BLM

Vale DISTRICT

Integrated Invasive Plant Management for the Vale District

Environmental Assessment

(Revised December 2016)

(DOI-BLM-ORWA-V000-2011-047-EA)

aphthona cyparissiae, a biocontrol for leafy spurge

Medusahead rye at Brownlee Reservoir

Scotch thistle

Sulphur cinquefoil on the Grand Ronde River

Herbicide application by horseback

December 2016

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

Vale District
100 Oregon Street
Vale, OR 97918

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interest of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

Changes to the EA

The following edits have been made to the EA as a result of public comment or new information.

Edits made since the September 2016 Revised EA

New or rewritten text made since the September 2016 Revised EA appears in blue in this Revised EA.

Chapter 1 – Purpose and Need

Page 13 – A summary of the September 2016 public comment period was added.

Page 15 – The word "religious" was changed to "spiritual" in the *Cultural Resources Important to Native American Tribes* issues list and throughout the document.

Page 17-18 – Language clarifying the determinations made through Endangered Species Act consultation was added.

Page 21-22 – Relevant Required Design Features from the Oregon Greater Sage-Grouse Resource Management Plan Amendment were added.

Chapter 2 – The Alternatives

Page 28 – Information was added to better articulate how monitoring will be used to inform targeted grazing.

Page 29 – Information was added about who is responsible for direct control treatments.

Page 30 - Page 117 – A reference to the 2001 Native Plan Materials Manual was updated to the 2008 Integrated Vegetation Management Handbook.

Page 37 – The data used to create Table 2-3 was refined and updated to include data back to 1980.

Page 38 – A footnote was added defining 'Landsat'.

Page 45-46 – Information about how targeted grazing using cattle would be implemented under the Proposed and Revised Proposed Actions was clarified.

Page 48 – Recently completed NEPA decisions were added to the *Summary of Existing NEPA Authorizing Invasive Plant Treatments* table. This change is also noted on page 95.

Page 53 – Three footnotes were added or modified in *Herbicide Information* table

- Footnote 2 was modified to clarify how the maximum rate is determined.
- A footnote was added that defines how and where herbicides are registered for use.
- A footnote was added that clarifies that actual application rates can be found in the *Treatment Key*.

Page 73 – A footnote about treatments in invasive annual grasses in Categories 5 and 6 was corrected to accurately reflect what the

Page 75 – In Table 2-11, *Estimated Treatment Acres (by Alternative and Category)*, the two rows describing targeted grazing with cattle were combined into one row.

Page 81 – Clarification about the *Use Fewer of the Herbicides Approved for Consideration* alternative not considered in detail was added to show that the Decision-maker could modify the Revised Proposed Action to remove an herbicide or modify its use, if necessary.

Page 82 – In the *Include the Use of Herbicides for Native Plants and Use Additional Herbicides* alternative not considered in detail, the sagebrush example was changed to juniper to more accurately reflect the sort of treatments that would be considered,

Chapter 3 – Affected Environment and Environmental Consequences

Page 83 – A reference to the 2016 PEIS was added, saying the effects analysis tiers to the 2016 PEIS.

Page 83 – A sentence was added to a footnote saying more information is provided throughout Chapter 3.

Page 84 – A definition for “risk” was provided, and how risk ratings relate to effects in Chapter 3 were explained.

Page 84 – More information was provided about risk ratings (from the Risk Assessments) and how they relate to the effects analysis.

Page 86 – The pounds of herbicides that would be used under the alternatives was updated in the text and a footnote.

Page 89 – Lime Hill Fire Emergency Stabilization and Rehabilitation was deleted from the reasonably foreseeable action list.

Invasive Plants

Page 93 – The list of EAs authorizing the use of herbicides since the 2010 Oregon EIS was updated.

Page 93 – A Project Design Feature was relocated from the *Livestock Grazing* to the *Invasive Plants* section. A footnote points to more information regarding monitoring plans that has been added as Appendix H.

Page 98 – Examples of stressors that reduce herbicide effectiveness were added.

Native Vegetation

Page 104-105 – Native annual grass species present in big sagebrush/grasslands were added.

Page 111 – The effects of two herbicides (picloram and dicamba) were incorrectly attributed in the *Effects of Herbicides* table and were moved to the right location.

Page 115 – Language and citations were added saying invasive annual grasses can outcompete and displace native annuals.

Soil Resources

Page 149 – A sentence was added saying that when soil surveys are completed for the Malheur Resource Area, they will be factored into targeted grazing treatments.

Water Resources

Page 163 – A footnote was added referencing the Project Design Feature in the *Riparian Habitats* section that only goats and sheep will be for targeted grazing in riparian areas.

Riparian Habitats

Page 167 – A definition for "armored" streambank was added.

Fish and Other Aquatic Species

Page 182 – A sentence was added saying that surveys are conducted where projects may affect Special Status fish. This same sentence was added to the *Wildlife* section on page 202.

Page 182 – A mitigation measure avoiding the use of glyphosate with POEA was brought forward from Appendix A as a relevant example.

Page 185 – A citation for the 2,4-D Risk Assessment was updated.

Page 192 – Language was added to clarify that aminopyralid, fluroxypyr, and rimsulfuron are not used in aquatic areas because they are not registered for use by the EPA in those areas.

Wildlife

Page 196 – The kit fox was added to the list of small mammals present on the District.

