	Alligare, LLC	81927-12
Diuron	Ceannard Diuron 80DF	Ceannard, Inc.	58035-16
Diuron	Direx 4L	Makhteshim Agan of N. A.	66222-54
Diuron	Diuron 4L	Drexel Chemical Company	19713-36

Active Ingredient	Trade Name	Manufacturer	EPA Registration Number
Diuron	Diuron 4L	Loveland Products, Inc.	34704-854
Diuron	Diuron 4L	Makhteshim Agan of N. A.	66222-54
Diuron	Diuron 80	Drexel Chemical Company	19713-274
Diuron	Diuron 80 WDG	Loveland Products, Inc.	34704-648
Diuron	Diuron 80DF	WinField-United	9779-318
Diuron	Karmex DF	Makhteshim Agan of N. A.	66222-51
Diuron	Parrot 4L	Makhteshim Agan of N. A.	66222-54
Diuron	Parrot DF	Makhteshim Agan of N. A.	66222-51
Fluridone	Alligare Fluridone	Alligare, LLC	81927-45
Fluridone	Avast!	SePRO Corporation	67690-30
Fluridone	Sonar AS	SePRO Corporation	67690-4
Fluridone	Sonar Precision Release	SePRO Corporation	67690-12
Fluridone	Sonar Q	SePRO Corporation	67690-3
Fluridone	Sonar SRP	SePRO Corporation	67690-3
Fluroxypyr	Alligare Flagstaff	Alligare, LLC	81927-61
Fluroxypyr	Alligare Fluroxypyr	Alligare, LLC	66330-385-81927
Fluroxypyr	Comet Selective	Nufarm Americas Inc.	71368-87
Fluroxypyr	Stark Ultra	Atticus, LLC	91234-45
Fluroxypyr	Vista XRT	Corteva Agriscience	62719-586
Fluroxypyr + 2,4-D	TrumpCard	Helena Agri-Enterprises, LLC	5905-581
Fluroxypyr + 2,4-D + Dicamba	E-2 Herbicide	Nufarm Americas Inc.	228-442
Fluroxypyr + Clopyralid	Truslate Selective Herbicide	Nufarm Americas Inc.	71368-86
Fluroxypyr + Clopyralid	Whiplash	Atticus, LLC	91234-46
Fluroxypyr + Picloram	Alligare Triumph XTR	Alligare , LLC	81927-64
Fluroxypyr + Picloram	Surmount	Corteva Agriscience	62719-480
Fluroxypyr + Picloram	Trooper Pro	Nufarm Americas Inc.	228-599
Fluroxypyr + Triclopyr	Alligare Cleargraze Pasture Herbicide	Alligare, LLC	81927-65
Fluroxypyr + Triclopyr	PastureGard	Corteva Agriscience	62719-637
Glyphosate	Accord Concentrate	Corteva Agriscience	62719-324
Glyphosate	Accord SP	Corteva Agriscience	62719-322
Glyphosate	Accord XRT	Corteva Agriscience	62719-517
Glyphosate	Accord XRT II	Corteva Agriscience	62719-556

Active Ingredient	Trade Name	Manufacturer	EPA Registration Number
Glyphosate	Alligare Dryphosate 75SG	Alligare, LLC	81927-60
Glyphosate	Alligare Glyphosate 4 PLUS	Alligare, LLC	81927-9
Glyphosate	Alligare Glyphosate 5.4	Alligare, LLC	81927-8
Glyphosate	Aqua Neat	Nufarm Americas Inc.	228-365
Glyphosate	Aqua Star	Albaugh, LLC	42750-59
Glyphosate	Aquamaster	Bayer CropScience	524-343
Glyphosate	AquaPro Aquatic Herbicide	SePRO Corporation	62719-324-67690
Glyphosate	Buccaneer	Tenkoz	55467-10
Glyphosate	Buccaneer Plus	Tenkoz	55467-9
Glyphosate	Cornerstone 5 Plus	WinField-United	1381-241
Glyphosate	Credit 41	Nufarm Americas Inc.	71368-20
Glyphosate	Credit 41 Extra	Nufarm Americas Inc.	71368-20
Glyphosate	Credit Xtreme	Nufarm Americas Inc.	71368-81
Glyphosate	Gly Star 5 Extra	Albaugh, LLC	42750-59
Glyphosate	Gly Star Original	Albaugh, LLC	42750-60
Glyphosate	Gly Star Plus	Albaugh, LLC	42750-61
Glyphosate	Gly-4	Universal Crop Protection Alliance	42750-60-72693
Glyphosate	Gly-4 Plus	Universal Crop Protection Alliance	72693-1
Glyphosate	Gly-4 Plus	Universal Crop Protection Alliance	42750-61-72693
Glyphosate	GlyphoMate 41	PBI/Gordon Corporation	2217-847
Glyphosate	Gly-Star K-Plus	Albaugh, LLC	42750-122
Glyphosate	Honcho Plus	Bayer CropScience	524-454
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	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 Plus	Loveland Products, Inc.	34704-890
Glyphosate	Rattler	Helena Agri-Enterprises, LLC	524-445-5905
Glyphosate	Razor Xtreme	Nufarm Americas Inc.	71368-81

Active Ingredient	Trade Name	Manufacturer	EPA Registration Number
Glyphosate	Rodeo	Corteva Agriscience	62719-324
Glyphosate	Roundup Custom	Bayer CropScience	524-343
Glyphosate	Roundup PRO	Bayer CropScience	524-475
Glyphosate	Roundup PRO Concentrate	Bayer CropScience	524-529
Glyphosate	Roundup PROMAX	Bayer CropScience	524-579
Glyphosate	Showdown	Helena Agri-Enterprises, LLC	71368-25-5905
Glyphosate + 2, 4-D	Imitator + 2,4-D	Drexel Chemical Company	19713-635
Glyphosate + 2, 4-D	Landmaster BW	Albaugh, LLC	42570-62
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	Velosa	Helena Agri-Enterprises, LLC	5905-579
Hexazinone	Velpar DF VU	Bayer Environmental Science	432-1576
Hexazinone	Velpar DF VU	Environmental Science, LLC (Envu)	101563-187
Hexazinone	Velpar L VU	Bayer Environmental Science	432-1573
Hexazinone	Velpar L VU	Environmental Science, LLC (Envu)	101563-184
Hexazinone + Sulfometuron methyl	Oustar	Bayer Environmental Science	432-1553
Hexazinone + Sulfometuron methyl	Oustar	Environmental Science, LLC (Envu)	101563-169
Hexazinone + Sulfometuron methyl	Westar	Bayer Environmental Science	432-1558
Hexazinone + Sulfometuron methyl	Westar	Environmental Science, LLC (Envu)	101563-174
Imazapic	Alligare Panoramic 2SL	Alligare, LLC	66222-141-81927
Imazapic	Nufarm Imazapic 2SL	Nufarm Americas Inc.	71368-99
Imazapic	Open Range G	Wilbur-Ellis Co., LLC	2935-557
Imazapic	Plateau	BASF Corporation	241-365
Imazapyr	Alligare Ecomazapyr 2SL	Alligare, LLC	81927-22
Imazapyr	Alligare Imazapyr 2SL	Alligare, LLC	81927-23
Imazapyr	Alligare Imazapyr 4SL	Alligare, LLC	81927-24
Imazapyr	Alligare Rotary 2 SL	Alligare, LLC	81927-6
Imazapyr	Arsenal	BASF Corporation	241-346
Imazapyr	Arsenal Applicators Conc.	BASF Corporation	241-299

Active Ingredient	Trade Name	Manufacturer	EPA Registration Number
Imazapyr	Arsenal PowerLine	BASF Corporation	241-431
Imazapyr	Chopper	BASF Corporation	241-296
Imazapyr	EZ-JECT Copperhead Herbicide Shells	EZ-JECT, Inc.	83220-2
Imazapyr	Habitat	BASF Corporation	241-426
Imazapyr	Habitat Herbicide	SePRO Corporation	241-426-67690
Imazapyr	Polaris	Nufarm Americas Inc.	228-534
Imazapyr	Polaris AC Complete	Nufarm Americas Inc.	228-570
Imazapyr	Polaris Herbicide	Nufarm Americas Inc.	241-346-228
Imazapyr	Polaris SP	Nufarm Americas Inc.	228-536
Imazapyr	SSI Maxim Arsenal 0.5G	SSI Maxim Co., Inc.	34913-23
Imazapyr	SSI Maxim Arsenal 5.0 G	SSI Maxim Co., Inc.	34913-24
Imazapyr	Stalker	BASF Corporation	241-398
Imazapyr + Diuron	Alligare Mojave 70 EG	Alligare, LLC	81927-25
Imazapyr + Diuron	Imazuron	Nufarm Americas Inc.	228-654
Imazapyr + Diuron	Sahara DG	BASF Corporation	241-372
Imazapyr + Diuron	SSI Maxim Topside 2.5G	SSI Maxim Co., Inc.	34913-22
Metsulfuron methyl	Alligare MSM 60	Alligare, LLC	81927-7
Metsulfuron methyl	AmTide MSM 60DF Herbicide	AmTide, LLC	83851-3
Metsulfuron methyl	Cimarron MAX - Part A	Bayer Environmental Science	432-1555
Metsulfuron methyl	Escort XP	Bayer Environmental Science	432-1549
Metsulfuron methyl	Escort XP	Environmental Science, LLC (Envu)	101563-167
Metsulfuron methyl	Patriot	Nufarm Americas Inc.	228-391
Metsulfuron methyl	Plotter	Albaugh, LLC (Rotam)	83100-3-83979
Metsulfuron methyl	Plotter	Rotam North America, Inc.	83100-3-83979
Metsulfuron methyl	PureStand	Nufarm Americas Inc.	71368-38
Metsulfuron methyl	Rometsol	Albaugh, LLC (Rotam)	83100-2-83979
Metsulfuron methyl	Rometsol	Rotam North America, Inc.	83100-2-83979
Metsulfuron methyl + Chlorsulfuron	Cimarron Plus	Bayer Environmental Science	432-1572
Metsulfuron methyl + Chlorsulfuron	Cimarron Plus	Environmental Science, LLC (Envu)	101563-183
Picloram	Alligare Picloram 22K	Alligare, LLC	81927-18
Picloram	Alligare Triumph 22K	Alligare, LLC	81927-18
Picloram	Alligare Picloram K	Alligare, LLC	81927-17

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Active Ingredient	Trade Name	Manufacturer	EPA Registration Number
Picloram	Grazon PC	Corteva Agriscience	62719-181
Picloram	OutPost 22K	Corteva Agriscience	62719-6
Picloram	Tordon 22K	Corteva Agriscience	62719-6
Picloram	Tordon K	Corteva Agriscience	62719-17
Picloram + 2, 4-D	Alligare Gunslinger P+D	Alligare, LLC	81927-16
Picloram + 2, 4-D	Alligare Picloram + D	Alligare, LLC	81927-16
Picloram + 2, 4-D	Alligare Triumph RTU	Alligare, LLC	81926-74
Picloram + 2,4-D	Graslan L	Corteva Agriscience	62719-655
Picloram + 2, 4-D	Grazon P+D	Corteva Agriscience	62719-182
Picloram + 2, 4-D	Grazon P+D	Corteva Agriscience	62719-182
Picloram + 2, 4-D	HiredHand P+D	Corteva Agriscience	62719-182
Picloram + 2, 4-D	Pathway	Corteva Agriscience	62719-31
Picloram + 2, 4-D	Tordon 101 Mixture	Corteva Agriscience	62719-5
Picloram + 2, 4-D	Tordon RTU	Corteva Agriscience	62719-31
Rimsulfuron	Alligare Laramie 25DF	Alligare, LLC	81927-57
Rimsulfuron	Grapple	Nufarm Americas Inc.	71368-121
Rimsulfuron	Hinge	Albaugh, LLC (Rotam)	83100-40-83979
Rimsulfuron	Hinge	Rotam North America, Inc.	83100-40-83979
Rimsulfuron	Tetris SG	Atticus, LLC	91234-85
Sulfometuron methyl	Alligare SFM 75	Alligare, LLC	81927-26
Sulfometuron methyl	Oust XP	Bayer Environmental Science	432-1552
Sulfometuron methyl	Oust XP	Environmental Science, LLC (Envu)	101563-168
Sulfometuron methyl	Spyder	Nufarm Americas Inc.	228-408
Sulfometuron methyl + Chlorsulfuron	Landmark XP	Bayer Environmental Science	432-1560
Sulfometuron methyl + Metsulfuron methyl	Alligare SFM Extra	Alligare, LLC	81927-5
Sulfometuron methyl + Metsulfuron methyl	Oust Extra	Bayer Environmental Science	432-1557
Sulfometuron methyl + Metsulfuron methyl	Oust Extra	Environmental Science, LLC (Envu)	101563-173
Sulfometuron methyl + Metsulfuron methyl	Spyder Extra Selective	Nufarm Americas Inc.	228-690
Tebuthiuron	Alligare Tebuthiuron 20 P	Alligare, LLC	81927-41
Tebuthiuron	Alligare Tebuthiuron 80 WG	Alligare, LLC	81927-37
Tebuthiuron	Savannah	Sharda USA LLC	83529-170
Tebuthiuron	Spike 20P	Corteva Agriscience	62719-121

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Active Ingredient	Trade Name	Manufacturer	EPA Registration Number
Tebuthiuron	Spike 80DF	Corteva Agriscience	62719-107
Tebuthiuron	SpraKil S-5 Granules	SSI Maxim Co., Inc.	34913-10
Tebuthiuron + Diuron	SpraKil SK-13 Granular	SSI Maxim Co., Inc.	34913-15
Tebuthiuron + Diuron	SpraKil SK-26 Granular	SSI Maxim Co., Inc.	34913-16
Tebuthiuron + Imazapyr	Transformer 5G	SSI Maxim Co., Inc.	34913--2
Triclopyr	Alligare Boulder 6.3	Alligare, LLC	81927-54
Triclopyr	Alligare Triclopyr 3	Alligare, LLC	81927-13
Triclopyr	Alligare Triclopyr 4	Alligare, LLC	81927-11
Triclopyr	Element 3A	Corteva Agriscience	62719-37
Triclopyr	Element 4	Corteva Agriscience	62719-40
Triclopyr	Forestry Garlon XRT	Corteva Agriscience	62719-553
Triclopyr	Garlon 3A	Corteva Agriscience	62719-37
Triclopyr	Garlon 4	Corteva Agriscience	62719-40
Triclopyr	Garlon 4 Ultra	Corteva Agriscience	62719-527
Triclopyr	Pathfinder II	Corteva Agriscience	62719-176
Triclopyr	Relegate	Nufarm Americas Inc.	228-521
Triclopyr	Remedy	Corteva Agriscience	62719-70
Triclopyr	Remedy Ultra	Corteva Agriscience	62719-552
Triclopyr	Renovate 3	SePRO Corporation	62719-37-67690
Triclopyr	Renovate OTF	SePRO Corporation	67690-42
Triclopyr	Tahoe 3A	Nufarm Americas Inc.	228-520
Triclopyr	Triclopyr 3A	Albaugh, LLC	42750-127
Triclopyr	Triclopyr 4E	Albaugh, LLC	42750-126
Triclopyr	Trycera	Helena Agri-Enterprises, LLC	5906-580
Triclopyr	Vastlan	Corteva Agriscience	62719-687
Triclopyr + 2, 4-D	Alligare Everett	Alligare, LLC	81927-29
Triclopyr + 2, 4-D	Aquasweep	Nufarm Americas Inc.	228-316
Triclopyr + 2, 4-D	Candor	Nufarm Americas Inc.	228-565
Triclopyr + 2, 4-D	Crossbow	Corteva Agriscience	62719-260
Triclopyr + 2,4-D	Crossroad	Albaugh, LLC	42750-124
Triclopyr + Clopyralid	Alligare Prescott Herbicide	Alligare, LLC	81927-30
Triclopyr + Clopyralid	Redeem R&P	Corteva Agriscience	62719-337

Table F-3. Adjuvants approved for use on BLM-administered lands*

Adjuvant Class	Adjuvant Type	Trade Name	Manufacturer	ARBO II**
Surfactant	Non-Ionic	90-10 Surfactant	Brewer International	
Surfactant	Non-Ionic	A-90	Alligare, LLC	
Surfactant	Non-Ionic	Activate Plus	WinField-United	
Surfactant	Non-Ionic	Activator 90	Loveland Products, Inc.	
Surfactant	Non-Ionic	Ad Spray 90	Helena Agri-Enterprises, LLC	
Surfactant	Non-Ionic	Alligare 90	Alligare, LLC	
Surfactant	Non-Ionic	Alligare Surface	Alligare, LLC	
Surfactant	Non-Ionic	Alligare Surface West	Alligare, LLC	
Surfactant	Non-Ionic	Alligare Trace	Alligare, LLC	
Surfactant	Non-Ionic	Aquafact	Aqumix, Inc.	
Surfactant	Non-Ionic	Arvon	Wilbur-Ellis Co., LLC	
Surfactant	Non-Ionic	Audible 80	Exacto, Inc.	
Surfactant	Non-Ionic	Audible 90	Exacto, Inc.	
Surfactant	Non-Ionic	Brewer 90-10	Brewer International	
Surfactant	Non-Ionic	Chempro S-820	Chemorse Ltd.	
Surfactant	Non-Ionic	Chempro S-910	Chemorse Ltd.	
Surfactant	Non-Ionic	Chemsurf 80	Chemorse Ltd.	
Surfactant	Non-Ionic	Chemsurf 90	Chemorse Ltd.	
Surfactant	Non-Ionic	Cornbelt Premier 90	Van Diest Supply Co.	
Surfactant	Non-Ionic	Cornbelt Trophy Gold	Van Diest Supply Co.	
Surfactant	Non-Ionic	Denali-EA	Wilbur-Ellis Co., LLC	
Surfactant	Non-Ionic	Elite Platinum	Red River Specialities, Inc.	
Surfactant	Non-Ionic	Elite Premium	Red River Specialities, Inc.	
Surfactant	Non-Ionic	EP-90	EcoPak, LLC	
Surfactant	Non-Ionic	Haf-Pynt	Drexel Chemical Company	
Surfactant	Non-Ionic	Hum-AC 820	Drexel Chemical Company	
Surfactant	Non-Ionic	Induce	Helena Agri-Enterprises, LLC	
Surfactant	Non-Ionic	Induce pH	Helena Agri-Enterprises, LLC	
Surfactant	Non-Ionic	Inlet	Helena Agri-Enterprises, LLC	
Surfactant	Non-Ionic	LI-700	Loveland Products, Inc.	✓
Surfactant	Non-Ionic	Magnify	Monterey AgResources	✓
Surfactant	Non-Ionic	NIS 90:10	Precision Laboratories, LLC	
Surfactant	Non-Ionic	No Foam A	Creative Marketing & Research	
Surfactant	Non-Ionic	Optima	Helena Agri-Enterprises, LLC	
Surfactant	Non-Ionic	PAS-800	Drexel Chemical Company	
Surfactant	Non-Ionic	Preference	WinField-United	
Surfactant	Non-Ionic	Rainier-EA	Wilbur-Ellis Co., LLC	
Surfactant	Non-Ionic	Range Master	ORO Agri, Inc.	
Surfactant	Non-Ionic	Red River 90	Red River Specialities, Inc.	
Surfactant	Non-Ionic	Red River NIS	Red River Specialities, Inc.	
Surfactant	Non-Ionic	Scanner	Loveland Products, Inc.	
Surfactant	Non-Ionic	Spec 90/10	Helena Agri-Enterprises, LLC	
Surfactant	Non-Ionic	Spray Activator 85	Van Diest Supply Co.	

Adjuvant Class	Adjuvant Type	Trade Name	Manufacturer	ARBO II**
Surfactant	Non-Ionic	Spreader 90	Loveland Products, Inc.	
Surfactant	Non-Ionic	Spret	Helena Agri-Enterprises, LLC	
Surfactant	Non-Ionic	Surf-Ac 820	Drexel Chemical Company	
Surfactant	Non-Ionic	Surf-Ac 910	Drexel Chemical Company	
Surfactant	Non-Ionic	UAP Surfactant 80/20	Loveland Products, Inc.	
Surfactant	Non-Ionic	Wetcit	ORO Agri, Inc.	
Surfactant	Non-Ionic	X-77	Loveland Products, Inc.	
Surfactant	Silicone Based	Aero Dyne-Amic	Helena Agri-Enterprises, LLC	
Surfactant	Silicone Based	Aircover	WinField-United	
Surfactant	Silicone Based	Alligare OSS/NIS	Alligare, LLC	
Surfactant	Silicone Based	Chempro S-172	Drexel Chemical Company	
Surfactant	Silicone Based	Dyne-Amic	Helena Agri-Enterprises, LLC	✓
Surfactant	Silicone Based	Elite Marvel	Red River Specialities, Inc.	
Surfactant	Silicone Based	Freeway	Loveland Products, Inc.	
Surfactant	Silicone Based	Kinetic	Helena Agri-Enterprises, LLC	✓
Surfactant	Silicone Based	Phase	Loveland Products, Inc.	
Surfactant	Silicone Based	Phase II	Loveland Products, Inc.	
Surfactant	Silicone Based	Scrimmage	Exacto, Inc.	
Surfactant	Silicone Based	SilEnergy	Brewer International	
Surfactant	Silicone Based	Sil-Fact	Drexel Chemical Company	
Surfactant	Silicone Based	Sil-MES 100	Drexel Chemical Company	
Surfactant	Silicone Based	Silnet 200	Brewer International	
Surfactant	Silicone Based	Silwet L-77	Helena Agri-Enterprises, LLC	
Surfactant	Silicone Based	Speed	Precision Laboratories, LLC	
Surfactant	Silicone Based	Sun Spreader	Red River Specialities, Inc.	
Surfactant	Silicone Based	Syl-coat	Wilbur-Ellis Co., LLC	
Surfactant	Silicone Based	Syl-Tac-EA	Wilbur-Ellis Co., LLC	
Surfactant	Silicone Based	Thoroughbred	WinField-United	
Surfactant	Spreader/Sticker	Agri-Trend Spreader	Agri-Trend	
Surfactant	Spreader/Sticker	Antero-EA	Wilbur-Ellis Co., LLC	
Surfactant	Spreader/Sticker	Aqua-King Plus	WinField-United	
Surfactant	Spreader/Sticker	Attach	Loveland Products, Inc.	
Surfactant	Spreader/Sticker	Bond	Loveland Products, Inc.	✓
Surfactant	Spreader/Sticker	Bond Max	Loveland Products, Inc.	
Surfactant	Spreader/Sticker	Chempro S-196	Chemorse Ltd.	
Surfactant	Spreader/Sticker	Cohere	Helena Agri-Enterprises, LLC	
Surfactant	Spreader/Sticker	CWC 90	CWC Chemical, Inc.	
Surfactant	Spreader/Sticker	Gulfstream	WinField-United	
Surfactant	Spreader/Sticker	Insist 90 Plus	Wilbur-Ellis Co., LLC	
Surfactant	Spreader/Sticker	Nu Film 17	Miller Chem. & Fert. Corp.	
Surfactant	Spreader/Sticker	Nu Film P	Miller Chem. & Fert. Corp.	
Surfactant	Spreader/Sticker	Nu-Film-IR	Miller Chem. & Fert. Corp.	
Surfactant	Spreader/Sticker	Onside Kick	Exacto, Inc.	
Surfactant	Spreader/Sticker	Pinene II	Drexel Chemical Company	

Adjuvant Class	Adjuvant Type	Trade Name	Manufacturer	ARBO II**
Surfactant	Spreader/Sticker	Protyx	Precision Laboratories, LLC	
Surfactant	Spreader/Sticker	Rocket DL	Monterey AgResources	
Surfactant	Spreader/Sticker	Surf-King Plus	WinField-United	
Surfactant	Spreader/Sticker	Tactic	Loveland Products, Inc.	✓
Surfactant	Spreader/Sticker	TopFilm	Biosorb, Inc.	
Surfactant	Spreader/Sticker	Widespread Max	Loveland Products, Inc.	
Oil Based	Crop Oil Concentrate	60/40 Crop Oil Concentrate	Chemorse Ltd.	
Oil Based	Crop Oil Concentrate	Agri-Dex	Helena Agri-Enterprises, LLC	✓
Oil Based	Crop Oil Concentrate	Alligare Forestry Oil	Alligare, LLC	
Oil Based	Crop Oil Concentrate	Brewer 83-17	Brewer International	
Oil Based	Crop Oil Concentrate	Cornbelt Crop Oil Concentrate	Van Diest Supply Co.	
Oil Based	Crop Oil Concentrate	Cornbelt Premium Crop Oil Concentrate	Van Diest Supply Co.	
Oil Based	Crop Oil Concentrate	Crop Oil Concentrate (Helena)	Helena Agri-Enterprises, LLC	
Oil Based	Crop Oil Concentrate	Crop Oil Concentrate (Loveland)	Loveland Products, Inc.	
Oil Based	Crop Oil Concentrate	Exchange	Precision Laboratories, LLC	
Oil Based	Crop Oil Concentrate	Herbimax	Loveland Products, Inc.	
Oil Based	Crop Oil Concentrate	Maximizer Crop Oil Conc.	Loveland Products, Inc.	
Oil Based	Crop Oil Concentrate	Monterey Crop Oil	Monterey AgResources	
Oil Based	Crop Oil Concentrate	Mor-Act Adjuvant	Wilbur-Ellis Co., LLC	
Oil Based	Crop Oil Concentrate	Peptoil	Drexel Chemical Company	
Oil Based	Crop Oil Concentrate	Power-Line Crop Oil	Land View Inc.	
Oil Based	Crop Oil Concentrate	Primary	Drexel Chemical Company	
Oil Based	Crop Oil Concentrate	Prime Oil	WinField-United	
Oil Based	Crop Oil Concentrate	R.O.C.	Wilbur-Ellis Co., LLC	
Oil Based	Crop Oil Concentrate	Red River Forestry Oil	Red River Specialities, Inc.	
Oil Based	Crop Oil Concentrate	Red River Pacer Crop Oil	Red River Specialities, Inc.	
Oil Based	Crop Oil Concentrate	Superb HC	WinField-United	✓
Oil Based	Methylated Seed Oil	60/40 MSO	Chemorse Ltd.	

Adjuvant Class	Adjuvant Type	Trade Name	Manufacturer	ARBO II**
Oil Based	Methylated Seed Oil	Alleviate	Wilbur-Ellis Co., LLC	
Oil Based	Methylated Seed Oil	Alligare MSO	Alligare, LLC	
Oil Based	Methylated Seed Oil	Alligare MSO West	Alligare, LLC	
Oil Based	Methylated Seed Oil	Atmos	WinField-United	
Oil Based	Methylated Seed Oil	Conquer	Chemorse Ltd.	
Oil Based	Methylated Seed Oil	Cornbelt Base	Van Diest Supply Co.	
Oil Based	Methylated Seed Oil	Cornbelt Griptite MSO	Van Diest Supply Co.	
Oil Based	Methylated Seed Oil	Cornbelt Locktite MSO	Van Diest Supply Co.	
Oil Based	Methylated Seed Oil	Cornbelt Methylated Soy-Stik	Van Diest Supply Co.	
Oil Based	Methylated Seed Oil	Destiny HC	WinField-United	✓
Oil Based	Methylated Seed Oil	Elite Supreme	Red River Specialities, Inc.	
Oil Based	Methylated Seed Oil	Glacier-EA	Wilbur-Ellis Co., LLC	
Oil Based	Methylated Seed Oil	Hasten-EA	Wilbur-Ellis Co., LLC	
Oil Based	Methylated Seed Oil	Hot MES	Drexel Chemical Company	
Oil Based	Methylated Seed Oil	Inergy	WinField-United	
Oil Based	Methylated Seed Oil	Kixyt	Precision Laboratories, LLC	
Oil Based	Methylated Seed Oil	MES-100	Drexel Chemical Company	
Oil Based	Methylated Seed Oil	Monterey M.S.O.	Monterey AgResources	
Oil Based	Methylated Seed Oil	MSO	Alligare, LLC	
Oil Based	Methylated Seed Oil	MSO Concentrate (Alligare)	Alligare, LLC	
Oil Based	Methylated Seed Oil	MSO Concentrate (Loveland)	Loveland Products, Inc.	
Oil Based	Methylated Seed Oil	MSO-100	Ag Spray, Inc.	
Oil Based	Methylated Seed Oil	Persist Ultra	Precision Laboratories, LLC	
Oil Based	Methylated Seed Oil	Premium MSO	Helena Agri-Enterprises, LLC	
Oil Based	Methylated Seed Oil	Red River Supreme	Red River Specialities, Inc.	
Oil Based	Methylated Seed Oil	Renegade-EA	Wilbur-Ellis Co., LLC	
Oil Based	Methylated Seed Oil	Sun Wet	Brewer International	
Oil Based	Methylated Seed Oil	Sunburn	Red River Specialities, Inc.	
Oil Based	Methylated Seed Oil	SunEnergy	Brewer International	
Oil Based	Methylated Seed Oil	Sunset	Red River Specialities, Inc.	
Oil Based	Methylated Seed Oil	Super Spread MSO	Wilbur-Ellis Co., LLC	
Oil Based	Methylated Seed Oil + Organosilicate	Alligare MVO Plus	Alligare, LLC	
Oil Based	Vegetable Oil	Amigo	Loveland Products, Inc.	
Oil Based	Vegetable Oil	BeanOil	Drexel Chemical Company	
Oil Based	Vegetable Oil	Competitor	Wilbur-Ellis Co., LLC	✓
Oil Based	Vegetable Oil	Elite Natural	Red River Specialities, Inc.	
Oil Based	Vegetable Oil	Motion	Exacto, Inc.	
Oil Based	Vegetable Oil	Noble	WinField-United	
Oil Based	Vegetable Oil	Vegetoil	Drexel Chemical Company	
Fertilizer Based	Nitrogen Based	Actamaster Soluble Spray Adjuvant	Loveland Products, Inc.	
Fertilizer Based	Nitrogen Based	Actamaster Spray Adjuvant	Loveland Products, Inc.	
Fertilizer Based	Nitrogen Based	Alliance	WinField-United	
Fertilizer Based	Nitrogen Based	AMS-All	Drexel Chemical Company	

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Adjuvant Class	Adjuvant Type	Trade Name	Manufacturer	ARBO II**
Fertilizer Based	Nitrogen Based	AMS-Supreme	Drexel Chemical Company	
Fertilizer Based	Nitrogen Based	AMS-Xtra	Drexel Chemical Company	
Fertilizer Based	Nitrogen Based	Bronc	Wilbur-Ellis Co., LLC	
Fertilizer Based	Nitrogen Based	Bronc Max	Wilbur-Ellis Co., LLC	✓
Fertilizer Based	Nitrogen Based	Bronc Plus Dry	Wilbur-Ellis Co., LLC	
Fertilizer Based	Nitrogen Based	Bronc Plus Dry EDT	Wilbur-Ellis Co., LLC	✓
Fertilizer Based	Nitrogen Based	Cayuse Plus	Wilbur-Ellis Co., LLC	
Fertilizer Based	Nitrogen Based	Class Act NG	WinField-United	✓
Fertilizer Based	Nitrogen Based	Cornbelt Gardian	Van Diest Supply Co.	
Fertilizer Based	Nitrogen Based	Cornbelt Gardian Plus	Van Diest Supply Co.	
Fertilizer Based	Nitrogen Based	Corral AMS Liquid	WinField-United	
Fertilizer Based	Nitrogen Based	Dispatch	Loveland Products, Inc.	
Fertilizer Based	Nitrogen Based	Dispatch 111	Loveland Products, Inc.	
Fertilizer Based	Nitrogen Based	Dispatch 2N	Loveland Products, Inc.	
Fertilizer Based	Nitrogen Based	Dispatch AMS	Loveland Products, Inc.	
Fertilizer Based	Nitrogen Based	Flame	Loveland Products, Inc.	
Fertilizer Based	Nitrogen Based	Holzit	Drexel Chemical Company	
Fertilizer Based	Nitrogen Based	Nitro-Surf	Drexel Chemical Company	
Fertilizer Based	Nitrogen Based	Quest	Helena Agri-Enterprises, LLC	
Fertilizer Based	Nitrogen Based	Transactive HC	Helena Agri-Enterprises, LLC	
Special Function	Buffering Agent	Brimstone	Wilbur-Ellis Co., LLC	
Special Function	Buffering Agent	BS-500	Drexel Chemical Company	
Special Function	Buffering Agent	Buffers P.S.	Helena Agri-Enterprises, LLC	
Special Function	Buffering Agent	Oblique	Red River Specialities, Inc.	
Special Function	Buffering Agent	Spray-Aide	Miller Chem. & Fert. Corp.	
Special Function	Buffering Agent	Tri-Fol	Wilbur-Ellis Co., LLC	
Special Function	Buffering Agent	Yardage	Exacto, Inc.	
Special Function	Colorants/Dyes	Alligare Super Marking Dye	Alligare, LLC	
Special Function	Colorants/Dyes	Brandt Bulls Eye Blue SS	Brandt Consolidated, Inc.	
Special Function	Colorants/Dyes	Brandt Bulls Eye Red SS	Brandt Consolidated, Inc.	
Special Function	Colorants/Dyes	Bullseye	Milliken Chemical	
Special Function	Colorants/Dyes	Elite Ruby	Red River Specialities, Inc.	
Special Function	Colorants/Dyes	Elite Sapphire	Red River Specialities, Inc.	
Special Function	Colorants/Dyes	Elite Sapphire WSB	Red River Specialities, Inc.	
Special Function	Colorants/Dyes	Elite Splendor	Red River Specialities, Inc.	
Special Function	Colorants/Dyes	Hash Mark Green Powder	Exacto, Inc.	
Special Function	Colorants/Dyes	Hask Mark Blue Liquid	Exacto, Inc.	
Special Function	Colorants/Dyes	Hask Mark Blue Liquid HC	Exacto, Inc.	
Special Function	Colorants/Dyes	Hask Mark Blue Powder	Exacto, Inc.	
Special Function	Colorants/Dyes	Hask Mark Green Liquid	Exacto, Inc.	
Special Function	Colorants/Dyes	Hi-Light	BASF	
Special Function	Colorants/Dyes	Marker Dye	Loveland Products, Inc.	
Special Function	Colorants/Dyes	Mark-It Blue	Monterey AgResources	
Special Function	Colorants/Dyes	Mark-It Red	Monterey AgResources	

Adjuvant Class	Adjuvant Type	Trade Name	Manufacturer	ARBO II**
Special Function	Colorants/Dyes	Mystic HC	WinField-United	
Special Function	Colorants/Dyes	SensiPro Blue Granule High-Concentrate	Sensient	
Special Function	Colorants/Dyes	SensiPro Blue Liquid	Sensient	
Special Function	Colorants/Dyes	SensiPro Blue Liquid High-Concentrate	Sensient	
Special Function	Colorants/Dyes	SensiPro Green Granule	Sensient	
Special Function	Colorants/Dyes	SensiPro Green Liquid	Sensient	
Special Function	Colorants/Dyes	SensiPro Red Granule	Sensient	
Special Function	Colorants/Dyes	SensiPro Red Liquid	Sensient	
Special Function	Colorants/Dyes	Signal	Precision Laboratories, LLC	
Special Function	Colorants/Dyes	SPI-Max Blue Spray Marker	Prokoz	
Special Function	Colorants/Dyes	Spray Indicator XL	Helena Agri-Enterprises, LLC	
Special Function	Colorants/Dyes	Turftrax	Loveland Products, Inc.	
Special Function	Colorants/Dyes	Turftrax Blue Spray Indicator	Loveland Products, Inc.	
Special Function	Compatibility/Suspension Agent	Convert	Precision Laboratories, LLC	
Special Function	Compatibility/Suspension Agent	E Z Mix	Loveland Products, Inc.	
Special Function	Compatibility/Suspension Agent	Mix	Drexel Chemical Company	
Special Function	Compatibility/Suspension Agent	Support	Loveland Products, Inc.	
Special Function	Defoaming Agent	Alligare Anti-Foamer	Alligare, LLC	
Special Function	Defoaming Agent	Alligare Defoamer	Alligare, LLC	
Special Function	Defoaming Agent	Cornbelt Defoamer	Van Diest Supply Co.	
Special Function	Defoaming Agent	Defoamer	Brewer International	
Special Function	Defoaming Agent	Fighter-F 10	Loveland Products, Inc.	
Special Function	Defoaming Agent	Fighter-F Dry	Loveland Products, Inc.	
Special Function	Defoaming Agent	Foam Fighter	Miller Chem. & Fert. Corp.	
Special Function	Defoaming Agent	Foambuster Max	Helena Agri-Enterprises, LLC	
Special Function	Defoaming Agent	Fome-Kil	Drexel Chemical Company	
Special Function	Defoaming Agent	FTF Defoamer	Wilbur-Ellis Co., LLC	
Special Function	Defoaming Agent	Gundown Max	Precision Laboratories, LLC	
Special Function	Defoaming Agent	Red River Defoamer	Red River Specialities, Inc.	
Special Function	Defoaming Agent	Revere	Exacto, Inc.	
Special Function	Defoaming Agent	Suppression	Chemorse Ltd.	
Special Function	Defoaming Agent	Tripleline	Creative Marketing & Research	
Special Function	Defoaming Agent	Unfoamer	Loveland Products, Inc.	
Special Function	Deposition Aid	Agripharm Drift Control	Walco International	
Special Function	Deposition Aid	Alligare Downforce	Alligare, LLC	
Special Function	Deposition Aid	Alligare Pattern	Alligare, LLC	
Special Function	Deposition Aid	Arborchem Basal Oil	Arborchem Products	
Special Function	Deposition Aid	Border AQ	Precision Laboratories, LLC	
Special Function	Deposition Aid	Chem-Trol	Chemorse Ltd.	
Special Function	Deposition Aid	Cide-Kick	Brewer International	

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Adjuvant Class	Adjuvant Type	Trade Name	Manufacturer	ARBO II**
Special Function	Deposition Aid	Cide-Kick II	Brewer International	
Special Function	Deposition Aid	Clasp	Helena Agri-Enterprises, LLC	
Special Function	Deposition Aid	Compadre	Loveland Products, Inc.	
Special Function	Deposition Aid	Cornbelt Locktite	Van Diest Supply Co.	
Special Function	Deposition Aid	Crosshair	Wilbur-Ellis Co., LLC	
Special Function	Deposition Aid	CWC Sharpshooter	CWC Chemical, Inc.	
Special Function	Deposition Aid	Cygnat Plus	Brewer International	✓
Special Function	Deposition Aid	Direct	Precision Laboratories, LLC	
Special Function	Deposition Aid	DLZ	Helena Agri-Enterprises, LLC	
Special Function	Deposition Aid	Droplex	WinField-United	
Special Function	Deposition Aid	Efficax	Wilbur-Ellis Co., LLC	
Special Function	Deposition Aid	Elite Secure Ultra	Red River Specialities, Inc.	
Special Function	Deposition Aid	Exit	Miller Chem. & Fert. Corp.	
Special Function	Deposition Aid	Grounded	Helena Agri-Enterprises, LLC	
Special Function	Deposition Aid	Grounded - W	Helena Agri-Enterprises, LLC	
Special Function	Deposition Aid	Infuse	Loveland Products, Inc.	
Special Function	Deposition Aid	Intact Plus	Loveland Products, Inc.	
Special Function	Deposition Aid	Interlock	WinField-United	✓
Special Function	Deposition Aid	Liberate	Loveland Products, Inc.	✓
Special Function	Deposition Aid	LOX	Drexel Chemical Company	
Special Function	Deposition Aid	LOX PLUS	Drexel Chemical Company	
Special Function	Deposition Aid	Mist-Control	Miller Chem. & Fert. Corp.	
Special Function	Deposition Aid	Offside	Exacto, Inc.	
Special Function	Deposition Aid	PointBlank WM	Helena Agri-Enterprises, LLC	
Special Function	Deposition Aid	Poly Control 2	Brewer International	
Special Function	Deposition Aid	Reign	Loveland Products, Inc.	
Special Function	Deposition Aid	Reign LC	Loveland Products, Inc.	
Special Function	Deposition Aid	Secure Ultra	Red River Specialities, Inc.	
Special Function	Deposition Aid	Strike Zone DF	Helena Agri-Enterprises, LLC	
Special Function	Deposition Aid	Sustain	Miller Chem. & Fert. Corp.	
Special Function	Deposition Aid	Syndetic	Chemorse Ltd.	
Special Function	Deposition Aid	Volare DC	Precision Laboratories, LLC	
Special Function	Deposition Aid	Weather Gard	Loveland Products, Inc.	
Special Function	Diluent/Deposition Agent	Bark Oil	Crop Production Services	
Special Function	Diluent/Deposition Agent	Bark Oil EC	Crop Production Services	
Special Function	Diluent/Deposition Agent	Elite Premier	Red River Specialities, Inc.	
Special Function	Diluent/Deposition Agent	Elite Premier Blue	Red River Specialities, Inc.	
Special Function	Diluent/Deposition Agent	EP Base Oil	EcoPak, LLC	
Special Function	Diluent/Deposition Agent	EP Base Oil for TK	EcoPak, LLC	

Adjuvant Class	Adjuvant Type	Trade Name	Manufacturer	ARBO II**
Special Function	Diluent/Deposition Agent	EP Base Oil Plus	EcoPak, LLC	
Special Function	Diluent/Deposition Agent	Hy-Grade EC	CWC Chemical, Inc.	
Special Function	Diluent/Deposition Agent	Hy-Grade I	CWC Chemical, Inc.	
Special Function	Diluent/Deposition Agent	Improved JLB Oil Plus	Brewer International	
Special Function	Diluent/Deposition Agent	In-Place	Wilbur-Ellis Co., LLC	
Special Function	Diluent/Deposition Agent	JLB Oil Plus	Brewer International	
Special Function	Diluent/Deposition Agent	Red River Basal Oil	Red River Specialities, Inc.	
Special Function	Diluent/Deposition Agent	Thinvert Concentrate	Waldrum Specialities, Inc.	
Special Function	Diluent/Deposition Agent	Thinvert RTU	Waldrum Specialities, Inc.	
Special Function	Diluent/Deposition Agent	W.E.B. Oil	Wilbur-Ellis Co., LLC	
Special Function	Foam Marker	Align	Helena Agri-Enterprises, LLC	
Special Function	Foam Marker	F.M.-160	Drexel Chemical Company	
Special Function	Foam Marker	Red River Foam Marker	Red River Specialities, Inc.	
Special Function	Foam Marker	Trekker Trax	Loveland Products, Inc.	
Special Function	Foam Marker	Tuff Trax Foam Concentration	Loveland Products, Inc.	
Special Function	Tank Cleaner	All Clear	Loveland Products, Inc.	
Special Function	Tank Cleaner	Back Field	Exacto, Inc.	
Special Function	Tank Cleaner	Cornbelt Tank-Aid	Van Diest Supply Co.	
Special Function	Tank Cleaner	Elite Vigor	Red River Specialities, Inc.	
Special Function	Tank Cleaner	Red River Tank Cleaner	Red River Specialities, Inc.	
Special Function	Tank Cleaner	SSC-11	Wilbur-Ellis Co., LLC	
Special Function	Tank Cleaner	Tank and Equipment Cleaner	Loveland Products, Inc.	
Special Function	Tank Cleaner	Wipe Out XS	Helena Agri-Enterprises, LLC	
Special Function	Water Conditioning	AccuQuest WM	Helena Agri-Enterprises, LLC	
Special Function	Water Conditioning	Alligare Water Conditioner Gold	Alligare, LLC	
Special Function	Water Conditioning	Blendmaster	Loveland Products, Inc.	
Special Function	Water Conditioning	Breeze	WinField-United	
Special Function	Water Conditioning	Choice	Loveland Products, Inc.	
Special Function	Water Conditioning	Choice Weather Master	Loveland Products, Inc.	
Special Function	Water Conditioning	Choice Xtra	Loveland Products, Inc.	
Special Function	Water Conditioning	Climb	Wilbur-Ellis Co., LLC	
Special Function	Water Conditioning	Completion	Exacto, Inc.	
Special Function	Water Conditioning	Cornbelt En-Pack	Van Diest Supply Co.	
Special Function	Water Conditioning	Cornbelt N-Tense	Van Diest Supply Co.	
Special Function	Water Conditioning	Cut-Rate	Wilbur-Ellis Co., LLC	✓
Special Function	Water Conditioning	Cynder	Wilbur-Ellis Co., LLC	
Special Function	Water Conditioning	Elite Imperial	Red River Specialities, Inc.	

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Adjuvant Class	Adjuvant Type	Trade Name	Manufacturer	ARBO II**
Special Function	Water Conditioning	Hel-Fire	Helena Agri-Enterprises, LLC	
Special Function	Water Conditioning	Import	Precision Laboratories, LLC	
Special Function	Water Conditioning	Sequestra	Drexel Chemical Company	
Special Function	Water Conditioning	Shepherd Complete	Van Diest Supply Co.	
Special Function	Water Conditioning	Shepherd VaporGard + DRA	Van Diest Supply Co.	
Special Function	Water Conditioning	Smoke	Helena Agri-Enterprises, LLC	
Special Function	Water Conditioning	Transport LpH	Precision Laboratories, LLC	
Special Function	Water Conditioning	Transport Plus	Precision Laboratories, LLC	

* Approved list as of April 24, 2023.

** Approved for use near water under ARBO II.

APPENDIX G – Herbicide Risk Assessment Summaries

The risk tables presented in this appendix are used in the individual analysis in Chapter 3 and **Appendix H**. This appendix was adapted from the 2010 Oregon FEIS (USDI BLM 2010a: 85-91). Risk assessments are updated periodically and are available at <https://www.fs.usda.gov/foresthealth/protecting-forest/integrated-pest-management/pesticide-management/pesticide-risk-assessments.shtml>.

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.

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 LD₅₀.⁵¹ LD₅₀ (LD = lethal dose) represents the amount of herbicide that results in the death of 50 percent of a test population. Therefore, the lower the LD₅₀, the more toxic the herbicide. Table G-1 shows the three categories that the EPA uses for classifying herbicides (USDI 1992a).

EPA terms

LD ₅₀	Lethal Dose to 50% of the population
LOC	Level of Concern
NOAEL	No Observed Adverse Effect Level
LOAEL	Lowest Observed Adverse Effect Level

BLM terms

RQ	Risk Quotient
ECC	Estimated Exposure Concentration
TRV	Toxicity Reference Value
ARI	Aggregated Risk Index

Forest Service terms

HQ	Hazard Quotient
RfD	Reference Dose
TI	Toxicity Index

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.

⁵¹ LC₅₀ (lethal concentration) in the case of aquatic organisms.

Table G-1. Herbicide label categories

Categories	Signal Word Required on Label	Oral LD ₅₀ (mg./kg.)	Dermal LD ₅₀ (mg./kg.)	Inhalation LD ₅₀ (mg./kg.)	Probable Oral Lethal Dose for 150 lb. Human
I – Highly Toxic	DANGER, POISON, skull & crossbones	Up to and including 50	Up to and including 200	Up to and including 0.2	A few drops to a teaspoonful
II – Moderately Toxic	WARNING	From 50 to 500	From 200 to 2,000	From 0.2 to 2	Over one teaspoonful to one ounce
III – Slightly Toxic	CAUTION	From 500 to 5,000	From 2,000 to 20,000	From 2 to 20	Over one ounce to one pint or one pound.

In addition, the EPA has established Levels of Concern (LOC) for herbicides, which is the dose of the herbicide above which effects would be expected. The LOCs are used by EPA for registration, and to indicate potential risk to non-target organisms and the need to consider regulatory action (USEPA 2007). In the absence of information indicating otherwise, the LOC is generally 1/10th of the Lowest Observed Adverse Effect Level (LOAEL); that is, the lowest dose level where there was a statistically significant increase in frequency or severity of adverse effects⁵² 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

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 2010 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.

⁵² Lethal or sub-lethal.

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 receptors⁵³ to direct spray, surface runoff, wind erosion, and accidental spills were analyzed.

Most of the Human Health and Ecological Risk Assessments were developed by the BLM for the 2007 PEIS, the 2016 PEIS, or by the Forest Service for the *2005 Pacific Northwest Region Invasive Plant Program EIS* (Table G-2). Risk assessments are periodically updated and are available online:

<https://www.fs.usda.gov/foresthealth/protecting-forest/integrated-pest-management/pesticide-management/pesticide-risk-assessments.shtml>.

The Risk Assessments, related separate analyses, and the PEISs include analysis of degradates and other ingredients for which information is available and not constrained by confidential business information restrictions. Preparing a Risk Assessment for every conceivable combination of herbicide, tank mix, adjuvants (including surfactants), and other possible mixtures is not feasible, as the BLM cannot prepare hundreds of Risk Assessments, and the cost would be exorbitant. To the degree a toxic substance is known to pose a human or ecological risk, the BLM has undertaken analysis to assess its impacts through Risk Assessments. More detailed information about uncertainty in the Risk Assessment process is included in Appendix 13 of the 2010 Oregon FEIS.

Table G-2. Human Health and Ecological Risk Assessment sources

Herbicide	Human Health	Ecological
2,4-D	BLM (2016)	
Aminopyralid	BLM (2016)	
Chlorsulfuron	Forest Service	BLM (2007)
Clopyralid	BLM (2016)	
Dicamba	Forest Service	
Dicamba + diflufenzopyr	NA	BLM (2007)
Diflufenzopyr	BLM (2007)	NA
Fluroxypyr	BLM (2016)	
Glyphosate	Forest Service	
Hexazinone	Forest Service	
Imazapic	BLM (2007)	
Imazapyr	Forest Service	
Metsulfuron methyl	Forest Service	
Picloram	Forest Service	
Rimsulfuron	BLM (2016)	
Sulfometuron methyl	BLM (2007)	
Triclopyr	Forest Service	
<i>Herbicides analyzed for Research and Demonstration</i>		
Fluazifop-P-butyl	Forest Service ¹	
Sethoxydim	Forest Service ²	

1. Scoping/screening level Risk Assessment, not adopted by the BLM.

2. Not adopted by the BLM

When evaluating risks from the use of herbicides proposed in a NEPA planning document, reliance on EPA's herbicide registration process as the sole demonstration of safety is insufficient. The

⁵³ An ecological entity such as a human, fish, plant, or slug.

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 2010 Oregon FEIS are the source for much of the individual herbicide information presented in each of the effects analyses in this EA, including the high-moderate-low risk categories shown in the tables in this appendix.

Drift

Assuming non-target animals and plants are not directly sprayed, drift is the process most likely to result in herbicides getting onto non-target plants and animals, as well as herbicides moving outside the treatment area. Drift, defined as that part of a sprayed herbicide that is moved from the target area by wind while it is still airborne, is primarily dependent upon the elevation of the spray nozzle, droplet size, and air movement. The smaller the droplet, the longer it stays suspended and the farther it can travel. Drift is one exposure scenario examined in the Risk Assessments and summarized on the risk tables at the end of this appendix.

Spray drift can be reduced by increasing droplet size because 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 1×10^{-4} mm Hg (Woodward et al. 1997). All of the herbicides covered by the EIS have very low vapor pressures (maximum is 4×10^{-6} mm Hg and they range to as low as 5.5×10^{-16} mm Hg (Vencill et al. 2002).

High, Moderate, and Low Risk in BLM and Forest Service Risk Assessments

The Risk Assessments measure both acute toxicity and chronic toxicity. Chronic toxicity is difficult to measure, especially in humans, but shows the results of sub-lethal doses that could result in cumulative deposits that could cause long-term problems in a vital body function. There is no standard measure for chronic toxicity.

BLM Ecological Risk Assessments

The BLM Ecological Risk Assessments established a Risk Quotient (RQ) for every herbicide and defined risk categories as follows:

0	No Risk	RQ < most conservative LOC for the species
L	Low Risk	RQ = 1 to 10 times the most conservative LOC for the species
M	Moderate Risk	RQ = 10 to 100 times the most conservative LOC for the species (generally equal to LOAEL to 10-times LOAEL)
H	High Risk	RQ > 100 times the most conservative LOC for the species

The RQ is calculated using the Estimated Exposure Concentration (EEC) and the Toxicity Reference Value (TRV). The EEC is the dose that an organism would be exposed to under the test scenario; e.g., *consumption* would indicate the amount of herbicide eaten on a sprayed material (a cow eating only sprayed grass for a day, for example), and *direct spray* indicates that the organism was sprayed directly with a wand or was in a flight path (a non-target plant species, for example). The TRV is the toxicity of the herbicide – usually the LOAEL or NOAEL. The RQ is the EEC divided by the TRV. An uncertainty factor can be brought in if it is thought that a species (or a particular individual within the species) is particularly susceptible to herbicide use, or that the single dose does not represent long-term exposure.

For example, the TRV (the dose that can be consumed with a potentially adverse effect) for a mule deer consuming vegetation contaminated with bromacil⁵⁴ 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 contaminated with bromacil sprayed at the typical application rate (4 lbs./acre), the EEC (the amount of herbicide that the mule deer will be exposed to by eating the contaminated vegetation) is 33.7 milligrams per kilograms of body weight per day. Thus, the RQ is 33.7 mg./kg. divided by 170 mg./kg., or 0.198, which is a risk category of 0 (or no risk).

Tank Mixes - The BLM evaluated risks from mixing two herbicides together in a tank mix. The BLM assumed that products in a tank mix act in an additive manner. Therefore, to simulate a tank mix of two herbicides, RQs for those two herbicides were combined (details provided in the individual Risk Assessments). The application rates within the tank mix are not necessarily the same as those of each individual active ingredient applied alone. The percent of RQs exceeding LOCs for each of the 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)

⁵⁴ An herbicide not included in this analysis.

The BLM Human Health Risk Assessments used the Aggregated Risk Index (ARI) and defined risk categories as follows:

O	No Risk	Majority of ARIs > 1
L	Low Risk	Majority of ARIs < 1 but > 0.1
M	Moderate Risk	Majority of ARIs < 0.1 but > 0.01
H	High Risk	Majority of ARIs < 0.01

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

Forest Service Risk Assessments

The Forest Service Risk Assessments are very similar to the BLM's Ecological Risk Assessments. The Forest Service Risk Assessments established a Hazard Quotient (HQ) for every herbicide and established risk categories as follows:

O	No Risk	HQ < LOC for the species
L	Low Risk	HQ = 1 to 10 times the LOC ⁵⁵ for the species
M	Moderate Risk	HQ = 10 to 100 times the LOC for the species
H	High Risk	HQ > 100 times the LOC for the species

The HQ is calculated using the Reference Dose (RfD) and the Toxicity Index (TI). The RfD is the dose that an organism would be exposed to under the test scenario; the TI is the toxicity of the herbicide and the HQ is the RfD divided by the TI. An uncertainty factor can be brought in if it is thought that a species (or a particular individual within the species) is particularly susceptible to herbicide use, or that the single dose does not represent long-term exposure.

Risk Assessments consist of the following:

- *Hazard Identification:* What are the dangers inherent with the herbicide (e.g., endocrine disruption, carcinogenic, etc.)?

⁵⁵ 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, pers. comm.)." (USDA 2005: 4-73)

- *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 effects observable?
- *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, or leaf damage, for example. Uncertainty factors are added to address hypersensitive individuals, or accommodate uncertainties in the measurements, such as inferring effects to one species based on actual tests on other species. Uncertainty factors are typically multiples of 10, so the assumed Lowest Observable Effects (LOAEL) dose could have been inflated 10, 100, or even 1,000 times for uncertainties. Thus, exposure of the average individual to the dose identified as having an effect, probably would not have an effect. Nevertheless, the L or low rating indicates risks start at that point. Moderate (M) risk categories indicate risk starts at doses one-tenth those of the low ratings; high is one-hundredth of the testing scenario dose. Testing scenarios are severe – e.g., soaking the test animal – so Standard Operating Procedures and Mitigation Measures such as buffers, wind speed limits, and so forth, as well as required safety equipment, limit exposure to substantially less than tested doses. For herbicides with moderate and high risk categories for a particular receptor, special cautions are implemented. For example, buffers for Special Status plant species are as large as 1,500 feet for some herbicides (see Conservation Measures in **Appendix E**). The zero, low, moderate, or high human health risk categories shown on Tables G-3 through G-8 are more conservative than the EPA ratings used to apply the Caution, Warning, or Danger/Poison signal words to herbicide labels.

The Risk Assessments are summarized on tables showing herbicide risk categories at BLM maximum and typical application rates to vegetation, wildlife, and humans, in a variety of application scenarios. Tables F-3 and F-6 show herbicide risks to vegetation, from BLM and Forest Service Risk Assessments respectively. Tables F-4 and F-7 show herbicide risks to wildlife, fish, and aquatic invertebrates, and Tables F-5 and F-8 show the risks to human health. Further information about the Human Health Risk Assessments can be found in the *Human Health and Safety* section of Chapter 4 of the 2010 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 2010 Oregon FEIS.

Table G-3. BLM-evaluated herbicide risk categories¹ for vegetation

Application Scenario	Chlorsulfuron		Imazapic		Diflufenzopyr + Dicamba		Fluridone		Sulfometuron		Aminopyralid		Fluroxypyr		Rimsulfuron	
	Typ ²	Max ²	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max
Direct Spray																
Terrestrial plants	H ¹ [1:1]	H [1:1]	L [1:1]	M [1:1]	M [1:1]	H [1:1]	NE	NE	O [1:1]	L [1:1]	H [1:1]	H [1:1]	H [1:1]	H [1:1]	H [1:1]	H [1:1]
Special Status terrestrial plants	H [1:1]	H [1:1]	L [1:1]	M [1:1]	H [1:1]	H [1:1]	NE	NE	H [1:1]	H [1:1]	H [1:1]	H [1:1]	H [1:1]	H [1:1]	H [1:1]	H [1:1]
Aquatic plants, pond	M [1:2]	M [2:2]	L [1:2]	L [2:2]	M [1:2]	M [1:2]	O [2:2]	O [2:2]	H [2:2]	H [2:2]	O [2:2]	O [4:4]	O [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]	O [2:2]	O [2:2]	H [2:2]	H [2:2]	O [2:2]	O [2:2]	O [2:2]	O [2:2]	H [1:2]	H [1:2]
Accidental Spill to a Pond																
Aquatic plants, pond	NE	H [1:2]	NE	H [2:2]	NE	M [1:1]	NE	L [2:2]	NE	H [2:2]	O [2:2]	O [4:4]	O [2:2]	L [2:4]	H [1:2]	M [2:4]
Off-Site Drift																
Terrestrial plants	M [5:12]	M [8:12]	O [18:18]	O [13:18]	O [5:6]	O [4:6]	NE	NE	O [12:12]	O [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]	O [17:18]	O [13:18]	L [3:6]	L [4:6]	NE	NE	H [5:12]	H [8:12]	L [10:18]	L [10:18]	L [13:18]	L [11:18]	L [9:18]	L [8:18]
Aquatic plants, pond	O [24:24]	O [24:24]	O [36:36]	O [34:36]	O [12:12]	O [12:12]	NE	NE	L [13:24]	L [12:24]	O [36:36]	O [36:36]	O [36:36]	O [36:36]	O [24:36]	O [23:36]
Aquatic plants, stream	O [24:24]	O [22:24]	O [36:36]	O [33:36]	O [8:12]	O [6:12]	NE	NE	L [14:24]	L [10:24]	O [36:36]	O [36:36]	O [36:36]	O [36:36]	O [24:36]	O [23:36]
Surface Runoff																
Terrestrial plants	O [42:42]	O [42:42]	O [42:42]	O [42:42]	O [42:42]	O [42:42]	NE	NE	O [42:42]	O [42:42]	O [42:42]	O [42:42]	O [42:42]	O [42:42]	O [42:42]	O [42:42]
Special Status terrestrial plants	O [42:42]	O [42:42]	O [42:42]	O [42:42]	O [34:42]	O [33:42]	NE	NE	O [32:42]	O [28:42]	O [42:42]	O [42:42]	O [42:42]	O [42:42]	O [42:42]	O [42:42]
Aquatic plants, pond	O [64:84]	O [53:84]	O [80:84]	O [62:84]	O [70:84]	O [67:84]	NE	NE	L [42:84]	L [38:84]	O [84:84]	O [84:84]	O [84:84]	O [84:84]	O [55:84]	O [54:84]
Aquatic plants, stream	O [80:84]	O [77:84]	O [84:84]	O [83:84]	O [84:84]	O [84:84]	NE	NE	O [69:84]	O [60:84]	O [84:84]	O [84:84]	O [84:84]	O [84:84]	O [84:84]	O [84:84]
Wind Erosion																
Terrestrial plants	O [9:9]	O [9:9]	O [9:9]	O [9:9]	O [9:9]	O [9:9]	NE	NE	O [9:9]	O [9:9]	O [9:9]	O [8:9]	O [9:9]	O [8:9]	O [8:9]	O [8:9]
Special Status terrestrial plants	O [9:9]	O [9:9]	O [9:9]	O [9:9]	O [9:9]	O [9:9]	NE	NE	O [9:9]	O [9:9]	O [8:9]	O [8:9]	O [8:9]	O [7:9]	O [8:9]	O [8:9]

¹ Shading denotes herbicides that are limited by Mitigation Measures to typical application rates where feasible.

1. Risk categories: 0 = No risk (majority of RQs < most conservative LOC for non-Special Status species); L = Low risk (majority of RQs 1-10x most conservative LOC for non-Special Status species); M = Moderate risk (majority of RQs 10-100x most conservative LOC for non-Special Status species); H = High risk (majority of RQs >100 most conservative LOC for non-Special Status species); and NE = Not evaluated. The Risk Category is based on the risk level of the majority of risk quotients observed in any of the scenarios for a given exposure group and receptor type. See more information at the risk tables in Chapter 4 of the Ecological Risk Assessments (ENSR 2005a-f, AECOM 2014a, b, 2015) to determine the specific scenarios that result in the displayed level of risk for a given receptor group. The number in brackets represents the number of RQs in the indicated risk category: number of scenarios evaluated.

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

Table G-4. BLM-evaluated herbicide risk categories¹ for wildlife, fish, and aquatic species

Application Scenario	Chlorsulfuron		Imazapic		Diflufenzopyr + Dicamba		Fluridone		Sulfometuron methyl		Aminopyralid		Fluroxypyr		Rimsulfuron	
	Typ ²	Max ²	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max
Direct Spray																
Non Special Status Species																
Small mammal – 100% absorption	0 ¹	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pollinating insect – 100% absorption	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small mammal – 1st order dermal absorption	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fish pond	0	0	0	0	0	0	0	0	0	0	0 [2:2]	0 [4:4]	0 [2:2]	0 [4:4]	0 [2:2]	0 [4:4]
Fish stream	0	0	0	0	0	0	0	L	0	0	0 [2:2]	0 [2:2]	0 [2:2]	0 [2:2]	0 [2:2]	0 [2:2]
Aquatic invertebrates pond	0	0	0	0	0	0	0	L	0	0	0 [2:2]	0 [4:4]	0 [2:2]	0 [4:4]	0 [2:2]	0 [4:4]
Aquatic invertebrates stream	0	0	0	0	0	0	0	L	0	0	0 [2:2]	0 [2:2]	0 [2:2]	0 [2:2]	0 [2:2]	0 [2:2]
Special Status Species																
Small mammal – 100% absorption	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pollinating insect – 100% absorption	0	0	0	0	0	0	0	0	0	0	0	0	L	L	0	0
Small mammal – 1st order dermal absorption	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fish pond	0	0	0	0	0	0	0	M	0	0	0 [2:2]	0 [4:4]	0 [2:2]	0 [2:4]	0 [2:2]	0 [4:4]
Fish stream	0	0	0	0	0	0	0	L	0	0	0 [2:2]	0 [2:2]	0 [2:2]	0 [2:2]	0 [2:2]	0 [2:2]
Aquatic invertebrates pond	0	0	0	0	0	0	0	H	0	0	0 [2:2]	0 [4:4]	0 [2:2]	0 [3:4]	0 [2:2]	0 [4:4]
Aquatic invertebrates stream	0	0	0	0	0	0	0	L	0	0	0 [2:2]	0 [2:2]	0 [2:2]	0 [2:2]	0 [2:2]	0 [2:2]
Indirect Contact with Foliage After Direct Spray																
Non Special Status Species																
Small mammal – 100% absorption	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pollinating insect – 100% absorption	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small mammal – 1st order dermal absorption	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Application Scenario	Chlorsulfuron		Imazapic		Diflufenzopyr + Dicamba		Fluridone		Sulfometuron methyl		Aminopyralid		Fluroxypyr		Rimsulfuron	
	Typ ²	Max ²	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max
Special Status Species																
Small mammal – 100% absorption	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pollinating insect – 100% absorption	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small mammal – 1st order dermal absorption	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ingestion of Food Items Contaminated by Direct Spray																
Non Special Status Species																
Small mammalian herbivore – acute	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small mammalian herbivore – chronic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Large mammalian herbivore – acute	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Large mammalian herbivore – chronic	0	0	0	0	L	M	0	0	0	0	0	0	0	0	0	0
Small avian insectivore – acute	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small avian insectivore – chronic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Large avian herbivore – acute	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Large avian herbivore – chronic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Large mammalian carnivore – acute	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Large mammalian carnivore – chronic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Special Status Species																
Small mammalian herbivore – acute	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small mammalian herbivore – chronic	0	0	0	0	0	0	0	L	0	0	0	0	0	0	0	0
Large mammalian herbivore – acute	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Large mammalian herbivore – chronic	0	0	0	0	L	M	0	0	0	0	0	0	0	0	0	0
Small avian insectivore – acute	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small avian insectivore – chronic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Large avian herbivore – acute	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Large avian herbivore – chronic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Large mammalian carnivore – acute	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Large mammalian carnivore – chronic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Accidental Spill to Pond																
Non Special Status Species																
Fish, pond	NE	0	NE	0	NE	0	NE	M	NE	0	0 [2:2]	0 [4:4]	0 [2:2]	0 [4:4]	0 [2:2]	0 [4:4]
Aquatic invertebrates, pond	NE	0	NE	0	NE	0	NE	H	NE	0	0 [2:2]	0 [4:4]	0 [2:2]	0 [4:4]	0 [2:2]	0 [4:4]
Special Status Species																
Fish, pond	NE	0	NE	0	NE	0	NE	M	NE	0	0 [2:2]	0 [4:4]	0 [2:2]	0 [2:4]	0 [2:2]	0 [4:4]
Aquatic invertebrates, pond	NE	0	NE	0	NE	0	NE	H	NE	0	0 [2:2]	0 [4:4]	0 [2:2]	0 [3:4]	0 [2:2]	0 [4:4]

Application Scenario	Chlorsulfuron		Imazapic		Diflufenzopyr + Dicamba		Fluridone		Sulfometuron methyl		Aminopyralid		Fluroxypyr		Rimsulfuron	
	Typ ²	Max ²	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max
Off-Site Drift																
Non Special Status Species																
Fish, pond	0	0	0	0	0	0	NE	NE	0	0	0	0	0	0	0	0
											[36:36]	[36:36]	[36:36]	[36:36]	[36:36]	[36:36]
Fish, stream	0	0	0	0	0	0	NE	NE	0	0	0	0	0	0	0	0
											[36:36]	[36:36]	[36:36]	[36:36]	[36:36]	[36:36]
Aquatic invertebrates, pond	0	0	0	0	0	0	NE	NE	0	0	0	0	0	0	0	0
											[36:36]	[36:36]	[36:36]	[36:36]	[36:36]	[36:36]
Aquatic invertebrates, stream	0	0	0	0	0	0	NE	NE	0	0	0	0	0	0	0	0
											[36:36]	[36:36]	[36:36]	[36:36]	[36:36]	[36:36]
Special Status Species																
Fish, pond	0	0	0	0	0	0	NE	NE	0	0	0	0	0	0	0	0
											[36:36]	[36:36]	[36:36]	[36:36]	[36:36]	[36:36]
Fish, stream	0	0	0	0	0	0	NE	NE	0	0	0	0	0	0	0	0
											[36:36]	[36:36]	[36:36]	[36:36]	[36:36]	[36:36]
Aquatic invertebrates, pond	0	0	0	0	0	0	NE	NE	0	0	0	0	0	0	0	0
											[36:36]	[36:36]	[36:36]	[36:36]	[36:36]	[36:36]
Aquatic invertebrates, stream	0	0	0	0	0	0	NE	NE	0	0	0	0	0	0	0	0
											[36:36]	[36:36]	[36:36]	[36:36]	[36:36]	[36:36]
Surface Runoff																
Non Special Status Species																
Fish, pond	0	0	0	0	0	0	NE	NE	0	0	0	0	0	0	0	0
											[84:84]	[84:84]	[84:84]	[84:84]	[84:84]	[84:84]
Fish, stream	0	0	0	0	0	0	NE	NE	0	0	0	0	0	0	0	0
											[84:84]	[84:84]	[84:84]	[84:84]	[84:84]	[84:84]
Aquatic invertebrates, pond	0	0	0	0	0	0	NE	NE	0	0	0	0	0	0	0	0
											[84:84]	[84:84]	[84:84]	[84:84]	[84:84]	[84:84]
Aquatic invertebrates, stream	0	0	0	0	0	0	NE	NE	0	0	0	0	0	0	0	0
											[84:84]	[84:84]	[84:84]	[84:84]	[84:84]	[84:84]
Special Status Species																
Fish, pond	0	0	0	0	0	0	NE	NE	0	0	0	0	0	0	0	0
											[84:84]	[84:84]	[84:84]	[84:84]	[84:84]	[84:84]
Fish, stream	0	0	0	0	0	0	NE	NE	0	0	0	0	0	0	0	0
											[84:84]	[84:84]	[84:84]	[84:84]	[84:84]	[84:84]
Aquatic invertebrates, pond	0	0	0	0	0	0	NE	NE	0	0	0	0	0	0	0	0
											[84:84]	[84:84]	[84:84]	[84:84]	[84:84]	[84:84]
Aquatic invertebrates, stream	0	0	0	0	0	0	NE	NE	0	0	0	0	0	0	0	0
											[84:84]	[84:84]	[84:84]	[84:84]	[84:84]	[84:84]

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

NOD IPM-HR EA

DOI-BLM-ORWA-N000-2022-0003-EA

1. Risk categories: 0 = No risk (majority of RQs < most conservative LOC for non-Special Status species); L = Low risk (majority of RQs 1-10x most conservative LOC for non-Special Status species); M = Moderate risk (majority of RQs 10-100x most conservative LOC for non-Special Status species); H = High risk (majority of RQs >100 most conservative LOC for non-Special Status species); and NE = Not evaluated. The Risk Category is based on the risk level of the majority of risk quotients observed in any of the scenarios for a given exposure group and receptor type. See more information at the risk tables in Chapter 4 of the Ecological Risk Assessments (ENSR 2005a-f, AECOM 2014a, b, 2015) to determine the specific scenarios that result in the displayed level of risk for a given receptor group. The number in brackets represents the number of RQs in the indicated risk category: number of scenarios evaluated.

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

Table G-5. BLM-evaluated herbicide risk categories¹ for human health

Receptor	Diflufenzopyr			Fluridone			Imazapic			Sulfometuron			Aminopyralid			Fluroxypyr			Rimsulfuron ³		
	Typ ²	Max ²	Accid	Typ	Max	Accid	Typ	Max	Accid	Typ	Max	Accid	Typ	Max	Accid	Typ	Max	Accid	Typ	Max	Accid
Hiker/hunter (adult)	01	0	0	0	0	0	NC	NC	NE	NC	NC	NE	NC	NC	NE	NC	NC	NE	0	0	0
Berry picker (child)	0	0	0	0	0	L	NC	NC	NE	NC	NC	NE	NC	NC	NE	NC	NC	NE	0	0	0
Berry picker (adult)	0	0	0	0	0	0	NC	NC	NE	NC	NC	NE	NC	NC	NE	NC	NC	NE	0	0	0
Angler (adult)	0	0	0	0	0	0	NC	NC	NE	NC	NC	NE	NC	NC	NE	NC	NC	NE	0	0	0
Residential – contaminated water (child)	0	0	0	0	0	L	NC	NC	NE	NC	NC	NE	NC	NC	NE	NC	NC	NE	0	0	0
Residential – contaminated water (adult)	0	0	0	0	0	L	NC	NC	NE	NC	NC	NE	NC	NC	NE	NC	NC	NE	0	0	0
Native American (child)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Native American (adult)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Swimmer (child)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NE	NE	NE
Swimmer (adult)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NE	NE	NE
Human/backpack - applicator/mixer/loader	0	0	NE	0	0	L-H	0	0	NE	0	0	NE	0	0	NE	0	0	NE	0	0	L - M
Human/horseback - applicator	0	0	NE	0	0	L-H	0	0	NE	0	0	NE	0	0	NE	0	0	NE	0	0	L - M
Human/horseback - mixer/loader	0	0	NE	0	0	L-H	0	0	NE	0	0	NE	0	0	NE	0	0	NE	0	0	L - M
Human/horseback - applicator/mixer/loader	0	0	NE	0	0	L-H	0	0	NE	0	0	NE	0	0	NE	0	0	NE	0	0	L - M
ATV – applicator ⁴	0	0	NE	0	0	L-H	0	0	NE	0	0	NE	0	0	NE	0	0	NE	0	0	L - M
ATV - mixer/loader	0	0	NE	0	0	L-H	0	0	NE	0	0	NE	0	0	NE	0	0	NE	0	0	L - M
ATV - applicator/mixer/loader	0	0	NE	0	0	L-H	0	0	NE	0	0	NE	0	0	NE	0	0	NE	0	0	L - M
Truck - applicator ⁴	0	0	NE	0	0	L-H	0	0	NE	0	0	NE	0	0	NE	0	0	NE	0	0	L - M
Truck - mixer/loader	0	0	NE	0	0	L-H	0	0	NE	0	0	NE	0	0	NE	0	0	NE	0	0	L - M
Truck - applicator/mixer/loader	0	0	NE	0	0	L-H	0	0	NE	0	0	NE	0	0	NE	0	0	NE	0	0	L - M
Boat - applicator	NE	NE	NE	0	0	L-H	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
Boat - mixer/loader	NE	NE	NE	0	0	L-H	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
Boat - applicator/mixer/loader	NE	NE	NE	0	0	L-H	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE

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

1. Risk categories: 0 = No risk (majority of ARIs > 1); L = Low risk (majority of ARIs >1 but < 0.1); M = Moderate risk (majority of ARIs > 0.1 but < 0.01); H = High risk (majority of ARIs < 0.01); NE = Not evaluated; and NC = Not Calculated (based on toxicity assessment, no dose response values are available due to low toxicity. The reported risk category represents the typical/most common risk level for estimated risks from various time periods. See the Vegetation Treatments Programmatic EISs Human Health Risk Assessments Final Reports (ENSR 2005g, AECOM 2014c) and for the range of risk levels for each scenario.

2. Typ = Typical application rate; Max = Maximum application rate; and Accid = Accidental rate. Typical and maximum application rate categories include short-, intermediate-, and long-term exposures. Accidental scenario category includes accidents with herbicide mixed at both the typical and maximum application rates and with a concentrated herbicide.

3. For all worker receptors accidentally exposed to rimsulfuron, there is low risk from exposure to solutions mixed with the typical application rate, moderate risk from exposure to solutions

mixed with the maximum application rate.

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

Table G-6. Forest Service-evaluated herbicide risk categories¹ for vegetation

Scenario	2,4-D ^{2, 4}		Clopyralid		Dicamba		Glyphosate ^{3, 4}		Hexazinone		Imazapyr ³		Metsulfuron methyl		Picloram ³		Triclopyr ^{3,4}		Fluazifop-P-butyl ⁶		Sethoxydim		
	Typ ⁵	Max ⁵	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	0.1 ⁶	0.375 ⁶	Typ	Max	
Terrestrial Plants																							
Direct spray, susceptible plants	H ¹	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	M	M	M	M	
Direct spray, tolerant plants	L	L	O	L	O	O	L	M	M	M	L	L	L	M	L	M	O	L	O	O	M	M	
Off-site drift, low boom, susceptible plants	L [3:6]	L [3:6]	L [4:6]	M [3:6]	L [3:6]	H [3:6]	M [3:6]	M [4:6]	L [4:6]	M [3:6]	M [3:6]	H [3:6]	L [4:6]	M [4:6]	H [3:6]	H [4:6]	L [3:6]	M [3:6]	O [6:6]	O [5:6]	O [5:6]	O [4:6]	
Off-site drift, low boom, tolerant plants	O [6:6]	O [6:6]	O [6:6]	O [6:6]	O [6:6]	O [6:6]	O [6:6]	O [6:6]	O [5:6]	O [4:6]	O [6:6]	O [6:6]	O [6:6]	O [6:6]	O [6:6]	O [6:6]	O [6:6]	O [6:6]	O [6:6]	O [6:6]	O [6:6]	O [6:6]	
Off-site drift, backpack directed foliar, susceptible plants	O [5:6]	O [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]	O [4:6]	O [4:6]	O [6:6]	O [6:6]	O [6:6]	O [6:6]	
Off-site drift, backpack directed foliar, tolerant plants	O [6:6]	O [6:6]	NE	NE	NE	NE	O [6:6]	O [6:6]	O [6:6]	O [6:6]	O [6:6]	O [6:6]	NE	NE	O [6:6]	O [6:6]	O [6:6]	O [6:6]	O [6:6]	O [6:6]	O [6:6]	O [6:6]	
Surface runoff, susceptible plants	O [22:30]	O [21:30]	O [23:30]	O [22:30]	O [22:30]	O [22:30]	O	O	O [18:30]	O [17:30]	H	H	O [21:30]	O [18:30]	H	H	L	M	O	O	O [18:30]	O [17:30]	
Surface runoff, tolerant plants	O [30:30]	O [29:30]	O [30:30]	O [28:30]	O [30:30]	O [30:30]	O	O	O [22:30]	O [22:30]	L	M	O [25:30]	O [22:30]	O	O	O	O	O	O	O [30:30]	O [30:30]	
Aquatic Plants																							
Accidental spill, susceptible macrophytes	H	H	H	H	NE	NE	H	H	NE	NE	H	H	H	H	NE	NE	H	H	NE	NE	NE	NE	
Accidental spill, susceptible algae	H	H	L	L	H	H	H	H	H	H	L	L	M	H	H	H	H	H	H	H	M	M	
Accidental spill, tolerant algae	L	M	O	O	O	L	M	M	H	H	O	O	L	M	O	O	M	H	L	L	M	M	
Acute exposure, susceptible macrophytes	M	M	O	O	NE	NE	L	L	NE	NE	M	H	L	L	NE	NE	O	L	NE	NE	NE	NE	
Acute exposure, susceptible algae	L	L	O	O	O	L	L	L	H	H	O	O	O	O	L	L	M	H	M	M	O	O	
Acute exposure, tolerant algae	O	O	O	O	O	O	O	O	L	M	O	O	O	O	O	O	O	O	O	O	O	O	
Chronic exposure, susceptible macrophytes	O	L	O	O	NE	NE	O	O	NE	NE	M	M	O	O	NE	NE	H	H	NE	NE	NE	NE	

Chronic exposure, susceptible algae	0	0	0	0	0	0	0	0	M	M	0	0	0	0	0	0	0	0	L	M	0	0
Chronic exposure, tolerant algae	0	0	0	0	0	0	0	0	0	L	0	0	0	0	0	0	0	0	0	0	0	0

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

1. Risk categories: 0 = No risk (HQ < LOC); L = Low risk (HQ = 1 to 10 x LOC); M = Moderate Risk (HQ = 10 to 100 x LOC); H = High risk (HQ > 100 LOC); and NE = Not evaluated. Risk categories are based on upper estimates of hazard quotients and the LOC of 1.0. If more than one scenario is involved in an exposure pathway (i.e., off-site drift and surface runoff), then the number of scenarios with the given risk category (out of the total number of evaluated scenarios) is displayed in parentheses. The reported risk category is that of the majority of the HQs for all the scenarios. As a result, risk may be higher than the reported risk category for some scenarios within each category. For more information, see the individual Forest Service Risk Assessments.
2. In the 2010 Oregon 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 Oregon 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 G-7. Forest Service-evaluated herbicide risk categories¹ for wildlife, fish, and aquatic species

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

Consumption of contaminated vegetation, small mammal, on- site	M	M	0	0	0	0	L	L	0	0	0	0	0	0	L	M	L	M	L	M	0	0
Consumption of contaminated vegetation, small mammal, off- site	NE	NE	0	0	0	0	NE	NE	0	0	NE	NE	0	0	NE	NE	NE	NE	NE	NE	NE	NE
Consumption of contaminated vegetation, large mammal, on- site	L	L	0	L	0	0	0	0	L	M	0	0	0	0	0	L	M	H	L	L	0	0
Consumption of contaminated vegetation, large mammal, off -site	NE	NE	0	0	0	0	NE	NE	0	0	NE	NE	0	0	NE	NE	NE	NE	NE	NE	NE	NE
Consumption of contaminated water, small mammal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Birds																						
Acute/Accidental Exposures																						
Scenario	2,4-D ^{2,4}		Clopyralid		Dicamba		Glyphosate ^{3,4}		Hexazinone		Imazapyr ³		Metsulfuron methyl		Picloram ³		Triclopyr ^{3,4}		Fluazifop-P-butyl ⁶		Sethoxydim	
	Typ ⁵	Max ⁵	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	0.16	0.376	Typ	Max
Consumption of contaminated grass, large bird	0	0	0	L	L	M	0	L	L	L	0	0	0	0	0	0	L	M	0	0	0	0
Consumption of contaminated insects, small bird	0	L	0	L	L	M	0	L	L	L	0	0	0	0	0	0	L	M	0	0	0	0
Consumption of contaminated small mammal, predatory bird	0	0	0	0	0	0	0	L	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Consumption of contaminated fish, predatory bird, spill	0	0	0	0	0	0	0	L	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chronic Exposures																						
Consumption of contaminated vegetation, large bird, on-site	0	0	0	L	0	0	L	L	0	0	0	0	0	0	0	L	L	M	L	M	0	0
Consumption of contaminated vegetation, large bird, off-site	NE	NE	0	0	0	0	NE	NE	0	0	NE	NE	0	0	NE	NE	NE	NE	NE	NE	0	0
Consumption of contaminated fish, predatory bird	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	L	0	0
Aquatic Species																						
Acute/Accidental Exposures																						
Fish (susceptible species ⁷) – accidental spill	H	H	L	L	0	L	H	H	L	L	0	L	0	L	M	M	H	H	M	M	L	L
Fish (tolerant species) – accidental spill	L	L	0	0	0	0	M	H	0	L	NE	NE	0	0	0	L	M	H	M	M	L	L
Fish (susceptible species) – acute exposure, peak EEC	L	L	0	0	0	0	L	M	0	0	0	0	0	0	0	0	0	L	0	0	0	0
Fish (tolerant species) – acute exposure, peak EEC	0	0	0	0	0	0	0	L	0	0	NE	NE	0	0	0	0	0	0	0	0	0	0
Aquatic invertebrates – accidental spill	0	0	L	M	L	M	M	M	L	L	0	0	0	0	0	0	L	M	L	L	L	L

Aquatic invertebrates – acute exposure, peak EEC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chronic Exposures																						
Fish – chronic exposure	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NE	NE	NE
Aquatic invertebrates – chronic exposure	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NE	NE
Insects																						
Acute Exposures																						
Direct spray, bee, 100% absorption	L	L	0	L	NE	NE	NE	NE	L	L	NE	NE	0	0	NE	NE	NE	NE	NE	NE	NE	NE
Consumption of fruit by an herbivorous insect	NE	NE	NE	NE	NE	NE	0	0	NE	NE	0	0	NE	NE	0	0	0	0	0	0	NE	NE
Consumption of broadleaf/small Insects by an herbivorous Insect	NE	NE	NE	NE	NE	NE	L	L	NE	NE	0	0	NE	NE	0	0	0	L	0	0	NE	NE
Consumption of short grass by a herbivorous insect	NE	NE	NE	NE	NE	NE	L	L	NE	NE	0	0	NE	NE	0	0	0	L	0	0	NE	NE
Consumption of tall grass by a herbivorous insect	NE	NE	NE	NE	NE	NE	L	L	NE	NE	0	0	NE	NE	0	0	0	L	0	0	NE	NE

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

1. Risk categories: 0 = No risk (HQ < LOC); L = Low risk (HQ = 1 to 10 x LOC); M = Moderate risk (HQ = 10 to 100 x LOC); H = High risk (HQ > 100 LOC); and NE = Not evaluated. Risk categories are based on upper estimates of hazard quotients and the BLM LOCs of 0.1 for acute scenarios and 1.0 for chronic scenarios. The reader should consult the text of this section of the individual Forest Service Risk Assessments to evaluate risks at central estimates of hazard quotients.
2. In the 2010 Oregon 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 Oregon 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 G-8. Forest Service-evaluated herbicide risk categories¹ for human health

Scenario	2,4-D ^{2,4}		Chlorsulfuron		Clopyralid		Dicamba		Glyphosate ^{3,4}		Hexazinone		Imazapyr ³		Metsulfuron methyl		Picloram ³		Triclopyr ^{3,4}		Fluazifop-P-butyl ⁶		Sethoxydim	
	Typ ⁵	Max ⁵	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	0.1 ⁶	0.375 ⁶	Typ	Max
Workers																								
General Exposures																								
Directed foliar and spot treatments (backpack)	L ¹	L	0	0	0	0	0	0	0	0	0	L	0	0	0	0	0	0	0	L	0	0	0	0
Broadcast ground spray (boom spray)	L	L	0	L	0	0	0	L	0	0	0	L	0	0	0	0	0	0	0	L	0	0	0	0

Aquatic applications	L	L	NE	NE	NE	NE	NE	NE	NE	0	0	0	NE	0	0	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
Accidental/Incidental Exposures																									
Immersion of hands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wearing contaminated gloves	M	M	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	L	0	0	0	0
Spill on hands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spill on lower legs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Public																									
Acute/Accidental Exposures																									
Direct spray - child, entire body	0	L	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	0	L	0	0	0	0
Dermal - contaminated vegetation, woman	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	L	0	0	0	0
Consumption of contaminated fruit	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	L	0	0	0	0
Consumption of contaminated water - pond, spill	NE	NE	0	0	0	L	0	L	NE	NE	0	0	NE	NE	0	0	NE	NE	NE	NE	NE	NE	NE	NE	NE
Scenario	2,4-D ^{2,4}		Chlorsulfuron		Clopyralid		Dicamba		Glyphosate ^{3,4}		Hexazinone		Imazapyr ³		Metsulfuron methyl		Picloram ³		Triclopyr ^{3,4}		Fluazifop-P-butyl ⁶		Sethoxydim		
	Typ ⁵	Max ⁵	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	0.1 ⁶	0.375 ⁶	Typ	Max	
Consumption of contaminated water - stream, ambient	NE	NE	0	0	0	0	0	0	NE	NE	0	0	NE	NE	0	0	NE	NE	NE	NE	NE	NE	NE	NE	NE
Consumption of contaminated water - child	0	0	NE	NE	NE	NE	NE	NE	0	L	NE	NE	0	0	NE	NE	0	0	0	L	0	0	0	0	0
Consumption of contaminated fish - general public	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	L	0	0
Chronic/Longer-term Exposures																									
Consumption of contaminated fruit	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	L	0	0	0	0
Consumption of contaminated water	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Consumption of contaminated fish - general public	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Consumption of contaminated fish - subsistence populations	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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 Oregon 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 Oregon FEIS.

4. Where different formulations exist, risks reported are the most conservative.
5. Typ = Typical application rate; and Max = Maximum application rate.
6. Taken from scoping/screening level Risk Assessment Final Report (SERA 2014).

Appendix G Literature Cited

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AECOM 2014b	AECOM. 2014. Rimsulfuron Ecological Risk Assessment Final Report. Prepared for USDI BLM. Manchester, New Hampshire.
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ENSR 2005d	ENSR. 2005. Vegetation Treatments Programmatic EIS – Imazapic Ecological Risk Assessment Final Report. Prepared for the U.S. Department of the Interior Bureau of Land Management, Nevada State Office, Reno, Nevada. Westford, Massachusetts.
ENSR 2005e	ENSR. 2005. Vegetation Treatments Programmatic EIS – Overdrive® Ecological Risk Assessment Final Report. Prepared for the U.S. Department of the Interior Bureau of Land Management, Nevada State Office, Reno, Nevada. Westford, Massachusetts.
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APPENDIX H – Issues Not Analyzed in Detail

INAID #1 (Air Quality) How would prescribed fire treatments affect air quality?

This issue was not analyzed in detail because there is no potential for significance beyond what was analyzed in the Proposed Resource Management Plan and FEIS for Resource Management Plans for Western Oregon (FEIS for RMPs for Western Oregon) (USDI BLM 2016c: 145-164) and there are no new circumstances or information at the District level that would change the effects anticipated for this EA.

In general, the air quality in Northwest Oregon is good but with persistent problem areas where strong inversions tend to trap either carbon monoxide (CO) or particulate matter at certain times of the year concentrated around inland valleys. Poor air quality can develop when a major polluting activity or event combines with temperature inversions and strong high-pressure systems that create stagnant air. The Northwest Oregon District includes the following National Ambient Air Quality Standards non-attainment or maintenance areas: Portland, Salem-Keizer, Eugene-Springfield, and Oakridge. The District includes the following Smoke Sensitive Receptor Areas: the entire floor of the Willamette Valley, Oakridge, Astoria, Tillamook, Lincoln City, and Newport (ODF 2016). Impacts to air quality caused by prescribed burning tend to be of short duration (hours) and limited to the local area (less than five miles from the burn) (USDI BLM 2016c: 155). Air quality and smoke clearances on the District are regulated by Oregon Department of Forestry and Lane Regional Air Protection Agency.

As described in the FEIS for RMPs for Western Oregon, BLM will adhere to the Oregon Smoke Management Plan requirements and daily instructions issued by the Oregon Department of Forestry. The design of these requirements and instructions limit potential impacts to smoke sensitive receptors by limiting the amount of fuel burned on any given burn day and by maintaining adequate separation between burn units. As such, the BLM expects that potential increases in emissions would have no additional impacts on human health under any alternative (USDI BLM 2016c: 162). Compliance with the Oregon Smoke Management Plan would limit degradation of air quality (USDI BLM 2016c: 161).

The type of actions and the emissions from treatments under all alternatives are wholly within the actions analyzed in the FEIS for RMPs for Western Oregon to which this EA tiers. The BLM would apply all Project Design Features analyzed in the document to all alternatives, including evaluating weather conditions prior to implementing treatments, coordinating with officials to obtain all applicable smoke management permits, and ensuring burn plans comply with regulations that would minimize adverse effects. The emissions from BLM burning would be within the annual range of emissions identified within the FEIS for RMPs for Western Oregon.

INAID #2 (Climate Change) How would the proposed prescribed burn treatments affect climate change, including greenhouse gas emissions, and carbon storage?

BLM did not analyze this issue in detail because there is no potential for significant effects to climate change beyond the effects of prescribed fire described in the NEPA analyses to which this EA tiers; the 2016 PRMP FEIS and the 2010 FEIS for *Vegetation Treatments Using Herbicides on BLM Lands in Oregon*; and the 2016 PEIS.

Climate change is considered as an issue because the district proposes updating and revising its existing botany and invasive plant management program. Ecosystems store carbon, which affects atmospheric concentration of carbon dioxide, and thereby influences global climate.

Prescribed burning would have the biggest impacts under the alternatives and would result in emissions of carbon dioxide, methane, and nitrogen oxides. The 2010 Oregon FEIS discusses those emissions from other actions: “biocontrols, targeted livestock grazing, and seeding or planting are considered to have a negligible effect on climate change” (USDI BLM 2010a: 166). The 2016 PEIS states that none of the herbicides analyzed in the 2007 or 2016 PEISs were expected to have an adverse effect on greenhouse gas emissions given the relatively low amount of greenhouse gas emissions associated with herbicide treatments, and the role of invasive plant control in reducing the extent, frequency, and severity of wildfires (a contributor to greenhouse gas emissions) (USDI BLM 2016a: 4-9).

In the 2016 PRMP FEIS, “the BLM estimated the gross greenhouse gas emissions from timber harvest, prescribed burning, wildfires, and livestock grazing. These estimates are the direct emissions for all greenhouse gases emitted through natural processes (carbon dioxide, methane, and nitrous oxide). The carbon analysis under this issue accounts for the carbon losses from fire and timber harvest by evaluating changes in net carbon storage. This analysis includes all greenhouse gases, including those that lack carbon (nitrous oxide), and all relevant sources of emissions, including those that do not directly affect net carbon storage. Because methane and nitrous oxide have higher global warming potential than carbon dioxide, the BLM followed global and national standards by reporting greenhouse gas emissions as carbon dioxide equivalents (CO₂e). One methane molecule effectively equals 25 carbon dioxide molecules, and one nitrous oxide molecule effectively equals 298 carbon dioxide molecules” (USDI BLM 2016c: 174).

The BLM management activities that the 2016 PRMP FEIS identified as having a substantial effect on Greenhouse gas emissions across alternatives were timber harvesting, and prescribed burning. A wide variety of BLM activities produce greenhouse gases, but the absence of reliable data limits the BLM’s ability to estimate emissions (USDI BLM 2016c: 176).

The BLM is a relatively small emitter of greenhouse gases from harvest operations and prescribed fire within the planning area of the PRMP FEIS (Figure 3-17, USDI BLM 2016c). Management on private forests and on U.S. Forest Service lands each result in greater emissions. In large part, these differences reflect the differences in land base and, in the case of private forests, management intensity. Prescribed fire emissions in private forests are largely due to clean up of harvest-generated residue (activity fuels), whereas a portion of the prescribed fire emissions from U.S. Forest Service lands and BLM-administered lands arises from the hazardous fuels reduction program in both agencies under the National Fire Plan (USDI BLM 2016c: 177).

The BLM estimated greenhouse gas emissions for each alternative under the Proposed RMP FEIS, expressed in the form of carbon dioxide equivalent (CO₂e), using projected timber harvest, permitted levels of grazing, and prescribed burning. The Planning Criteria provides more detailed information on analytical assumptions, methods and techniques, and geographic and temporal scales, which BLM incorporates here by reference (USDI BLM 2014, p. 38). The BLM changed the method for this analysis from what was in the Planning Criteria by providing a greenhouse gas

emission for year 40 and by not estimating emissions past year 50, since that was the last year for which the BLM modeled wildfire (USDI BLM 2016c: 174).

The Bureau of Land Management (BLM) Northwest Oregon District manages 714,395 acres in 14 counties. This acreage includes all BLM-administered lands in Benton, Clackamas, Clatsop, Columbia, Lincoln, Linn, Marion, Multnomah, Polk, Tillamook, Washington, and Yamhill Counties, most BLM-administered lands in Lane County, and a small portion of Douglas County. The District currently controls invasive weeds in accordance with the proposed action analyzed in the 2018 Integrated Invasive Plant Management (IIPM) Environmental Assessment.

Under the Proposed Action, Alternative B, the District would treat invasive species in the most cost-effective and environmentally sound manner possible. The district would adhere to IPM principles, tailoring treatments to the target species or plant community, increasing efficiency and treatment efficacy. The district would treat up to 10,000 gross acres annually using the most effective treatment options according to the Treatment Key Recommendations (**Appendix A**) and specialist determinations. Under the Proposed Action, the District would treat rare plant and animal species habitat with a larger suite of restoration tools. These would include rare plant augmentation, implementing prescribed fire treatments on up to 400 acres per year, and selectively treating native species with herbicide to achieve habitat goals specified in approved Recovery Plans or other plans specifically identified as part of recovery or delisting plans, and Conservation Strategies, or Conservation Agreements for federally listed or other Bureau Sensitive species supporting recovery and delisting of Special Status, threatened, endangered, and Bureau Sensitive species.

Under Alternative B the following would occur under a 10,000-acre treatment scenario:

- Emissions from other actions such as seeding, or planting would have a negligible effect on climate change (USDI BLM 2010a: 166).
- Herbicides analyzed in the 2007 or 2016 PEISs were not expected to have an adverse effect on greenhouse gas emissions given the relatively low amount of greenhouse gas emissions associated with herbicide treatments.
- Herbicide weed treatments would reduce greenhouse emissions due to less mowing.
- Invasive plant control reduces the extent, frequency, and severity of wildfires (a contributor to greenhouse gas emissions) (USDI BLM 2016a: 4-9).
- Alternative B would result in 100 to 400 acres of prescribed fire per year and increase greenhouse emissions.

The district's intent is to manage invasive plants to minimize adverse ecological and economic effects. Under the No Action alternative, the district would continue treating weeds under the current parameters established in the 2018-2018 IIPM EA/FONSI and which would limit the District's use of herbicides to 25 percent or less of treatments and gross treatment acres would be limited to 6,000 acres annually. All the activities in Alternative B except prescribed burning would reduce greenhouse gas emissions. Treating weeds with herbicides would reduce mowing. Bringing back native species would increase carbon sequestration. 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 BLM 2010a: 174).

Placing BLM's greenhouse gas emissions in a statewide or national context is difficult for the same reasons as discussed above for carbon storage. In addition, greenhouse gas emissions are rarely estimated for the forestry subsector alone. The EPA groups emissions from forestry operations into the agricultural sector. In 2013, national emissions from the agricultural sector were 586.8 Tg CO₂e, or 8.8 percent of total U.S. emissions. Land use and forestry emissions accounted for 1.9 percent of agricultural emissions, or 10.9 Tg CO₂e (EPA 2015). Data for the state of Oregon does not include an estimate of emissions from land use and forestry (USDI BLM 2016c: 179).

Within the PRMP FEIS of 2016, "the Proposed RMP prescribed fire greenhouse gas emissions would increase to 17 percent of the western Oregon prescribed fire emissions, or 0.28 Tg CO₂e per year, on average" (USDI BLM 2016c: 180).

An illustration follows of how much CO₂ the 400 acres of prescribed burning proposed in the IPMAHR project would produce and how it compares to the projected CO₂ production anticipated in the 2016 RMP FEIS. The 2016 PRMP FEIS identified that prescribed fire would contribute 58 percent (70,986 Mg) of the total carbon produced by plan activities, which was 122,389 Mg. Dividing that by the western Oregon's plan area, 2.5 million, equals .03 Mg per acre per year. The IPMAHR plan's 400 acres per year of prescribed burning equals 12 Mg per year based on these estimates.

12 MG produced by 400 acres of prescribed burns proposed in the IPMAHR would be .01 percent of the CO₂ predicted by all activities proposed in the 2016 PRMP FEIS. This would be .02 percent of the produced CO₂ predicted by the 2016 PRMP FEIS from prescribed burning. Based on the Interagency Working Group on Social Cost of Greenhouse Gases' Technical Support Document the social cost of 12Mg of CO₂ per year would be \$16.12e-7 (\$0.000000612), which is statistically \$0, based on a 3 percent discount rate (IWG 2021: 5). This illustrates that the amount of CO₂ produced by prescribed burning in this project and its cost would be difficult to measure.

This conclusion fits within the context of the relevant conclusions of the 2016 PRMP FEIS, and the proposed alternative of the 2010 Oregon FEIS. No significant climate change impacts will result from this invasive plant management and habitat restoration project. There would not be a dramatic increase in carbon emissions because of this project nor will there be a population increase in invasive/non-native species if the proposed project proceeds as planned. For these reasons, any differences among the effects of the alternatives on climate change would not inform the decision, and therefore the BLM did not analyze this issue in detail.

INAID #3 (Cultural and Traditional Resources) How would prescribed fire treatments affect cultural resources?

Meadow resoration units where fire is prescribed were intensively inventoried for cultural resources. All eligible or potentially eligible cultural resources within meadow restoration units where the IPMAHR proposes prescribed fire would be avoided; therefore there is no potential for significance and the District did not need to do a detailed analysis.

There is a potential prescribed burning could damage or destroy cultural artifacts. Prescribed fire could potentially disturb or destroy unidentified cultural resources on or near the ground surface. The potential for damage would vary with the amount of ground disturbance and burning under each alternative. Mixing organic matter in archeological burning for weed control sites could contaminate carbon 14 dating samples, making them unreliable for scientific analysis. Burning could destroy combustible cultural materials and damage stone artifacts. (USDI BLM 1985: 47)

BLM identified that prescribed fire treatments proposed by the IMPAHR may impact cultural resource sites, therefore, BLM conducted a pre-project survey within meadow restoration units where BLM is proposing prescribed fire. The BLM did not identify any Historic Properties within prescribed fire units. Additionally, BLM will complete a post-project survey on a percentage of all prescribed fire units in accordance with Appendices A & D of the State Protocol (Oregon SHPO and USDI 2015) after completion of the project.

If BLM proposes prescribed burning in the future on additional units, BLM will complete additional interdisciplinary environmental reviews, appropriate cultural resource inventory, analysis, and consultation prior to implementation in compliance with the National Historic Preservation Act (NHPA), the National Environmental Policy Act (NEPA), Executive Order 11593, and the 2015 BLM-Oregon SHPO State Protocol (Oregon SHPO and USDI 2015). This would include extensive background research and a GIS-based probability model to guide the cultural resource inventory and the consideration of potential effects of proposed activities to cultural resources.

The IPMAHR project's proposed prescribed burning will not impact cultural resources therefore the issue does not need further analysis.

INAID #4 (Cultural) How would manual, mechanical, biological, mulching, rare plant augmentation and competitive seeding affect cultural resource sites?

The BLM did not analyze this issue in detail because there is no potential for significance since the BLM did not identify any previously recorded cultural resources within the Area of Potential Effect (APE), which covers all locales within a quarter mile of proposed project actions, where BLM is proposing potentially ground disturbing activities. Treatments would include manual (hand pulling and using hand methods such as shoveling, hoeing, pruning, raking, haying, grubbing, and solarization); mechanical (weed whacking, mowing, thermalization, and use of power-based tools such as chainsaws, mowers, brush cutters, and masticators); biological (targeted grazing); and rare plant augmentation and competitive seeding (planting plugs and seeds by hand). The proposed manual, mechanical, and biological treatments involve minimally ground disturbing activities that have little potential to damage or destroy cultural artifacts.

The 2007 PER identified and disclosed potential impacts as follows. "Treatments involving surface and shallow subsurface disturbance would likely introduce organic materials to lower soil layers, thereby contaminating surface or shallow subsurface cultural resource sites containing early historic or prehistoric datable organics, such as charcoal, wood, or preserved plant materials. Plant and pollen contamination would lead to incorrect or inaccurate analytical results by researchers studying such remains preserved at sites. Surface and shallow subsurface effects would also include horizontal and vertical displacement of the upper portion of soils in which may contain

archaeological resources, compromising depositional context and integrity, and artifact damage or detection” (USDI BLM 2007d: 4-107).

The use of hand tools and hand-operated power tools to cut or clear vegetation could disturb both surface and subsurface cultural resources. However, such manual treatments have the least potential to affect known identified cultural sites. Although dating, sample cleaning, and processing has improved over the past few years, mulching with organic materials would complicate radiometric dating of materials from cultural resource sites” (USDI BLM 2007d: 4-107).

Biological treatments using grazing animals could damage surface artifacts and disrupt surface and shallow subsurface cultural materials. However, site-specific pretreatment investigations and development of measures to discourage livestock from using sensitive areas would decrease this possibility. Because of their small size and host-specific action, insects or pathogens would be unlikely to affect cultural resources, although treatments might affect organic site constituents (e.g., baskets, cordage, etc.) if present. BLM would undertake consultation with Indian tribes to locate any areas of vegetation of significance to tribes that biological treatments could affect. The BLM would work with tribes to minimize effects to these resources from grazing or other biological treatments (USDI BLM 2007d: 4-107).

As identified in the Vegetation Treatments on Bureau of Land Management Lands in 17 Western States PER, discloses the general effects on the environment of using non-herbicide treatment methods, including fire use, and mechanical, manual, and biological control methods, to treat hazardous fuels, invasive species, and other unwanted or competing vegetation (USDI BLM 2007d: ES-1). Oregon is one of the western states identified in the 2007 PER, and the IPMAHR will be using the same treatments identified in the PER to treat invasive plants.

BLM conducted extensive background research using multiple archaeological databases, historic maps sources and a GIS-based probability model. BLM has not identified previously recorded cultural resources within the APE where it is proposing manual, mechanical, or biological treatments. BLM did not conduct cultural resource inventories in support of the IPMAHR where the District is proposing the above described activities, due to the limited potential of these activities to affect cultural resource sites. Therefore, avoidance or other mitigation measures are not necessary for this project within manual, mechanical, and biological treatments. The BLM would include all future treatment units not analyzed in this EA in an ATP and separate site-specific analysis would occur. Should BLM identify ground disturbing treatments in the future, BLM would conduct an intensive cultural resource inventory and avoid sites, if present, or BLM would make efforts to minimize effects through specific design criteria.

INAID #5 (Cultural) How would herbicide treatments including Early Detection Rapid Response (EDRR) and aquatic affect traditional plant populations or native plant use?

The District did not analyze this issue in detail because there is no potential for significance beyond what was analyzed in the 2010 Oregon FEIS, 2007 PEIS and 2016 PEIS, to which this issue is tiered and summarized below (USDI BLM 2010a: 283-289, USDI BLM 2007a: 149-152, USDI BLM 2016a: 4-73 to 4-75).

EDRR

The 2010 Oregon FEIS identifies that its “action alternatives are all set in the context of Integrated Vegetation Management, and that all include the BLM’s emphasis on prevention, early detection, rapid response, and using the most appropriate methods to protect the environment” (USDI BLM 2010a: 23). The 2007 PEIS also included the cumulative effects of prevention, early detection, and rapid response in the analysis since it is the most cost-effective methods for weed control (USDI BLM 2007a: 4-197). “Prevention, early detection, and rapid response strategies that reduce the need for vegetative treatments should lead to a reduction in the number of acres treated using herbicides in the future by reducing or preventing noxious weed establishment” (USDI BLM 2007a: 4-197).

Risk to Tribes

Some of the “Tribes with interests within the State of Oregon also have treaty reserved, or Executive Order rights upon unoccupied Federal lands outside the bounds of their respective Indian reservations. These rights include fishing, hunting, gathering, trapping, and the right to graze domestic livestock. There are also tribes without specific off-reservation reserved rights who continue to gather natural resources for traditional or cultural purposes” (USDI BLM 2010a: 284).

“Removal of invasive vegetation, when done in such a way that the resources are not adversely affected, can contribute to the restoration and maintenance of historic and ethnographic cultural landscapes (USDOI National Park Service 2003)” (USDI BLM 2016a: 4-71).

The 2007 PEIS, 2010 Oregon FEIS and 2016 PEIS identified that implementation of herbicide treatments may affect food or other natural resources on which the tribes depend. Herbicides can harm plants used by American Indians and can affect the health of the people who gather, handle or ingest recently treated plants, fish or other animals contaminated by the herbicides. Since traditionally gathered plants and animals may occur near vegetation treatment areas, drift from herbicide treatments may occur in areas utilized by American Indians (USDI BLM 2007a: 4-149, USDI BLM 2010a: 286, USDI BLM 2016a: 4-72). While the risks identified in the Human Health-Incidental Contact with Pesticides issue (**INAID #10**) would still apply, the “risk levels determined for Native American receptors reflect unique exposure scenarios as well as typical scenarios for public receptors, but with higher levels of exposure than public receptors” (USDI BLM 2007a: 4-149). The 2010 Oregon FEIS also identified that there would be BLM lands temporarily closed to traditional hunting and plant gathering following herbicide treatments (USDI BLM 2010a: 289).

The 2016 PEIS and 2007 PEIS looked at Native American exposure to herbicides “via dermal contact with spray, dermal contact with sprayed foliage, ingestion of drinking water from a sprayed pond, ingestion of berries containing spray, dermal contact with water in a sprayed pond, and ingestion of fish from a sprayed pond...” (USDI BLM 2016a: 4-73). The 2016 PEIS concluded that “no risks to public receptors from exposures resulting from routine use (typical or maximum application rate) or accidental scenarios. Additionally, there are no risks to Native American adults or children under any of the modeled exposure scenarios. These results indicate that aminopyralid, fluroxypyr, and rimsulfuron do not pose an unacceptable risk to Native American receptors, even under worst-case accidental exposure scenarios” (USDI BLM 2016a: 4-73 to 4-74).

“The risk to human health associated with use of glyphosate, picloram, imazapic, metsulfuron methyl, and triclopyr at typical application rates is low or zero. Risks to human health are low to moderate for 2,4-D under some scenarios but the herbicide would be reduced to ounces per acre and would be used in tank mixes for approximately 50 percent of the acres projected. Bromacil and diuron...have high health risks to humans under most exposure scenarios, but these herbicides would be used for bare-ground treatments adjacent to roads and other developments, not on previously undeveloped areas or areas traditionally used for Tribal gathering” (USDI BLM 2010a: 289). The use of diquat “in very limited scenarios at the typical application rate and where risk to human receptors is not predicted, such as ground applications from trucks not near residences or berry gathering sites” (USDI BLM 2007a: 4-151).

All three FEISs emphasize the importance of the completion of cultural resource reviews, inventories and consultation with American Indian tribes in areas likely to include cultural resources and traditional cultural values prior to vegetation treatments to reduce potential effects to cultural resources. Pre-disturbance site identification methods and avoidance or other protection methods would reduce the chance that treatments would impact significant cultural resources and therefore would result in negligible cumulative impacts to cultural resources (USDI BLM 2010a: 292, USDI BLM 2007a: 4-149, 4-228, 4-245, 4-249, USDI BLM 2016a: 4-71, 4-72, 4-119, 4-122).

Aquatic Treatments

The 2010 Oregon FEIS identified that “lakes and wetlands may have invasive submerged species [and that these species] are becoming common invaders of aquatic ecosystems, outcompeting native vegetation. For example...Eurasian watermilfoil multiplies rapidly and forms canopies over the native plants, literally choking out native plants and severely restricting recreational activities. In addition, it degrades water quality and fish habitat, accelerates eutrophication (over-abundance of nutrients), and lowers amounts of oxygen in the water (USDI BLM 2010a: 203).

The 2010 Oregon FEIS identifies the herbicide risk factors for Aquatic Plants in Table 3-13, the risks range from no risk to high risk (USDI BLM 2020: 95). The 2010 Oregon FEIS identified the impacts of imazapyr, glyphosate, triclopyr, fluridone, and 2,4-D for use as aquatic herbicides to treat invasive plants (USDI BLM 2010a: 205).

The 2010 Oregon FEIS identified there were short-term risks to fish from the use of diquat, and the use of diquat was on a “restricted basis, and then only in ponds that support very few native aquatic species because they are dominated by invasive plants or contain species not effectively controlled with other herbicides. Other aquatic herbicides evaluated in [the 2010 Oregon FEIS] (fluridone, 2,4-D, and imazapyr) also pose relatively low risk to fish and would be used instead of diquat when native aquatic species are present, as appropriate” (USDI BLM 2010a: 225).

The 2010 Oregon FEIS declared that “[i]n general, the alternatives proposed in this analysis would be expected to have short-term negative and long-term beneficial effects on aquatic habitats. With the Standard Operating Procedures and PEIS Mitigation Measures, it is anticipated that negative effects would be minimized. Most herbicide uses proposed by the alternatives, those reducing the effects of invasive plants or improving habitat, would have long-term beneficial effects on fish and their habitats” (USDI BLM 2010a: 220).

Risk to Native Plants

The 2016 PEIS identified that even though aminopyralid, fluroxypyr, and rimsulfuron “are generally low risk, they would still impact non-target plants under direct spray and spill scenarios, much like the herbicides that would be used most extensively under the No Action Alternative [herbicides identified in the 2007 PEIS]. Therefore, there would not be a substantial difference between the No Action Alternative and the Preferred Alternative in terms of risk to non-target plants” (USDI BLM 2016a: 4-36 to 4-37).

The 2007 PEIS’s selected action “would result in the most extensive impacts to vegetation (both negative and positive) because it proposes the most acres for treatment.” The 2007 PEIS allows “BLM managers more options in choosing herbicides to best match treatment goals and application conditions, and might therefore reduce overall risk to vegetation and increase positive ecosystem benefits from treatment” (USDI BLM 2007a: 4-66).

The IPMAHR EA analysis area lies within the area analyzed for the 2007 PEIS, 2010 Oregon FEIS, and the 2016 PEIS. BLM analyzed for treatments in the FEISs the herbicides identified for use as treatment for invasive plants in the IPMAHR EA. BLM will use the recommended concentrations identified in the EISs to treat identified areas in the IPMAHR. BLM will incorporate the special PDFs identified in the cultural and vegetation sections of the FEISs into the treatment protocols for the IPMAHR.

There are no direct or indirect impacts of herbicide application to traditional plant populations or native plant use in the IPMAHR beyond what the BLM has already identified in the 2010 Oregon FEIS, 2007 PEIS and the 2016 PEIS. Overall, the proposed treatments in Alternatives B and C would be beneficial to native trees, shrub, and plant populations, particularly in meadow and prairie settings. Restoration of these habitats would provide more suitable native plant collection areas for Tribal practitioners. Importantly, timely communication of herbicide application plans are vital to ensure that treatments do not affect the health of Tribal practitioners. Under these alternatives, Tribal notification would occur at the ATP and Early Detection and Rapid Response (EDRR) levels. BLM would provide ATPs, including maps of treatment areas, to the Tribes on an annual basis at a minimum, and more frequently, as possible. Every effort would be made to communicate EDRR treatment areas as they are known, though these notification periods would be much shorter in order to treat invasive weed populations quickly and effectively. BLM would explore alternative notification methods to improve the current process, in consultation with Tribes, and foster opportunities to collaborate on meadow restoration to enhance native plant populations.

As summarized above, there are no impacts to traditional plant populations or native plant use beyond what BLM already analyzed in the 2007 PEIS, 2010 Oregon FEIS, and 2016 PEIS and therefore the District does not need to analyze this issue in detail.

INAID #6 (Fisheries) How would aquatic and terrestrial herbicide treatments affect Bureau Special Status Species including ESA listed fish and aquatic species?

BLM did not analyze this issue in detail because there is no potential for significant effects to fish and aquatic organisms beyond the effects of herbicides described in the NEPA analyses to which

this EA tiers; the 2007 and 2016 PEISs, and the 2010 Oregon FEIS (USDI BLM 2010a: 208-240, USDI BLM 2007a: 4-36 to 4-96, USDI BLM 2016a: 4-41 to 4-51).

To consider this issue, the BLM looked at the invasive plant program within the riparian area (150 to 220 feet from waterbodies) and adjacent streams and waterbodies. The nature of the disturbance associated with terrestrial invasive plant treatments would not affect fish and other aquatic organisms, including those that are federally listed or Bureau Sensitive, or their habitat in dispersed areas across the District in any given year. Depending on the site, streamside treatments would remove invasive vegetation that often supports fewer native insects than native plant species, which could temporarily affect food availability for insectivorous fish species, such as salmonids (USDI BLM 2010a: 230).

Treatment of floating and emergent plants would have no significant effects beyond those described in the analysis 2010 Oregon FEIS to which this EA tiers (USDI BLM 2010a: 208-240). Aquatic herbicides that are formulated for aquatic treatments have short life spans and minimal direct adverse effects to aquatic organisms.

PDFs:

- The BLM will confine the use of fluazifop-P-butyl to flat, dry ground located greater than 300 feet from any surface water connected to a stream network outside the West Eugene Wetlands.
- The BLM would apply Fluoridone to standing water and closed systems where there is no outflow to running streams and where there are no listed fish present.

These actions are wholly within the actions evaluated in the EISs to which this EA tiers, and no new or changed circumstances apply to change the effects of those actions at the scale evaluated in this EA.

INAID #7 (Fisheries) How would targeted grazing in Riparian Reserves affect BSS and ESA listed species?

BLM did not analyze this issue in detail because there is no potential for significance beyond what BLM analyzed in the 2010 Oregon FEIS. BLM is incorporating that analysis by reference and has summarized here.

As Identified in the 2010 Oregon FEIS, “[t]he use of livestock to control invasive plants requires a highly specialized operation, often involving animals that are “trained” to forage on the target plant, and usually involving temporary fencing to keep the animals within the target area. The livestock species, grazing intensity, and management of the grazing animals used to treat invasive plants are different from grazing for livestock production. The specific use of livestock in this type of control effort has not been utilized extensively in riparian areas or near aquatic ecosystems. Current techniques for using directed livestock as an invasive plant treatment tool are not likely to have adverse effects on riparian areas and aquatic environments” (USDI BLM 2010a. p. 231).

The anticipated treatment type and location of targeted grazing will be similar across alternatives and therefore the effects to aquatic species from each alternative does not vary. The analysis of the effects to fish from the use of livestock is in the 2010 Oregon FEIS (USDI BLM 2010a; p. 231).

The use of livestock is unlikely to result in adverse effects due to the limited interaction with stream and riparian ecosystems. Livestock used for invasive weed removal are specialized and trained to consume target species and includes the use of temporary fencing to limit the proximity to streambanks. Only on rare occasions would BLM use targeted grazing in riparian areas that are near fish bearing streams.

INAD #8 (Fisheries) How would native plant restoration treatments using prescribed fire and felling of large trees affect BSS and ESA listed aquatic species?

BLM did not analyze this issue in detail because there is no potential for significant effects to BSS and ESA listed aquatic species beyond the effects of prescribed fire described in the 2010 Oregon FEIS (USDI BLM 2010a: 208-240).

The risk of harm to fish from prescribed fire for weed control depends on fire intensity, timing, and landform, among other factors. Prescribed burning has the potential to bare large areas of soil, and thus increase both surface erosion and sedimentation of streams. Heavy runoff from burned areas can increase water pH, indirectly affecting aquatic biota. (USDI BLM 2010a: 231)

Treatment methods, such as mechanical methods and prescribed fire can result in soil disturbance and sedimentation in aquatic bodies, and retreatment in the same areas is more likely because a single treatment is less likely to adequately achieve control. (USDI BLM 2010a: 232)

The 2010 FES concluded, “Site-specific implementation of Standard Operating Procedure would help prevent this method from being used where significant adverse stream effects would occur (PER: 2-31)”. (USDI BLM 2010a: 231)

Also as referenced in the 2007 PER, [r]emoval of streamside vegetation could increase water temperatures resulting from the loss of stream shade (Clark 2001). In coldwater systems, resulting temperature increases would contribute to water quality degradation and potential effects to coldwater fisheries. In the Pacific Northwest, the majority of streams on federally-administered forestlands are impaired by elevated stream temperatures (USDA Forest Service 2005, USDI BLM 2007d: 4-22)

The IPMAHR EA project area is within the analysis area for the 2010 Oregon FEIS and the 2007 PER which the FEIS references. The 2007 PER discussed the effects of fire use to fish and aquatic organisms and the District is summarizing and incorporating that analysis here by reference. Effects to aquatic species and their habitats would likely be less than high intensity wildfire. Prescribed fire is unlikely to result in direct effects including mortality or indirect effects to instream habitat, bank stability and erosion, or shade and stream temperature. (USDI BLM 2007d: 4-59 to 4-74). The 2010 Oregon EIS analyzed the effect of prescribed fire treatment on wetland and riparian resources (USDI BLM 2010a: 208-216) and fish (USDI BLM 2010a: 216-240) and the District is summarizing and incorporating that analysis here, by reference (USDI BLM 2010a: 208-240). The effects from prescribed fire could include the reduction of ground cover leading to

increase sedimentation and erosion. Post-treatment runoff could indirectly affect fish adjacent to and downstream of treatment sites.

Within the District, streams adjacent to proposed fire treatments are generally small, intermittent, and perennial streams flowing through dryer grasslands and open forest canopies. Streams may contain resident fish species, BSS, or ESA listed species toward the upper extent of their distribution. These streams, given their dry site condition, generally do not have large trees that would have contributed streams with woody debris that provide habitat and structure to aquatic species. More open stands generally would allow for more sun through the canopy and would lead to elevated stream temperatures locally. Proposed treatments units on BLM vary in size from 6 to 116 acres. Historically grazed meadows may have more compacted ground and soils.

See Table H-1 for BSS and ESA species found in the project area.

Table H-1. Bureau special status and ESA-listed aquatic species that are found in aquatic systems across the District with the potential to be affected by treatments

Common Name	Scientific Name	Federal status
Lower Columbia coho salmon	<i>Oncorhynchus kitsuch</i>	ESA threatened
Lower Columbia Chinook salmon	<i>Oncorhynchus tshawytscha</i>	ESA threatened
Lower Columbia steelhead trout	<i>Oncorhynchus mykiss</i>	ESA threatened
Upper Willamette River steelhead trout	<i>Oncorhynchus mykiss</i>	ESA threatened
Upper Willamette River Chinook salmon	<i>Oncorhynchus tshawytscha</i>	ESA threatened
Oregon Coast coho salmon	<i>Oncorhynchus kitsuch</i>	ESA threatened
Bull trout	<i>Salvelinus confluentus</i>	ESA threatened
Pacific lamprey	<i>Entosphenus tridentatus</i>	Bureau sensitive
Coastal cutthroat trout (SW Washington/Columbia River DPS)	<i>Oncorhynchus clarkii clarkii</i>	Bureau sensitive
Western ridged mussel	<i>Gonidea angulata</i>	Bureau sensitive

For this Issue, the spatial scale is the treated meadow units and up to ¼ mile downstream. Streambanks adjacent to treated units may experience disturbance and removal of ground vegetations that could become a source of sediment and runoff to adjacent streams.

Additionally, spatial scale is the treated meadow units and up to ¼ mile downstream. Streambanks adjacent to treated units may experience disturbance and removal of ground vegetations that could become a source of sediment and runoff to adjacent streams.

Additionally, the intensity and duration of effects are as follows:

- Short term: A change in a resource or its condition lasting less than one year.
- Long term: A change in a resource or its condition lasting greater than one year.
- Negligible: The impact would not be detectable or measurable to aquatic habitat or aquatic species.

- Minor localized effect: Short-term changes to aquatic habitat or aquatic species would be measurable or perceptible in small, localized habitats, but would fall within the range of natural variability and would result in no appreciable changes to aquatic species or their habitats beyond the scale of an individual habitat unit (e.g., a single pool).

As noted in , it is unlikely that stream form and function, and therefore fish habitat, would be affected through the use of prescribed fire. Fire in the Riparian Reserves and adjacent to streams would be low intensity and vegetation would quickly regrow in response to fire. Trees tipped into adjacent streams would create some small disturbance to the stream and streambanks in the short-term but would create habitat for aquatic BSS and ESA species over the long term that would be beneficial to those species. Streams in general are lacking in large structural components such as large wood and the addition of tipped trees would offset that reduction. Over the long-term, removal of some ground cover in the Riparian Reserve could result in sediment in runoff, however the small size of proposed treatment areas and the remaining undisturbed soil would limit the amount of fine sediment reaching streams. The short-term affect may result in some fine sediment delivery during subsequent rain events, however because of regrowth of ground cover over the following years, the long-term effect would be negligible.

The No Action Alternative and Alternatives B and C would not significantly affect aquatic species along treatment areas. Application of PDFs to limit the amount of fire reaching perennial and fish bearing streams along with the small size of intermittent streams and treatment areas would result in no significant effect to aquatic species. Under Alternative B and C, tree tipping to create canopy openings would potentially result in large wood contributed to adjacent stream channels providing structural stability and fish habitat in larger perennial streams with Bureau Sensitive and ESA listed fish nearby. There would be some short-term disturbance resulting from felling trees intersecting streams however it would be short in duration and disturbed fish would quickly recolonize habitats. Overall, treatment of meadow and prairie habitats using fire and tree tipping would result in short-term impacts; however, there is no potential for significant effects to BSS and ESA listed aquatic species beyond the effects described in the 2010 Oregon FEIS.

INAID #9 (Fuels) How would the use of prescribed fire and commercial removal of encroaching trees into meadows (up to 40 inches DBH) affect Fire Hazard in the Wildland Developed Area (WDA)?

BLM did not analyze this issue in detail because there is no potential for significance beyond what BLM analyzed in the FEIS for RMPs for Western Oregon (USDI BLM 2016c: 253 to 264) and there are no new circumstances or information at the site-specific level that would change the effects anticipated for this EA.

The FEIS for RMPs for Western Oregon analyzed the effects of commercial harvests on fire hazard close to developed areas for the Northwestern Oregon RMP planning area (USDI BLM 2016c: 253 to 264). As stated in the FEIS for RMPs for Western Oregon “The results of this analysis do not include effects from non-commercial hazardous fuels work, which would contribute toward reducing fire hazard similarly among all alternatives and the Proposed RMP and be less likely to result in structural stage shifts (USDI BLM 2016c: 255).

The BLM assumed that a one-mile buffer around the West Wide Wildfire Risk Assessment WDA data layer represents the geographic scope of possible immediate risks to the public and firefighter safety within close proximity to communities located within the Wildland Urban Interface. The WDA provides a delineation of where people live in the wildland, classifying a minimum of 1 structure per 40 acres as a developed area (USDI BLM 2016c: 253 to 254).

In the FEIS for RMPs for Western Oregon analysis, the BLM assigned forest structural stages (USDI BLM 2016c: 1203-1206, Appendix C) to a relative ranking of stand-level fire hazard (USDI BLM 2016c: 254, Table 3-34). While the FEIS analysis did not specifically account for surface fuel loading, the BLM assumed that descriptions of forest vegetation structural conditions and fuel continuity reflect relative stand-level fire hazard. The BLM quantified the stand-level fire hazard ratings as low to high within the planning area.

The FEIS for RMPs for Western Oregon found that in 50 years...the Proposed RMP would result in a decrease of stand-level fire hazard for the 298,441-forested acres within close proximity to Wildland Development Areas (ODF 2013) in the coastal/north. [T]he Proposed RMP would reduce the acres of Moderate or High fire hazard and increase the acres of Low hazard, relative to current conditions. (USDI BLM 2016c: 264).

Vegetation treatments proposed in this EA would maintain or reduce fire hazard. Treatments would in most cases not change forest structural stages. The BLM would continue to treat fuels following management activities for restoration and hazardous fuels reduction purposes. The treatment of these fuels would reduce potential fire intensity, particularly in areas with higher fire risk. On treatment units, approximately 1,840 acres of non-herbicide methods would occur annually to remove or reduce undesirable vegetation, and herbicide treatments would occur on approximately 613, 2,249, or 8,382 acres annually based on the alternative selected. BLM would use prescribed fire on up to 400 acres. The proposed treatments would not have effects on fire hazard within the WDA beyond those disclosed in the FEIS to which this analysis is tiered.

INAID #10 (Human Health) What are the effects to human health from incidentally coming into contact with herbicides used on BLM- administered lands?

This issue was not analyzed in detail because there is no potential for significance beyond what BLM analyzed in the 2010 Oregon FEIS and the 2007 and 2016 PEISs (USDI BLM 2010a: 345-358, USDI BLM 2007a: 4-174 to 4-196, USDI BLM 2016a: 4-87 to 4-103) and there are no new circumstances or information at the District level that would change the effects anticipated for this EA.

The herbicides identified for use in the 2010 Oregon FEIS and the 2007 and 2016 PEISs are the same herbicides proposed for use in the IPMAHR EA. The formulations in herbicides 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 G** and USDI BLM 2010a: 345). The BLM analyzed exposure scenarios for human health effects for the public in the 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 BLM 2010a: 347).

Table H-2 displays a summary of information describing the effects of the herbicides that have risk to the public that is greater than 0 in one or more Risk Assessment-modeled scenarios. All other herbicides had no risk for any of the modeled scenarios of public exposure, including incidental handling, consumption, and contact with the skin. Human health Risk Assessments include scenarios that address subsistence populations and Native American populations (see **Appendix G**). Additional information about the risk ratings discussed below are in **Appendix G** – Herbicide Risk Assessment Summaries.

Table H-2. Summary of Effects of Herbicides on Human Health*

2,4-D	The public faces zero risk from all modeled scenarios except one; there is low risk to a child having herbicide sprayed over their entire body at maximum application rate. In the human health Risk Assessment conducted to support the reregistration of 2,4-D (USEPA 2004), the EPA concluded that there is not sufficient evidence that 2,4-D is an endocrine disrupting chemical.
Clopyralid	The public faces zero risk from all modeled scenarios except one; there is low risk to the public from the consumption of water from a pond contaminated with a spill.
Dicamba	The public faces zero risk from all modeled scenarios except one; there is low risk to the public from the consumption of water from a pond contaminated with a spill.
Fluazifop-P-butyl	There is low risk to subsistence population consuming fish from fluazifop-P-butyl applications at the maximum rate after an accidental spill into a pond.
Glyphosate	For both workers and members of the public, there are no risks associated with nearly all exposures to glyphosate at the typical or maximum application rate (SERA 2011a). The Risk Assessment calculated no risk for all but one of the tested scenarios. There is low risk to children associated with accidental exposure to glyphosate through consumption of contaminated water after an herbicide spill at the maximum rate into a small pond.
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.

*Table does not include herbicides with no measurable risk. Herbicide information summarized from the 2010 Oregon FEIS (USDI BLM 2010a: 345-358), the 2007 PEIS (USDI BLM 2007a: 4-174 to 4-196), the 2016 PEIS (USDI BLM 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 reduce the likelihood that the modeled exposure scenarios described would actually occur, and thus reduce the described adverse effects. All the herbicides proposed for use in the action alternatives have zero risk at typical rates. As shown in Table A-4, *Treatment Key Recommendations* in **Appendix A**, BLM

would not typically use 2,4-D, dicamba, and triclopyr at the maximum rates. However, BLM would use clopyralid, fluazifop-P-butyl, and glyphosate at the maximum rate for a few species. Specifically, BLM would use Clopyralid to control species in the hawkweed and Canada thistle species groups. BLM would use Fluazifop-P-butyl on perennial grasses. And BLM would use Glyphosate on snapdragons, perennial peas, perennial grasses, perennial mustards, miscellaneous herbaceous (perennial and annual), and buttercup species groups.

The only scenarios with risk that are theoretically possible under the alternatives are associated with an accidental spill of herbicides into water:

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

As described in the 2010 Oregon FEIS, BLM does not expect accidental spills directly into water to occur; targeted application methods and Protection Measures would prevent these scenarios from happening. Manufacturers have not registered Clopyralid or fluazifop-P-butyl for aquatic use and, when used, the District would buffer any waterbodies (see **Appendix E** for buffers).

The 2010 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 BLM included to account for hypersensitive individuals and otherwise accommodate uncertainties into the measurements. Thus, herbicide exposure of a healthy (not susceptible) individual to a dose identified as having a risk would have no effect on them. Nevertheless, the low rating indicates that the potential for risk starts at that level of concern (USDI BLM 2010a: 91). The *Human Health* section of those Risk Assessments also include scenarios with children and women (see **Appendix G – Herbicide Risk Assessment Summaries**).

The administrative boundaries of the District include the largest metropolitan areas (Portland, Eugene, and Salem) in Oregon. BLM lands within the administrative boundary have highly used recreation sites; includes lands used for the collection of mushrooms and berries; and lakes, rivers and trails used for recreational swimming and hiking. Local Tribes have treaty rights 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 BLM 2010a: 284).

BLM's scattered and infrequent use of herbicide under all alternatives (typically once per year at a site) is not comparable to industrial uses on neighboring farms or timberlands (USDI BLM 2010a: 744). The BLM manages 6.7 percent of the land within the Northwest Oregon District boundary and the BLM use of herbicides is a small fraction (0.01 percent) of the pounds of pesticides used in the water basins containing these District-managed lands (ODA 2009). The District would not spray herbicides aerially, and BLM would apply drift reduction strategies to spot and broadcast treatments. BLM would apply all Standard Operating Procedures and

Mitigation Measures analyzed in 2010 Oregon FEIS and the 2007 and 2016 PEISs to all alternatives.

As detailed in the Protection Measures, the BLM would notify the public prior to herbicide applications. The Northwest District signs treatment areas at recreation areas and sites with high public use prior to the treatment. BLM would prepare and make available an ATP of the areas identified for treatment prior to the beginning of control treatments each year and as needed on an ad hoc basis. BLM will post the ATP on BLM's National NEPA Register (ePlanning) and share it with the Tribes as part of ongoing consultation. In addition, the BLM is in the process of transitioning from the National Invasive Species Information Management System (NISIMS) database to the Vegetation Management Action Portal (VMAP). VMAP is the national database where the BLM records and accesses infestation and treatment data now and in the foreseeable future. Since data has not fully migrated to VMAP, BLM created the infestation map publicly available on the BLM National NEPA Register (ePlanning).

BLM analyzed the IPMAHR's use of proposed herbicides and their application rates in the 2010 Oregon FEIS and the 2007 and 2016 PEISs, no further analysis is necessary.

INAID #11 (Human Health) What are the hazards to workers treating invasive plants mechanically, manually, and with herbicides?

This issue was not analyzed in detail because there is no potential for significance beyond what BLM analyzed in the 2010 Oregon FEIS and the 2007 and 2016 PEISs (USDI BLM 2010a: 345-358, USDI BLM 2007a: 4-174 to 4-196, USDI BLM 2016a: 4-87 to 4-103) and there are no new circumstances or information at the District level that would change the effects anticipated for this EA.

There is a potential exposure and injury to workers from pesticides. As described in the Human Health and Safety section of the 2010 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 BLM 2010a: 343). Manual, mechanical, and chemical treatments can all present health hazards to workers. Hazards could include falling objects (e.g., when cutting trees such as the invasive tree-of-heaven and hawthorn), tripping or slipping on hazards on the ground, protruding objects such as branches and twigs, poisonous plants and insects, and dangerous wildlife. Workers are subject to heat-related illness (potentially exacerbated by safety equipment such as chainsaw chaps or face guards) or hypothermia when working in extreme weather conditions and may incur musculoskeletal injuries related to improper body mechanics (USDI BLM 2010a: 343-345).

As described in the 2010 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 BLM 2010a: 349-350).
- Chlorsulfuron and dicamba at the maximum rate can cause temporary skin or eye irritation to applicators (USDI BLM 2007a: 4-184, USDI BLM 2010a: 350).
- Fluridone can cause reversible eye irritation (USDI BLM 2007a: 4-183, USDI BLM 2010a: 348).

- Workers applying hexazinone face low risk from spills on lower legs and wearing contaminated gloves. The most likely effects would include skin, eye, and respiratory tract irritation (USDI BLM 2007a: 4-184, USDI BLM 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 BLM 2016a: 4-102).

Further information about these modeled scenarios is in each herbicide's human health Risk Assessment (See **Appendix G** – Herbicide Risk Assessment Summaries).

The 2010 Oregon FEIS identified for mechanical, manual and herbicide treatments that “[t]he potential for hazard exposure (risk of injuries) is exacerbated when workers are fatigued, poorly trained, poorly supervised, or do not follow established safety practices. Appropriate training, together with monitoring and intervention to correct unsafe practices, would minimize risk of worker injury and illness. Compliance with Occupational Safety and Health Administration (OSHA) standards, along with agency, industry, and manufacturers’ recommendations reduces the potential exposure and risk of injury to workers.” (USDI BLM 2010a: 344-345).

The BLM identified the herbicides, their application rates, and mechanical treatments proposed for use in the IPMAHR project in the 2010 Oregon FEIS, 2007 PEIS and 2016 PEIS. The BLM prepared the 2010 Oregon FEIS to analyze, at the programmatic scale, a proposal to increase the number of herbicide available to the nine BLM districts in Oregon (USDI BLM 2010a: 4). The 2007 PEIS analyzes the effects of using herbicides for treating vegetation on public lands in the western U.S., including Alaska. (USDI BLM 2007a: 1-4). The 2016 PEIS proposed treatments using aminopyralid, fluroxypyr, and rimsulfuron on public lands in the western U.S. (USDI BLM 2016a: ES-1). The IPMAHR lies within the analysis area of all three EISs.

During the implementation of the proposed treatments in the IPMAHR EA, BLM will minimize the potential for worker injury and illness using appropriate training, monitoring and intervention to correct unsafe practices. BLM will comply with Standard Operating Procedures, Mitigation Measures, and Occupational Safety and Health Administration (OSHA) standards and industry and manufacturers’ recommendations, which will reduce potential exposure and injury to workers (USDI BLM 2010a: 344-345). only BLM certified or state licensed applicators, or persons working under their direct supervision, will apply herbicide on BLM-administered lands in Oregon (USDI BLM 2010a: 85). BLM renews certifications every three years by completing a one-week EPA-compliant training course. BLM would apply all Standard Operating Procedures and Mitigation Measures analyzed in those documents would to all alternatives.

The exposure of workers to injury due to manual, mechanical or pesticide treatment of invasive species under all alternatives are within the actions analyzed in the 2010 Oregon FEIS, 2007 PEIS and 2016 PEIS.

BLM strictly controls prescribed fires and only initiates them when burning conditions (soil moisture, relative humidity, wind, fuel load, etc.) are favorable. BLM would treat a maximum of 400 acres annually with prescribed fire, representing only 4 percent of annual treatments and a fraction of a percent of the entire Northwest Oregon District. Even if all this acreage were treated

in the high soil burn severity classification, and thereby identified as detrimental to soils, the BLM would still be well within the threshold specified by the RMP.

INAID #12 (Hydrology) How would prescribed fires implemented across a landscape, including within riparian areas, affect stream form and function?

BLM did not analyze this issue in detail because there is no potential for significance because the BLM is incorporating the PER by reference and the IPMAHR project is not proposing high severity burns.

Although fire is a natural process that most landscapes evolved with, it can be destructive. However, under the right conditions, it can rejuvenate the landscape and eliminate invasive plants among other benefits. Nonetheless, prescribed fire is a tool proposed for consideration in this EA. Potential detrimental effects include increased runoff from a reduction in water infiltration; these factors, when combined, can result in enhanced stream flows, the likes of which can re-shape stream form and function. The 2007 PER confirms this, “The burning of vegetation would be expected to lead to an increase in surface runoff and sediment inputs to water, and a decrease in infiltration” (USDI BLM 2007d: 4-22)

“The amount of runoff would be a factor of the timing and severity of the fire, the slope of the treatment site, and the timing, amount, and intensity of precipitation. High severity fires tend to burn much of the organic material on a site, exposing mineral soil, and sometimes forming hydrophobic soil layers. Erosion, runoff, and water quality are often unaffected on level areas after a low severity prescribed burn, whereas adverse effects to water resources may persist for 9 to 15 months on moderate slopes, and for 15 to 30 months on steep slopes (Wright et al. 1976)” (USDI BLM 2007d: 4-22).

A description of low, moderate, and high soil burn severity is in a technical report that Annette Parsons et al completed for the US Forest Service:

- Low soil burn severity: Surface organic layers are not completely consumed and are still recognizable. Structural aggregate stability is not changed from its unburned condition, and roots are generally unchanged because the heat pulse below the soil surface was not great enough to consume or char any underlying organics. The ground surface, including any exposed mineral soil, may appear brown or black (lightly charred), and the canopy and understory vegetation will likely appear “green.”
- Moderate soil burn severity: Up to 80 percent of the pre-fire ground cover (litter and ground fuels) may be consumed but generally not all of it. Fine roots (~0.1 inch or 0.25 cm diameter) may be scorched but are rarely completely consumed over much of the area. The color of the ash on the surface is generally blackened with possible gray patches. There may be potential for recruitment of effective ground cover from scorched needles or leaves remaining in the canopy that will soon fall to the ground. The prevailing color of the site is often “brown” due to canopy needle and other vegetation scorch. Soil structure is generally unchanged.
- High soil burn severity: All or nearly all of the pre-fire ground cover and surface organic matter (litter, duff, and fine roots) is generally consumed, and charring may be visible on

larger roots. The prevailing color of the site is often “black” due to extensive charring. Bare soil or ash is exposed and susceptible to erosion, and aggregate structure may be less stable. White or gray ash (up to several centimeters in depth) indicates that considerable ground cover or fuels were consumed. Sometimes very large tree roots (> 3 inches or 8 cm diameter) are entirely burned extending from a charred stump hole. Soil is often gray, orange, or reddish at the ground surface where large fuels were concentrated and consumed (Parsons et al, 2010: 10).

The IPMAHR EA project area is located within the area identified for the 2007 PER, to which this EA incorporates by reference.

Although natural wildfire would have occurred in upland and riparian environments of the Northwest Oregon District in the late summer and fall, the District would implement prescribed fires in the late fall, winter, and early spring to allow for better burn control and to minimize soil burn severity. Soil burn severity in the context of this Issue, if high, produces ash which can fill in natural pores of the soil, creating a hydrophobic layer impervious to water infiltration.

The IPMAHR project would apply prescribed fire across the landscape, including streams and their riparian areas. The District would implement prescribed fires at a time that would minimize soil burn severity. The maximum prescribed fire treatment size for any given treatment area would not likely exceed 10 acres, thereby minimizing the potential for streamflow enhancement.

In order to minimize soil burn severity in prescribed fires, the BLM is adopting the following Project Design Feature: 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. A higher soil and fuel moisture will dampen the negative effects to soil from burning including loss of organic soil horizons and creation of hydrophobic soil conditions which can affect runoff patterns. To conduct prescribed burns under favorable conditions, the District will consider seasonality. Depending on the goals of the prescribed burn, spring and fall can be ideal times to minimize soil burn severity.

Additionally, if high soil burn severity does occur, any hydrophobic soils will break down within the duration of the first couple fall and winter rainstorms. The limit of flow enhancement, if flow enhancement were to occur, downstream from the treatment area would be 200 feet or less. These observations are based on field observations of flow enhancement that has occurred downstream of clearcuts which can similarly enhance flows capable of altering stream form and function.

Prescribed fires mimicking a natural process, and implemented on a small number of acres, will have little effect on infiltration and runoff patterns; and thus, unlikely to affect stream form and function. “Annual water yields and short-term baseflows generally increase if overstory vegetation is removed by fire, only to return to preburn levels as vegetation recovers. Prescribed burning generally has little effect on water yields (Beschta 2000)” (USDI BLM 2007d: 4-21). Under normal conditions, burn severity will be low or nonexistent. In most cases, some vegetation will remain on the ground or will quickly regrow thanks to the stimulation the fire provides. Regardless, the District is not expecting significant amounts of ash generation and expects soil porosity to remain largely unchanged. As a result of maintaining soil porosity, water infiltration will remain

unchanged. And because water will continue to infiltrate the soils, the District does not expect flow enhancement. Because these streams have already evolved under enhanced flows, their geomorphology is such that in the unlikely scenario that a prescribed fire does burn at high severity, its form and function will remain unchanged.

INAID #13 (Recreation) How would manual, mechanical, herbicide and prescribed fire treatments of invasive plants affect the management and use of recreation management areas?

The BLM did not analyze this issue in detail because there is no potential for significance beyond what BLM analyzed in 2010 Oregon FEIS, the 2007 FEIS, and the 2016 PEIS (USDI BLM 2010a: 309, USDI BLM 2007a: 4-118, USDI BLM 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 2010 Oregon FEIS and 2007 FEIS, manual and mechanical methods would continue to be the primary form of treatment of invasive plants in developed recreation sites (USDI BLM 2010a: 309; USDI BLM 2007a: 4-118). BLM may temporarily close recreation sites during herbicide or prescribed fire treatments to reduce herbicide exposure and public safety concerns, but the closures would only be temporary. BLM may restrict access to a site for a few hours or days, depending on the reentry requirements of the herbicide label or the safety considerations of an ongoing prescribed fire. 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. Treatments with herbicides in developed recreation sites would generally be spot treatments to target specific plants, which would limit potential exposure to visitors. The 2010 Oregon FEIS did not discuss the effects of aminopyralid, fluroxypyr, or rimsulfuron; a discussion of the effects of these three herbicides was in the 2016 PEIS, which concluded “the nature, extent, and intensity of impacts to recreation would be similar to those under the No Action Alternative” (USDI BLM 2016a: 4-81).

The IPMAHR EA area is located within the analysis area for 2010 Oregon FEIS, 2007 PEIS, and the 2016 PEIS. In this EA, the BLM is proposing use of the same mechanical, manual, prescribed fire, biological, and herbicide treatments identified in the EISs. BLM would apply all Standard Operating Procedures and Mitigation Measures analyzed in the documents to all alternatives.

The type of actions and treatments under all alternatives are wholly within the actions analyzed in the USDI BLM 2007a, USDI BLM 2010a and USDI BLM 2016a.

INAID #14 (Soils) How would the proposed herbicide treatments affect soils productivity?

BLM did not analyze this issue in detail because there is no potential for significance beyond what BLM analyzed in the 2010 Oregon FEIS and the 2007 and 2016 PEISs (USDI BLM 2010a: 178-187, USDI BLM 2007a: 4-16, USDI BLM 2016a: 4-10 to 4-13) and additional analysis at the District level would not change the conclusions from the 2010 Oregon FEIS and the 2007 and 2016 PEISs.

Biological processes (organisms and plant uptake), physical parameters (adsorption, volatilization, hydrolysis, and leaching), and other parameters (climate, slope, and vegetative cover) affect the

ability of soils to hold and break down herbicides (USDI BLM 2010a: 178-187, USDI BLM 2007a: 4-16, USDI BLM 2016a: 4-10 to 4-13).

The 2010 Oregon FEIS describes that in the event herbicides do contact the soil, herbicides affect few soil organisms directly (USDI BLM 2010a: 178). While there are varying amounts of information available for each herbicide, chlorsulfuron, picloram, and metsulfuron methyl would reduce the presence of soil biota for a period of up to three weeks; the remaining herbicides have no or slight adverse effects (USDI BLM 2010a: 182-185, USDI BLM 2007a: 4-16, USDI BLM 2016a: 4-11 to 4-13). Noted effects from diflufenzopyr, imazapic, or imazapyr was at application rates many times higher than those used by the BLM. Hexazinone and imazapyr have little data about their effects to soil life, and available studies had application rates many times higher than proposed for BLM-administered land (USDI BLM 2010a: 178).

Soils on the District range in texture classes from sandy loams to clays (weighted average of 23 percent clay) and are high in organic matter (weighted average of 14 percent), meaning soils within the District have high adsorption capacity and herbicides applied to soils may attach to and potentially move with them (USDI BLM 2010a: 179-181, USDI BLM 2007a: 4-14, USDI BLM 2016a: 4-11). In the cases where herbicides move down through the soil, the main concern is groundwater contamination (discussed further in **INAD #18 (Water Quality)** *How would treating terrestrial weeds with herbicides affect water quality, including ground and surface water used for domestic and municipal supply?*).

Proposed herbicide use, in the IPMAHR EA, would not cause negative effects to soil productivity due to the limited scale (an average of 500 acres per year under the No Action Alternative, 8,200 acres under Alternatives 2, and 5,500 acres under Alternative 3) and methods of herbicide application (almost entirely spot treatments under the No Action and 95 percent spot treatments under the action alternatives).

BLM did not analyze the use of the herbicides Fluzifop-P-butyl and sethoxydim, which it is proposing for use in limited areas for research and demonstration, in the EISs to which this document tiers. BLM does not expect these herbicides to have short (within the growing season of the treatment) or long term (after the growing season of the treatment) soil productivity effects due to their chemical characteristics and because BLM would use each only on 15 acres or less per field office. The Risk Assessment for fluzifop-P-butyl discusses adverse effects on terrestrial arthropods at the treated site, and explains that functional recovery (i.e., repopulation) within one year would be expected and no effects would be expected at a distance of 100 feet from the treated site, indicating highly localized, temporary effects (SERA 2014). Sethoxydim's Risk Assessment indicates it is relatively non-toxic to terrestrial animals including some invertebrates at higher application rates than are proposed in this EA (SERA 2001).

The use of herbicides and their application rates under all alternatives are within the actions analyzed in the 2010 Oregon FEIS and the 2007 and 2016 PEISs. BLM would apply all Standard Operating Procedures and Mitigation Measures analyzed in those documents to all alternatives (see **Appendix E**). Given the quantity used and the distribution across the District, localized effects to soil function from all other herbicides would not be detectable or measurable.

INAID #15 (Soils) How would the proposed prescribed fire treatments affect soil productivity?

The BLM did not need to analyze in detail the effects of prescribed fire for weed treatments and their effects on soil productivity because there is no potential for significance beyond what BLM analyzed in the 2016 FEIS/PRMP to which this analysis tiers (USDI BLM 2016c: 756, 764-765).

High soil burn severity can negatively affect ground surface characteristics, organic matter, chemical composition, structure, and infiltration capacity of the soils (Parsons et al., 2010). A high soil burn severity converts fuels to ash which can settle into soil pores which in turn create soils that are hydrophobic. Hydrophobic soils inhibit water infiltration and promote runoff and erosion. A rating of high soil burn severity does not necessarily correlate with fire intensity or even burn duration. One might observe a loss of soil productivity in a burn if there is a concentration of fuels (e.g., slash piles), fuel loads are high, or atmospheric conditions (relative humidity, wind speed, etc.) are conducive to burning. In prescribed fires, high soil burn severity is not the objective and rarely observed.

Prescribed fire special habitats where there are rare or sensitive botanical species of interest or concern being outcompeted by non-native vegetation that prescribed fire could treat. Typically, these special habitats are also unique from a soil's perspective; in fact, they usually exist because of something unique in the soils or drainage patterns of the site. And often, these unique sites have low soil productivity because the soils are shallow, impermeable, or are otherwise inhospitable to "typical" vegetation. In the context of this EA, prescribed fire shall be used in special habitats which have a relatively small footprint.

In the FEIS analysis, the BLM grouped together fuel reduction treatments for activity fuels such as the slash remaining after timber harvest and for hazardous risk fuels not associated with timber harvest (USDI BLM 2016c: 756). The effects of the use of fuels treatments for noxious weeds would be similar since soil burn intensity is the primary indicator for assessing whether or not a prescribed burn has negatively affected soil productivity. In the FEIS, BLM compared the combined amount of detrimental soil disturbance to a threshold of 20 percent of areas treated (USDI BLM 2016c: 764). The FEIS identified that the current detrimental soil disturbance covers approximately six percent of the decision area. Raising that level by 20 percent would increase the detrimental soil disturbance to approximately seven percent of the decision area. Even then, there is only an expected reduction of growth from those areas in the future of 10 percent. Therefore, the sustainability of all lands under the decision area remains at approximately 99 percent of their current potential (USDI BLM 2016c: 765).

INAID #16 (Visual Resource Management) What are the potential impacts from the project on the Visual Resource Management Classes?

BLM did not analyze this issue in detail because there is no potential for significance beyond what BLM analyzed in the 2010 Oregon FEIS and the 2016 PEIS (USDI BLM 2010a: 293-295, USDI BLM 2016a: 4-1, 4-76 to 4-77) and there are no new circumstances or information at the District level that would change the effects anticipated for this EA.

The 2010 Oregon FEIS describes that treatments could have short-term negative effects for the first year following treatment, but in the long term, effects would be beneficial because of the return of native vegetation (USDI BLM 2010a: 296).

The short-term negative visual effects of herbicide treatments would vary based on “which herbicide is applied and how it is applied” but that the effects from the application of herbicides using a backpack sprayer or wicking method would not be easily discernable (USDI BLM 2010a: 294). The 2010 Oregon FEIS did not discuss the effects of aminopyralid, fluroxypyr, or rimsulfuron. The effects of these three herbicides were discussed in the 2016 PEIS, which states that impacts to visual resources nationwide from a program that included these three herbicides would be similar to the program without those three herbicides (USDI BLM 2016a: 4-77).

Prescribed fire treatments would result in a short-term visual effect of a burned-over, charred, and blackened landscape. BLM normally uses prescribed fire as a weed control treatment where invasive plants dominate the landscape, and thus a loss of only a few native species would occur because of the treatment. The District would follow these treatments with reseeding of the area with native vegetation, resulting in new growth in the next growing season, with the long-term positive effect of creating a native species-dominated vegetation landscape ((USDI BLM 2010a: 293).

The type of actions and the amount of treatments under all alternatives are wholly within the actions analyzed in the 2010 Oregon FEIS and the 2016 PEIS. BLM would apply all Standard Operating Procedures and Mitigation Measures analyzed in those documents to all alternatives. On the Northwest Oregon District, treatments would not be noticeable at the viewshed scale; under the action alternatives, 95 percent of herbicide treatments would be spot treatments to target specific plants (to keep effects to non-target species to a minimum). BLM would use selective herbicides when broadcast spraying; treatments would kill only target invasive plants, leaving remaining native vegetation unharmed. Standard Operating Procedures include requirements for project designs that blend with topographic forms, do not attract attention, and restore the existing line and color. Because of these measures, herbicide treatments under all alternatives would not result in large patches of dead invasive plants that would be noticeable at the landscape (viewshed) level. Due to the temporary nature of any discernable visual contrast introduced by invasive plant treatments, BLM can ensure conformance with assigned Visual Resource Management Class objectives because projects have up to 5 years (the short-term timeframe as described in the Visual Resource Contrast Rating Handbook) to come into conformance with visual objectives (USDI BLM 1986: 3).

INAID #17 (Water Quality) How would treating any riparian vegetation affect stream side shade cover and stream temperature?

BLM did not analyze this issue in detail because there is no potential for significance beyond what was analyzed in the 2007 and 2010 PEISs and the 2010 Oregon FEIS to which this analysis tiers (USDI BLM 2010a: 140 to 210, USDI BLM 2007a: 4-25 to 4-90, 4-247, USDI BLM 2016a: 4-22) and the 2007 PER which is incorporated by reference (USDI BLM 2007d: 4-23, 4-71, 4-69).

Wetland and riparian area species and function can potentially be adversely affected by herbicide use, by non-herbicide invasive weed control measures, and by the increase of noxious weeds and

other invasive plants (USDI BLM 2010a: 210). Water quality degradation could result from removal of riparian vegetation and reduction in shade. With the loss of shade, the resulting increase in surface-water temperature fluctuations could drive water temperature beyond tolerable limits for temperature sensitive fish and other aquatic species (USDI BLM 2007a: 4-25). While streams and lakes naturally warm and can provide a range of thermal regimes, if a body of water exceeds thresholds established by Oregon Department of Environmental Quality (ODEQ) or Oregon Department of Fish and Wildlife (ODFW), it could pose a risk to the health and human safety of humans or animals respectively. Elevated water temperatures can increase productivity which can decrease dissolved oxygen and provide ideal growing conditions for Harmful Algae Blooms (USDI BLM 2010a: 190) which are toxic to humans and many animals. The increased solar radiation that results from the loss of streamside or poolside vegetation causes temperatures, light levels, and autotrophic production (plants and algae) to increase. The resulting effects on some special status species, and particularly salmonids, may include reduced growth efficiency, an increased likelihood of succumbing to disease, and an increase in food production (USDI BLM 2007d: 4-71).

[P]ositive long-term impacts to fish and aquatic invertebrates [from herbicide treatments] include improvement of riparian and instream habitat, through eradication of aquatic weeds that dominate water systems and the resulting increase in dissolved oxygen content, and the regrowth of native riparian vegetation and increase in shade habitat (USDI BLM 2007a: 4-90). While loss of vegetation could lead to short-term impacts such as increased sedimentation and nutrient loading, and alteration of vegetation, water temperature, and hydrologic conditions, it is expected that these short-term impacts would be minimal given that extensive removal of riparian vegetation would be unlikely (USDI BLM 2016a: 4-22). “Vegetation treatments that restore native plant communities and ecosystem function would reduce sediment input into streams by improving degraded areas and providing suitable vegetative cover between areas of erosion and streams and other aquatic bodies” (USDI BLM 2007d: 4-69).

Daily temperature fluctuations in forest streams are largely regulated by the amount of solar radiation they receive (Beschta 2000). Removal of overhead vegetation along watercourses can lead to increased water temperatures after a prescribed fire. Elevated stream temperatures are detrimental to most coldwater fish species. Retaining vegetated buffers between stream courses and treatment areas, and revegetating burned areas along streams, can help to reduce effects to water temperature and stream organisms (USDI BLM 2007d: 4-23).

Aquatic plant control can cause a high rate of plant decomposition and may cause rapid oxygen loss from water that can seriously degrade water quality. The magnitude of this effect depends on water temperature, lake or pond stratification, and the amount and rate of plant decomposition. The effects can persist from a few weeks to an entire growing season but are generally not permanent (USDI BLM 2007a: 4-25).

Because manual treatments would occur over small areas (65 percent of treatments would be less than 100 acres), and would involve minimal soil disturbance or vegetation removal, the effects to water resources would be minimal (USDI BLM 2007d: 4-23).

The IPMAHR EA project area is within the analysis area for the 2010 Oregon FEIS, 2007 PEIS, the 2007 PER which the PEIS references and the 2016 PEIS. The 2007 PER discussed the effects of invasive plant treatments on water quality, to include water temperature, and the District is summarizing and incorporating that analysis here by reference.

There are hundreds of miles of perennial streams in each Field Office – thousands of miles on the district. Similarly, there are thousands of miles of impaired stream on the district. While one invasive plant species or another can be found virtually everywhere across the Northwest Oregon District, the majority of streams flowing through BLM-managed lands are forested and well-shaded. Typically shading can effectively combat the development and spread of invasive plants. Treatment proposals are usually going to focus on developed recreation sites, along roadways, and in meadows or other special habitats where the canopy cover is already open to some degree.

Successful control of invasive plants in wetlands and riparian areas...would lead to improved conditions in these habitats over the long term. The eventual growth of desirable vegetation in treated areas would moderate water temperatures, buffer the input of sediment and herbicides from runoff, and promote bank stability in riparian areas (USDI BLM 2007a: 4-247).

INAID #18 (Water Quality) How would treating terrestrial weeds with herbicides affect water quality, including ground and surface water used for domestic and municipal supply?

BLM did not analyze this issue in detail because there is no potential for significance beyond what BLM analyzed in the 2010 Oregon FEIS and the 2016 PEIS (USDI BLM 2010a: 204- 206, USDI BLM 2016a: 4-19) and there are no new circumstances or information at the site-specific level that would change the effects anticipated for this EA.

The routes for herbicides to contaminate water include accidental spills, drift into streams from spraying, runoff (e.g., from a rainstorm soon after application), and leaching through soil into groundwater. The depth to groundwater, soil conditions, and rainfall influence the potential for groundwater contamination. The proportion of herbicide that is on or in the plant, soil, and water after application influences whether an herbicide will runoff or drift; application method, weather conditions (application timing), herbicide formulation and application rate, and amount and type of vegetation and groundcover influence this proportion (Kerle et al. 2007). The potential for impacts from herbicide drift, runoff, or spills would be reduced by Standard Operating Procedures that require buffers from water; the 2010 Oregon FEIS describes that buffers are effective at reducing the movement of herbicide to streams (Berg 2004, Dent and Robben 2000, Rashin and Graber 1993, all cited in USDI BLM 2010a: 205). The BLM would primarily use spot treatments for herbicide applications because the applicator can target specific plants and minimize herbicide contact with the soil or water. BLM would use drift reduction agents when necessary. BLM would apply herbicides primarily during the dry season (May through September with applications outside this period only if the District does not expect rainfall) allowing time for microbial, chemical, and photo degradation prior to rainfall.

During preparation of the Annual Treatment Plan, the BLM would identify domestic water sources, areas with shallow groundwater, and areas of groundwater-surface water interaction and suggest appropriate treatment methods to minimize the risk of herbicide leaching. There are many

exempt uses for groundwater that do not require a water right (OWRD 2013) so it is possible that unknown wells exist on BLM-administered land. BLM notification of adjoining landowners prior to herbicide application gives the public an opportunity to disclose the location of water systems so the BLM can implement water quality protection measures. In conjunction with the interdisciplinary team review of the Annual Treatment Plan, District hydrologists would consult these records to make sure that water right holders are aware of proposed herbicide treatments in their area, and to eliminate or minimize the risk of water contamination. BLM would buffer wells or springs, when proximate to treatment areas, from herbicide treatments.

While treatment activities vary between alternative, the effects to water quality, including ground and surface water used for domestic and municipal supply is all the same. The application of all herbicide treatments would be per label guidance which includes buffers, timing, and conditional application.

If herbicides do reach domestic-use water sources despite Protection Measures, Risk Assessments for human consumption of contaminated water show no risk at typical rates of application for all herbicides and low risk for clopyralid, dicamba, triclopyr, and glyphosate applied at the maximum rate (see , for additional detail). Mitigation Measures limit triclopyr application to the typical rate where feasible, and BLM would apply clopyralid at typical to less than maximum application rates, thereby reducing the already low risk associated with these herbicides. The type of actions and the amount of treatments under all alternatives are wholly within the actions analyzed in the 2010 Oregon FEIS and 2016 PEIS.

INAD #19 (Water Quality) How would treating aquatic invasive plants with herbicides affect water quality?

BLM did not analyze this issue in detail because there is not potential for significance beyond what BLM analyzed in the 2010 Oregon FEIS and the 2016 PEIS to which this analysis tiers (USDI BLM 2010a: 204-208, USDI BLM 2016a: 4-14 to 4-21) and there are no new circumstances or information at the site-specific level that would change the effects anticipated for this EA.

The routes for herbicides to contaminate water include accidental spills, drift into streams from spraying, runoff (e.g., from a rainstorm soon after application), and leaching through soil into groundwater (USDI BLM 2016a: 4-16). The depth to groundwater, soil conditions, and rainfall influences the potential for groundwater contamination. The proportion of herbicide that is on or in the plant, soil, and water after application influences whether an herbicide will runoff or drift; application method, weather conditions (application timing), herbicide formulation and application rate, and amount and type of vegetation and groundcover influence this proportion (Kerle et al. 2007).

The potential for impacts from herbicide drift, runoff, or spills would be reduced by Standard Operating Procedures that require buffers from water; the 2010 Oregon FEIS describes that buffers are effective at reducing the movement of herbicide to streams (Berg 2004, Dent and Robben 2000, Rashin and Graber 1993, all cited in USDI BLM 2010a: 205). The BLM would primarily use spot treatments for herbicide applications because the applicator can target specific plants and minimize herbicide contact with the soil or water. BLM would use drift reduction agents when necessary. BLM would apply herbicides primarily during the dry season (May through September with

applications outside this period only if the District does not expect rainfall) allowing time for microbial, chemical, and photo degradation prior to rainfall.

During preparation of the Annual Treatment Plan, the BLM would identify domestic water sources, areas with shallow groundwater, and areas of groundwater-surface water interaction and suggest appropriate treatment methods to minimize the risk of herbicide leaching. There are many exempt uses for groundwater that do not require a water right (OWRD 2013) so it is possible that unknown wells exist on BLM-administered land. BLM notification of adjoining landowners prior to herbicide application gives the public an opportunity to disclose the location of water systems so the BLM can implement water quality protection measures. In conjunction with the interdisciplinary team review of the Annual Treatment Plan, District hydrologists would consult these records to make sure that water right holders are aware of proposed herbicide treatments in their area, and to eliminate or minimize the risk of water contamination. BLM would buffer wells or springs, when proximate to treatment areas, from herbicide treatments.

While treatment activities vary between alternative, the effects to water quality, including ground and surface water used for domestic and municipal supply is all the same. The application of all herbicide treatments would be per label guidance which includes buffers, timing, and conditional application. The BLM's contribution to downstream effects is minimized with Standard Operating Procedure implementation such as required buffer widths and limits on application methods. Use of additional project-specific mitigation measures would limit the extent and duration of direct and indirect impacts and, therefore, the addition of cumulative effects (USDI BLM 2010a: 208). Additionally, "[t]he BLM's SOPs to protect water resources would continue to be implemented. These include procedures designed to prevent accidental spills of herbicides into aquatic habitats" (USDI BLM 2016a: 2-21).

If herbicides do reach domestic-use water sources despite Protection Measures, Risk Assessments for human consumption of contaminated water show no risk at typical rates of application for all herbicides and low risk for clopyralid, dicamba, triclopyr, and glyphosate applied at the maximum rate (see **INAID #10 (Human Health)** *What are the effects to human health from incidentally coming into contact with herbicides used on BLM- administered lands?* for additional detail). Mitigation Measures limit triclopyr application to the typical rate where feasible, and BLM would apply clopyralid at typical to less than maximum application rates, thereby reducing the already low risk associated with these herbicides. The type of actions and the number of treatments under all alternatives are wholly within the actions analyzed in the 2010 Oregon FEIS and 2016 PEIS.

INAID #20 (Water Quality) How does erosion and runoff from upland manual and biological vegetation treatments affect water quality?

BLM did not analyze this issue in detail because there is no potential for significance due to the low impact from manual treatments, limited use of biological (grazing) treatments and the PDFs applied to both in this project. This is because:

- Effects from manual and biological upland treatments would occur at an adequate distance from streams, springs, and wetlands.

- These upland treatments would have a well-vegetated buffer between the treatment and the water resource which would act as a natural filter.
- And finally, the District did not analyze this issue in detail, because the amount of soil disturbance from these upland treatments is both spatially and temporally insignificant. Soil disturbance would only occur where workers physically remove unwanted vegetation from the ground; these areas are typically not prone to erosional processes because of their limited disturbance. Regardless, the area where BLM physically removes vegetation usually stabilizes within one growing season.

The mechanism for water quality impairment stems from soil disturbance generating loose sediment which could mobilize to the stream network under the right conditions (e.g., slope, precipitation, etc.) The concern for increased risk is related to overall water quality and habitat provisions for aquatic life. While streams and lakes can be naturally turbid (less clear) depending on a variety of conditions such as season, flow velocity, land management, and underlying geology, if a body of water exceeds thresholds established by ODEQ or ODFW, it could pose a risk to the health and human safety of humans or animals respectively. Sediments can harm spawning habitat, make foraging more difficult for aquatic organisms, and harm breathing organs of aquatic animals (USDI BLM 2007a: 4-244).

Manual removal of weeds results in disturbed soil which could mobilize under the right conditions and eventually enter the stream network resulting in an increase of stream turbidity. Similarly, targeted grazing, could result in soil disturbance from excessive trampling that under the right conditions could result in mobilized soil which in turn could enter the stream network. If mobilized soil were to enter the stream network, stream turbidity would immediately elevate an amount if the stream were perennial; in intermittent streams, turbidity would not increase until the fall or winter when water returns to that part of the stream network.

“An increase in soil erosion and surface water runoff could result from vegetation reduction, which could lead to streambank erosion and sedimentation in wetlands and riparian areas (Ott 2000). The amount and likelihood of streambank erosion and sedimentation would be directly proportional to the size of the treatment area (i.e., larger treatment areas would lead to increased risk of streambank erosion and sedimentation). Additionally, sedimentation could result in a reduction in the acres of wetland and riparian habitat” (USDI BLM 2007a: 4-38). “Rates of runoff would be influenced by precipitation rates, soil types, and proximity to the treated area. All vegetation removal activities could disturb the soil and reduce the amount of vegetation binding to soil, potentially causing erosion and increased sedimentation. The removal of vegetation would decrease the amount of rainfall captured by plants, detritus, and soil, potentially leading to increased stormwater flows, runoff velocity, and sedimentation” (USDI BLM 2007a: 4-243).

“Domestic animals would likely affect non-target vegetation by browsing and trampling/kicking up plants. The extent of effects to non-target vegetation would depend on the animal species used, the plant species’ tolerance to grazing, management of the grazing system (i.e., timing, area, intensity, frequency, and duration), and the site’s pre-treatment condition and disturbance history. Different types of livestock have different food preferences. Sheep and goats typically prefer broadleaved forbs, although sheep generally consume more grass than goats (Walker et al. 1994).

Cattle prefer grasses (Olson 1999). These diet preferences could result in alterations to plant species composition after prolonged periods of grazing” (USDI BLM 2007d: 4-49).

“Section 303(d) of the Clean Water Act requires that water bodies violating state water quality standards and failing to protect beneficial uses be identified and placed on a 303(d) list. The delisting of 303(d) listed streams is a priority of the BLM. Nonpoint source pollution, which is the largest source of water quality problems on public lands, comes from diffuse or scattered sources rather than from an outlet, such as a pipe, that constitutes a point source. Sediment is a nonpoint source of pollution that results from activities such as grazing and timber harvest, and from erosion associated with wildfires and the spread of noxious weeds. Erosion and delivery of eroded soil to streams is the primary nonpoint source pollution problem of concern to the BLM” (USDI BLM 2007a: 4-207).

ODEQ has identified impaired streams across Oregon based on excessive sedimentation; these streams are listed under section 303(d) of the Clean Water Act. It is possible that proposed treatments described in this EA would occur in upland areas adjacent to listed streams or immediately upstream of listed stream segments.

Treatment of vegetation would cause a short-term increase in soil erosion and surface water runoff. Successful control of invasive plants, however, would lead to improved conditions in watersheds over the long term, with the greatest improvement likely to occur in degraded watersheds. The eventual growth of desirable vegetation in treated areas would moderate water temperatures, buffer the input of sediment and herbicides from runoff, and promote streambank stability (USDI BLM 2007a: 4-247).

Nearly all manual treatments would involve pulling or cutting vegetation with non-motorized hand equipment or chainsaws. Manual treatments would have less direct effect on soil than the other proposed treatments. Laborers and vehicles accessing the site could disturb topsoil and/or surface organic matter, providing prime conditions for re-invasion by weedy species; however, the extent of this disturbance should be limited. Leaving vegetation residues on the soil surface, or mulching and spreading them after a manual treatment, would help protect the soil surface. Pulling weeds out of the ground slowly and carefully, and replacing soil in disturbed areas where possible, would further minimize effects to soil at manual treatment sites (USDI BLM 2007d: 4-17).

“The use of grazing animals has a greater likelihood of affecting non-target vegetation than insects and pathogens. Although grazing animals such as goats, sheep, and cattle are often looked upon negatively in terms of effects on vegetation, they can beneficially alter the appearance, productivity, and composition of plant communities if used in moderation and at appropriate stocking densities (Payne and Bryant 1998). Goats are effective in controlling shrubs such as oaks, mesquite, chamise, and sumac on desert shrublands and chaparral (USDI BLM 1991a). Goats are also effective in controlling vegetation in sensitive areas where use of fire or herbicides is undesirable, such as near residential areas or near streams and wetlands” (USDI BLM 2007d: 4-56).

The IPMAHR EA project area is within the analysis area of the 2007 PEIS, to which this EA is tiered, and the area identified for the 2007 PER, to which this EA incorporates by reference.

There are thousands of miles of streams on the District. There are many fewer miles of sediment-impaired streams on BLM-managed lands on the District. In fact, only Big Elk Creek (Marys Peak Field Office), Molalla River (Cascades Field Office), and Table Rock Fork (Cascades Field Office) are listed by DEQ as being sediment impaired. There are other streams on the Northwest Oregon District which are listed by DEQ for sedimentation impairment, but that do not flow through BLM-managed lands and shall not be discussed further in this analysis for lack of connection to any of the alternatives proposed in this EA.

Manual vegetation removal in the context of this Issue consists of physical removal (uprooting) of the invasive vegetation. Uprooting and removing vegetation provides a theoretical pathway for disturbed soil to erode and runoff into a stream network; however, manual vegetation treatment generally does not denude the landscape and native vegetation would remain. Remaining vegetation would combine to adequately filter and dissipate any mobilized sediment before it reaches the stream network.

Targeted grazing on the Northwest Oregon District may utilize goats to reduce growth of invasive plants. Specifically, up to 100 goats on 10 acres annually across the District would be utilized for targeted grazing. Grazing would occur in the spring and summer, outside of the stream network and its riparian area. Water for the goats would be brought in from offsite to keep the goats out of the stream network. Additionally, the grazing area would be fenced to prevent grazing on desirable vegetation. There is a theoretical amount of soil disturbance that comes from livestock trampling, but this amount is expected to be minimum due to the relatively dry soil conditions in the spring and summer and the relatively low weight of the goats.

“Standard Operating Procedures used to reduce adverse effects to water resources from non-herbicide vegetation treatments include...maintaining vegetated buffers between treatment areas and water bodies; and maintaining a vegetated buffer and minimizing the removal of vegetation near drinking water sources. Additionally, the BLM would not wash equipment or vehicles in water bodies, and would minimize use of domestic animals near drinking water sources and adjacent to water bodies if trampling is likely to cause soil erosion” (USDI BLM 2007d: 4-21).

The IPMAHR would require: Targeted grazing would occur a minimum of 10m from perennial streams and 10m from intermittent streams if water is present.

Any soil disturbed either from manual vegetation removal or targeted grazing could, under the right conditions (steep slopes, high precipitation) mobilize to the nearest downhill stream. Under these conditions, however, remaining vegetation on the landscape would adequately filter the mobilized sediment. Furthermore, the manual removal and targeted grazing would occur at a distance from the stream network that has been shown to adequately filter and buffer the effects of sedimentation. Finally, while sedimentation is a concern in all water bodies, there are only three streams listed for sedimentation impairment on the district and treatments in the upland adjacent to the stream segments would not be dissimilar to those described above (i.e., well-vegetated buffers exist to filter sedimentation).

INAID #21 (Wildlife) How would herbicide treatments affect terrestrial wildlife species?

BLM did not analyze this issue in detail because there is no potential for significant effects to wildlife from herbicides beyond those described in the NEPA analyses to which this EA tiers: the 2007 and 2016 Programmatic EISs (PEIS) completed at the national level (USDI BLM 2007a: 4-96 to 4-124; USDI BLM 2016a: 4-51 to 4-63) and the 2010 Oregon FEIS (USDI BLM 2010a: 241-258).

The 2007 PEIS (USDI BLM 2007a) assessed impacts from 11 herbicides evaluated by the BLM (USDI BLM 2007a: 4-102 to 4-105), of which six⁵⁶ are in this EA as herbicides that the Northwest Oregon District could use. Additionally, the 2007 PEIS used Forest Service evaluations for eight⁵⁷ additional herbicides (USDI BLM 2007a: 4-105 to 4-109), which the District is also including in this EA.

Wildlife species considered in this analysis are wildlife species on the OR/WA BLM State Director Special Status Species List (USDA and USDI 2021a). These include species listed under the Threatened and Endangered Act (ESA) as well as Bureau Sensitive Species. BLM also considered other terrestrial wildlife species in groups with various exposure categories that it analyzed in detail in the 2007 PEIS (USDI BLM 2007a: 4-102 to 4-100), the 2010 PEIS (USDI BLM 2010a: 246-250), and the 2016 PEIS (USDI BLM 2016a: 4-54 to 4-57), to which this EA tiers. In the 2007 PEIS, the BLM impacts assessment addressed the effects of the following herbicide exposure scenarios on terrestrial wildlife (USDI BLM 2007a: 4-102 to 4-100):

Direct spray of terrestrial wildlife:

- Small mammals at 100% absorption
- Pollinating insects at 100% absorption
- Small mammals at 1st order dermal absorption where absorption occurs over 24 hours, taking into account the potential for some non-absorption of herbicide

Indirect contact with foliage after direct spray:

- Small mammal – 100% absorption
- Pollinating insect – 100% absorption
- Small mammal – 1st order dermal absorption

Ingestion of food items contaminated by direct spray:

- Small mammalian herbivore – acute⁵⁸ and chronic⁵⁹ exposure
- Large mammalian herbivore – acute and chronic exposure
- Small avian insectivore – acute and chronic exposure
- Large avian herbivore – acute and chronic exposure

⁵⁶Chlorsulfuron, Dicamba, Diflufenzopyr, Fluridone, Imazapic, Overdrive (Diflufenzopyr + dicamba), and Sulfometuron methyl

⁵⁷ 2,4-D, Clopyralid, Glyphosate, Hexazinone, Imazapyr, Metsulfuron methyl, Picloram, and Triclopyr.

⁵⁸ Acute exposure is a short term contact with a chemical. It may last a few seconds or a few hours.

⁵⁹ Chronic exposure extends over the average lifetime or for a significant fraction of the lifetime of the individual. Chronic exposure studies are used to evaluate the carcinogenic potential of chemicals and other long-term health effects (USDI BLM 2007a:7-3).

- Large mammalian carnivore – acute and chronic exposure

BLM considered these exposure scenarios the most plausible routes for acute (short-term) and chronic (long-term) impacts under a variety of conditions. “The selected receptors represent the range of wildlife species found on public lands, as well as the different feeding guilds that are present (herbivore, omnivore, and carnivore)” (USDI BLM 2016a: 4-54). Species that are year-long residents and have a small range (i.e., insects, small mammals, and territorial, non-migrating birds) would be more at risk for adverse effects than more mobile species. Also, there could be impacts to species feeding on animals exposed to high levels of herbicide, particularly if the herbicide bioaccumulates in their systems. Wildlife that inhabits subsurface areas (e.g., insects and burrowing mammals or birds) may also be at higher risk if soils are non-porous and herbicides have high soil-residence times. (USDI BLM 2016a: 4-54). In general, the impacts of herbicide on wildlife would primarily be site- and application-specific (USDI BLM 2016a: 4-54).

Depending on the type of herbicide treatment, pollinators could either benefit from or be adversely affected by herbicide treatments. BLM expects pollinators to benefit from treatments that remove non-native species that inhibit the growth of native plant species used by pollinators or limit native forb diversity. On the other hand, pollinators that utilize invasive plant species as food and nectar sources could be adversely affected by treatments that target these species, especially if alternative plants are not available nearby (USDI BLM 2016a: 4-54 to 4-55).

For the analysis in the 2007 PEIS, the BLM evaluated toxicological data for surrogate wildlife receptors obtained from literature reviews and used these to establish quantitative benchmarks. The BLM further subdivided the data into acute adverse effect levels, chronic adverse effect levels, and no observed adverse effect levels. The results are in Table 4-22 of the 2007 PEIS (USDI BLM 2007a: 4-103). Of the seven herbicides that BLM considered in the 2007 PEIS, none have a high risk for the wildlife groups above. Dicamba has a moderate risk at maximum application rate to small avian insectivores (acute). Overdrive has a moderate risk at maximum application rate to large mammalian herbivores (chronic). The other five herbicides that BLM evaluated in the PEIS had either No risk or Low risk to the wildlife groups evaluated (USDI BLM 2007a: 4-103).

The Forest Service (FS) evaluated the eight herbicides in footnote 2 using a larger group of categories based on Acute/Accidental Exposures and Chronic Exposures. These results are in the 2007 PEIS, Table 4-23 (USDI BLM 2007a: 4-107). Of the evaluated herbicides, 2,4-D was the only herbicide that presented a high risk to several of the above groups (USDI BLM 2007a: 4-107, Table 4-23). At typical application levels, 2,4-D presented a high risk to small bird insectivores and predatory birds consuming contaminated fish groups. At maximum application levels 2,4-D presented a high risk to these groups as well as to large birds consuming contaminated grass and small mammals consuming contaminated insects. The herbicides with the lowest risk to wildlife as evaluated by the FS were Clopyralid, Imazapyr, and Metsulfuron methyl, which generally presented No risk or Low risk to the wildlife groups evaluated.

In the 2010 PEIS for Oregon, the BLM re-evaluated most of the previous herbicides and split the groups above by Special Status species and Non-Special Status species in Table 3-14 (USDI BLM 2010a: 96-97). Again, none of the herbicides analyzed in this PEIS present a high risk to the wildlife groups evaluated.

Also, in the 2010 PEIS, the BLM used the Forest Service evaluation of nine herbicides, including two new herbicides: Dicamba and Hexazinone. Dicamba presents a moderate risk at maximum application to small mammals who receive a direct spray, large mammals consuming contaminated grasses, large birds consuming contaminated grasses, small mammals consuming contaminated insects, and small birds consuming contaminated insects. At typical application rates, the risk is none or low. Hexazinone presents no risk or low risk to the animal groups evaluated. At chronic exposures, maximum application of Hexazinone presents a moderate risk to large mammals consuming contaminated vegetation onsite. Triclopyr presents a moderate risk to 9 of the BLM evaluated wildlife groups (USDI BLM 2010a: 98-99, Table 3-15). Out of the nine herbicides in the 2010 PEIS evaluated by the Forest Service, Clopyralid, Imazapyr, and Metsulfuron methyl presented either No risk or Low risk to the wildlife groups evaluated.

The 2016 PEIS used the same wildlife groups as the 2007 PEIS (USDI BLM 2016a: 4-53 to 4-54) to evaluate the impacts of three additional herbicides: Aminopyralid, Fluroxypyr, and Rimsulfuron. This EA includes all three as herbicides that the Northwest District could use. The 2016 PEIS concluded that “based on risk assessments, aminopyralid, fluroxypyr, and rimsulfuron generally have very low risk to wildlife” (USDI BLM 2016a: 4-55).

Generalized effects of herbicides on terrestrial wildlife as summarized from the 2007, 2010, and 2016 PEIS, to which this document tiers, is in Table H-3.

Table H-3. Summary of generalized effects of herbicides on wildlife

Herbicide	Generalized effects on terrestrial wildlife
2,4-D	Of the foliar-use herbicides considered in this EA, 2,4-D is one of the more toxic for wildlife. 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 in USDI BLM 2010a: 247) for up to a month following treatment (Farm Service Genetics 2008 in USDI BLM 2010a: 247). Mammals are more susceptible to toxic effects from 2,4-D, and the sublethal effects to pregnant mammals were noted at acute rates below LD50. At both the typical and maximum application rates, mammals had low risk from consumption of 2,4-D contaminated prey (e.g., insects, small mammals) or forage items (e.g., contaminated vegetation) (Table G-7 in Appendix G). However, these mammal groups did not specifically include bats; only small and large mammalian herbivores were included. Bats are wide-ranging and forage in multiple locations two miles or more from their roost sites. Birds are less susceptible to 2,4-D than mammals; birds tend to have no risk at typical applications rates and low risk at maximum application rates per the risk assessments (Tables G-4 and G-7 in Appendix G), 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. The salt form is practically nontoxic to amphibians, but the ester form is highly toxic. It can be neurotoxic to amphibians, although not all

Herbicide	Generalized effects on terrestrial wildlife
	amphibians respond the same (e.g., toads were more susceptible than leopard frogs) (USDI BLM 2010a: 247). The risk assessment from the 2010 Herbicides PEIS indicates that 2,4-D poses a low risk to honeybees at both the typical and maximum application rates (USDI BLM 2010a: 795, Attachment 5 in Appendix 12), but little information is available for other terrestrial invertebrates. Application rates recommended for 2,4-D (Appendix A, Table A-4 in this EA) are at or near the typical application rates from the PEIS documents to which this EA tiers. BLM would use these rates about 95% of the time when using 2,4-D. Based on site conditions, about 5% of the time, the application rate of 2,4-D would be up to the maximum application rate analyzed in the PEIS documents to which this EA tiers (Appendix B, Table B-2 in this EA). In all but one wildlife group in the scenarios evaluated (i.e., consumption of contaminated insects by small birds), the effects of application of 2,4-D on wildlife were the same under the typical and maximum application rates. Application of 2,4-D to the group “consumption of contaminated insects, small bird” had no risks when applied at the typical application rate. Use of this herbicide had low risk when applied at the maximum rate (Appendix G, Table G-7 in this EA).
Aminopyralid	The risk assessment for aminopyralid indicates 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) and therefore no risk (Table G-4 in Appendix G). Therefore, exposure of wildlife to this active ingredient by direct spray, contact with sprayed vegetation, or ingestion of plant materials or prey items exposed to this active ingredient is not a concern from a toxicological perspective. Recommended application rates for aminopyralid range from less than typical to maximum application rates (Appendix A, Table A-4 in this EA) from the PEIS documents to which this EA tiers. When used, BLM would apply the recommended application rates of this herbicide approximately 95% of the time. Based on site conditions, about 5% of the time, the application rate of aminopyralid would be up to the maximum application rate analyzed in the PEIS documents to which this EA tiers (Appendix B, Table B-2 in this EA). At all application levels, aminopyralid would pose no risk to wildlife (Appendix G, Table G-4 in this EA).
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

Herbicide	Generalized effects on terrestrial wildlife
	information on the effects of chlorsulfuron on terrestrial invertebrates, amphibians, or reptiles (USDI BLM 2010a: 248). The recommended application rates for chlorsulfuron (Appendix A, Table A-4) are only slightly higher than the typical application rate (Appendix B, Table B-2) analyzed in the PEIS documents to which this EA tiers. Approximately 95% of the time the BLM would use the recommended application rates of this herbicide (Appendix A, Table A-4). Based on site conditions, about 5% of the time, the application rate of chlorsulfuron would be up to the maximum application rate (Appendix B, Table B-2) analyzed in the PEIS documents to which this EA tiers. At all application levels, chlorsulfuron would pose no risk to wildlife (Appendix G, Table G-4 in this EA).
Clopyralid	At both the typical and maximum application rates, small mammals had low risk from consumption of clopyralid-contaminated prey (e.g., insects), and large mammals had a low risk from consumption of clopyralid-contaminated forage items (e.g., contaminated vegetation) (Table G-7 in Appendix G). Large and small birds have low risk from ingestion of contaminated food items at the maximum application of clopyralid, and there is no risk (i.e., hazard quotients are below the level of concern) under the typical rate (Table G-7 in Appendix G). Similar to birds, there is no risk to honeybees from direct spray at typical application rates, and there is low risk at the maximum application rate of clopyralid (Table G-7 in Appendix G). No studies on reptiles, amphibians, or invertebrates were found (SERA 2004b in USDI BLM 2010a: 248). Depending on the target species group, recommended application rates for clopyralid range from below typical application rates to the maximum application rates analyzed in the PEIS documents to which this EA tiers (see Appendix A, Table A-4 and Appendix B, Table B-2 in this EA). Approximately 95% of the time the BLM would use the recommended application rates of this herbicide (Appendix A, Table A-4). Based on site conditions, about 5% of the time, the application rate of chlorsulfuron would be up to the maximum (Appendix B, Table B-2).
Dicamba	At the typical application rate of dicamba, small mammals had low risk from consumption of contaminated prey (e.g., insects), and large mammals had a low risk from consumption of dicamba- contaminated forage items (e.g., contaminated vegetation) (Table G-7 in Appendix G). At the maximum application rate, the risk to small mammals from consumption of dicamba-contaminated prey (e.g., insects) and the risk to large mammals from consumption of contaminated vegetation elevates to moderate risk (Table G-7 in Appendix G). Consumption of contaminated fruit or contaminated water by small mammals (i.e., spill) was no risk at typical application rates but

Herbicide	Generalized effects on terrestrial wildlife
	elevated to a low risk at maximum application levels. Consumption of contaminated small mammals by larger mammals poses no risk according to the risk assessments (Table G-7 in Appendix G). Dicamba has a low risk of adverse effects on bird reproduction 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 in USDI BLM 2010a, p. 247). In addition, the consumption of contaminated prey (e.g., insects) by small birds has low risk at the typical application rates and moderate risk at the maximum application rates (Table G-7 in Appendix G). The Forest Service did not evaluate Dicamba against honeybees and other invertebrates. Amphibians are as tolerant as fish to the acute toxicity of dicamba, and aquatic invertebrates appear more susceptible to dicamba than fish or amphibians. An accidental spill would have a low risk to aquatic invertebrates at typical application rates but a moderate risk at maximum application rates (Appendix G, Table G-7). BLM did not list Dicamba separately in the treatment recommendations (Appendix A, Table A-4). BLM would use it alone 5% of the time which could be at the maximum rate. Therefore, use of dicamba at the maximum rate would have a moderate risk of adverse effects on some wildlife groups evaluated.
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. The mixture is practically nontoxic (e.g., no risk, according to the risk assessment) to birds, but there are 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. The risk assessment indicates there is a chronic low risk at typical application rates and moderate risk at maximum application rates to large mammalian herbivores that ingest food items contaminated by direct spray (Table G-4 in Appendix G). It has low toxicity to honeybees (e.g., no risk at typical and maximum application rates according to the risk assessment, Table G-4 in Appendix G). It is practically nontoxic to aquatic invertebrates (e.g., no risk at typical and maximum application rates according to the risk assessment, Table G-4 in Appendix G), although they are more susceptible to dicamba than fish. Effects to terrestrial mollusks were not evaluated. One study on dicamba indicates it is practically nontoxic to amphibians (ENSR 2005d, in USDI BLM 2010a: 249).

Herbicide	Generalized effects on terrestrial wildlife
	Recommended application rates for treatment with dicamba and diflufenzopyr range from below minimum application rates (0.18 lbs./acre) to the maximum application rate analyzed in the PEIS documents to which this EA tiers (see Appendix A, Table A-4 and Appendix B, Table B-2 in this EA). Approximately 95% of the time the BLM uses this herbicide combination it would use the recommended application rates (Appendix A, Table A-4). Based on site conditions, about 5% of the time, the application rate of chlorsulfuron would be up to the maximum application rate (Appendix B, Table B-2).
Fluazifop-P-butyl	The risk characterization for mammals and birds is based solely on laboratory studies and modeled estimates of exposure (SERA 2014: 115). All acute/accidental exposure scenarios presented no risk to mammals or birds at either application level (Appendix G, Table G-7). However, at the 0.16 acid equivalent (ae) per acre, there is a low risk to both small and large mammals as well as large birds consuming contaminated vegetation. At the 0.376 rate, this increases to a moderate risk for small mammals and large birds; it remains low for large mammals. The higher rate also presents a low risk to bird consuming contaminated fish. An accidental spill would pose a low risk to aquatic invertebrates at both application rates. Otherwise, this herbicide poses no risk to aquatic invertebrates. It also poses no risk to insects, including direct spray on bees with 100% absorption. BLM would only use Fluazifop-P-butyl for research and demonstration. BLM would only treat a total of 15 gross acres with fluazifop-P-butyl under this EA, for the life of the EA.
Fluridone	Fluridone exhibits low toxicity to most terrestrial mammals; small mammals would be more susceptible than large mammals. Acute oral exposure of fluridone is practically nontoxic to birds. Fluridone is one of the aquatic herbicides with the highest risk factors to aquatic species (fish and aquatic invertebrates) at maximum application rates (no risk or not evaluated at typical application rates). However, it has very low risk to other wildlife forms (Table G-4, Appendix G). Stream-dwelling aquatic invertebrates have a low risk, and pond-dwelling invertebrates have a high risk at the maximum application rates (Table G-4 in Appendix G). BLM did not evaluate amphibians and reptiles. However, application timing could avoid the amphibian egg and larval stages at the treatment site (ENSR 2005g in USDI BLM 2010a: 249). Although terrestrial invertebrates' exposure to fluridone is not likely, BLM did not quantify the risks to this group (e.g., terrestrial mollusks) in the risk assessment. About 95% of the time the application rates of fluridone will be minimal under this EA (Appendix A, Table A-4 in this EA). However, based on site

Herbicide	Generalized effects on terrestrial wildlife
	specific conditions, about 5% of the time, the application rate of fluridone would be up to the maximum application rate (Appendix B , Table B-2).
Fluroxypyr	The risk assessment indicates that there is a low risk to invertebrate/insect pollinators under typical and maximum application rates under the 100 percent absorption scenario (direct spray) (Table G-4 in Appendix G). The District categorized all other risk quotients as shown in the risk assessments (Table G-4 in Appendix G). Therefore, exposure of wildlife to this active ingredient by direct spray, contact with sprayed vegetation, or ingestion of plant materials or prey items exposed to this active ingredient is of low concern from a toxicological perspective. The recommended treatment varies from just below the typical application rate to just below the maximum application rate (Appendix A, Table A-4; Appendix B, Table B-2). According to the risk assessment (Appendix G, Table G-4) under all scenarios, application of fluroxypyr is no risk to wildlife (except low risk to pollinating insects with 100% absorption) under either typical or maximum application rates.
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. The BLM no longer uses formulations that include POEA. At both the typical and maximum application rates of glyphosate, small mammals had low risk from consumption of contaminated prey (e.g., insects), and large mammals had a low risk from consumption of glyphosate-contaminated vegetation (Table G-7 in Appendix G). Observed effects in mammals related to reduced feeding efficiency and reduced weight gain. Glyphosate poses a low risk to birds that consume contaminated food items (either insects or small mammals) at the maximum application rate but no risk at the typical application rate (Table G-7 in Appendix G). Glyphosate does not bioaccumulate. Larval amphibians were more susceptible in some studies (Relyea 2005b in USDI BLM 2010a: 248) but less so in others (Thompson et al. 2004 in USDI BLM 2010a: 248). However, glyphosate without POEA has not been tested on a wide range of amphibians. Aquatic invertebrates had a moderate risk from accidental spills under both typical and maximum application rates according to the risk assessment (Table G-7 in Appendix G). However, they showed no risk of chronic exposure under both typical and maximum application rates. The Forest Service did not evaluate honeybees, but the risk assessment indicates that glyphosate poses low risk at both the typical and maximum application rates for herbivorous insects that consume contaminated vegetation (Table G-7 in Appendix G). Most field studies suggest that effects on terrestrial invertebrates would be minimal (SERA 2011a: 206). However, more recent research indicates that glyphosate used in agricultural settings

Herbicide	Generalized effects on terrestrial wildlife
	affects honeybee appetite, foraging behavior, and navigation (Balbuena et al. 2015 and Herbert et al. 2014). A recent study found that chronic exposure (two years) to ultra-low doses of glyphosate (approximately 4ng/kg body weight per day) resulted in kidney and liver damage to laboratory animals (Mesnage et al. 2015: 11). Most of the treatment recommendations for glyphosate are applications that are just above the typical application rate (3 vs 2 lbs./acre) (Appendix A, Table A-4 in this EA). Approximately 95% of the treatments with glyphosate would use the recommended application rate (Appendix A, Table A-4). Based on site-specific conditions, about 5% of the treatments would use the maximum application rate (Appendix B, Table B-2) from the PEIS documents to which this EA tiers.
Hexazinone	Hexazinone inhibits photosynthesis and, at higher levels, inhibits the synthesis of RNA, proteins, and lipids in plants. Hexazinone poses zero to low risk to most mammals for ingestion under both acute and chronic scenarios. It poses moderate risk to large mammals consuming contaminated vegetation treated at the maximum application level. Birds are more tolerant than mammals (SERA 2005c in USDI BLM 2010a: 249). Hexazinone poses a low risk to birds that consume contaminated food items (e.g., insects or contaminated grass) at both the typical and maximum application rates (Table G-7 in Appendix G). Similarly, mammals that consume hexazinone-contaminated food items (e.g., small mammals eating contaminated insects or large mammals eating contaminated vegetation) have low risk at both the typical and maximum application rates with one exception. Chronic exposure for large mammals consuming contaminated forage is a moderate risk at the maximum application level (Table G-7 in Appendix G). Hexazinone poses low risk to honeybees subjected to direct spray at both the typical and maximum application rates. The Forest Service did not evaluate the effects on herbivorous insects from consuming hexazinone contaminated vegetation (Table G-7 in Appendix G). Aquatic invertebrates had no risk from hexazinone based on the risk assessment and a low risk if subjected to an accidental spill (Table G-7 in Appendix G). Studies of the effects of hexazinone on amphibians are not well documented. The recommended application levels are below or at typical application rates (Appendix A, Table A-4; Appendix B, Table B-2). About 95% of the time, BLM would apply this herbicide at the recommended level. Based on site specific conditions, BLM would apply this herbicide at the maximum application rate about 5% of the time.
Imazapic	Imazapic is an ALS inhibitor that rapidly metabolizes and does not bioaccumulate. Mammals are more susceptible during pregnancy, and larger

Herbicide	Generalized effects on terrestrial wildlife
	mammals are more susceptible than small mammals. There is no evidence of adverse short-term exposure risks to birds for imazapic, but there is some evidence of chronic growth reduction. 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 the 2010 PEIS, along with other ALS inhibitors (SERA 2004c in USDI BLM 2010a: 250). 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). The 2007 Herbicide PEIS risk assessment for imazapic found no risk to insect pollinators, which should pertain to honeybees and other special status bees such as Franklin’s bumble bee (Table G- 4 in Appendix G). The Treatment Key recommends application of imazapic at application rates that are generally higher than the typical rates up to the maximum application rate (Appendix A, Table A-4; Appendix B, Table B-2). Since there are no ratings that exceed the level of concern even at maximum application rates, use of this herbicide would have no risk to wildlife.
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 2004d in USDI BLM 2010a: 250). The risk assessment indicates that imazapyr is no risk to mammals, birds, and most invertebrates, although BLM did not evaluate for honeybees, amphibians, and reptiles (Table G-7 in Appendix G). The Treatment Key recommends application of imazapyr at application rates that are generally higher than the typical rates up to the maximum application rate (Appendix A, Table A-4; Appendix B, Table B-2. Since there are no ratings that exceed the level of concern even at maximum application rates, use of this herbicide would have no risk to wildlife.
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, but a few exceeded the level of concern and were determined to be a low risk at maximum application rate (Appendix G, Table G-7). Metsulfuron methyl has very low toxicity to birds for direct spray and consumption and no mortality resulting from acute spray on honeybees. Aquatic invertebrates do not appear to be

Herbicide	Generalized effects on terrestrial wildlife
	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 in USDI BLM 2010a: 250). Metsulfuron methyl has no risk to honeybees, aquatic invertebrates, or birds at either the typical or maximum application rates (Table G-7 in Appendix G). Mammals that consume food items contaminated under the maximum application rate of metsulfuron methyl have low risk from exposure and no risk from consumption of contaminated food items under typical application rates (Table G-7 in Appendix G). Direct spray on small mammals with 100% absorption is a low risk at both typical and maximum application rates. The Treatment Key recommends application levels that range from below typical to the maximum application rate, depending on target plant species (Appendix A, Table A-4 and Appendix B, Table B-2). About 95% of the use of this herbicide would be based on the Treatment Key recommendations (Appendix A, Table A-4). Based on site specific conditions, about 5% of the application could be up to the maximum rate analyzed in the PEIS documents to which this EA tiers (Appendix B, Table B-2).
Picloram	Studies on birds, bees, and snails 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. The risk assessment indicates that chronic exposure for large mammals that consume vegetation contaminated with picloram at the maximum rate would be low risk (Table G-7 in Appendix G). However, chronic exposure due to consumption of contaminated vegetation was a low risk to small mammals at typical application rates and elevated to a moderate risk at maximum application levels (Appendix G, Table G-7). Birds were not at risk for adverse effects under either the typical or maximum application rates with one exception. Large birds that consumed contaminated vegetation were not at risk under the typical application but were at low risk under the maximum application rate. BLM found no information in the literature about picloram's effect on reptiles (SERA 2011b: 63). Additionally, BLM found no conclusive studies on invertebrates. The risk assessment found that there was no risk to aquatic invertebrates (Appendix G, Table G-7). The Forest Service did not evaluate honeybees in the risk assessment. The Treatment Key recommends picloram application rates from just below typical to maximum application rate for woody species. About 95% of the time picloram is used on the District would follow the Treatment Key

Herbicide	Generalized effects on terrestrial wildlife
	recommendations. Based on site specific conditions, about 5% of the time the District would apply picloram at the maximum application rate.
Rimsulfuron	Data from the literature indicate that rimsulfuron has low toxicity to birds (AECOM 2014b), and the risk assessment indicates it has no risk to birds (Table G-4 in Appendix G). Based on a review of available ecotoxicological literature, rimsulfuron is not acutely toxic via dermal or oral routes of exposure to mammals. BLM found no toxicity studies for amphibians in the published literature. Based on the risk assessment, rimsulfuron also has no risk to terrestrial wildlife species, aquatic invertebrates, or pollinating insects (Table G-4 in Appendix G). The Treatment Key recommends application rates from below typical to maximum (Appendix A, Table A-4; Appendix B, Table B-2). Since there was no risk to terrestrial wildlife, aquatic invertebrates, or pollinating insects in the risk assessments (Appendix G, Table G-4), application of this herbicide at either the typical or maximum rates would have no adverse impacts on wildlife.
Sethoxydim	The Forest Service risk assessment indicates that, of the evaluated groups, sethoxydim would have no effect on mammals or birds under either acute/accidental or chronic exposure scenarios using both typical and maximum application rates (Appendix G, Table G-7). Aquatic invertebrates exposed to an accidental spill would have a low risk under both application rates. BLM did not evaluate risk levels for insects. BLM would only use Sethoxydim for research and demonstration. BLM would only treat 15 gross acres, in total, with sethoxydim under this EA, for the life of the EA.
Sulfometuron methyl	Sulfometuron methyl has the lowest risk to all groups of wildlife of the herbicides evaluated (with other ALS inhibitors). All scenarios indicate a no risk rating that exceeded the level of concern for most wildlife taxa, although it would be moderately toxic to amphibians. Amphibians are particularly vulnerable to changes in their environment (chemical and physical) because they have skin with high permeability, making them at risk to dermal contact, and have complex life cycles, making them vulnerable to developmental defects during the many stages of metamorphosis (ENSR 2005f). Sulfometuron methyl can cause malformations in amphibians (SERA 2004f in USDI BLM 2010a: 250), but whether endocrine disruption, cellular toxicity, or other pathways causes the malformations has not been reported. The Treatment Key recommends application rates from below typical to maximum rates analyzed in the PEIS documents to which this EA tiers (Appendix A, Table A-4 and Appendix B, Table B-2). Since all scenarios

Herbicide	Generalized effects on terrestrial wildlife
	evaluated indicate no risk to wildlife, application of this herbicide at either the typical or maximum rates would have no adverse impacts on wildlife.
Triclopyr	Triclopyr is available as triethylamine (TEA) salt and butoxyethyl ester (BEE). Manufacturers have labeled some formulations of the TEA salt of triclopyr 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), has about the same toxicity as triclopyr. Using less-toxic formulas reduces risk (USDI BLM 2010a: 250). At the typical application rate of triclopyr, most mammals had no risk from consumption of contaminated prey (e.g., small mammals ingesting contaminated insects or predatory mammals ingesting contaminated small mammals) but low risk at maximum application rates (Table G-7 in Appendix G). Large mammals had a moderate risk from consumption of triclopyr-contaminated forage items (e.g., contaminated vegetation) at the typical application rate and a high risk at the maximum application rate (Table G-7 in Appendix G). The consumption of contaminated prey (e.g., insects) by small birds has low risk at the typical application rates and moderate risk at the maximum application rates (Table G-7 in Appendix G). Consumption of contaminated prey (e.g., small mammals) is no risk to predatory birds (Table G-7 in Appendix G). Triclopyr has a low risk to aquatic invertebrates from an accidental spill at the typical application rates and a moderate risk at the maximum application rate. The risk assessment does not evaluate for Honeybees, but herbivorous insects were at no risk under typical application rates of triclopyr and at low risk under the maximum application rate (Table G-7 in Appendix G). The Treatment Key recommends application levels at or slightly above the typical application rates for most invasive species (Appendix A, Table A-4; Appendix B, Table B-2). PDFs limit this herbicide to typical application rate where feasible. About 95% of the time, the BLM would follow the recommendations in the Treatment Key (Appendix A, Table A-4). Based on site specific conditions, BLM could apply triclopyr at the maximum rate about 5% of the time (Appendix B, Table B-2).

The Northwest Oregon District manages 714,395 acres in 14 counties. These lands include a wide variety of habitats, including forests, meadows, oak woodlands, oak savannas, wetlands, ponds, streams (and their associated riparian areas), and dunes. While some wildlife would benefit from or tolerate invasive plants (e.g., American black bear consuming Himalayan blackberry fruit or Columbian white-tailed deer using Himalayan blackberry as cover or forage), invasive plants seldom provide the same quality of food and cover as native species (USDI BLM 2010a: 251). The International Union for the Conservation of Nature generally ranks invasive species as one of the top 10 threats to currently threatened species (IUCN 2008, as cited in USDI BLM 2010a: 251).

The 2010 Oregon FEIS notes that native bird diversity corresponds with native plant diversity. Invasive plants (e.g., watermilfoil, purple loosestrife, reed canary grass) can crowd out amphibians and many invasive plants are unpalatable to wildlife species (USDI BLM 2010a: 242, 251-253). The 2010 Oregon FEIS concludes that long-term beneficial effects to native wildlife populations occur with treatment of invasive plants, because adverse habitat changes can result from invasive plants (USDI BLM 2010a: 252).

There are no new circumstances or information at the site-specific level that would change the effects anticipated for this EA that the BLM did not address in the 2007 and 2016 Programmatic EISs and the 2010 Oregon FEIS. The District chose the herbicides analyzed in this EA in part because they were unlikely to have adverse effects to wildlife (**Appendix G** and USDI BLM 2010a: 245) and Mitigation Measures adopted with the Records of Decision for these three PEISs mitigated the potentially significant effects at the National and State level. The District further minimized the risk of adverse effects with Project Design Features (**Appendix E**), which incorporate these Mitigation Measures.

A summary of the specific effects evaluations of herbicides proposed for use under this EA as well as the methodology for analysis is in **Appendix G** of this document. These tables include the effects analysis for two additional experimental herbicides proposed in this EA: Fluazifop-P-butyl and Sethoxydim. The Forest Service evaluated them and the risk categories for wildlife are in Table G-7. These experimental herbicides pose no acute risk to the wildlife groups evaluated. For Fluazifop-P-butyl, there is a low chronic risk to small mammals and large birds consuming contaminated vegetation on site at the 0.16 lbs. of active ingredient equivalent (a.i.) application level and a moderate risk to the same groups with an application level of 0.376 a.i. BLM did not evaluate this herbicide for chronic exposure to small and large mammals, or large birds, consuming contaminated vegetation off-site. Sethoxydim posed no risk to the wildlife groups evaluated. The District did not evaluate this herbicide for chronic exposure due to consumption of contaminated vegetation by small and large mammals off-site.

Below is a summary of the impacts of herbicides on terrestrial animal groups.

Birds

The 2010 Oregon Herbicide PEIS determined that birds would avoid the treatment area during treatment because of noise and activity (USDI BLM 2010a: 253-254). As described in the 2010 Oregon Herbicide PEIS, disturbance may disrupt normal behavior to the extent that survival of adults is impaired, or reproduction compromised. Effects would depend on the intensity of disturbance, extent of habitat affected, duration of the activity, and whether the activity occurs during a vulnerable time, such as during restriction to a nest, breeding area, or winter range (USDI BLM 2010a: 253).

Associated with herbicide application, animals that temporarily leave the treatment area have a reduced risk of ingesting the herbicide while grooming or from ingesting herbicides on vegetation or prey (i.e., insects or other animals directly sprayed). Some pre-fledgling birds restricted to the treatment area could be adversely affected by broad-scale treatments using herbicides with

moderate toxicity⁶⁰ (USDI BLM 2010a: 246-250). However, the Northwest Oregon District applies herbicide treatments with hand-directed sprayers and applies herbicides selectively (i.e., treatments are not broad-scale, aerial application) and are not likely to result in a direct spray scenario.

The risk assessments indicate that overall there is no risk (most herbicides) to low risk (i.e., for glyphosate only) to predatory birds (e.g., northern spotted owls [see below], marbled murrelets [see below], bald eagles or golden eagles) due to the ingestion of small mammal prey (owls and eagles) or small fish (murrelets or eagles) that have been contaminated with herbicides (Tables G-4 and G-7 in **Appendix G**). The instance of low risk from contaminated prey ingestion could occur during maximum application rates of glyphosate.

In contrast, for insectivorous birds—like purple martin or Oregon vesper sparrow—the risk assessments indicate that there is a range of no risk (most herbicides), low risk (i.e., 2,4-D, clopyralid, glyphosate, hexazinone, dicamba, and triclopyr), to moderate risk (i.e., for dicamba and triclopyr) due to the ingestion of insect prey contaminated with herbicides (Table G-4 and G-7 in **Appendix G**). There is low risk to insectivorous birds at typical application rates of hexazinone, dicamba, and triclopyr. At the maximum application rates, 2,4-D, clopyralid, glyphosate, and hexazinone are low risk, but dicamba and triclopyr are moderate risk to insectivorous birds from consumption of contaminated prey (Table G-4 and G-7 in **Appendix G**).

Disruption

Weed treatments cause low to moderate levels of above-ambient noise that could disturb nesting birds or their young. Weed treatments may involve the use of truck-mounted sprayers, backpack sprayers, mechanical brushing or mowing, sawing, hand pulling, mulching, digging and grubbing, seeding, prescribed fire, and planting, thereby increasing noise and human activity. Normal invasive plant treatments do not require more than a few hours of work within any quarter-mile road segment in a 24-hour period and typically last less than a week in any given area. Some species of birds are ground-nesters (e.g., Oregon vesper sparrow, grasshopper sparrow), and treatments involving equipment like mowers/brush attachments or prescribed fire could physically crush or kill individual birds, their nests, and/or cause birds to flush from the nest, leading to egg/chick abandonment.

Project design features for Wildlife Resources and Special Status Wildlife (in **Appendix E**) that include the use of timing restrictions to minimize impacts to wildlife during nesting and other important periods would help to further reduce the potential for adverse effects to special status birds. Specific timing restrictions will be determined by the project wildlife biologist(s) based on review of the annual treatment plan and the status and location of birds of concern in the vicinity of the treatments.

Mammals

⁶⁰ Triclopyr, 2,4-D, and dicamba applied at the maximum rate have a moderate risk to birds in certain risk assessment scenarios; all other scenarios are low or no risk. See Tables G-4 and G-7 in **Appendix G**.

Consumption of small mammals contaminated by 2,4-D (at both typical and maximum application rates) or contaminated by triclopyr (at maximum application rate) poses a low risk to predatory mammals such as the Pacific marten or gray wolf (Table G-7 in **Appendix G**). The other herbicides either posed no risk to predatory mammals due to ingestion of contaminated prey (Table G-7 in **Appendix G**) or BLM did not evaluate them (Table G -4 in **Appendix G**).

Consumption by small mammals of insects contaminated with 2,4-D, clopyralid, glyphosate, or hexazinone (e.g., bats) would be low risk at both the typical and maximum application rates (Tables G-4 and G-7 in **Appendix G**).

Insects contaminated by metsulfuron methyl or triclopyr and consumed by small mammals would pose no risk to them at the typical applicate rate but would pose low risk at the maximum application rates (Table G-7 in **Appendix G**). In addition, dicamba-contaminated insects consumed by small mammals would pose low risk to them at the typical application rate and moderate risk at the maximum application rate. Therefore, for insectivorous small mammals (e.g., bats), there is no risk to low risk depending on the herbicide used (Tables G-4 and G-7 in **Appendix G**).

Amphibians and Reptiles

The updated risk assessment indicates that 2,4-D poses a moderate risk to direct spray to amphibians at both the typical and maximum application rates (Tables G-4 and G-7 in **Appendix G**). Glyphosate poses a low risk to amphibians at the typical and maximum application rates.

Sulfometuron methyl and aminopyralid pose no risk to amphibians under typical and maximum application rates, and the remaining herbicides did not have hazard quotients evaluated in the risk assessment for amphibians.

In general, the project design features included for amphibians and reptiles (Section 5.5) would reduce impacts to Bureau sensitive herpetofauna, since the District would conduct surveys prior to treatments, and project design features identified for aquatic organisms would be implemented where aquatic herpetofauna occur.

Invertebrate Pollinators (Bees and Butterflies)

Several pollinators that occur on the Northwest Oregon District are special status wildlife species. The 2010 Oregon FEIS describes that BLM used adult European honeybees (*Apis mellifera*) as a surrogate for invertebrates in the risk assessments.

Herbicide use may inadvertently cause short-term damage to common nectar sources for Fender's blue butterfly (e.g., oxeye daisy), Taylor's checkerspot, and Oregon silverspot butterflies. However, as treatments would reduce the prevalence of invasive plant species, which are a major threat to many listed butterflies (USDI FWS 2010) including Fender's blue butterfly (USDI FWS 2020d: 59), such treatments would have long-term benefits to butterflies.

The project design features included in **Appendix E** that include the use of timing restrictions to minimize impacts to wildlife during nesting and other important periods would help to further reduce the potential for adverse effects to special status invertebrate species and pollinators.

Specific timing restrictions will be determined by the project wildlife biologist(s) based on review of the annual treatment plan and the status and location of special status species pollinators in the vicinity of the treatments.

The risk assessments (Tables G-4 and G-7 in **Appendix G**) indicate that there is low risk to honeybees (and other insects) due to direct spray from either the typical or maximum application rates of fluroxypyr, glyphosate, or hexazinone and at the typical applicate rate of clopyralid (Table G-4 and G-7 in **Appendix G**). There is also a low risk to honeybees (and other herbivorous insects) from the consumption of vegetation contaminated by fluroxypyr and glyphosate (either at typical or maximum application rates) (Tables G-4 and G-7 in **Appendix G**). Triclopyr at the maximum application rate is also low risk to herbivorous insects that ingest contaminated vegetation. There is also the potential risk of disruption or even crushing or burning of individuals during vegetation treatment operations that occur during the flight season in occupied habitat.

The 2016 PEIS expected herbicide treatments to benefit pollinators because they remove non-native plant species that either limit native forb diversity or inhibit the growth of native plant species used by pollinators. The PEIS cites Federal guidance identifying the removal of invasive species as an effective way to increase pollinator abundance and diversity (USDI BLM 2016a: 4-54). 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 BLM 2016a: 4-54 to 4-56).

Other Invertebrates (e.g., Mollusks and Cladocerans)

Pond-dwelling, aquatic invertebrates are at high risk from use of fluridone at the maximum applicate rate (Table F-4 in **Appendix G**). At the typical rate of application, fluridone would have no risk to pond-dwelling invertebrates like the hairy water flea (Table F-4 in **Appendix F**). Effects to terrestrial mollusks were not evaluated.

Summary

In summary, most of the herbicides evaluated for use on the Northwest Oregon District present No Risk or a Low to Moderate risk to the wildlife groups evaluated when applied at the typical application rate. Effects would generally be on a small scale at the treatment site, since herbicides would be applied directly to the targeted plants. Adverse impacts to some individuals in the area may occur in the short-term. Most applications would occur only once a year, although repeated treatments often occur in subsequent years. That would allow ample time for the herbicides to dissipate before the next treatment. Therefore, impacts are likely limited to acute, localized impacts in the wake of treatment. The exception would be the geranium group, which would need multiple herbicide treatments in a year to be effective. The recommendation is to treat 3-5 times a year; generally, only three times with herbicides combined with fire treatments and competitive seeding. If there are multiple applications of herbicide in a year, the treatments would occur at least one month apart, so the herbicide has time to dissipate prior to the next application. Therefore, the likelihood of chronic exposure of wildlife to herbicides under this EA is negligible.

There is no potential for significant effects from the herbicide use addressed in this EA beyond those already disclosed in the 2007 and 2016 programmatic EISs and the 2010 Oregon PEIS. For

these reasons, the BLM considered this issue but did not analyze it in detail. Analysis of this issue is not necessary to evaluate how the alternatives respond to the Purpose and Need and there is no potential for significant effects beyond those described in the 2007 and 2016 PEISs and the 2010 Oregon PEIS.

INAID #22 (Wildlife) How would herbicide treatments affect terrestrial Special Status Species?

BLM did not analyze this issue in detail because there is no potential for significant effects to Special Status Species from proposed treatments beyond those described in the NEPA analyses to which this EA tiers: the 2007 and 2016 Programmatic EISs (both completed at the national level and the 2010 Oregon FEIS).

Effects to special status species would be similar to or the same as effects to non-special status species identified in the previous issue. A complete list of the Special Status Species documented or suspected on the Northwest Oregon District is at the end of this section.

In the 2007 PEIS, the BLM assessment of herbicide impacts addressed the same exposure scenarios as listed in the previous issue, but specifically addressed the impacts to Special Status Species (USDI BLM 2007a: 4-118 to 4-124). Terrestrial herbicides with the greatest likelihood of impacting special status wildlife species via any exposure pathway and proposed for use on the NWOD are 2,4-D, hexazinone, and triclopyr, for which moderate to high risks were predicted to terrestrial wildlife under one or more exposure scenarios (USDI BLM 2007a: 4-107, 4-120, 4-121). Terrestrial herbicides analyzed in the 2007 PEIS and proposed for use on the NWOD with the least likelihood of impacting special status wildlife species include chlorsulfuron, imazapic, and sulfometuron methyl (USDI BLM 2007a: 4-120). See **Appendix G** Tables G-4 and G-7 for impacts to all evaluated wildlife groups.

There are a total of 47 terrestrial Special Status species on the OR/WA State Director Special Status Species List (USDI BLM 2021) documented or suspected to occur on the Northwest Oregon District. Table H-4 shows these special status species along with their habitat and diet. Of these, 29 Special Status wildlife species occur on the Northwest Oregon District, including five federally listed species: northern spotted owl, marbled murrelet, gray wolf, streaked horned lark, and Fender's blue butterfly (Table H-4). Additionally, there are 18 Special Status wildlife species suspected to occur on the District including three federally listed species: Taylor's checkerspot butterfly, Oregon silverspot butterfly, and Pacific marten coastal distinct population segment (Table H-4).

The 2007 Final Biological Assessment addressed the effects of herbicide treatments on the following special status species that are present on the NWOD; the District incorporates this information by reference: Oregon silverspot butterfly (USDI BLM 2007c: 6-11 to 6-13), Fender's blue butterfly (USDI BLM 2007c: 6-12 – 6-13), northern spotted owl, (USDI BLM 2007c: 6-84 to 6-85) and marbled murrelet (USDI BLM 2007c: 6-82 to 6-83). The effects to the Taylor checkerspot butterfly are in the 2015 Biological Assessment for Vegetation Treatments Using Aminopyralid, Fluroxypyr, and Rimsulfuron, which this EA incorporates by reference (USDI BLM 2015d: 6-11 to 6-13).

The following discussion analyzes effects of herbicide treatments to federally listed species in greater depth. A description of impacts to Bureau Sensitive Species in the various wildlife groups is under .

Oregon silverspot butterfly (ESA Threatened)

Known populations of the Oregon silverspot butterfly (*Speyeria zerene hippolyta*) do not occur on lands managed by the BLM. They generally occur along a narrow band on the Pacific Coast. However, there are efforts to reestablish the early blue violet at the Yaquina Head Outstanding Natural Area and reintroduce Oregon silverspot butterfly once the habitat establishes.

Apart from early blue violets, Oregon silverspot caterpillars are also known to feed on a few other violet species, such as yellow stream violets and Aleutian violets. Nectar plants most frequently used by Oregon silverspot butterflies are members of the aster family, including the following native species: Canada goldenrod, dune goldenrod, California aster, pearly everlasting, dune thistle, and yarrow. They are also known to nectar on two common introduced species: tansy ragwort and false dandelion. The flowering seasons of these species overlap, providing an array of nectar choices for adult butterflies throughout the flight season (USDI BLM 2007c: 6-11).

Fender's blue butterfly (ESA Endangered)

The Fender's blue butterfly (*Icaricia icarioides fender*) is endemic to the upland prairies of the Willamette Valley. There are a few known sites of Fender's blue butterfly on lands managed by the BLM on the NWOD.

The primary habitat requirement for the Fender's blue is its host plant, Kincaid's lupine, which is the larval food source. Spurred lupine and sickle keeled lupine may be secondary food plants (USDI BLM 2007c: 6-12). "Adult butterflies lay their eggs on the host plant, which serves as a food source for the caterpillars during May and June. Newly hatched larvae feed for a short time, reaching their second developmental stage in the early summer, at which point they enter an extended diapause (maintaining a state of suspended activity). Diapausing larvae remain in the leaf litter at or near the base of the host plant through the fall and winter and may become active again in March or April of the following year. Some larvae may be able to extend diapause for more than one season depending upon the individual and environmental conditions (Mattoni 1997). Once the larvae break diapause, they feed and grow through three to four additional developmental stages, enter their pupal stage, and then emerge as adult butterflies in April and May. A Fender's blue butterfly may complete its life cycle in 1 year." (USDI BLM 2007c 6-12).

Taylor's Checkerspot Butterfly (ESA Endangered)

The 2015 Biological Assessment for Vegetation Treatments Using Aminopyralid, Fluroxypyr, and Rimsulfuron, which this document incorporates by reference, analyzed the effects of herbicides on Taylor's Checkerspot butterfly (USDI BLM 2015d: 6-11 to 6-13).

Taylor's checkerspot butterfly (*Euphdryas editha taylori*) is a medium-sized butterfly found in open habitats dominated by grassland vegetation. In Oregon, there are two populations known on grassland hills of the Willamette Valley (USDI BLM 2015d: 6-11).

Taylor's checkerspot butterflies produce one brood per year. Adults typically have a flight period of 10-14 days, generally in May. Depending on conditions, the flight period may begin in late April and extend into early July and can last as long as 45 days. Female Taylor's checkerspot butterflies and their larvae utilize plants that contain defensive chemicals. As maturing larvae feed, they accumulate these defensive chemical compounds from the host plant into their bodies, which appears to deter predation. Larval host plants include members of the Broomrape family, such as paintbrushes and owl's clover, as well as member of the Plantain family. The larvae may also utilize additional food plants (USDI BLM 2015d: 6-11).

Indirect Effects to Special Status Butterflies Common to all Treatment Methods (USDI BLM 2007c: 6-12 to 6-13)

The special status butterfly species on the NWOD inhabit open areas, which are typically either formed or maintained by a disturbance. Therefore, fire suppression activities have likely resulted in a reduction of available habitat for these species. The District expects all treatment activities that increase the amount of open habitat on the site would have long-term positive effects on these species, provided that the needed larval food plants and nectar plants are present on the site. Creation of open areas adjacent to known locations of these species would also have the potential to increase the size and range of existing populations in some instances.

The removal of non-native plant species from habitats in which these species occur, or in nearby habitats, the District also expects to have a positive effect. Non-native species can exclude larval food plants and nectar sources, which butterflies are dependent upon for survival and the completion of their life cycle. Non-native species can also change the habitat structurally so that adults are unable to forage adequately.

Vegetation treatments could also have indirect negative effects on butterfly populations by causing mortality to larval host plants or nectar plants. Without an adequate population of these habitat elements, the special status butterfly species would be unable to persist.

Effects to Special Status Butterflies from Herbicide Treatments (USDI BLM, 2007c: 6-13)

Direct Effects

During herbicide treatments in areas where listed butterflies occur, trucks and/or ATVs used to apply herbicides could crush larvae, eggs, and adults. Workers on foot with backpack sprayers, could also trample butterflies in the treatment area, resulting in injury or mortality.

Inadvertent exposure of butterflies to herbicides would be likely if treatments were to occur in areas where these species occur. Reasonable exposure pathways include direct spray (particularly during sedentary phases of the life cycle) and dermal contact with herbicide treated vegetation. According to ERAs, direct spray of butterflies by 2,4-D, glyphosate, hexazinone, or triclopyr at the typical application rate, or clopyralid, imazapyr, or picloram at the maximum application rate, would potentially result in negative health effects. In addition, contact with vegetation treated by glyphosate, hexazinone, or triclopyr at the maximum application rate, or by 2,4-D at the typical application rate, could result in negative health effects to butterflies. Negative health effects could include mortality, reduced reproductive output, behavioral modification, and/or increased susceptibility to environmental stresses. These toxicological effects could lead to a further decrease

in the size and viability of affected populations. Small, fragmented populations could lead to potentially extirpation or become more susceptible to future extirpation because of environmental stresses and other factors. Table 6-1 provides additional information on the application rates for the predicted risks to terrestrial invertebrates, as well as the relative level of risk for each herbicide.

Based on the information in risk assessments, there are no toxicological risks to listed butterflies associated with the use of aminopyralid and rimsulfuron (USDI BLM 2015d: 6-13).

Indirect Effects

Listed butterfly species could suffer indirect effects from herbicide treatments if treatments unintentionally sprayed herbicides on non-target host and nectar plants. The District predicts indirect effects to non-target plant species from direct spray by all herbicides approved for use by the BLM. In addition, impacts may occur to non-target plants by off-site drift and surface runoff of several herbicides approved for use by the BLM. Localized elimination or a reduction in numbers of host and/or nectar plants could result in negative population-level effects to the listed butterfly or moth species that rely on these plants (USDI BLM 2007c: 6-13). The District has included PDFs to minimize the impacts of herbicide treatments on listed butterflies.

Conservation Measures

There is a low risk to terrestrial invertebrates from direct spray of fluroxypyr. Implement the following conservation measure:

- When conducting herbicide treatments in or near habitat used by listed butterflies, avoid use of fluroxypyr, where feasible. If pre-treatment surveys determine the presence of listed butterflies, do not use fluroxypyr to treat vegetation (USDI BLM 2015d: 6-12).

Streaked Horned Lark

October 3, 2013, the FWS listed the streaked horned lark (*Eremophila alpestris strigata*) as a threatened species (78 FR 61452), under the Endangered Species Act of 1973, as amended (16 U.S. C. 1531 et seq.).

“The streaked horned lark (*Eremophila alpestris strigata*) is a small, ground-dwelling bird that is a subspecies of the wide-ranging horned lark (*E. alpestris*). It is endemic to the Pacific Northwest (British Columbia, Washington, and Oregon) (Altman 2011). The breeding range of the subspecies historically extended from Southern British Columbia, Canada, south through the Puget Lowlands and outer coast of Washington, along the lower Columbia River, through the Willamette Valley, along the Oregon coast, and into the Umpqua and Rogue River Valleys of southwestern Oregon. The subspecies has been extirpated as a breeding species throughout much of its former range, and currently is only found in three regions: the south Puget Sound in Washington, the Washington coast and lower Columbia River islands, and the Willamette Valley of Oregon. The majority of streaked horned larks winter in the Willamette Valley (72 percent) and on the islands in the lower Columbia River (20 percent). The rest winter on the Washington coast or in the south Puget Sound (Pearson et al. 2005b)” (USDI BLM 2015d: 6-47 to 6-48).

In Oregon, they occur on the Northwest Oregon District in the Willamette Valley. They are most abundant in the southern part of the Willamette Valley. Populations are known from municipal airports in the valley (including Eugene, Corvallis, Salem, and McMinnville), Baskett Slough, William L Finley, and Ankeny units of the FWS Willamette Valley National Wildlife Refuge Complex, Oregon Department of Fish and Wildlife's E.E. Wilson Wildlife Area, and on private and municipal lands in the Willamette Valley. Most streaked horned larks winter in the Willamette Valley (USDI FWS 2014: 36-37).

Habitat used by streaked horned larks is generally flat with 16-17 percent bare ground and sparse, low-stature vegetation primarily composed of grasses and forbs. Vegetation height is generally less than 13 inches. A key attribute of habitat used by larks is an open, flat, treeless landscape of 300 acres or more. Some patches with the appropriate characteristics (i.e., bare ground, low stature vegetation) may be smaller in size if the adjacent areas provide the required open landscape; this situation is common in agricultural habitats and on sites next to water (USDI BLM 2015d: 6-48; USDI FWS 2014: 37-38).

Horned larks create nests in shallow depressions in the ground and line them with soft vegetation. They nest in a broad range of habitats including native prairies, coastal dunes, agricultural fields, recently planted Christmas tree farms with extensive bare ground, gravel shoulders of lightly traveled roads, and municipal airports. Wintering streaked horned larks use habitats that are very similar to breeding habitats (USDI BLM 2015d: 6-48; USDI FWS 2014: 38).

Streaked horned larks forage on the ground in low vegetation or on bare ground. Adults feed on a wide variety of grass and weed seeds but feed insects to their young. They appear to select habitats based on the vegetation structure rather than the presence of any specific food plants (Moore 2008 in USDI FWS 2014: 38).

Direct Effects of Herbicide Treatments on Streaked Horned Larks

The presence of workers and vehicles in streaked horned lark habitats during herbicide treatments would temporarily disturb some birds. If treatments were to occur near nesting birds, adverse effects to breeding success could occur. Although most birds would leave the area, some birds (particularly young, flightless birds) could inadvertently receive direct spray of herbicides. Direct spray of plant materials, and insects used as food sources could occur. The 2007 PEIS notes: "Based on risks predicted by the ERAs for terrestrial vertebrate species (see Table 6-2), direct spray of birds by 2,4-D, clopyralid, glyphosate, hexazinone, picloram, or triclopyr at the typical application rate, or by imazapyr or metsulfuron methyl at the maximum application rate, would potentially result in negative effects to listed plovers or terns." (USDI BLM 2007c: 6-62).

It continues "After an herbicide treatment program, plovers and/or terns in or near the treated area could be exposed to herbicides through contact with contaminated foliage. Via this exposure pathway, negative health effects to birds could occur if vegetation was sprayed by 2,4-D at the typical application rate, or by glyphosate, hexazinone, or triclopyr at the maximum application rate. Birds could also be exposed to herbicides by consuming contaminated food items. In the case of the western snowy and piping plovers, food would include various aquatic invertebrates, and in the case of the least tern, food would include fish. According to the ERAs, exposure to herbicides by consumption of fish exposed to 2,4-D or hexazinone at the typical application rate would

potentially result in negative effects to birds (see Table 6-4). Birds that ingested aquatic invertebrates sprayed by 2,4-D, diquat, diuron, glyphosate, hexazinone, or triclopyr at the typical application rate, or by clopyralid or imazapyr at the maximum application rate, could potentially experience negative health effects.” (USDI BLM 2007c: 6-62)

Plovers and terns are similar to streaked horned larks and inhabit the same type of open habitats with sparse vegetation. In fact, in the 2015 PEIS Biological Assessment, the BLM grouped all three bird species together in terms of the effects of herbicide treatments. Therefore, the District concluded that the effects shown in this Biological Assessment for plovers and terns are the same for streaked horned larks.

Indirect Effects of Herbicide Treatments on Streaked Horned Larks

Non-native species have negatively impacted the breeding habitat for streaked horned larks, which currently nest in disturbed areas where cover of vegetation is sparse. Because the streaked horned lark nests in open areas, vegetation removal through herbicide treatments would be unlikely to negatively affect the habitat of this species. Furthermore, treatments that control invasive plant species to maintain or recover the open conditions favored by this species could have a long-term positive effect by increasing the suitability of habitat. (USDI BLM 2007c: 6-62; USDI BLM 2015d: 6-49).

Marbled Murrelets

The North American subspecies of marbled murrelet (*Brachyramphus marmoratus marmoratus*) is a small seabird found on the Pacific Coast. Marbled murrelets nest in within 35 to 50 miles of the Pacific Coast and nest on lands administered by the Tillamook, Marys Peak, and Siuslaw Field Offices of the Northwest Oregon District BLM. The majority of detections on the NWOD occur within about 35 miles of the Pacific Coast.

Marbled murrelets feed primarily on fish and invertebrates in nearshore marine waters. During the summer, major food items include Pacific sand lance, northern anchovy, Pacific herring, and other small schooling fish, while during the winter, krill, amphipods, and herring are major prey items. Marbled murrelets usually forage alone, or in pairs, and are active in search of food both day and night.

Marbled murrelets produce one egg per nest, which the female lays on the limb platform of an old-growth conifer tree. “These forests are generally characterized by large trees (32 inches diameter at breast height or larger), a multi-storied stand, and a moderate to high canopy closure. In certain parts of the range, marbled murrelets are also known to use mature forests with an old-growth component. In order to provide suitable nest platforms, trees must have large branches or deformities (Binford et al. 1975; Carter and Sealy 1987; Hamer and Cummins 1990, 1991; Singer et al. 1991, 1992). Marbled murrelets tend to nest in the oldest trees in the stand. Observations of nests indicate that they tend to be located high above ground, usually with good overhead protection, in locations that allow easy access to the exterior of the forest. In Oregon and Washington, nests are in stands dominated by Douglas-fir” (USDI BLM 2007c: 6-83).

Northern Spotted Owl (ESA Threatened)

The northern spotted owl current federal listing is as threatened under the Endangered Species Act, but on December 15, 2020, the U.S. Fish and Wildlife Service determined that reclassification of the northern spotted owl from a threatened species to an endangered species is warranted but precluded by higher priority actions (85 FR 81144).

The northern spotted owl (*Strix occidentalis caurina*) is one of three subspecies of the spotted owl, a nocturnal bird of forest habitats. Extensive studies of northern spotted owls during the last 30 years have shown the species to be strongly associated with late-successional forests throughout much of its range. “Suitable owl habitat has moderate to high canopy closure (60 to 80 percent); a multi-layered, multi-species canopy dominated by large (> 30 inches diameter at breast height) overstory trees; a high incidence of large trees with various deformities (e.g., large cavities, broken tops, dwarf-mistletoe infections, and other evidence of decadence); numerous large snags; large accumulations of fallen trees and other woody debris on the ground; and sufficient open space below the canopy for owls to fly (Thomas et al. 1990). Usually, the features characteristic of owl habitat are most commonly associated with old-growth forests or mixed stands of old-growth and mature trees, which do not assimilate these attributes until 150 to 200 years of age.” (USDI BLM 2007c: 6-84)

“Monogamous and long-lived, northern spotted owls tend to mate for life. However, specific northern spotted owl pairs usually do not nest every year, nor are nesting pairs successful every year. Nesting behavior begins in February to March, with nesting occurring from March to June. The timing of nesting and fledging varies with latitude and elevation (Forsman et al. 1984). The number of eggs in a clutch ranges from one to four, with two eggs being most common. Fledging occurs from mid-May to late June, with parental care continuing into September. Females are capable of breeding in their second year, but it is likely that most do not breed until their third year (Barrows 1985; Miller and Meslow 1985b; Franklin et al. 1986). Males do most of the foraging during incubation and assist with foraging during the fledging period.” (USDI BLM 2007c: 6-84)

Effects of Herbicide Treatments on Marbled Murrelets and Northern Spotted Owls

The BLM would conduct weed treatments on up to 10,000 gross⁶¹ acres annually on the District. Typical annual treatment would be about 3,000-6,000 gross acres. The District designed treatments for a variety of weedy species, but northern spotted owls do not typically use such species for nesting or roosting functions. Some weedy species may house prey species (e.g., deer mice or woodrats among the blackberry brambles), but habitat for such prey is generally not limited. Even though individual prey items within treatment areas could become contaminated by herbicides, the proposed actions under the alternatives would not appreciably limit forage opportunities for spotted owls nor contaminate the entire prey base on the District because the scale and intensity of weed treatments would be dispersed across the District’s 714,395 acres.

The PDFs included in **Appendix E**, under Threatened and Endangered Wildlife, include a variety of measures to minimize impacts to spotted owl and marbled murrelet nesting habitat. The project design features would protect and retain the structural components of known or suspected nest sites during treatment, would maintain sufficient dead and downed material during treatments to

⁶¹ That is, the District would not treat all acres within this amount. Net acres (e.g., actual sprayed acres) would be no more than 10 percent of the gross treatment acres in any given year.

support northern spotted owl prey species, and would not alter forest structure in old growth stands. In addition, the Field Office wildlife biologist(s) would review the annual treatment plan prior to treatment to evaluate the impacts to northern spotted owl nest sites/activity centers or marbled murrelet occupied sites by the proposed treatment and protect these sites (**Appendix E**, Threatened and Endangered Wildlife). Project design criteria adopted in consultation with U.S. Fish and Wildlife Service and included in this EA's PDFs would further protect the northern spotted owl and its critical habitat.

Direct Effects

Herbicide treatments would involve workers and the use of vehicles (trucks/ATVs) which could potentially disturb murrelets or spotted owls. Disturbance would be temporary, and effects would be greatest during the breeding season, when reduced reproductive success could occur. It is unlikely that treatments would expose murrelets or owls to herbicides, as herbicides would be applied to individual targeted plant species (i.e., spot application) and not sprayed over a large area (i.e., broadcast application).

The risk assessments indicate that overall there is no risk (for most herbicides) to low risk (i.e., for glyphosate only) to predatory birds, like the spotted owl, due to the ingestion of small mammal prey contaminated with herbicides (Table G-4 and G-7 in **Appendix G**). The instance of low risk from contaminated prey ingestion could occur during maximum application rates of glyphosate. The maximum application rate for glyphosate is 8 lbs. per acre. The District could apply up to 7 lbs. of glyphosate per acre. In areas that use the higher application rate, there could be a low risk to spotted owls due to ingestion of contaminated prey.

Marbled murrelets feed exclusively on fish in the Pacific Ocean. While there will be some treatment of weeds near the ocean, it is unlikely that enough herbicide would enter the ocean waters to affect marbled murrelet prey.

Indirect Effects

Herbicide treatments should not have a substantial effect on spotted owl or murrelet habitat. Treatments would not target nesting trees during herbicide applications. Some alteration of the composition of lower canopy layers could occur, but would not affect key habitat components, such as snags and woody debris.

Pacific marten

The Northwest Oregon District Coast Range is within the historic but outside the current verifiable range of the Pacific marten (USDI FWS 2019a: 74, 77). The Central Coastal Oregon population is within the larger boundaries of the Siuslaw Field Office, but do not occur on lands managed by the BLM. This population occurs on shore-pine dominated forest in the coastal dunes ecosystem in the Oregon Dunes Recreation Area, which is managed by the Siuslaw National Forest (USDI FWS 2019a: 78). The FWS listed the coastal distinct population segment (DPS) of Pacific marten (*Martes caurina*) as Threatened under the Endangered Species Act (USDI FWS 2020a: 63806). It is possible, however, that in the future Pacific marten can move onto lands managed by the BLM in the Coast Range.

Coastal martens tend to select older forest stands (e.g., late-successional, old-growth, large-conifer, mature, late-seral, structurally complex forests), or forests that have characteristics such as old and large trees, multiple canopy layers, downed logs and other decay elements, dense understory development, and biologically complex structure and composition (USDI FWS 2020a: 63807).

Marten resting habitat is comprised of large diameter trees with large horizontal limbs, standing snags with cavities, and downed hollow logs. In coastal Oregon, structures providing cavities or chambers are likely seasonally important during the rainy period (i.e., late fall through late spring) (USDI FWS 2019a: 25). The most common den structures used by Pacific martens are large diameter live and dead trees with cavities (USDI FWS 2019a: 26). The District expects that large trees with cavities would be protected as part of the retention under all alternatives, if operationally feasible to do so. The amount and distribution of these types of trees retained would be determined at the project implementation level.

While martens use older forests, they may be found in forests with smaller diameter trees if combined overstory and understory cover remains high (USDI FWS 2019a: 27). Marten also select habitat based on prey availability. Many of the key prey species for Pacific marten such as red-backed vole, flying squirrel, Douglas's squirrel, and chipmunks are most numerous in older forest stands with dense shrub layers (USDI FWS 2019a: 27).

Overall, mammals dominate the diet of Pacific marten, but birds, insects and fruits are seasonally important (Martin 1994, pp. 298–301 in USDI FWS 2019a: 23). In an analysis of 90 scats across three seasons in the central coastal Oregon populations, martens fed largely on mammals (predominantly voles), birds and berries (contained in 80, 53, and 63 percent of scats respectively). A large percentage of winter scats contained berries in fall and winter (100 and 86 percent respectively) and mammals in all three seasons, with voles being the most common (Eriksson et al. 2019, entire in USDI FWS 2019a: 23). The availability of prey species to the coastal marten varies seasonally (Slauson and Zielinski 2017: 1703, 1706 in USDI FWS 2019a: 23).

Many of the key prey species of the coastal marten (such as red-backed vole, flying squirrel, Douglas's squirrel, and chipmunks) reach their highest densities in forest stands with structural features characteristic of older forests with dense shrub layers where the key food resources of those prey species—conifer seed crops and fruiting bodies of ectomycorrhizal fungi—reach their greatest abundances (USDI FWS 2019a: 24, 27). “Complex physical structure on or near the forest floor is typically provided by dense coarse woody debris and is directly related to predation success for martens (Thompson et al. 2012: 212–221). It has been shown for American martens that when this complexity is reduced, predation success declines due in part to the increased vigilance prey exhibit when in the more open habitat (Andruskiw et al. 2008: 2275–2277).” (USDI FWS 2019a: 24)

Marten home ranges vary from 1.2 miles up to 3.9 miles. However, telemetry work in the coastal dune forest of the central coastal Oregon population revealed the smallest reported home ranges of any North American marten, with mean territory sizes of 0.84 km² (0.32 mi²) for 3 females and 3.06 km² (0.4 mi²) for 4 males (Moriarty et al. 2017b: 684; Linnell et al. 2018: 10 in USDI FWS 2019a: 31).

Direct Effects of herbicides on Pacific marten

It is unlikely that Pacific marten would be sprayed directly as they would avoid humans contact. However, they could come in contact with vegetation that has been sprayed. Similar to Canada lynx (USDI BLM 2007c: 6-141), if a direct exposure were to occur, animals that were directly exposed could suffer negative health effects as a result of direct spray by 2,4-D, clopyralid, or hexazinone at the typical application rate, or additionally glyphosate, metsulfuron methyl, or triclopyr at the maximum application rate (see Table G-7). Furthermore, dermal contact with foliage sprayed by 2,4-D, clopyralid, or hexazinone at the typical application rate, or additionally glyphosate, metsulfuron methyl, or triclopyr at the maximum application rate, could potentially result in negative health effects to Pacific marten (see Table G-7).

Based on the results of the ERAs, it is possible that a Pacific marten would suffer negative health effects if it consumed a prey item sprayed by 2,4-D at the typical application rate, or by 2,4-D or triclopyr at the maximum application rate (see Table G-7).

Indirect effects of herbicide treatments on Pacific marten

Herbicide treatments could potentially affect Pacific marten prey via direct spray or ingestion exposure pathways. However, it is unlikely that populations of prey would change substantially, since these species would also be able to flee or hide from treatments (similar to Canada lynx in USDI BLM 2007c: 6-142).

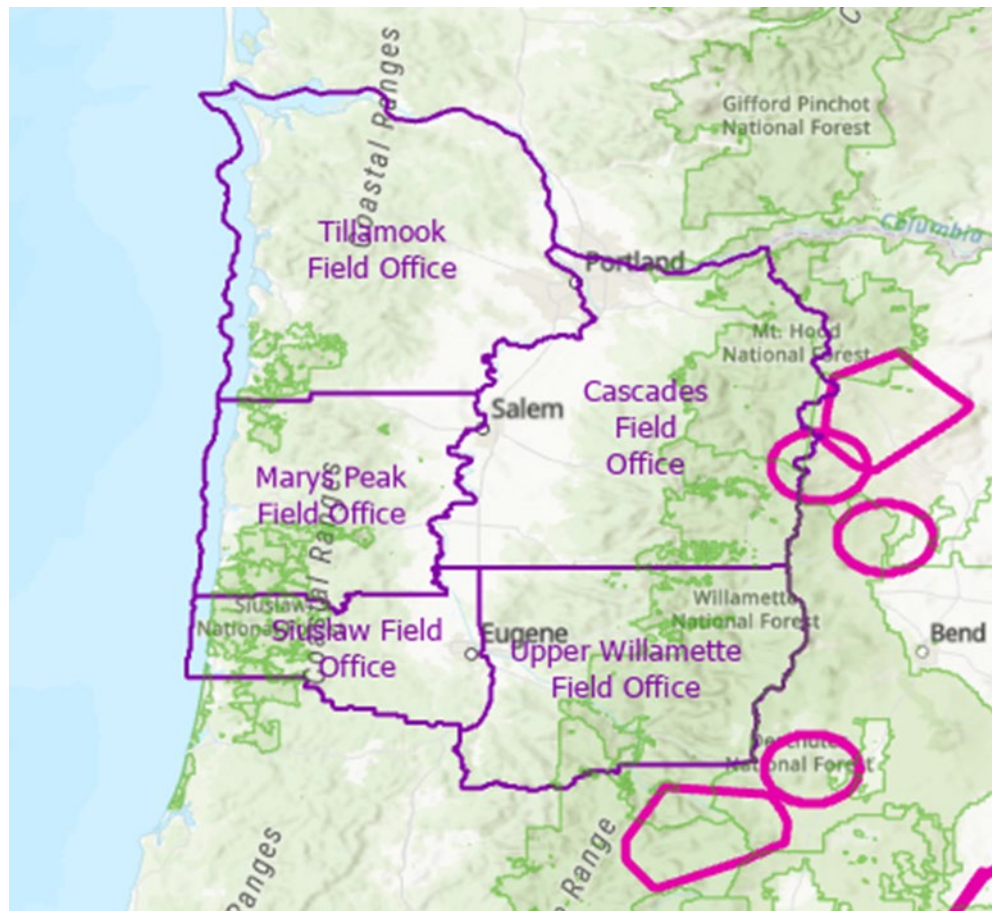
Gray wolf

Gray wolves (*Canis lupus*) are the largest wild members of the dog family. While they historically occurred in Oregon, they were extirpated in the 1940s. In 1999, the first wolf from the reintroduced Idaho population was known to have traveled to Oregon. In 2008, the first recent reproduction by wolves was documented in northeastern Oregon (ODFW 2019: 1). Currently wolves are colonizing in eastern Oregon and have been moving into western Oregon.

The most recent GIS layer showing the confirmed wolf locations near the Northwest Oregon District is in Figure H-1. The areas shown in the magenta polygons are minimum convex polygons created from confirmed resident locations of wolves. Data includes GPS radio-collar data and confirmed wolf locations collected by ODFW and FWS biologists via telemetry, remote camera photographs, and observations of tracks, scat or wolves. Known wolf locations in the vicinity of the Northwest Oregon District are on the Willamette or Mt Hood National Forests.

Currently, gray wolves are not known to occur on lands managed by the BLM within the Northwest Oregon District. If they move on to lands administered by the BLM, the BLM will apply PDFs pertaining to gray wolves as shown in **Appendix E**, Special Status Wildlife, Gray Wolf, in this EA.

Figure H-1. Areas of known wolf activity in 2021 (magenta polygons) from the Oregon Department of Fish and Wildlife (ODFW 2022). Green bordered polygons show National Forests



Effects of Herbicide Treatments on Wolves (from USDI BLM 2007c: 6-160 to 6-163)

Direct Effects

It is unlikely that treatments would expose wolves to herbicides, since animals would avoid treatment sites and herbicide applicators may see them. Nonetheless, negative health effects could occur from the unintentional spraying of one or more wolves by 2,4-D, clopyralid, glyphosate, hexazinone, picloram, or triclopyr at the typical application rate, or by imazapyr or metsulfuron methyl at the maximum application rate (see Tables G-4 and G-7). Following an herbicide treatment, wolves could potentially suffer negative effects from dermal contact with foliage treated with 2,4-D at the typical application rate, or with glyphosate, hexazinone, or triclopyr at the maximum application rate. (USDI BLM 2007c: 6-160 to 6-163)

As a carnivore that feeds on large animals, it is unlikely that the BLM chemical treatments would directly expose the wolves prey items to herbicides. However, the ERAs did indicate the potential for negative health effects to occur if a wolf consumed prey items sprayed by 2,4-D or diuron at the typical application rate, or by triclopyr at the maximum application rate (see Tables G-2 and

G-7). The potential for negative effects to wolves from exposure to hexazinone via ingestion of contaminated prey cannot be determined. (USDI BLM 2007c: 6-160 to 6-163)

The 2015 Biological Assessment (USDI BLM 2015d: 6-114 to 6-115) adds that aminopyralid, Fluroxypyr and Rimsulfuron would not likely adversely affect gray wolves if the conservation measures from the 2007 PEIS are followed. These conservation measures are in this EA's PDFs in **Appendix E** (Threatened and Endangered Wildlife, Special Status Wildlife, Gray Wolf).

Indirect Effects

Herbicide treatments would have few effects on wolf habitat or prey. Over the long term, treatments that reduce the cover of non-native species could benefit habitat by helping to restore native plant communities and possibly increasing the diversity of food sources. (USDI BLM 2007c: 6-160 to 6-163)

Summary of Effects of Herbicides on Special Status Species

Most⁶² of the herbicides evaluated for use on the Northwest Oregon District present No Risk or a Low to Moderate risk to the wildlife groups evaluated when applied at the typical application rate. These groups include the Special Status Species found on the Northwest Oregon District. Effects would generally be on a small scale at the treatment site, since herbicides would be applied directly to the targeted plants. There may be some short term adverse impacts to individuals in the area. Most applications would occur only once a year, although there may be a need for repeat treatments in subsequent years. That would allow ample time for the herbicides to dissipate before the next treatment. Therefore, limiting treatment impacts to acute, localized impacts. The exception would be the geranium group, which would need multiple herbicide treatments in a year to be effective. The recommendation is to treat 3-5 times a year; generally, only three times with herbicides combined with fire treatments and competitive seeding. If the application of herbicide occurs multiple times per year, these treatments would occur at least one month apart, so the herbicide has time to dissipate prior to the next application. Therefore, the likelihood of chronic exposure of wildlife to herbicides under this EA is negligible.

There is no potential for significant effects from the herbicide use addressed in this EA beyond those already disclosed in the 2007 and 2016 PEISs and the 2010 Oregon PEIS. For these reasons, the BLM considered this issue but did not analyze it in detail. Analysis of this issue is not necessary to evaluate how the alternatives respond to the Purpose and Need and there is no potential for significant effects beyond those described in the 2007 and 2016 PEISs and the 2010 Oregon PEIS.

⁶² 2,4-D showed the highest risk to a variety of wildlife groups (see **Appendix G**, Table G-7). Only about 0.02% of the acres proposed would the District treat with 2,4-D.

Table H-4. Wildlife threatened & endangered species and Bureau Sensitive species that are known or suspected to occur on the Northwest Oregon District.

Common Name	Scientific Name	2023 Status ¹	NWOD presence ²	General Habitat and Diet
Amphibians				
Cope's giant salamander	<i>Dicamptodon copei</i>	SEN	Documented	Stream-dwelling amphibian reliant on cool, perennial streams with coarse substrates, often occurring in small streams with high gradients in forested uplands. Larval or paedomorphic adult forms are restricted to aquatic environments. Terrestrial adults are found in riparian areas close to surface waters. Diet: most is immature aquatic insects with additional components including fish eggs, small fish, coastal tailed frog tadpoles, and small larvae and eggs of their own species and of the coastal giant salamander. (Foster and Olson 2014: 3)
Foothill yellow-legged frog	<i>Rana boylei</i>	SEN	Documented	A stream-obligate species primarily observed in or along the edges of streams. Habitat elements that provide both refuge from winter peak flows and adequate moisture include pools, spring, seeps, submerged root wads, undercut banks, and large boulders or debris at high-water lines. The species is non-specific regarding vegetation type and macroclimate of its terrestrial habitat. It is found in a wide variety of vegetation types including valley-foothill hardwood, hardwood-conifer, riparian habitats as well as mixed conifer and wet meadows. Diet: tadpoles feed on algae, diatoms, and detritus scraped from submerged rocks and vegetation. Adults feed on a wide range of arthropods, small fish, small frogs, aquatic and terrestrial invertebrates including snails, moths, flies, beetles, etc. (USDI FWS 2021: 22)
Birds				
Aleutian cackling goose	<i>Branta hutchinsii leucopareia</i>	SEN	Suspected	Wintering Range is in coastal areas, mudflats, shallow tidal waters, and salt-water marshes with extensive beds of bulrush and cord grass near or adjacent to agricultural fields of grain or cover crops. Inland on wet grasslands, freshwater marshes, lakes, reservoirs, and rivers within easy flying distance of agricultural fields. Migration habitat similar plus upland heath, grassy fields, pastures and agricultural fields.

Common Name	Scientific Name	2023 Status ¹	NWOD presence ²	General Habitat and Diet
				Diet: Almost entirely herbivorous. Depend mainly on grasses, sedges or other green monocots in summer. Fall and winter, rely on berries, seeds, or agricultural grains. (Mowbray et al. 2020a)
Bald eagle	<i>Haliaeetus leucocephalus</i>	SEN	Documented	Breeding: Typically breeds in mature forest patches with openings/edges, relatively close (usually < 2 km) to water with suitable foraging opportunities. Diet: Opportunistic forager. Diet varies greatly based on food availability. In most regions, it favors aquatic habitat for foraging with fish taken most frequently. Also, less frequently, aquatic birds, aquatic mammals, reptiles, amphibians, crustaceans, and scavenging carrion. (Buehler 2022)
Black swift	<i>Cypseloides niger</i>	SEN	Suspected	Summer breeding visitor to western North America. It nests in small colonies at sites behind waterfalls, in caves or deep gorges, or sea cliffs and sea caves. Moisture and shade are associated with nest site location. Diet: aerial insectivores. (Stone 2007)
Bufflehead	<i>Bucephala albeola</i>	SEN	Documented	Along the coast, uses shallow waters in secluded coves, harbors, estuaries, or along beaches. Inland, occurs on ponds, lakes, impoundments, or bays along slow-moving rivers. Diet: mainly aquatic invertebrates (insects, crustaceans, mollusks. Some seeds. (Gauthier 2020)
California brown pelican	<i>Pelecanus occidentalis californicus</i>	SEN	Suspected	Primarily warm coastal marine and estuarine environments year-round. Breeds on dry, rocky offshore islands in the north Gulf of California and along the Pacific coast of California. Diet: mainly fish and some marine invertebrates. (Shields 2020)
Dusky Canada goose	<i>Branta canadensis occidentalis</i>	SEN	Documented	Winters in the Willamette Valley. In coastal areas, inhabits mudflats, shallow tidal waters, and salt-water marshes with extensive beds of bulrush and cord grass near or adjacent to agricultural fields of grain or cover crops; inland, on wet grasslands, freshwater marshes, lakes, reservoirs, and rivers within easy flying distance of agricultural fields.

Common Name	Scientific Name	2023 Status ¹	NWOD presence ²	General Habitat and Diet
				Diet: almost exclusively herbivorous. Eat grasses, sedges, other green monocots, berries, seeds, including agricultural grains. (Mowbray et al. 2020b)
Grasshopper sparrow	<i>Ammodramus savannarum</i>	SEN	Documented	Moderately open grasslands and prairies with patchy bare ground. More likely to occupy large tracts of habitat than small fragments. Diet: mostly insects in summer; prefers grasshoppers. In winter, primarily seeds and sedges. (Vickery 2020)
Harlequin duck	<i>Histrionicus histrionicus</i>	SEN	Documented	Breed in coastal estuarine sites and inland mountain stream systems. In the Oregon Cascades, Harlequin ducks were found nesting near first through fifth order streams. Nest sites were found in a variety of forest types and seral stages, ranging in age from 30-300 years old, from floodplain areas with a high disturbance frequency to relatively stable upslope sites with older vegetation. Also found in riparian areas. Nest sites either on the ground or in cavities. Vegetative cover may be important protection. Diet: In winter forage close to shore, often in shallow intertidal zones. Diet generalist. Consume nearly entirely animal diet (crustaceans, limpets, chitons) in the winter. Consume insects during the breeding season. (Rockwell 2018)
Lewis's woodpecker	<i>Melanerpes lewis</i>	SEN	Documented	Breeding: open canopy, brushy understory offering cover, dead or downed woody material, available perches and abundant insects; open riparian woodland; oak woodlands; nut or fruit orchards. Diet: primarily free-living (not wood-boring) insects, acorns or other nuts and fruit. (Vierling et al. 2020)
Marbled murrelet	<i>Brachyramphus marmoratus</i>	FT	Documented	Breeding habitat consists of mature and old-growth coniferous forests, or forests with old-growth components, including, but not limited to, large trees with large limbs or large platforms (4-32 inches wide; average 13 inches) created by damage, disease, mistletoe, or other factors; moss or other nesting substrate (e.g., needles, lichen); and multilayered canopies within 50 miles of the Pacific Ocean. Diet: small schooling fish in the Pacific Ocean (Nelson 2020)

Common Name	Scientific Name	2023 Status ¹	NWOD presence ²	General Habitat and Diet
Northern spotted owl	<i>Strix occidentalis caurina</i>	FT	Documented	Most observed in mature and old growth conifer forests. In general, uses forest with greater complexity and structure than random sites for nesting. Roosts sites have high canopy cover dominated by large-diameter trees and multiple canopy layers. Diet: small and medium-sized mammal, primarily rodents, including northern flying squirrels, woodrats, voles, mice, hares/rabbits, and pocket gophers. (Gutierrez et al. 2020)
Oregon vesper sparrow	<i>Pooecetes gramineus affinis</i>	SEN	Documented	Breeding: Meadows, grasslands with shrub component, prairie Non-breeding: pastures and weeds bordering cultivated fields and roadsides, hedgerows, and barren to overgrown fields. Diet: Invertebrates, insects, spiders, beetles, grasshoppers, and caterpillars during the breeding season; grass seeds, weed seeds, and waste grains in all seasons. (Jones and Cornely 2020)
Purple martin	<i>Progne subis</i>	SEN	Documented	Montane forest and lowland oak and riparian woodland with dead snags containing woodpecker holes. High-intensity fire created nesting snags and open areas for foraging. Timber harvest with snag retention in large openings. Diet: Arboreal insectivore. Flying insects all times of the year. (Brown et al. 2021)
Streaked horned lark	<i>Eremophila alpestris strigata</i>	FT	Documented	Typically inhabits areas of short vegetation or bare ground, including shortgrass prairie, brushy flats, fields of row crop stubble, mowed areas such as airfields. Diet: Mostly seeds but some insects, larvae and worms. (Beason 2020)
Tricolored blackbird	<i>Agelaius tricolor</i>	SEN	Suspected	Mostly in CA; scattered sites in OR. Nesting historically in wetlands, freshwater marshes; recently in agricultural croplands; Himalayan blackberries typically associated with stock ponds, irrigated pasture, and natural creeks. Diet: Forages in a wide variety of habitats that may provide seeds and invertebrates. Opportunistic forager that will consume any locally abundant insect resource, including grasshoppers, caterpillars, grains, snails, beetles, weevils, and small clams. Often exploits storage bins of livestock food. Individuals pick seeds and insect prey from the ground, glean vegetation, and occasionally fly-catch near and above breeding colonies. (Beedy et al. 2020)

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Tufted puffin	<i>Fratercula cirrhata</i>	SEN	Documented	Marine, along rocky coasts and offshore islands. Mostly offshore during the winter. Breeds colonially on steep rocky islands and mainland cliffs. Diet: 50-70% of adult diet is invertebrates and the remainder fish, but adults feed mostly fish to young. Mostly small schooling fishes; adults take more squid, polychaetes, and euphausiids. Nonbreeding season: predominantly squid and euphausiids. (Piatt and Kitaysky 2020)
Upland sandpiper	<i>Bartramia longicauda</i>	SEN	Suspected	An obligate grassland species and “indicator species” for native prairie. Needs perches and low vegetation for visibility during courtship; higher vegetation to hide its nest; and lower vegetation during supervision of young. Generally, uses cultivated fields, mowed hayfields, and pastures for staging/stopovers during migration. Diet: 95-97% small invertebrates; 3-5% weed seeds. Prefer to forage in habitats with shorter vegetation than those used for nesting, brooding, or on wintering grounds. (Houston et al. 2020)
Insects				
A water flea	<i>Dumontia oregonensis</i>	SEN	Suspected	Water fleas are small crustacean members of the zooplankton community that spend their lives suspended in lakes and ponds. No males have been found. <i>D. oregonensis</i> is closely associated with seasonal wetland ecosystems, wet prairies, seasonally wet meadows, temporary creeks, and agricultural fields. Freshwater invertebrates like water fleas respond to seasonal rains, emerging as vernal pool fill. Because of this, <i>D. oregonensis</i> is likely present during the wet season from October through April. <i>D. oregonensis</i> appears to be associated with vegetation cover greater than 60%, which may provide habitat structure and refuge. Associated plants in California include tall flatsedge (<i>Cyperus eragrostis</i>), pale spikerush (<i>Eleocharis macrostachya</i>), and western mannagrass (<i>Glyceria occidentalis</i>). Oregon associations are unknown. Diet: In the lab, this species feeds on green algae (<i>Ankistrodesmus</i> sp.). (Hietala-Henschell and Blevins 2017)

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Coastal greenish blue butterfly	<i>Plebejus saepiolus littoralis</i>	SEN	Suspected	P.s. is primarily found in cool mountain meadows wherever moist seeps and clovers occur together; conifer trees adjacent to meadows serve as shelter and windbreaks. Larvae depend on clovers, particularly springbank clover (<i>Trifolium wormskioldii</i>). In Oregon P. s. littoralis populations associated with dune species, including springbank clover (<i>Trifolium wormskioldii</i>), invasive European beachgrass (<i>Ammophila arenaria</i>) and gorse (<i>Ulex europaeus</i>). Adults of the nominate species nectar on numerous flowering plants including clovers (<i>Trifolium</i> spp.), trefoil (<i>Lotus</i> spp.), bistort, chickweed, yarrow, purple thyme, and various composites. Females lay their eggs singly on the seeds or petals of blooming clover flowers (including <i>Trifolium monanthum</i>, <i>T. longipes</i>, and <i>T. wormskioldii</i>). In Oregon, documented populations on the Pacific Coast between Rock and Big Creeks and on the Oregon Dunes NRA near Florence. Caterpillars of this subspecies are food plant specialists that feed on springbank clover (<i>Trifolium wormskioldii</i>) in coastal grasslands. Larvae overwinter in vegetation or detritus at the base of their host plants. (Fallon 2017)
Fender's blue butterfly	<i>Plebejus icarioides fenderi</i>	FE	Documented	(1) Early seral upland prairie, wet prairie, or oak savanna habitat with a mosaic of low-growing grasses and forbs, an absence of dense canopy vegetation, and undisturbed subsoils; (2) larval host plants <i>Lupinus sulphureus</i> ssp. <i>kincaidii</i>, <i>L. arbustus</i> (longspur lupine), or <i>L. albicaulis</i> (sickle-keeled lupine); (3) adult nectar sources, such as: <i>Allium acuminatum</i> (tapertip onion), <i>Allium amplexans</i> (narrowleaf onion), <i>Calochortus tolmiei</i>, <i>Camassia quamash</i>, <i>Cryptantha intermedia</i> (clearwater cryptantha), <i>Eriophyllum lanatum</i>, <i>Geranium oreganum</i> (Oregon geranium), <i>Iris tenax</i> (Oregon iris), <i>Linum angustifolium</i> (pale flax), <i>Linum perenne</i> (blue flax), <i>Sidalcea campestris</i> (meadow checker-mallow), <i>Sidalcea malviflora</i> ssp. <i>virgata</i>, <i>Vicia cracca</i> (bird vetch), <i>V. sativa</i> (common vetch), and <i>V. hirsute</i> (tiny vetch); and (4) stepping-stone habitat, consisting of undeveloped open areas with the physical characteristics appropriate for supporting the short-stature prairie oak savanna plant community (well drained soils), within 1.2 miles (about 2 kilometers) of natal lupine patches. Recent surveys have determined that Fender's blue butterfly is endemic to the Willamette Valley and persists in about 17 populations on remnant prairies in Yamhill, Polk, Benton, and Lane Counties (see USDI FWS 2010: II-2 to II-4).

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				(USDI FWS 2010)
Haddock's rhyacophilan caddisfly	<i>Rhyacophila haddocki</i>	SEN	Documented	Free-living caddisflies that live in cool, lotic freshwater habitats. Non-feeding adult caddisflies typically perch during the day on riparian vegetation near their larval habitats. Adults collected near cool perennial streams and seeps in forested areas within the Oregon Coast Range. The type locality is near the highest point in the Oregon Coast Range and is in the subalpine zone. Vegetation is predominantly composed of old growth noble fir and western hemlock. Documented from one site on Marys Peak from 1966 and 1983 collections. (Blackburn 2017a)
Johnson's hairstreak	<i>Callophrys johnsoni</i>	SEN	Documented	Depend on coniferous forests that contain dwarf mistletoes of the genus <i>Arceuthobium</i> . Documented host mistletoes occur on western hemlock, Brewer's spruce, true firs, and pines. Occur in a wide range of habitats and forest stages, from moist old growth western hemlock to dry ponderosa pine woodlands. Diet: Larvae consume the mistletoe. Unknown how important nectar is to the adults. (Fallon and Black 2017)
Mardon skipper	<i>Polites mardon</i>	SEN	Suspected	Grassland habitats that vary by region (habitat on the NOD not described). Prairie habitats. Most populations are associated with a wide variety of wet to dry prairie habitats that include a strong native bunchgrass component, ample nectar sources and a seasonal or permanent water source. (Kerwin 2011)
Monarch butterfly	<i>Danaus plexippus</i>	SEN	Documented	Adult monarch butterflies during breeding and migration require a diversity of blooming nectar resources, which they feed on throughout their migration routes and breeding grounds (spring through fall). Monarchs also need milkweed (for both oviposition and larval feeding) embedded within this diverse nectaring habitat. The correct phenology, or timing, of both monarchs and nectar plants and milkweed is important for monarch survival. The position of these resources on the landscape is important as well. In western North America, nectar and milkweed resources are often associated with riparian corridors, and milkweed may function as the principal nectar source for monarchs in more arid regions. Individuals need nectar and milkweed resources year-round in nonmigratory

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				populations. Additionally, many monarchs use a variety of roosting trees along the fall migration route. (USDI FWS 2020c)
Oregon silverspot butterfly	<i>Speyeria zerene hippolyta</i>	FT	Suspected	The Oregon silverspot butterfly occupies an early successional, coastally-influenced grassland habitat that contains the caterpillar host plant, early blue violet (<i>Viola adunca</i>), adult nectar sources, and adult courtship areas. (USDI FWS 2001)
Taylor's checkerspot butterfly	<i>Euphydryas editha taylori</i>	FE	Suspected	Taylor's checkerspot butterfly occupies open grassland habitat found on prairies, shallow-soil, grassland bluffs, and grassland openings within a forested matrix in the Willamette Valley, Oregon. The two known sites in Oregon are on grassland hills in the Willamette Valley within a forested matrix. Food sources: Larval host plants include members of the Broomrape family (Orobanchaceae), such as <i>Castilleja</i> (paintbrushes) and <i>Orthocarpus</i> , which is now known as <i>Triphysaria</i> (owl's clover), and native and nonnative <i>Plantago</i> species, which are members of the Plantain family (Plantaginaceae). Nectar plants such as <i>Camassia quamash</i> (common camas), <i>Achillea millefolium</i> (yarrow), and <i>Lomatium</i> spp. (desert parsley or biscuit root) for adults. (78 FR 61451 61503)
Scott's apatanian caddisfly	<i>Allomyia scotti</i>	SEN	Suspected	Adults are terrestrial and presumably use riparian vegetation and forests surrounding high elevation larval aquatic habitat of cold mountain streams and springs. All known records of <i>A. scotti</i> are from Mt. Hood NF in Oregon's Cascade Range. Extensive surveys in the Cascade foothills on the Northwest Oregon District in 2019 did not find <i>A. scotti</i> on the District. It is unlikely to occur on the District as it is a glacial relict known from high elevations of 3,400 to 5,800 feet around Mt. Hood. (Fallon 2022)
Siskiyou short-horned grasshopper	<i>Chloealtis aspasma</i>	SEN	Suspected	Occurs in forest meadows and balds. It appears to be associated with drier upslope habitats along margins of wetlands and forest edges and may depend on damp rotting conifer logs and shade from standing trees around natural meadows. Females of this species may lay their eggs in the pith of blue elderberry (<i>Sambucus caerulea</i>), other plants with pithy stems, or vegetative substrates such as rotting wood.

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				<i>C. aspasma</i> has been found in an old logged-over clearcut surrounded by mixed conifer forest. The area was littered with slash from an adjacent clearcut. Vegetation in the clearing consisted of grassed, forbs, and elderberry. <i>C. aspasma</i> has been found in sites with the following plants present: elderberry, grasses, herbaceous shrubs, wild strawberry, Oregon white oak (<i>Quercus garryana</i>)/ponderosa pine (<i>Pinus ponderosa</i>), white fir (<i>Abies concolor</i>), alder (<i>Alnus</i>), sedge, mules-ear, species in the borage family (<i>Boraginaceae</i>), snowberry (<i>Symphoricarpos albus</i>), and corn lily (<i>Veratrum californicum</i>). (Hietala-Henschell 2017)
Siuslaw sand tiger beetle	<i>Cicindela hirticollis siuslawensis</i>	SEN	Suspected	Known range limited to river mouths along Pacific Ocean beaches from central Washington to Eureka, CA. Seven of the extant sites occur on BLM-owned land, and are concentrated along the New River and Floras Lake. Six of the sites are on USFS-owned land: Sutton Creek, Siltcoos River, Tahkenitch Creek, Umpqua Spit, and Tenmile Creek. <i>Cicindela h. siuslawensis</i> is associated with sandy river mouths along Pacific Coast beaches. <i>Cicindela h. siuslawensis</i> adults are associated with habitat at river mouths, inland up coastal rivers (up to 1.5 km upstream), in backwater wetlands or sandflats, and at or near the water's edge. This subspecies prefers firm, flat, moist sand close to the freshwater outflows, areas near the high water mark, and on backwater sandflats. Larval burrows were found to be concentrated in transition zones near the high water line at the interface of wet and dry sand and in lightly vegetated backwater sandflats. (Hietala-Henschell and McMullen 2018)
Suckley cuckoo bumble bee	<i>Bombus suckleyi</i>	SEN	Documented	In Oregon, this species was historically observed along the Cascades Mountains, with a few observations in the Coast Range. The two most recent records from the state are from 1994 in Lane County and 2015 in Jackson County. Bumble bees inhabit a wide variety of natural, agricultural, urban, and rural habitats, although species richness tends to peak in flower-rich meadows of forests and subalpine zones. <i>Bombus suckleyi</i> has three basic habitat requirements: suitable occupied nesting sites for its host (e.g., <i>Bombus occidentalis</i>), nectar and pollen from floral resources available throughout the duration of the colony period (spring, summer and fall), and suitable overwintering sites for the queens.

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				<i>Bombus suckleyi</i> is a generalist forager. Generally, this species is associated with plants in the following genera: “Aster”, Chrysothamnus, Cirsium, and Solidago, and Centaurea. Plant genera that are associated with <i>B. occidentalis</i> – its known host, and a prerequisite for the survival of <i>B. suckleyi</i> – in Oregon include: Trifolium, Cirsium, Rubus, Solidago, Epilobium, Spiraea, Tilia, Cicuta, Heracleum, and Plantago. (Hatfield et al. 2017)
Western bumble bee	<i>Bombus occidentalis</i>	SEN	Suspected	Bumble bees inhabit a wide variety of natural, agricultural, urban, and rural habitats, although species richness tends to peak in flower-rich meadows of forests and subalpine zones. While <i>B. occidentalis</i> was historically known throughout Oregon and Washington, it is now largely confined to high elevation sites and areas east of the Cascade crest. Reports of <i>B. occidentalis</i> nests are primarily in underground cavities such as old squirrel or other animal nests and in open west-southwest slopes bordered by trees, although a few nests have been reported from above-ground locations such as in logs among railroad ties. The plant genera most commonly associated with <i>B. occidentalis</i> observations or collections from Oregon and Washington include: Cirsium, Spiraea, Centaurea, Solidago, Lupinus, Chamaenerion, Plantago, Anaphalis, Aquilegia, and Erigeron. These floral associations do not necessarily represent <i>B. occidentalis</i>’ preference for these plants over other flowering plants, but rather may represent the abundance of these flowers in the landscape. (Lamke and Hatfield 2020)
Mammals				
Fisher	<i>Pekania pennanti</i>	SEN	Documented	Fishers occupy a diverse range of conifer, mixed conifer, and mixed conifer-hardwood forests with moderate to high canopy cover. Fisher home ranges may be composed of a mosaic of successional stages that often included high proportions of mid- to late-successional forests. Sites where fishers were detected were more structurally complex with greater log volume, greater densities of medium and large dead wood (snags, down wood), greater overstory or shrub cover, and large or greater basal area of hardwood trees.

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				Diet: Various species of squirrels, western red-backed voles, dusky-footed woodrats, chipmunks, snowshoe hares, and ground squirrels. Fisher prey species vary regionally and seasonally. (Lofroth et al. 2010)
Fringed myotis	<i>Myotis thysanodes</i>	SEN	Documented	Primarily forest-dwelling in Oregon. More likely to occupy late-successional/old-growth forests. More associated with the upper canopy than the lower structural layers within forested habitat. In the Oregon Coast Range, nightly activity was most strongly associated with increasing percent cover in the canopy layer. Roost structures include snags, caves, mines, rock crevices, trees, etc. Roost snags tend to be among the largest in diameter and tallest available. Bridges, especially those on smaller waterways in forested habitat west of the Cascades, are prime night roost structures year-round. In the Pacific Northwest, cast-in-place, girder, and concrete bridges with texture on the underside of the bridge tend to get used the most. Foraging habitat includes forest edges and forest clearings, including roads. Detected foraging over streams and in the upper forest canopy. Diet: Bats feed on a wide variety of insects and other invertebrates using a combination of gleaning (capturing stationary insects on a solid substrate) and hawking (aerial pursuit and capture). In the Oregon Coast Range, they primarily consumed larger invertebrates of terrestrial rather than aquatic origin. Prey in the Oregon Coast range includes Araneae (spiders), Lepidoptera (moths and butterflies), Coleoptera (beetles), Homoptera (aphids, scale insects, cicadas, and leafhoppers), Diptera (flies), Neuroptera (lacewings, mantidflies, antlions, etc.) and Orthoptera (grasshoppers, locusts, crickets) in order of volume. (Gervais 2017a: 11-17)
Gray wolf	<i>Canis lupus</i>	FE	Documented	As of December 2022, there is no evidence of resident wolves on BLM lands on the District (ODFW 2022). Gray wolver are habitat generalists. Wolves in Oregon primarily use forested habitat with seasonal shifts to more open habitats that reflect seasonal distribution of prey (e.g., lower elevation elk wintering areas). Data from collared wolves indicate that while denning occurs on both public and private land in Oregon, all known den sites occurred within forested habitat. GPS-collared dispersal in Oregon also occurred largely through forested habitats. However, long distance

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				dispersers generally crossed a variety of land cover types and landscape features (e.g., open prairie or shrub habitats, roads, rivers, etc.). Predictors of wolf habitat in Oregon from previous research includes 1) forested areas; 2) public ownership of land; 3) prey availability; 4) low human presence; and 5) low road density. Not all of Oregon's historical wolf habitat is currently available to wolves due to high human densities, extensive road systems, and cultivated habitats. Current areas of unsuitable habitat and range include the Willamette Valley. Wolves are not known to occur in the Oregon Coast Range (ODFW 2019: 9-10, 24-25)
Pallid bat	<i>Antrozous pallidus</i>	SEN	Suspected	Pallid bats are found primarily in grasslands, shrub-steppe, and desert environments with rocky outcrops, but also dry open oak or ponderosa forest, and open farmland. In western Oregon, they occur in drier interior valleys. They utilize open vegetation at ground level up to a few meters above the ground for foraging, and roost sites that offer a range of thermal environments. Roosts are most commonly rock crevices, but buildings, bridges, live trees and snags are also used. Snags used include ponderosa pine and oak species (<i>Quercus garryana</i> and <i>Q. kellogii</i>). In the Pacific Northwest, cast-in-place, girder, and concrete bridges with texture on the underside of the bridge tend to get used the most. In western Oregon, bats selected larger concrete bridges that maintained higher night-time temperatures than did smaller ones. Pallid bats appear to form social groups that roost together. Pallid bats typically forage in open, uncluttered habitat with little vegetation at or within a few meters of the ground near roosting sites. In Oregon, foraging pallid bats flew within the canopies of Douglas-fir trees and appeared to be gleaning insects there. Forest edge can also be valuable foraging and roosting habitat. Foraging areas and roosts are typically in fairly close proximity to each other. Pallid bats are primarily ground gleaners. They forage by listening for audible noises made by prey on the ground. They are opportunistic predators, primarily of arthropods. General categories of prey are flightless, capable of flight but largely active on the ground, and organisms that may be capable of strong flight but that frequently land and sit on vegetation. Pallid bats do not typically take prey that are in flight. (Gervais 2016: 8-13)

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Pacific marten Coastal DPS ²	<i>Martes caurina</i>	FT	Suspected	Martens tend to select older forest stands with a mixture of old and large trees, multiple canopy layers, snags and other decay elements, dense understory development, and biologically complex structure and composition. Martens typically select the largest available structures for resting and denning. The most common den structures used by Pacific martens are large diameter live and dead trees with cavities. A diversity of resting structures is needed to meet seasonal requirements across the home range. Diet: mainly small mammals but also birds, insects, and fruits. Key prey species are red-backed vole, flying squirrel, Douglas's squirrel, and chipmunks. (USDI FWS 2019c: 24 – 27)
Townsend's big-eared bat	<i>Corynorhinus townsendii</i>	SEN	Documented	In Oregon, there is significant use of buildings, bridges, tunnels, and mines for roosting. Along the coast they utilize basal hollows of trees for roosts. Habitat associations include a variety of forest types such as Douglas-fir (<i>Pseudotsuga menziesii</i>), western hemlock (<i>Tsuga heterophylla</i>), mixed conifer and hardwood, and oak woodlands (<i>Quercus</i> spp.). They frequently occur in the vicinity of surface water. In the Pacific Northwest, cast-in-place, girder, and concrete bridges with texture on the underside of the bridge tend to get used the most for roosting. Regardless of the roost type, Townsend's big-eared bats hang from open surfaces rather than roost in crevices. In Oregon, hibernacula have been found in caves, mines, buildings, and bridges. Diet: Diet is dominated by medium to large moths. To a lesser extent, they also consume insects in the following families: Blattodea (cockroaches and termites), Coleoptera (beetles), Neuroptera (lacewings, mantidflies, antlions), Orthoptera (grasshoppers, locusts, crickets), Odonata (dragonflies and damselflies), Diptera (true flies), and Hymenoptera (sawflies, wasps, bees, ants). They catch prey in flight or by gleaning moths off foliage. (Gervais 2017b: 7, 10, 12-14)
Mollusks				
Cascades axetail slug	<i>Carinacauda stormi</i>	SEN	Documented	Sites where this species has been detected include a dominant overstory of Douglas-fir (<i>Pseudotsuga menziesii</i>), with western hemlock (<i>Tsuga heterophylla</i>) and vine maple (<i>Acer circinatum</i>) in the understory. Additional understory associations include salal (<i>Gaultheria shallon</i>) and Oregon grape (<i>Mahonia</i>

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				<i>aquifolium</i>). Preferred microhabitat is under vine maple leaves within a Douglas-fir needle litter/duff layer or where down wood creates pockets for leaf litter and moisture to collect. Also in small depressions on the forest floor where water collects. Forest age class does not seem to be a limiting factor. Rarely detected in forest stands where either incense-cedar (<i>Calocedrus decurrens</i>) or western redcedar (<i>Thuja plicata</i>) was a dominant tree species. There is considerable potential for negative impacts from silvicultural activities including fuel treatments, prescribed burning, and logging. Fire has the potential to negatively impact terrestrial gastropods in multiple ways: directly, by fire-related mortality, and indirectly, by altering microclimate conditions, and by reducing, eliminating, or otherwise altering resources, including vegetation, fungi, leaf-litter, duff, woody debris, and other habitat elements pertaining to shelter or food. Terrestrial gastropods, including slugs, live for the most part on vegetation and in litter, have limited mobility and poor active dispersal abilities, and are very sensitive to desiccation, they are highly vulnerable to fire itself and to subsequent habitat destruction. This species was documented on the Cascades FO. Surveys were conducted on the Upper Willamette FO with no detections. (Blackburn 2020)
Crater Lake tightcoil	<i>Pristiloma crateris</i>	SEN	Documented	<i>P. crateris</i> has been found in forested habitats among moist leaf litter and at the bases of vegetation in wet meadows and riparian areas along small streams. Known from mid to high elevation sites. Also found in perennially wet habitats within conifer forests and forest meadows from 985-6,562 ft in elevation. Suitable sites include riparian habitats in the western Oregon Cascades. Also found near springs, seeps, wetlands, and wet meadows. Association with moist woody debris, rocks, and litter in wet environments indicates that they likely feed on microscopic periphyton (bacteria, fungi, yeasts, and other microscopic organisms) found on these surfaces. Terrestrial mollusks are sensitive to activities that disturb, remove, or destroy essential habitat components, including ground vegetation, canopy cover, and groundwater, or that compact soils. Potentially harmful activities include logging activities, recreational activities, heavy equipment operation, and construction

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				operations. Even restoration projects aimed at restoring ecological functions in riparian habitats could have unintended short-term impacts for this riparian-associate. Documented in Northwest Oregon District on the west slopes of the Cascades (presumably Cascades and Upper Willamette FOs). (Blackburn 2017b)
Crowned tightcoil	<i>Pristiloma pilsbryi</i>	SEN	Documented	<i>P. pilsbryi</i> is a local endemic associated with riparian and old growth habitat. It has been found to be most abundant under dense thickets of salal (<i>Gaultheria shallon</i>) or other shrubs near the coast, occupying the deeper strata of decaying leaves. It is predominantly associated with moist forests, including floodplains. <i>P. pilsbryi</i> has been found in very moist floodplain forests, with salmonberry (<i>Rubus spectabilis</i>), vine maple (<i>Acer circinatum</i>), waterleaf (<i>Hydrophyllum</i>) and other floodplain edge plants, in addition to steep, rocky, partly forested slopes with coastal exposure. Terrestrial mollusks are sensitive to activities that disturb, remove, or destroy essential habitat components, including ground vegetation, canopy cover, and groundwater, or that compact soils. Potentially harmful activities same as for <i>P. crateris</i>. Primary threat is habitat loss. Documented on the Northwest Oregon District in Tillamook County (Tillamook FO). Suspected in Columbia County (Tillamook FO). (Hietala-Henschell and Blackburn 2019)
Pacific walker	<i>Pomatiopsis californica</i>	SEN	Suspected	<i>P. californica</i> is a southwest Oregon and northwest California coastal endemic with a very limited range. The northernmost site is near the Pacific coast in Land County on the Waldport Ranger District of the Siuslaw National Forest. In Oregon, <i>P. californica</i> has been collected at low elevations near the coast between 70-120 ft. All known records from Oregon with associated habitat descriptions are from springs and seeps, with some occurring in moist habitat near small streams. All associated springs appear to be in forested habitats. Diet: In general, freshwater snails in the family graze on algae, diatoms, and/or detritus, and are categorized in the aquatic herbivore and aquatic detritivore functional feeding groups. (Blackburn 2021: 3-9)

Common Name	Scientific Name	2023 Status ¹	NWOD presence ²	General Habitat and Diet
Puget oregonian	<i>Cryptomastix devia</i>	SEN	Documented	<i>C. devia</i> occurs in mature to old growth moist forests and riparian habitats, where it is found under logs, in leaf litter, and around seeps and springs. It almost always occurs under or near bigleaf maple (<i>Acer macrophyllum</i>) trees below approximately 2500 feet in elevation. It may be found under sword ferns growing under those trees, or on the underside of bigleaf maple logs. It is often associated with coarse woody debris and leaf litter. Canopy cover over natural occupied habitats is usually greater than 70%, with rare exceptions on wetter sites. Juveniles of this snail may also be found under or among mosses such as those that grow on the trunks of old bigleaf maples. The deep layers of decaying leaves which accumulate under late seral trees form the optimal microhabitat for the species. Flat or gentle slopes generally provide better habitat for this species than steep slopes, probably due to more stable environmental and soil conditions. Although large diameter, older bigleaf maple trees provide optimal suitable habitat for this species, patches of smaller diameter maples, or numerous individual maples interspersed in an upland conifer stand, can also contain relatively high densities of <i>C. devia</i>. In Oregon, records exist from Clackamas, Multnomah, Columbia, Wasco, Washington, and Yamhill Counties. There are 10 records of this species on the Northwest Oregon District from 2001-2019. All are in the Tillamook FO (GeoBOB 2023). Two historic records are from the northern part of the Cascades FO (near Portland) (GeoBOB 2023). (Laws 2022: 3-6) (GeoBOB 2023).
Rocky Mountain duskysnail	<i>Colligyrus greggi</i>	SEN	Documented	<i>Colligyrus</i> spp. occur in cold water seeps and springs. They are generally found in the coldest and most sheltered and shaded habitat of springs, including areas near spring sources. In Oregon, <i>C. greggi</i> prefers pristine, low nutrient spring flows absent of macrophytes, but has been documented in larger springs with yellowcress (<i>Rorippa</i>) and water hemlock (<i>Cicuta</i>). It is known from low to high elevations in cold, clean, well-oxygenated habitats. It has been documented on the Northwest Oregon District, but unclear where. It does not appear under this name/species name in GeoBOB (GeoBOB 2023). (Blackburn 2018: 5) (GeoBOB 2023)
Shiny tightcoil	<i>Pristiloma wascoense</i>	SEN	Suspected	Terrestrial snails like <i>P. wascoense</i> require moist to wet environments for respiration and movement. Most sites for this species are in ponderosa pine (<i>Pinus</i>

Common Name	Scientific Name	2023 Status ¹	NWOD presence ²	General Habitat and Diet
				ponderosa) and Douglas-fir (<i>Pseudotsuga menziesii</i>) forests at moderate to high elevations. Additional species present at sites where <i>P. wascoense</i> has been found include grand fir (<i>Abies grandis</i>), larch (<i>Larix</i>), spruce (<i>Picea</i>), willow (<i>Salix</i>), currant (<i>Ribes</i>), elderberry (<i>Sambucus</i>), huckleberry (<i>Vaccinium</i>), and quaking aspen (<i>Populus tremuloides</i>). Moist microhabitat conditions are important for this species. For example, samples of <i>P. wascoense</i> were collected under damp deciduous (e.g., cottonwood) and coniferous leaf litter, under rocks, and under downed logs. (Hietala-Henschell and Blackburn 2020: 2-5)
Reptiles				
Painted turtle (Western)	<i>Chrysemys picta</i>	SEN	Suspected	In Oregon, <i>C. picta</i> are most commonly found in sloughs, ponds, streams, rivers, and oxbow lakes associated with the streams and rivers. Painted turtles are often associated with mucky bottoms and sites with numerous basking sites and submerged and emergent vegetation. In streams and rivers, they are found in slow-moving pools. Because they nest on land, painted turtles rely on terrestrial habitat, which must be in close proximity to their aquatic habitat. Basking behavior is prominent in this species, and it appears that any emergent object may be utilized for this purpose. The primary use of terrestrial habitats by western painted turtles is for nesting. Western painted turtles nest near aquatic habitat, usually within 50 m. Flood plains, shrubby fields, roadsides, pastures, and open beaches have all been used as nesting habitat. Direct exposure to sunlight appeared to be the common characteristic of nests throughout the western painted turtle's range. A broad range of substrates used for nesting has also been reported for nests in Oregon. The primary criteria for nesting habitat are close proximity to their aquatic habitat, sparse vegetation, and good solar exposure. Within their aquatic habitat, daily movements to forage, thermoregulate, avoid predators, and find mates make up their aquatic home range. Overland movements from aquatic to terrestrial systems occur seasonally to seek nest sites and sometimes over-wintering areas. Dispersal occurs largely through aquatic systems, but overland movements are important as well. Diet: <i>C. picta</i> are omnivorous and feed on fish, crayfish, tadpoles, amphipods, some orders of insects as well as carrion and plants. (Gervais et al. 2009: 12-14)

Common Name	Scientific Name	2023 Status ¹	NWOD presence ²	General Habitat and Diet
Western pond turtle	<i>Actinemys marmorata</i>	SEN	Documented	Found in both intermittent and permanent aquatic habitats. Most common in stagnant or slow-moving waters. Aquatic habitats have basking sites such as mud banks, logs or other objects. Most <i>A. marmorata</i> in Oregon select overwintering sites either at the bottom of the substrate of aquatic habitats, in undercut banks along streams, or in terrestrial refugia typically buried under 5-10 cm of leaf litter or duff. Most movement to upland sites occurred during September and October. Shrubby, open, and forested environments have all been used for overwintering, although access to some solar radiation appears to be important. Nesting habitat is usually in areas of sparse vegetation consisting of grass and forbs, with compact soil composed of clay, silt or sandy loam (sometimes also gravel/cobble mixed with soil). Nests have good solar exposure with little or no tree canopy that would shade the nesting site and are located within approximately 200 m from water. Hatchlings primarily overwinter in their natal nests in Oregon. Diet: <i>A. marmorata</i> are omnivorous and opportunistic feeders. They forage exclusively in aquatic habitats. Animal matter constitutes the majority of their diet, but occasionally they eat small quantities of plant matter. They also scavenge (e.g., waterfowl and fish). (Rosenberg et al. 2009: 13-18)
¹ FE (Federally Endangered under the ESA); FT (Federally Threatened under the ESA); SEN (BLM 2021 Final Special Status Species List, Sensitive Species). ² DPS (Distinct Population Segment)				

INAID #23 (Wildlife) How would prescribed fire affect Wildlife, including ESA Listed Species and Bureau Sensitive Species?

BLM did not analyze this issue in detail because there is no potential for significant effects to wildlife from prescribed fire beyond those described in the 2007 Programmatic Environmental Report (PER) (USDI BLM 2007d: 4-75 to 4-76; 4-80; 4-85 to 4-86; 4-92), incorporated here by reference. The 2007 Environmental Report is associated with the 2007 PEIS (USDI BLM 2007a) to which this EA tiers.

Fire has influenced the composition, structure, and landscape patterns of wildlife habitat for millions of years. Therefore, wildlife has coexisted and adapted to perturbations from fire. Indeed, fire has an ecological role in the development of many wildlife habitats. Fire changes the composition and distribution of vegetation and generally improves the palatability and nutritional value of forbs, grasses, and some shrubs. Fire also promotes early-spring green-up, which is important to the nutrition of pregnant animals and young and can remove dead and dying material that may limit wildlife access to living vegetation (USDI BLM 2007d: 4-76).

Fire can kill and injure animals, although the number killed by fires is probably a small proportion of most animal populations. Animals with limited mobility that live above ground are most vulnerable. Fire may threaten a wildlife population limited in size, range, or mobility (USDI BLM 2007d: 4-76), such as the listed butterfly species documented or suspected on the Northwest Oregon District.

Time of year during which fire occurs is an important variable in wildlife mortality. The eggs and young of birds are susceptible to fire, especially ground-nesting birds. Often the nesting season coincides with the active period of plant growth when moisture conditions are too wet to sustain prescribed fires. If a fire burns in a mosaic pattern, leaving some areas of vegetation relatively unscathed, some young may survive. The young of small mammals that build dens or nests near the ground, such as small rodents and hares, are susceptible to fire. Woodrats are particularly susceptible to fire mortality because of their reluctance to leave their houses even when a fire is actively burning. Small mammals can often escape fire by going into burrows or hiding in rock crevices, under stumps or roots, or in large dead wood (USDI BLM 2007d: 4-76). Woodrats, hares, and other small rodents are prey for northern spotted owls. In addition, some amphibians, reptiles, and insects escape fire by burrowing into the soil or hiding under moist duff or leaves that burn less readily than drier forest or rangeland materials (USDI BLM 2007d: 4-76).

Wildlife that leaves an area due to fire may return soon thereafter if food or cover is available in unburned or burned areas. For example, scavengers and predators will often return to a burned area to feed upon insects or other dead or dying animals harmed by fire. Geese often move into burned marshes while plants are still smoldering to feed on plant roots, while deer and other herbivores may return to a burned area after green-up. Other wildlife may emigrate until more suitable conditions return. A number of bird species show declines in numbers for several years after a burn, while numbers of other species increase. "When fire increases the heterogeneity of the landscape, some species of wildlife benefit from having increased opportunities to select from a variety of habitat conditions and successional stages." (USDI BLM 2007d: 4-76).

Conifer forests on the Northwest Oregon District historically had a mixed severity fire regime in the West Cascades physiographic province and pulses of stand-replacing fires in the Oregon Coast physiographic province averaging at about 200 to several hundred-year intervals. Due to fire suppression, they are presently at risk for high-intensity, stand-replacing crown fires due to large fuel accumulations (USDI BLM 2007d: 4-85). The use of fire can increase plant diversity and structural complexity in conifer forests. Huff et al. (1985 in USDI BLM 2007d: 4-88) found the greatest bird diversity in forests about 20 years after a burn (USDI BLM 2007d: 4-88).

In oak stands, frequent, low intensity fires help to maintain stands with a native grass and forb understory. Native Americans provided low intensity fires prior to European settlement. Low intensity fires have since become limited due to fire suppression. The result is that conifers are encroaching into oak woodlands and oak savannas. One of the purposes of this EA is to restore these increasingly rare habitats on lands managed by the BLM on the Northwest Oregon District. Prescribed fire treatments would help to restore natural succession and disturbance processes to which native wildlife have adapted. In addition, treatments would increase plant diversity across landscapes and, in turn, increase the diversity and abundance of wildlife supported by habitat on public lands (USDI BLM 2007d: 4-85).

Replacement of fire-adapted vegetation by fire-intolerant associations generally leads to overall declines in herpetofauna abundance and diversity. Prescribed fire is a management tool used with other tools to benefit herpetofauna by restoring a historical mosaic of successional stages, habitat structures, and plant species composition. (USDI BLM 2007d: 4-85).

Wildland fires, spread of weeds, and other factors have caused habitat fragmentation and the loss of connectivity between blocks of habitat, especially in lower elevation forests and riparian areas. Fragmentation has isolated some animal populations and reduced the ability of populations to disperse across the landscape. Treatments that restore native vegetation in disturbed areas would reduce fragmentation and restore connectivity among blocks of similar habitat (USDI BLM 2007d: 4-85).

In general, prescribed fires have less impact than uncontrolled wildfires because of the limited scope in the scale of the former and prescribed fires can be timed to have less detrimental impact on wildlife species (such as limiting burning to the non-breeding season for wildlife that could be impacted). The PDFs in **Appendix E** provide limitations that limit the adverse impact on wildlife from prescribed burning (**Appendix E**, Wildlife Resources (Fire Use)).

Special Status Species

Generally, impacts to special status species from prescribed fire would be the same as those described above. However, the rarity and sensitivity of special status species and their habitats make them more susceptible to affects by disturbances associated with treatments. In some cases, populations of special status species benefit more from fuels reduction and control of non-native species than wildlife species with secure populations (USDI BLM 2007d: 4-91).

The BLM will implement PDFs (**Appendix E**, Special Status Wildlife) to minimize the risks to special status species from vegetation treatments. Included are PDFs to survey for special status species if the project may impact federally listed or Bureau Sensitive wildlife species, minimize

direct impacts to special status species unless conservation plans show that these species will benefit from fire, minimize use of ground-disturbing equipment near special status species, and using temporary roads when long-term access to treatment sites is not required (USDI BLM 2007d: 4-91).

Special status wildlife species occupy a wide variety of plant community types, as long as they provide adequate food, cover, and breeding habitat. These species tend to cover a large geographic area and eat a wide variety of food items, such as the bald eagle and gray wolf. Bald eagles are present on the Northwest Oregon District; to date, gray wolves are not.

The potential for fire treatments to directly harm special status wildlife depends on an animal's ability to escape the treatment area. Small, slow-moving wildlife such insects and other arthropods and small mammals would be more at risk than species that would be able to flee the area (USDI BLM 2007d: 4-92).

Indirect effects to special status species as a result of prescribed fire altering habitat depends on the habitat needs of the species. Prescribed burns may adversely affect species that require dense vegetation for cover. Other species may benefit from the increased forage quality of new vegetation growth after fire. Although habitats would recover quickly from fire treatments, the effects of habitat loss to species with non-secure populations could persist and contribute to making populations more susceptible to extirpation. Additionally, if a fire treatment were to burn through the entire habitat of a small, isolated population, extirpation of that population could potentially occur. This EA has PDFs that would protect federally listed butterflies by requiring that only a portion of the species' habitat would be treated with prescribed fire in one year (Table E-8). For sensitive species that are susceptible to extirpation, such as the monarch butterfly, the Field Office Wildlife Biologist would determine the extent of the population and whether prescribed burning should occur only on a portion of its habitat at one time.

Listed butterfly species

Butterflies are very susceptible to mortality caused by fire, as they are sedentary during the bulk of their life cycle. An unmonitored, uncontrolled wildfire could easily burn through an entire population of a rare butterfly species, and many species are at risk of elimination from such an occurrence. The fuels reduction activities proposed by the BLM would likely provide a long-term positive benefit for these species by reducing the likelihood of a future devastating wildfire. While prescribed fire can help to restore the historic fire regime and associated habitat, fires can also kill butterfly eggs and larvae (USDI BLM, 2007d: 4-92). There are PDFs listed in this EA designed to minimize adverse effects to listed butterfly species while restoring the habitat they evolved with. For example, only one third of the area occupied by Fenders blue butterfly or Kincaids lupine would be treated with prescribed fire in one year (**Appendix E**, Table E-8).

Summary of the effects of prescribed fire on wildlife species and special status species

In summary, prescribed fire may harm some individuals, such as small mammals, insects, mollusks and arthropods. The timing of prescribed burns can mitigate these effects by limiting burning to the non-breeding seasons and providing "cooler" burns that do not damage the upper soil layer where wildlife species may burrow to escape the fire. Fire prescription windows for broadcast

burning are generally during weather that is favorable for burning slash but not burning hot enough to damage the soil layer. Pile burning may damage the upper soil layer in localized areas (i.e., under the pile). On balance, however, following the recommendations in the special status species' conservation plans to restore special status species' habitats by prescribed fire, is beneficial to the species as a whole, even if it adversely impacts some individuals.

Standard burning prescriptions and PDFs related to prescribed fire and resulting smoke would minimize the impacts of prescribed burns on wildlife. There is no potential for significant effects from prescribed burning beyond those analyzed in the 2007 PER associated with the 2007 PEIS. For these reasons, the BLM considered this issue but did not analyze it in detail. Analysis of this issue isn't necessarily to evaluate how the alternatives respond to the Purpose and Need and there is no potential for significant effects beyond those described in the 2007 PER associated with the 2007 PEIS.

INAID #24 (Wildlife) How would mechanical and manual treatments affect Wildlife, including ESA Listed Species and Bureau Sensitive Species?

BLM did not analyze this issue in detail because there is no potential for significant effects to wildlife from mechanical and manual treatments beyond those described in the 2007 Programmatic Environmental Report (PER) which is incorporated here by reference (USDI BLM 2007d: 4-80; 4-82; 4-88 to 4-89; 4-92). This 2007 PER is associated with the 2007 PEIS (USDI BLM 2007a) to which this EA tiers.

Mechanical treatments would injure or kill plants by removing some or all of the plant material on the treatment site. Equipment is often noisy, and this noise may alter animal behavior or cause wildlife to leave an area during the disturbance. Hand-held equipment, such as chainsaws, create noise that can disturb wildlife and cause them to flee, alter their behavior, or alter their use of habitat. These effects would be short-term and not likely to have a long-term health effect on wildlife nor alter their long-term use of habitat (USDI BLM 2007d: 4-80).

Modification of oak woodlands can harm bird species if it reduces the number of niches or alters forage and cover habitat, particularly of native species. Mechanical treatments in oak woodlands would benefit wildlife by removing conifers and other encroaching woody species and by stimulating the growth of understory forbs and grasses (USDI BLM 2007d: 4-82). Mechanical treatments can benefit oak woodlands by increasing oak sprouts for ungulate forage, promote the development of forbs and grasses as forage and cover, and protecting oak stands from conifer encroachment to ensure maintenance of oak woodland habitat into the future (USDI BLM 2007d: 4-89).

Mechanical treatments allow for more precise control of vegetation treated than prescribed fires. Manual and mechanical treatments are especially effective in sensitive areas, such as wetland and riparian habitat, or near habitats of plant and animal species of concern. These areas require greater control over treatment effects (USDI BLM 2007d: 4-88).

Maintaining trees and shrubs near permanent water sources and in riparian areas provides cover for species that use these aquatic bodies, such as turkey, quail, and deer, and maintains travel corridors (USDI BLM 2007d: 4-89).

BLM should implement the following when treating forests and woodlands (USDI BLM 2007d: 4-89):

- Create openings within forest/woodland stands
- Leave slash and downed trees for lagomorphs and other ground-residing wildlife
- Maintain shrub canopies for vireos, thrushes, and other birds
- Create edge habitat while also maintaining large patches of woodland/forest habitat for interior species and
- Use prescribed fire to maintain habitat.

Special Status Species

As discussed for wildlife in general, use of mechanical treatments to remove vegetation would run the risk of crushing small animals, including arthropods, reptiles and amphibians, the young and eggs of ground nesting birds, and small mammals. For some special status species, loss of even a few individuals as a result of crushing could substantially increase the susceptibility of the population to future disturbances. Risks would be greatest if treatments occurred over the entire area occupied by a population (USDI BLM 2007d: 4-92).

Disturbances associated with mechanical or manual treatment could be substantial but limited in duration. Mobile animals, such as large adult birds and mammals could leave the area temporarily to avoid the disturbance. Less mobile animals might not be able to leave, resulting in disturbance and stress. In addition, the noise and human presence associated with mechanical treatments would likely cause some animals to temporarily abandon nests. For particularly sensitive species, these disturbances could result in reduced breeding success, which could in turn have population-level effects. (USDI BLM 2007d: 4-92).

Removal of large stands of vegetation during mechanical treatments could substantially alter the habitat of some special status wildlife species. Although the ultimate result of these treatments would be an improvement in habitat quality, the short term stresses on some special status species could outweigh the benefits. If the removal of the entire habitat of a special status species were to occur during treatment, extirpation of that population could also occur. There would be substantially less risk associated with treatments in a portion of the habitat, provided the untreated habitat was large enough to provide a temporary refuge for the population, and animals and their nests or burrows were not destroyed during the treatment (USDI BLM 2007d: 4-92).

Because manual treatments are not cost-effective for treating large areas, it is unlikely that special status wildlife would have to move far to avoid workers in their habitat. For the wildlife that cannot leave the area, disturbance from manual treatments would be short-term in nature, provided treatments did not require repeated entry into habitat. Treatments that would force some special status wildlife species to leave nests or young behind, temporarily, could introduce a reduced reproductive success risk to an already sensitive population (USDI BLM 2007d: 4-92).

Manual treatments in aquatic habitats

Manual treatments in aquatic habitat would use hand pulling and rakes to physically remove invasive aquatic plants. When access or water depth restricts access, treatments may require the use of rafts or canoes. Follow-up treatments would occur as water levels receded, including use of

a shovel to dig up root masses of previously pulled invasive plants. Treatments could occur in disconnected and isolated side channels and seasonally disconnected ponds in the summer, and in ponds, lakes, and pump channels or heliponds. Pulling invasive plants may inadvertently result in the removal of aquatic macroinvertebrates from aquatic habitat, particularly those benthic species that live and forage in and around aquatic vegetation. This would result in temporary localized displacement and/or a reduction in the local population of those invertebrates.

Western pond turtles and painted turtles are Bureau sensitive species that would benefit from treatments of aquatic invasive plant species. The District expects treatments to improve habitat diversity to support various life stages and increase oxygen levels in turtle habitat. However, if not timed properly, adverse effects may occur to these Bureau sensitive turtles because of the application of bottom barriers/weed mats or diver-assisted suction harvest/tractors. Western pond turtles often estivate at the bottom of ponds when temperatures are too hot or cold; bottom barriers/weed mats could suffocate turtles, and suction harvest/tractors could physically harm or kill individuals. The following project design feature minimizes the potential for these treatments to cause adverse effects to western pond turtles (see **Appendix E**, Bureau Sensitive Wildlife p. 233).

Survey for western pond turtles before applying bottom barriers/weed mats or diver-assisted suction harvest/tractors in turtle habitat (e.g., ponds and streams/rivers with pools and/or coves). If western pond turtles are present, restrict these types of treatments to only occur between late spring to early summer (e.g., May 7– July 15) or between late summer to early fall (e.g., August 15–September 15).

With application of this project design feature, no adverse impacts to Western pond turtles or painted turtles are expected.

Summary of effects from mechanical and manual treatments on wildlife species and special status species

Mechanical treatment could cause disturbance to wildlife that is not mobile enough to leave the treatment area. It is important to treat only a portion of a special status species' habitat so enough individuals remain to repopulate the treated area and to reduce the risk of extirpating that population, especially if it is rare. This EA includes PDFs that would conserve special status species such as butterflies by limiting the amount of habitat treated annually (**Appendix E**, Special Status Wildlife). Therefore, there is no potential for significant effects from mechanical treatments beyond those described in the 2007 PER that was associated with the 2007 PEIS.

Manual treatment may impact individuals that are not mobile enough to leave the treatment area, but it is usually short-term, and the area treated is smaller. Therefore, there is no potential for significant effects from manual treatments beyond those described in the 2007 PER that was associated with the 2007 PEIS.

PDFs would minimize the impacts of mechanical and manual treatments on wildlife. There is no potential for significant effects from mechanical and manual treatments beyond those analyzed in the 2007 PER associated with the 2007 PEIS. For these reasons, the BLM considered this issue but did not analyze it in detail.

INAD #25 (Wildlife) How would biological treatments affect Wildlife, including ESA Listed Species and Bureau Sensitive Species?

BLM did not analyze this issue in detail because there is no potential for significant effects to wildlife from biological treatments beyond those described in the 2007 Programmatic Environmental Report (PER) which is incorporated here by reference (USDI BLM 2007d: 4-83; 4-90; 4-93 - 4-94). The 2007 PER is associated with the 2007 PEIS (USDI BLM 2007a) to which this EA tiers.

Grazing domestic livestock is a treatment available to the District that can reduce or contain undesirable vegetation. These treatments usually occur in herbaceous communities (annual and perennial grassland and perennial forb communities) with significant weed infestations. Herbivores, wild or domestic, influence vegetation development. Uncontrolled grazing can remove residual cover needed by ground-nesting birds; create shifts in vegetation succession that cause negative, often difficult to reverse, impacts on wildlife habitat; reduce wildlife food and cover; and reduce native plant diversity. Livestock can directly harm wildlife by trampling on wildlife such as small mammals or their nests. Grazing can alter vegetative structure to the detriment of birds and small mammals (USDI BLM 2007d: 4-83).

When grazing is used for management of invasive or aggressive native plants, care should be taken to ensure that livestock do not substantially alter habitat structure. Livestock can benefit some wildlife by promoting grass cover when used in conjunction with rest-rotation grazing, removing dead vegetation, encouraging sprouting by shrubs, and removing competitive vegetation (USDI BLM 2007d: 4-90).

The effects of using insects and pathogens as the biological treatment would be minor because of strict controls that ensure that insects and pathogens specifically target vegetation and do not harm non-target species (USDI BLM 2007d: 4-90) (Also see **Appendix B**, Integrated Vegetation Management, Biological Control Agents (Biocontrols)). In most cases, the target plants would remain standing, although weakened or unable to reproduce. Agencies often use insects to control weeds because many insect species exhibit high host-specificity. The success of biological control programs often depends on the presence of a more desirable plant community that can fill in the spaces opened by the removal of the weed. Because control using biological agents would take time, wildlife might be better able to respond to changes in habitat than after treatments that modify habitat over a short period of time, such as fire and herbicide use (USDI BLM 2007d: 4-83).

Special Status Species

The effects of undesirable vegetation containment by domestic animals on special status wildlife species would depend on numerous factors, including the size and mobility of the species, the length of the grazing treatment, and whether the domestic animals used would be likely to graze on important forage plants or other required habitat components.

Larger, mobile animals, and birds that nest out of reach of domestic animals should be able to avoid contact with grazers. Less mobile species and young animals, including the eggs of ground nesting birds and butterfly eggs and larvae, would be more susceptible to injury or mortality through trampling and crushing. For special status species with small, at-risk populations, loss of

any animals or eggs could reduce the viability of the population, making it more susceptible to extirpation in the future (USDI BLM 2007d: 4-93). PDFs in this EA would minimize the risk to special status species from grazing (**Appendix E**, Wildlife Resources (Biological)).

The District does not anticipate that the use of biological control agents would result in adverse effects to the habitats of special status species. Gradual reduction in weed cover would improve many habitats without causing sudden losses of vegetation or structural changes. There would be some risk associated with using agents that attack plant species that are closely related to species required by special status wildlife for survival (e.g., butterfly host plants). Biological control agents undergo an extensive screening and testing process prior to authorization by the USDA APHIS program to release them. Despite these safeguards, there is always a risk that the release of an agent into a habitat in which it does not normally occur could result in unforeseen ecological harm (USDI BLM 2007d: 4-93). However, all available biological control agents (primarily insects) that are appropriate for the species present on the District have been released; there are no additional releases that are recommended at this time. Additionally, PDFs in this EA would minimize the risk to special status species from biological control agents (**Appendix E** (Biological) and Special Status Plants (Threatened and Endangered Plants) and (Bureau Sensitive Plants)).

Summary of effects of biological controls on wildlife and special status species

The District is not proposing extensive use of biological controls such as targeted grazing or release of insects or pathogens for vegetation control under this EA. Impacts of grazing could occur over a larger area, but PDFs would minimize the risk of trampling and crushing special status species and other wildlife. BLM and other agencies have used biological control agents (primarily insects) on noxious weeds throughout northwest Oregon. All available biocontrol agents that are appropriate for the species present on the District have been released; there are no additional releases that are recommended at this time. As stated above, biological control treatments must use the USDA APHIS program and will be subject to PDFs in this EA. This would minimize the risk to special status species from the use of biological controls.

There is no potential for significant effects from biological treatments beyond those analyzed in the 2007 PER associated with the 2007 PEIS. For these reasons, the BLM considered this issue but did not analyze it in detail.

INAID #26 (Wilderness) What are the potential impacts from the project on the Wilderness characteristics as defined in the Wilderness Act of 1964 (Public Law 88-577 [16 U.S.C. 1131-1136])?

This issue will not be analyzed in detail because there is no potential for significance beyond what BLM analyzed in the 2010 Oregon FEIS and the 2016 PEIS (USDI BLM 2010a: 294, 301, 303, USDI BLM 2007a: 1-4, USDI BLM 2016a: 4-117) and there are no new circumstances or information at the District level that would change the effects anticipated for this EA.

The IPMAHR EA tiers to the analysis in the 2010 Oregon FEIS to describe the effects to special management areas that protect ecologically critical areas such as Areas of Critical Environmental Concern, Wilderness, and Wilderness Study Areas (USDI BLM 2010a: 301-304). In these special management areas, treatments could have short-term and usually negligible negative effects for

the first year following treatment, but in the long term, effects would be beneficial to special area values because of the return of native vegetation (USDI BLM 2010a: 301). The short-term negative effects of treatments would vary based on which and how BLM applies herbicides and that the effects are not easily discernable when BLM applies herbicides using a backpack sprayer or wicking method (USDI BLM 2010a: 294). With a broader array of herbicides, the BLM would have the opportunity to substitute more effective and / or selective herbicides than those currently used in special areas (USDI BLM 2010a: 303).

“Should any of these treatment opportunities present themselves in a specially designated area, the treatment would need to be consistent with, and conform to, the special requirements and management objectives for that area. Therefore, treatments having the potential to negatively affect the unique values of the special area over the long term would be unlikely” (USDI BLM 2010a: 303). BLM will do a Minimum Requirements Analysis Framework (formerly Minimum Requirements Decision Guide) for all non-emergency treatments in Table Rock Wilderness.

The IPMAHR EA’s wilderness areas are located with the analysis area of the 2010 Oregon FEIS and BLM identified the treatments proposed in this EA in the 2010 Oregon FEIS, 2007 PEIS and the 2016 PEIS. BLM has already identified the impacts of the proposed activities in the identified EISs, and further analysis is not necessary.

INAID #27 (Wild and Scenic Rivers) How would manual, mechanical, cultural, biological, and herbicide invasive plant treatments; native and invasive plant prescribed fire treatments; and management, augmentation, and removal of encroaching native plants in desirable plant communities in special habitats affect the water quality, free-flowing condition, and botany/ecology, cultural/historic, fish/fisheries, geology, recreation, scenic, and wildlife outstandingly remarkable values of designated, suitable, and eligible wild and scenic rivers?

The BLM did not analyze this issue in detail because there is no potential for significant effects to wild and scenic rivers (WSR) beyond those described in the NEPA analyses to which this EA tiers: the 1985, 2007, and 2016 PEISs, and the 2010 Oregon FEIS (USDI BLM 1985: 48; USDI BLM 2007a: 4-155 to 156; USDI BLM 2010a: 298 to 304; USDI BLM 2016a: 4-77 to 4-80).

The BLM considered the effects of manual, mechanical, cultural, and biological invasive plant treatments; native and invasive plant prescribed fire treatments; and management, augmentation, and removal of encroaching native plants in desirable plant communities in special habitats on the water quality, free-flowing condition, and outstandingly remarkable values (ORV), collectively referred to as “river values,” of designated, suitable, and eligible wild and scenic rivers (WSR) within the Northwest Oregon District.

BLM policy in Manual 6400 states that the spread of terrestrial and aquatic invasive species should be prevented and controlled in designated, suitable, and eligible WSR corridors, and allows use of “a full range of manual and chemical prevention and control treatment methods” provided that they are consistent with direction in the land use plan; BLM Manual Sections 9011, 9014, and 9015; BLM Handbook 1740-2; and other approved Federal direction and that chemical treatment is carefully evaluated so as not to adversely affect water quality and ORVs (USDI BLM 2012 7.5.J.1 and 3.6.I.1). The manual also states that “...prescribed fire may be used to restore or

maintain habitat for threatened, endangered, or sensitive species; restore or maintain ecological conditions; and/or meet desired conditions of the CRMP (USDI BLM 2012 7.5.H.1 and 3.6.G.).”

The prevention and control of invasive species and use of vegetation treatments to restore special habitats is consistent with the direction in the 2016 RMP/ROD to “Conduct management actions, including...invasive species management, riparian or wildlife habitat improvements, forest management, and trail construction, in Wild and Scenic River corridors only if consistent with designated or tentative classifications and if any reductions in outstandingly remarkable values would be temporary and outstandingly remarkable values would be protected or enhanced over the long term” (USDI BLM 2016d: 56).” The actions analyzed in this EA are consistent with wild, scenic, and recreational WSR classifications and would either protect and enhance or not affect the free-flowing condition, water quality, and ORVs of the district’s designated, suitable, and eligible WSRs, summarized in Table H-5.

Table H-5. BLM-administered WSR acreages, classes, and ORVs by designated, suitable, and eligible WSR

Wild and Scenic River	Total acres on BLM	Class on BLM	Botany/ Ecology ORVs	Cultural/ Historic ORVs	Fish/ Fisheries ORVs	Geology ORVs	Hydrology ORVs	Recreation ORVs	Scenic ORVs	Water Quality** ORVs	Wildlife ORVs
Clackamas (D)*	144	Rec	USFS segment only	Yes (Cultural Resources)	Yes (Fish)			Yes			Yes
Elkhorn Creek (D)	1,376	Wild, Scenic			Yes (Fisheries)				Yes		
Lobster Creek (D)	1,673	Rec			Yes (Fisheries)						
Molalla (D)	5,545	Rec		Yes (Cultural)	Yes (Fish)	Yes		Yes	Yes		
Nestucca (D)	3,014	Rec	Yes (Ecology)		Yes (Fish)			Yes	Yes		Yes
Quartzville Creek (D)	2,033	Rec						Yes	Yes		
Salmon (D)	982	Rec, Scenic	Yes (Botany/ Ecology)		Yes (Fisheries)		USFS segment only	Yes	USFS segment only		Yes
Sandy (D)	667	Scenic, Rec	Yes (Botany/ Ecology)		Yes (Fisheries)	Yes		Yes	Yes	Yes	Yes
South Fork Clackamas (D)	334	Wild		Yes (Historic)					Yes		
Walker Creek (D)	570	Rec	Yes (Botanical, Ecology)		Yes (Fish)						
Little North Santiam (S)	1,205	Rec			Yes (Fish)			Yes	Yes		
McKenzie Seg A (S)	1,148	Rec			Yes (Fish)			Yes	Yes		Yes
Molalla Seg B (S)	76	Rec				Designated segment only		Yes	Yes		
North Fork Siletz (S)	1,000	Scenic	Yes (Ecology)		Yes (Fish)						Yes

Wild and Scenic River	Total acres on BLM	Class on BLM	Botany/ Ecology ORVs	Cultural/ Historic ORVs	Fish/ Fisheries ORVs	Geology ORVs	Hydrology ORVs	Recreation ORVs	Scenic ORVs	Water Quality** ORVs	Wildlife ORVs
Sandy (S)	1,729	Rec		Yes (Cultural)	Yes (Fish)			Yes	Yes		
Siuslaw Seg B (S)	4,529	Rec			Yes (Fish)						Yes
Siuslaw Seg C (S)	1,191	Rec						Yes			Yes
Nestucca Seg B (E)	212	Rec			Yes (Fish)			Yes	Yes		

*(D) indicates Congressionally designated; (S) indicates suitable; (E) indicates eligible.

**In addition to being a river value of all WSRs, water quality is an ORV in the Sandy WSR.

The following is a summary of the specific ORVs of each designated, suitable, and eligible WSR in the Northwest Oregon District and the findings from the evaluation of each river value:

The designated Nestucca, Salmon, Sandy, and Walker Creek WSRs have botanical, botany, and/or ecology ORVs, and the suitable North Fork Siletz WSR has an ecology ORV.⁶³ The specific descriptions of botany and ecology ORVs for these WSRs are as follows:

Nestucca

The ecology ORV of the Nestucca WSR is based on the presence of mature and old growth forests, and the presence of high quality-habitat for bald eagle, northern spotted owl, red tree vole, marbled murrelet, and coastal giant salamander; the only known breeding site in Oregon Coast Range for Harlequin ducks; and high-producing steelhead stream (Congressional Record: S5442).

Salmon

The botany/ecology ORV of the Salmon WSR is primarily based on the ecological diversity and productivity found in the Red Top/Salmon River meadows complex, an area that is managed by the United States Forest Service; however, in the BLM-administered river segments, the botany/ecology ORV is described as follows: “The number and variety of life zones and plant communities in a relatively short stretch of river are remarkable in comparison with several other rivers in the four-county area (USDA Forest Service 1992: 14). There are important small wetland areas along the river in segments 4 and 5, as well as one oxbow that provides important habitat for wildlife species. One of the wetlands (segment 5) is in the Wildwood Recreation Site administered by the...BLM.... In the lower two segments, plant communities and riparian areas have been heavily impacted, primarily on private land, by the high level of development along the river, reducing the value of the riparian area for wildlife and fish species” (USDA Forest Service 1992: 15). The two threatened, endangered, and sensitive plants identified in the ORV description, *Scheuchzeria palustris* ssp. *americana* and *Corydalis aquae-gelidae*, are not known to occur in the BLM-administered river segments.

Sandy

The botanical/ecological resources of the lower Sandy River are considered outstandingly remarkable because of the diversity of vegetation (plant species and communities), the presence of a unique low-elevation old-growth forest ecosystem, and its importance to scenic and wildlife values. The heterogeneity of the vegetation found in the Sandy River Gorge is one of its most distinctive and important characteristics. These unique vegetation assemblages contribute significantly to the scenic, scientific, and wildlife values of the river. In addition, the river corridor contains the last remaining stand of low-elevation old-growth forest representative of pre-European transitional vegetation in the Willamette Valley region (USDI BLM 1993: 19).

Walker Creek

The botanical ORV of the Walker Creek WSR is based on the relative scarcity of high-elevation wetland areas of the type found in the Walker Flat ACEC, which is included in the Walker Creek

⁶³ The Clackamas WSR’s botany/ecology ORV is present only present in a portion of the WSR corridor that is administered by the USDA Forest Service and would not be affected by the actions analyzed in this EA.

WSR corridor, and the presence of the threatened *Sidalcea nelsoniana* (USDI BLM 1992d: Appendix 2-83). In addition to the wetland areas, the 2019 Congressional Record's ecology ORV description notes the mature and old growth forests and clean, cold water that supports wild salmon and wild steelhead (Congressional Record 2019).

North Fork Siletz (Suitable)

The ecological value of the river corridor is rated as high because of the presence of the river dependent fisheries and wildlife relevant and important values within the Valley of the Giants Area of Critical Environmental Concern. This is the largest contiguous stand of ancient old growth forest in the northern Oregon Coast Range. The age of the forest, duff and huge size of the conifers are unique to this area. The area provides habitat for a variety of botanical species (plant, bryophyte, and lichen) of concern and is one of a few locations for the Bureau sensitive moss species, *Schistostega pennata*. However, these botanical values of significance in the river corridor are not considered outstandingly remarkable because they are not associated with the river or its riparian zone (USDI BLM 2015c: 272).

The BLM evaluated impacts to botany in **Issue 1 (Botany)** *How would the proposed treatments, including herbicide, manual, mechanical, cultural, and biological, and prescribed fire (limited to invasive plants), affect desirable plant communities and Special Status plants?;* **Issue 2 (Botany)** *How would the proposed treatments, including herbicide, manual, mechanical, cultural, and biological, and prescribed fire (limited to invasive plants) affect the rate of spread of invasive species?;* and **Issue 3 (Botany)** *What are the effects of prescribed fire, tree removal, and container plantings on desirable plant communities, including federally listed plants and Bureau Sensitive plants and fungi?.*

Evaluation of these issues concluded that the proposed treatments are wholly within the actions analyzed in the EISs to which this EA tiers. Further, invasive plant management and special habitat restoration within WSR corridors are necessary to achieve management objectives and protect and enhance botany, botanical, and ecology ORVs. Through the implementation of the SOPs and PDFs included in this EA, there would not be significant negative effects to botany, botanical, and ecology ORVs. Conversely, the failure to manage invasive plants or restore special habitats would lead to the degradation of these ORVs, which would not meet the requirements of the WSRA or the 2016 ROD/RMP (IPMAHR EA Issues 1, 2, and 3).

Cultural or historic ORVs are identified in the designated Clackamas, Molalla, and South Fork Clackamas WSRs and in the suitable Sandy WSR. Specific descriptions are as follows:

Clackamas

The Clackamas WSR's cultural ORV is based on the evidence of significant human use prior to European exploration and settlement, as well as a wide variety of evidence of historic use, as well as the river's important role in local and regional development (USDA Forest Service 1993b: 7).

Molalla and Table Rock Fork Molalla

The cultural value of the Table Rock Fork Molalla was rated as outstanding in the 1989 eligibility assessment because of the high site density of cultural sites, with five cultural sites recorded at the time of the assessment (USDI BLM 1990a: 5-10). Cultural values are not

described as being outstandingly remarkable in the eligibility assessment for the mainstem Molalla River or in its suitability assessment (USDI BLM 1994a). The 2019 Congressional Record does not separate the two river segments in its description of river values, but cites “five identified cultural sites” (Congressional Record 2019), likely referring to the sites in the Table Rock Fork Molalla.

South Fork Clackamas

The historic value of the South Fork Clackamas WSR is based on the water pipeline and associated features installed South Fork Water Board in the early 1900s (USDA Forest Service 2021: 68).

Sandy (Suitable)

As described in the 1990 eligibility assessment for the Sandy River Segments A and B, which are managed together as the suitable Sandy WSR, the cultural/historical value is judged to be outstandingly remarkable because of two historical sites within the river corridor (USDI BLM 1990a: 43).

The BLM evaluated impacts to cultural and historic resources in **INAID #3 (Cultural and Traditional Resources)** *How would prescribed fire treatments affect cultural resources?*, and **INAID #4 (Cultural)** *How would manual, mechanical, biological, mulching, rare plant augmentation and competitive seeding affect cultural resource sites?*, and **INAID #5 (Cultural)** *How would herbicide treatments including Early Detection Rapid Response (EDRR) and aquatic affect traditional plant populations or native plant use?* The potential impacts to cultural resources evaluated in these issues would be the same as those that could affect cultural and historic ORVs; the evaluation and associated PDFs identified in these issues is sufficient in determining that the District will protect the cultural and historic ORVs (IPMAHR EA INAIDs #3, #4, and #5 **(Cultural)**).

Fish or fisheries ORVs are identified in the designated Clackamas, Elkhorn Creek, Lobster Creek, Molalla, Nestucca, Salmon, Sandy, and Walker Creek WSRs; as well as in the suitable Little North Santiam, McKenzie Segment A, North Fork Siletz, Sandy, and Siuslaw Segment B WSRs; and the eligible Nestucca Segment B WSR, with the following specific descriptions:

Clackamas

Fish was found to be an ORV of the Clackamas WSR because the river contains the last significant run of wild late winter coho in the Columbia Basin, is one of two remaining historic runs of spring chinook in the Willamette Basin and contains an important population of winter steelhead (USDA Forest Service 1993b: 7).

Elkhorn Creek

Fisheries were found to be an ORV of the Elkhorn Creek WSR because the river is a regionally important producer of resident and anadromous fish and for the of the valuable habitat the WSR provides. Elkhorn Creek is critical habitat for several Endangered Species Act-listed species and BLM and Forest Service-sensitive species, including spring Chinook salmon, steelhead trout, Pacific lamprey, and coastal cutthroat trout, while introduced, non-ESA-listed coho salmon are also present in lower Elkhorn Creek. There is a high diversity of species relative to the native fish assemblage of the area, and Elkhorn Creek flows almost immediately into the Little North

Fork Santiam River, which supports a wild steelhead trout fishery. Riparian and instream habitat is largely unaltered and high quality; the WSR corridor supports a diversity of habitats for listed species, along with spawning, rearing, and migration habitats. These habitats serve as critical steelhead trout refugia for populations in the Little North Fork Santiam River watershed and Santiam Basin (USDA and USDI 2021b: 29-30).

Lobster Creek

The fisheries resource of the Lobster Creek WSR is rated as an ORV because of the exceptional salmon and steelhead production. The eligibility report notes that Lobster Creek is one of the top producers of predominantly wild fall Chinook salmon, coho salmon, and winter steelhead in the region (USDI BLM 1990b: 17). The 2019 Congressional Record describes the ORV as “wild coho salmon, wild winter steelhead, wild fall Chinook salmon, and lamprey” (Congressional Record 2019).

Molalla

The fish ORV of the Table Rock Fork – Molalla River, which makes up a portion of the designated WSR, were found to be an ORV because of the presence of Upper Willamette River (UWR) spring Chinook salmon and UWR winter steelhead trout. The Table Rock Fork is critical habitat for both species, which spawn and rear in the river segment. The Table Rock Fork produces approximately 1/3 of the extant native run of winter steelhead reared in the Molalla River basin. Other salmonid species include resident cutthroat and rainbow trout (USDI BLM 2015c: 354). Fish was not identified as an ORV of the designated portion of the mainstem Molalla River in eligibility and suitability assessments conducted in the 1990s. The 2019 Congressional Record does not differentiate between the designated mainstem Molalla and Table Rock Fork; it describes the fish ORV as “critical habitat for wild spring Chinook salmon and wild winter steelhead, native resident cutthroat trout” (Congressional Record 2019).

Nestucca

The fish ORV of the Nestucca WSR is based on the Nestucca River’s ranking as among the highest in the region for the production of spring and fall Chinook salmon and summer and winter steelhead. Coho salmon, chum salmon, sea-run cutthroat, and resident cutthroat are also present at various times, and overall fish habitat within the river segment is considered very good (USDI BLM 1994a: Appendix I-9). The 2019 Congressional Record also lists lamprey, dace, and sculpins when describing the fish ORV (Congressional Record 2019).

Salmon

The Salmon WSR’s fisheries ORV is based on the extremely important and productive anadromous fish spawning and rearing habitat provided in the lower, BLM-administered, portion of the river. The river also provides extremely important habitat for rare native anadromous species and has a nationally renowned summer steelhead fishery that draws anglers from within and outside of Oregon (USDA Forest Service 1993a: 16).

Sandy

The Sandy WSR’s fisheries ORV is based on the diversity of populations, quality of spawning and rearing habitat, and its regional importance and reputation as an excellent sport fishery. The river contains populations of at least eight runs of anadromous fish species and up-to-ten resident

species. The Sandy River system exhibits a relatively large number of anadromous species when compared to other rivers in the region. Habitat within the river segment is considered good to excellent, and it provides nearly ideal conditions for anadromous fish species. Riparian vegetation in the subbasin is afforded more protection than in other drainages in the state, contributing to generally good stream shading, which keeps water temperatures relatively cool (USDI BLM 1993: 18).

Walker Creek

The fish ORV of the Walker Creek WSR is described in the 2019 Congressional Record as “winter and summer steelhead, clean cold water that supports wild salmon and wild steelhead” (Congressional Record 2019).

Little North Santiam (Suitable)

The fisheries resources of the Little North Santiam River were identified as an ORV based on the river’s production of predominantly hatchery spring chinook salmon, winter steelhead, and rainbow trout, which is among the highest in the region (USDI BLM 1990a: 27). The Little North Santiam River is critical habitat for UWR spring Chinook salmon and UWR winter steelhead trout. The river is a key subbasin for the production of UWR winter steelhead and is managed as a wild steelhead fishery by the Oregon Department of Fish and Wildlife. Spring Chinook salmon also spawn and rear in the river. The North Santiam River basin is one of only two subbasins with substantial reproduction by wild Chinook salmon (USDI BLM 2015c: 182).

McKenzie Segment A (Suitable)

To describe the fish ORV of the McKenzie Segment A, the 1994 Eugene District FEIS suitability assessment states: “The river segment has populations of native rainbow and cutthroat trout. Bull trout have been in decline...Normally anadromous fish runs of chinook and steelhead are good, attracting local and regional fishermen. The river also supports white fish, dace, suckers, and sculpins” (USDI BLM 1994b: Appendices 185).

North Fork Siletz (Suitable)

Fish/fisheries were found to be an ORV of the North Fork Siletz River based on the presence of Bureau sensitive species, the rarity of summer steelhead, and the diversity of salmonid species in the North Fork Siletz River, combined with high quality habitat for salmonid production. The river is used for spawning, rearing, and migration by Oregon Coast steelhead. The North Fork Siletz supports a native run of summer steelhead, which use the segment for spawning and rearing; the river segment is the only known native run of summer steelhead on the northern Oregon coast between the Umpqua River and Columbia River. Spring Chinook, cutthroat trout, and Pacific lamprey are also present (USDI BLM 2015c: 271-272).

Sandy (Suitable)

The fisheries resource of the suitable segments of the Sandy River was found to be an ORV when the river was assessed for eligibility because of the exceptionally high-quality anadromous fish habitat and because production of spring and fall Chinook salmon and summer and winter steelhead is high relative to other rivers in the region. A rare native run of coho salmon also inhabits the river (USDI BLM 1990a: 42). The more recent suitability report adds eulachon to the anadromous fish species present in the river segment, and states that anadromous fish habitat

is generally of high quality; production of spring and fall Chinook salmon and winter steelhead is high relative to other rivers in the region; and the river has been designated as critical habitat for spring and fall Chinook salmon, winter steelhead trout, and eulachon, while it has been proposed as critical habitat for coho salmon (USDI BLM 2015c: 312).

Siuslaw Segment B (Suitable)

To describe the fish ORV of Siuslaw Segment B, the 1994 Eugene District FEIS suitability assessment states: “The Siuslaw River has remnant runs of summer steelhead and chinook as well as coho, sea run and resident cutthroat trout, and nongame species, the most abundant being sculpins” (USDI BLM 1994b: Appendices 188).

Nestucca Segment B (Eligible)

The fish ORV of the Nestucca Segment B is based on the high numbers of rearing coho in the river segment. This segment of the Nestucca River, along with the now-designated segment upstream, contain approximately 70% of the summer rearing population of Oregon Coast coho. The segment is designated as critical habitat for Oregon Coast coho salmon, and both a fall and spring run of Chinook are present, while steelhead also spawn and rear in the Nestucca Segment B (USDI BLM 2015c: 247).

The BLM evaluated impacts to fish and fisheries in **Issue 5 (Fisheries)** *How would aquatic manual/mechanical treatments affect federally listed and Bureau Sensitive listed fish?*; **INAID #6 (Fisheries)** *How would aquatic and terrestrial herbicide treatments affect Bureau Special Status Species including ESA listed fish and aquatic species?*; **INAID #7 (Fisheries)** *How would targeted grazing in Riparian Reserves affect BSS and ESA listed species?*; and **INAID #8 (Fisheries)** *How would native plant restoration treatments using prescribed fire and felling of large trees affect BSS and ESA listed aquatic species?*

The evaluation of **Issue 5 (Fisheries)** *How would aquatic manual/mechanical treatments affect federally listed and Bureau Sensitive listed fish?* concluded that certain manual and mechanical treatments within riparian areas that disturb soil, carried out over a large area, may lead to increased erosion and stream sedimentation. The resultant sedimentation may adversely affect fish by covering eggs or spawning gravels, reducing prey availability, or directly harming fish gills and reducing stream-carrying capacity for fish. However, the risk of harm to aquatic ecosystems due to fine sediment production from manual treatment or use of motorized hand tools is low and short-term; therefore, effects would be localized and minor (USDI BLM 2010a: 231). The pulling of invasive plants may inadvertently result in the removal of aquatic macroinvertebrates from aquatic habitat, particularly those species that live and forage in and around aquatic vegetation. This would result in temporary localized displacement or a reduction in population size, but many individual organisms would escape or remain in undisturbed areas and populations would quickly rebound. Therefore, negative effects to aquatic macroinvertebrate species diversity or populations, including those within WSRs, would be negligible. Conversely, “mechanical, manual, and herbicide treatments, and in some cases biological treatments, that reduce the amount of invasive aquatic vegetation would improve habitats for fish and other aquatic organisms” (USDI BLM 2007d: 4-69) and would therefore protect and enhance fish and fisheries ORVs. BLM is only proposing the placement of weed mats in ponds outside of the Northwest Oregon District’s designated, suitable, or eligible WSRs. Similarly, BLM is not proposing the use of the described aquatic mechanical treatment methods in the district’s WSRs.

The evaluation of **INAID #6 (Fisheries)** *How would aquatic and terrestrial herbicide treatments affect Bureau Special Status Species including ESA listed fish and aquatic species?* concluded that these actions are wholly within the actions evaluated in the documents to which this EA tiers and no new or changed circumstances apply to change the effects of those actions at the scale evaluated in this EA. Further, the nature of the disturbance associated with terrestrial invasive plant treatments would not affect fish and other aquatic organisms, including federally listed or Bureau Sensitive species or their habitat since treatments would occur in dispersed areas across the district in any given year. Depending on the site, streamside treatments would remove invasive vegetation that often supports fewer native insects than native plant species, which could temporarily affect food availability for insectivorous fish species, such as salmonids (USDI BLM 2010a: 230). Treatment of floating and emergent plants would have no significant effects beyond those described in the analysis to which this EA tiers (USDI BLM 2010a: 208-240). Aquatic herbicides formulated for aquatic treatments have short life spans and minimal direct adverse effects to aquatic organisms (see **INAID #6 (Fisheries)** *How would aquatic and terrestrial herbicide treatments affect Bureau Special Status Species including ESA listed fish and aquatic species?*). For these reasons, the BLM concluded that any reductions to fish and fisheries ORVs from aquatic and terrestrial herbicide treatments would be temporary, and thus ensure the protection of these ORVs.

As stated in the issue analysis for targeted grazing in Riparian Reserves, the techniques for using directed livestock as an invasive plant treatment tool are not likely to have adverse effects on riparian areas and aquatic environments (USDI BLM 2010a: 231). The District would only conduct targeted grazing in riparian areas on rare occasions, and fencing would be used to limit the livestock's proximity to streambanks. BLM is currently not proposing targeted grazing within any of the district's designated, suitable, or eligible WSR corridors. If BLM identifies a need for this type of treatment in WSR corridors in the future, PDFs will prevent adverse impacts to river values; therefore, they will protect fish/fisheries values from adverse effects.

Special habitat restoration treatments using fire and the felling of large trees could require that the District cut some larger overstory trees, felling them toward the stream, which could result in a minor reduction in overstory shade; however, most streams in treatment areas are small, intermittent streams that would not be subject to warming during the summer. Additionally, given the small intermittent streams, fish would not be present in these streams during the summer treatment windows. Over the long-term, removal of some ground cover in the Riparian Reserve could result in sediment in runoff, however the small size of proposed treatment areas and the remaining undisturbed soil would limit the amount of fine sediment reaching streams. The short-term affect may result in some sediment delivery up to quarter mile downstream during subsequent rain events, however due to the regrowth of ground cover over the following years, the long-term effect would be negligible (IPMAHR EA **INAID #8 (Fisheries)**).

BLM is not proposing any actions that would affect the free-flowing condition of the district's designated, suitable, and eligible WSRs in this EA; however, the District could incorporate trees felled in prescribed fire and special habitat restoration treatments into the channel as large wood for instream restoration. The District would evaluate the in-stream placement of these trees in a separate NEPA process. The addition of large woody debris into streams in northwest Oregon replicates a natural process and generally benefits aquatic organisms, water quality, and hydrologic

systems. If necessary, BLM would complete a Section 7(a) of the WSR evaluation before instream restoration work to ensure the protection and enhancement of the free-flowing condition of designated WSRs.

BLM identified Geology ORVs in the designated Molalla⁶⁴ and Sandy WSRs; however, the actions evaluated in this EA would not impact the basalt rosette formations found in the Molalla WSR and the incised oxbows of the Sandy WSR.

The designated Sandy WSR has a hydrology ORV, but it is only present in the United States Forest Service-managed portion of the WSR, which is upstream from the BLM-administered river segments. There would be no potential to impact this ORV through the actions evaluated in this EA.

Recreation ORVs are identified in the designated Clackamas, Molalla, Nestucca, Quartzville Creek, Salmon, and Sandy WSRs; the suitable Little North Santiam, McKenzie Segment A, Molalla Segment B, Sandy, Siuslaw Segment C WSRs; and the eligible Nestucca Segment B WSR, with the following specific descriptions:

Clackamas

The Clackamas WSR's recreation ORV is based on the river's proximity to Portland and associated high recreation demand; the diversity of recreational opportunities it offers, including whitewater boating; and the high potential for recreation-related interpretive opportunities (USDA Forest Service 1993b: 7).

Molalla

In the eligibility assessment for the mainstem Molalla River, the recreational value was rated as outstanding because it was determined to be "one of the top recreational rivers within the Mid-Willamette Valley region in terms of present use and future potential." The assessment lists tubing, swimming, wading, sunbathing, and fishing as activities people are willing to travel from outside the region to enjoy in the Molalla River. The recreation value was not described as being outstandingly remarkable in the eligibility assessment for Table Rock Fork Molalla (USDI BLM 1990a: 7). The 2019 Congressional Record does not separate the two river segments in its description of river values, but cites "hiking, horseback riding, white water boating, and mountain biking" when describing the recreational ORV of the designated Molalla WSR (Congressional Record 2019).

Nestucca

The eligibility assessment for the Nestucca WSR describes its recreation value as being outstanding because of the bank and drift boat sport fishing opportunities that attract large numbers of local and out-of-region participants. The 1994 suitability assessment further describes day hiking, camping, picnicking, and nature study, along with the highly scenic drive

⁶⁴ Before the designation of the Molalla WSR, the suitable Molalla Segment B included a geology ORV. When the majority of the suitable segment was added to the National Wild and Scenic Rivers System as the Molalla WSR under the John D. Dingell Jr. Conservation, Management, and Recreation Act, the features for which the geology ORV was identified were included in the designated segment. The portion of Molalla Segment B that the Congressional designation did not include does not include these outstandingly remarkable geological features.

along the Nestucca River National Back Country Byway as contributing to the recreation ORV (USDI BLM 1994a: Appendix I-9).

Quartzville Creek

The CRMP for the Quartzville Creek WSR lists recreational mining and Class IV whitewater boating when describing the WSR's recreational ORV (USDI BLM 1992f: 22).

Salmon

The Salmon WSR's recreation ORV is based on the wide variety of high-quality recreational opportunities available along the length of the river (USDA Forest Service 1993a: 16).

Sandy

The Sandy WSR's recreation ORV is based on the river's "outstandingly remarkable recreational sports fishery", as well as its opportunities for nature study, land-based recreational day use, and non-motorized boating or floating.

Little North Santiam (Suitable)

The recreational ORV of the suitable Little North Santiam WSR is described in the 1990 eligibility assessment as being based on the salmon/steelhead fishing it offers, as well as the easy river access and numerous recreation facilities in the corridor (USDI BLM 1990a: 27). The 2015 suitability report notes that changes to fisheries management policy have reduced the amount of bank fishing taking place; however, high levels of public access and high quality opportunities for camping and picnicking are present throughout the corridor, as are developed recreation facilities (USDI BLM 2015c).

McKenzie Segment A (Suitable)

The recreational ORV of the McKenzie Segment A is described in the 1994 suitability report as being identified due to the several recreational facilities and attractions within the river corridor. Eagle Rock, Brown's Hole, and Marten's Rapids are also identified as well-known points of interest. Primary recreational attractions are bank and drift boat fishing and white-water rafting, while other activities include picnicking, photograph, watching wildlife, other types of boating, swimming, and driving for pleasure (USDI BLM 1994b: Appendices 184).

Molalla Segment B (Suitable)

The suitable Molalla Segment B was assessed for eligibility along with the segment of the mainstem Molalla that was designated in 2019 and shares the designated segment's description of the recreation ORV.

Sandy (Suitable)

The 1990 eligibility assessment for the suitable segments of the Sandy River rated recreation as an ORV for the excellent steelhead fishing and the draw of sportfishing for other species, whitewater rafting/kayaking, and day hiking (USDI BLM 1990a: 42).

Siuslaw Segment C (Suitable)

As identified in the recreation ORV description in the 1992 eligibility assessment, the recreational activities offered in Siuslaw Segment C are fishing, watching wildlife, nature photography, drift boating, and some canoeing, noting that fishing is very popular between

Whittaker and Wildcat Creeks, while out-of-state tourists visit the campgrounds and fish the river (USDI BLM 1992c: 15).

Nestucca Segment B (Eligible)

The eligible Nestucca Segment B's recreation ORV is based on the popular recreation fisheries the river provides, as the river segment is one of the top sport fishing rivers in Oregon for summer and winter steelhead. Drift and bank fishing attract large numbers of local and out-of-region participants.

The BLM evaluated impacts to recreation inside recreation management areas under **INAID #13 (Recreation)** *How would manual, mechanical, herbicide and prescribed fire treatments of invasive plants affect the management and use of recreation management areas?* which determined that effects would be the same as those described in the analyses for the Oregon EIS, the 2007 FEIS, and the 2016 PEIS (USDI BLM 2010a: 309, USDI BLM 2007c: 4-118, USDI BLM 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 (IPMAHR EA **INAID #13 (Recreation)**). BLM disclosed the effects of manual, mechanical, biological, and prescribed fire treatment types on recreation outside recreation management areas in the 2007 PER (USDI BLM 2007d: 4-119 to 4-122).⁶⁵

WSR corridors with recreation ORVs often include recreation management areas. However, BLM has identified recreation ORVs specifically for their river-related recreation which requires protection and enhancement, even though all, or portions of which, are often outside recreation management areas. PDFs applied to treatments in WSR corridors with recreation ORVs would be sufficient to protect recreation values. In many cases, the beneficial effects of the proposed activities would also enhance recreation ORVs by removing invasive plants that block river access routes and scenic views and allowing use and maintenance of recreation facilities. The proposed treatments would not affect water-based components of recreation ORVs, such as boating.

Scenic ORVs are identified in the designated Elkhorn Creek, Molalla, Nestucca, Quartzville Creek, Sandy, and South Fork Clackamas WSRs; the suitable Little North Santiam, McKenzie Segment A, Molalla Segment B, and Sandy WSRs; and the eligible Nestucca Segment B, with the following specific descriptions:⁶⁶

Elkhorn Creek

The scenic ORV of the wild segment of the Elkhorn Creek WSR is exemplary because of the visual interplay of vegetation, water, and geology; the constrained, dramatic views created by the geology; and the opportunity to see an undisturbed, natural landscape for an extended length of the wild segment. The wild segment offers iconic examples of scenic elements that appear to be untouched by modern humans (USDA and USDI 2021b: 22).

⁶⁵ This EA is not proposing some of the treatment techniques described in the PER, such as chaining and tilling, and BLM would not implement them within WSR corridors.

⁶⁶ The scenic ORV of the designated Salmon WSR is located only within the United States Forest Service-administered portion of the WSR, which is upstream from the BLM-administered segment. There would be no potential for the actions evaluated in this EA to impact this ORV.

Molalla

The Molalla WSR's scenic ORV is described as being characterized by a wide range of colors and textures, from grays and blacks on exposed rock outcrops to greens and browns from a wide variety of vegetative types present within the viewshed. The river's character ranges from clear pools to riffles and whitewater. Large boulders, covered with moss and vegetative growth add to the scenic quality, while human influences detract slightly from some of the views (USDI BLM 1994a: Appendix I-4). The 2019 Congressional Record further states that "the highly rated scenery includes gorgeous river and views of cliffs, moss-covered boulders and diverse stream-side vegetation" (Congressional Record 2019).

Nestucca

The scenic ORV of the Nestucca WSR is based on scenic qualities that include views of a steep, thickly vegetated Coast Range canyon exhibiting a multi-age mix of vegetation with a wide range of colors and textures. The "mature and old growth forests" mentioned in the Congressional Record (Congressional Record 2019) likely are a reference to the "canopy of 200-foot tall Douglas fir and various hardwood species" described in the 1994 suitability assessment, which also highlights the scenic values offered along the Nestucca River National Back Country Byway.

Quartzville Creek

The Quartzville Creek WSR's scenic ORV consists of the unique combination of cascading whitewater, water clarity, rocky outcrops, and diverse vegetation of conifers and hardwoods providing color variation and height diversity (USDI BLM 1992f: 22). The scenic drive along Quartzville Creek is also described as a scenic ORV (USDI BLM 1992e: 11).

Sandy

The Sandy WSR's scenic ORV is based on the distinctive canyon landscape, characterized by its near-pristine condition, steep topographic relief, and varied and diverse vegetation. The ORV is further enhanced by rapids, pools, and occasional riverside cliffs and waterfalls (USDI BLM 1993: 18).

South Fork Clackamas

The South Fork Clackamas WSR's scenic resources were found to be an ORV based on the river corridor's unique and highly memorable views of forested waterfalls, as well as the unique views offered by the historic Oregon City Waterworks facilities (USDA Forest Service 2021: 65).

Little North Santiam (Suitable)

The scenic ORV of the Little North Santiam is characterized by a combination of deep, clear pools and riffles that provide visual contrast; rock outcrops that add to visual diversity; and mature and diverse streamside vegetation (USDI BLM 2015c: 181).

McKenzie Segment A (Suitable)

The scenic ORV of the McKenzie Segment A is based on the view from the river, which includes steep-to-gentle hillsides; conifers that cover hillsides where logging has not occurred and ascend vertically down to the river's edge to mix with finely textured alders and riparian vegetation; fine texture broken and varied by ferns, plants, thick mossy trees, branches and rocks,

all of which provide an enclosed edge of contrast for the rushing river waters. Deciduous trees contribute fall colors, and Eagle Rock protrudes from the south bank of the river (USDI BLM 1994b: Appendices 185).

Molalla Segment B (Suitable)

The scenic value of the suitable portion of Molalla Segment B is not differentiated from the portion designated in 2019 and shares the description from the 1994 suitability assessment.

Sandy (Suitable)

The scenic ORV of the suitable segments of the Sandy River is based on the corridor's "A" rating as defined in the Visual Resources Handbook 11-8410-1. The river is characterized by diverse riverside vegetation and a variety of textures and forms (USDI BLM 2015c: 311).

Nestucca Segment B (Eligible)

The eligibility report for Nestucca Segment B states that the scenic ORV rating is based on the Nestucca River corridor's "A" rating as defined in the Visual Resources Handbook 11-8410-1 (USDI BLM 2015c: 246).

The BLM evaluated impacts to visual resources in **INAID #16 (Visual Resource Management)** *What are the potential impacts from the project on the Visual Resource Management Classes?* Although there are differences between VRM and the management of scenic ORVs, identified specifically for their river-related qualities that BLM must protect and enhance, the VRM analysis in the documents to which this EA tiers considered the same range of impacts that would occur in WSRs with scenic ORVs. These documents concluded that, with PDFs, negative impacts to scenery from the treatment of invasive plants by manual, mechanical, prescribed burning, biological, and herbicidal methods would be limited to one to three years, while long-term impacts would improve the overall health and visual quality of the landscape (IPMAHR EA **INAID #16 (Visual Resource Management)**). By extension, this conclusion supports the finding that, although there would be short-term negative effects from invasive plant treatments within the viewshed of the river or other features identified in scenic ORV descriptions, SOPs and PDFs for WSRs with scenic ORVs would prevent degradation of scenic ORVs. In the long term (approximately three years after treatment and beyond), treatments would protect and enhance scenic ORVs (USDI BLM 2010a: 296).

The BLM evaluated impacts to water quality in **INAID #17 (Water Quality)** *How would treating any riparian vegetation affect stream side shade cover and stream temperature?* (IPMAHR EA **INAID #17 (Water Quality)**); **INAID #18 (Water Quality)** *How would treating terrestrial weeds with herbicides affect water quality, including ground and surface water used for domestic and municipal supply?* (IPMAHR EA **INAID #18 (Water Quality)**); **INAID #19 (Water Quality)** *How would treating aquatic invasive plants with herbicides affect water quality?* (IPMAHR EA **INAID #19 (Water Quality)**); **INAID #20 (Water Quality)** *How does erosion and runoff from upland manual and biological vegetation treatments affect water quality?* (IPMAHR EA **INAID #20 (Water Quality)**); and **INAID #12 (Hydrology)** *How would prescribed fires implemented across a landscape, including within riparian areas, affect stream form and function?* (IPMAHR EA **INAID #12 (Hydrology)**).

These issues concluded that the actions and extent of treatments under all alternatives are wholly within the actions analyzed in the 2010 Oregon EIS and 2016 PEIS. The Oregon EIS concluded that treating aquatic invasive plants would result in improved water quality (USDI BLM 2010a: 205). Through the implementation of the SOPs and PDFs included in this EA, there would be no potential for significant effects to water quality beyond those analyzed in the documents to which this EA tiers; therefore, ensuring the protection of water quality.

In addition to having water quality as a river value, the designated Sandy WSR has a water quality ORV (USDI BLM 1993: 19). There is no need for additional evaluation of the impacts to water quality beyond that described above in the water quality river value section. Potential effects would be the same in the Sandy WSR as elsewhere in the Northwest Oregon District and there would be no potential to impact the ORV, which relates to the natural coloration of the Sandy River's water, from the actions evaluated in this EA.

Wildlife ORVs are identified in the designated Clackamas, Nestucca, Salmon, and Sandy WSRs, as well as the suitable McKenzie Segment A, North Fork Siletz, Siuslaw Segment B, and Siuslaw Segment C WSRs, with the following specific descriptions:

Clackamas

Wildlife is an ORV of the Clackamas WSR based on the presence of bald eagle, elk, and northern spotted owl; potential habitat for peregrine falcon; and the outstanding potential for wildlife-related interpretive opportunities (USDA Forest Service 1993b: 7).

Nestucca

The Nestucca WSR's wildlife ORV was described in the 2019 Congressional Record as "High quality habitat for bald eagle, northern spotted owl, red tree vole, marbled murrelet, and coastal giant salamander; the only known breeding site in Oregon Coast Range for Harlequin ducks" (Congressional Record 2019).

Salmon

The Salmon River's wildlife ORV is based on the important habitat provided along the entire river,⁶⁷ offering summer and winter range for big game species and important habitat for federally listed threatened and sensitive species such as the sandhill crane (USDA Forest Service 1993a: 16).

Sandy

The Sandy WSR's wildlife ORV is based on the regional significance of habitat diversity and the number of species present. The Sandy River Gorge offers one of the greatest levels of diversity in both wildlife species and habitat of any river in the region, and the educational and scientific values are correspondingly varied and significant, which is reflected in the river's use for local wildlife and natural history educational and interpretive programs. The Sandy River Gorge and vicinity provides a diversity of habitat for the full complement of wildlife species typical of a low elevation site in the north Cascade Range of Oregon; provides habitat for species typical of

⁶⁷ The upper meadow complexes are also a component of the wildlife ORV, but that portion of the river is managed by the Forest Service.

the Willamette valley; and is especially valuable because the area is relatively isolated and undisturbed, yet close to the Portland metropolitan area. Habitats bordering the river and major tributaries provide critically important travel corridors for wildlife movement, especially for big game species like the Roosevelt elk (USDI BLM 1993: 19).

McKenzie Segment A (Suitable)

The wildlife ORV of the McKenzie Segment A is described in the 1994 Eugene District FEIS as being based on the use of the river by osprey for nesting and foraging for fish and for the river segment's inclusion in the Pacific Bald Eagle Recovery Plan as key habitat for the recovery of the bald eagle population (USDI BLM 1994b: Appendices 185).

North Fork Siletz (Suitable)

The wildlife ORV of the suitable North Fork Siletz is based on the important corridor provided by the river for marbled murrelets to reach the Valley of the Giants, the highest murrelet nesting area in the northern Oregon Coast Range. The ORV description also mentions northern spotted owls, known to use the river segment as a home range, bald eagles, which routinely hunt along the river segment, and a locally important elk population (USDI BLM 2015c: 272).

Siuslaw Segment B (Suitable)

The suitable Siuslaw Segment B was found to have a wildlife ORV because “the northern spotted owl, an endangered species, also inhabits the timber lands in the area” (USDI BLM 1994b: Appendices 188).

Siuslaw Segment C (Suitable)

The suitable Siuslaw Segment C was found to have a wildlife ORV due to the discovery of a marbled murrelet nest site along the river segment in 1991, the year before the eligibility assessment, for the segment's identification as a recovery site for the bald eagle, and because the northern spotted owl also inhabits the area (USDI BLM 1992c: 15).

The District analyzed the effects of the proposed action on wildlife ORVs under **INAIID #21 (Wildlife)** *How would herbicides affect terrestrial wildlife species, including Bureau Sensitive Species?*; **INAIID #22 (Wildlife)** *How would treatments affect terrestrial Special Status Species?*; and **INAIID #23 (Wildlife)** *How would prescribed fire affect Wildlife, including ESA Listed Species and Bureau Sensitive Species?*; **INAIID #24 (Wildlife)** *How would mechanical and manual treatments affect Wildlife, including ESA Listed Species and Bureau Sensitive Species?* **INAIID #25 (Wildlife)** *How would biological treatments affect Wildlife, including ESA Listed Species and Bureau Sensitive Species?* These issues concluded that, through the implementation of the PDFs included in this EA, there would be no potential for significant effects to wildlife beyond those analyzed in the documents to which this EA tiers (IPMAHR EA INAIIDs #21, #22, #23, and #24 (Wildlife)). SOPs and PDFs for WSRs with wildlife ORVs would prevent degradation of wildlife ORVs; therefore, ensuring the protection of wildlife ORVs.

For the reasons summarized above, the BLM concludes that the actions proposed in this EA would protect and enhance or not affect the free flow, water quality, and ORVs of the designated, suitable, and eligible WSRs in the Northwest Oregon District. The BLM considered this issue but did not address it in detail because there is no potential for significant effects to river values in designated, suitable, and eligible WSRs in the Northwest Oregon District beyond the effects of manual,

mechanical, cultural, and biological treatments described in the documents to which this EA tiers. The nature of the disturbance associated with the proposed invasive plant treatments is consistent management guidance for WSRs provided in BLM Manual 6400 sections 3.6 and 7.5 and the management direction for WSRs in the 2016 Northwestern and Coastal Oregon ROD/RMP (USDI BLM 2016d: 56), as the proposed action is consistent with designated and tentative river classifications, any reductions in ORVs would be temporary, and the protection and enhancement of ORVs would occur over the long term.

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