Page 199 – The Washington ground squirrel status was changed from candidate to sensitive.

Page 209 – A sentence was added to describe the effects of native ungulates consuming aminopyralid-treated vegetation.

Livestock Grazing

Page 210 – A footnote was added clarifying that the *Livestock Grazing* section addresses grazing through permits and leases, while targeted grazing as a tool to control invasive plants is addressed in the *Invasive Plants* section.

Page 212 – A Project Design Feature was added to prevent livestock from eating plants treated with aminopyralid.

Wildland Fire and Fuels Management

Page 221 – The acres of wildfire were updated to be consistent with updated data from Table 2-3.

Implementation Costs

Page 274 – A footnote was added to Table 3-50 explaining actual annual expenditures are limited by budget and priorities.

Human Health and Safety

Page 276 – The effects of invasive plants on allergies was added.

Page 280 – The terms "cancer hazard" and "cancer risk" used by the International Agency for Research on Cancer were added as a footnote.

Page 280 – Language was added from the Risk Assessments to describe why chronic risk exposures are not expected for rimsulfuron.

Appendices

Appendix A – The Herbicides, Formulations, and Adjuvants

Page 320 – It was noted that additional protection measures can be found in numerous other BLM or Department of the Interior documents and that exclusion from the Appendix does not indicate that these additional measures are not also potentially applicable.

Page 340 – Information about Oregon Greater Sage-Grouse Approved Resource Management Plan Amendment management direction and required design features was added.

Appendix B – The Herbicides, Formulations, and Adjuvants

Page 363 –In Table B-1, *General Constraints from Herbicide Labels*, it was noted that the label states that picloram should not be applied within the root zone of desirable trees unless such injury can be tolerated.

Appendix C - Herbicide Risk Assessment Summaries

Page 380 – A sentence was added to describe that aquatic herbicide registration requires additional analysis by the EPA.

Page 382 – Aminopyralid, fluroxypyr, and rimsulfuron were added to Table C-2, *Human Health and Ecological Risk Assessment Sources.*

Page 382 – In the *Drift* section, it was noted that drift is the process most likely to result in herbicides moving outside the treatment area.

Appendix E: Invasive Plant Infestations

Page 406 - A table of invasive plants mapped in NISIMS by infestation size was added as Table E-5.

Appendix H: Process and Criteria Considered for Integrated Invasive Plant Management Utilizing Targeted Grazing

Page 428-431 – A new appendix was added to describe how monitoring will be used with targeted grazing treatments.

Other Changes

Page 284 – Definitions were added or modified for “allotment”, “aquatic,” “inerts,”, “maximum application rate”, “monoculture” and “pasture.”

Additions or corrections were made to *References* (EA:296-315).

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

Edits made since the December 2015 EA

Throughout Chapters 1, 2, 3, and the Appendices, three new herbicides (aminopyralid, rimsulfuron and fluroxypyr) have been added to the analysis in a Revised Proposed Action Alternative. The EA now describes that analysis for these three herbicides and tiers to a 2016 Programmatic Environmental Impact Statement. Effects from the use of these herbicides have been added to the *Environmental Consequences* sections for each resource in Chapter 3. Mitigation Measures and Conservation Measures from the 2016 PEIS and its Biological Assessment were incorporated.

In addition, the following changes have been made:

Chapter 1 – Purpose and Need

Page 11 – Information about a secretarial order on rangeland fire management was added to further support the Need for action.

Pages 12 – A summary of public comments received on the December 2015 EA was added.

Page 17 – The *Tribes* subsection of the *Consultation* section was updated to reflect that tribes were provided a copy of the December 2015 EA.

Pages 17-18 – The *National Marine Fisheries Service* and *Fish and Wildlife Service* subsections of the *Consultation* section was updated to include additional information about ARBO II and aerial application. In addition, further information about listed plants was included in the *Fish and Wildlife Service* subsection.

Page 22 – In the description of the *Oregon Greater Sage-Grouse Approved Resource Management Plan*, an additional Management Decision regarding livestock grazing was included to indicate Research Natural Areas where targeted grazing would not occur.

Chapter 2 – The Alternatives

Page 28 – Additional information about Pesticide Application Records and monitoring that would be done because of a Project Design Feature adopted for this analysis was described in the *Implementation Monitoring* section.

Page 33 – Table 2-1, *Summary of Known Invasive Plant Sites* was updated to include an alternate Latin name for kochia and to note that oregano can occur in riparian areas.

Page 36 – Tansy ragwort and cutleaf teasel were added to Table 2-2, *Invasive Plants Documented on Neighboring Lands but Not Known to Occur on the District*.

Page 37 – Table 2-3, *Summary of Recent Wildfires on BLM-Administered Lands Larger Than 10 Acres* was updated with 2015 data.

Page 38 – Language describing why invasive annual grasses mapping data is not complete was added.

Pages 38 – Footnotes were added to Table 2-4, *Invasive Annual Grass Species Widespread on the District* to clarify noxious weed classifications.

Page 40 - A sentence was added clarifying that *Category 7, Lower Priority Invasive Plants* would be treated in the future if they become a threat.

Pages 40 – Curly dock and additional perennial grasses were included in Table 2-5, *Lower Priority Invasive Plants.*

Page 41 – The four herbicides available District-wide and three available in limited areas under the No Action Alternative have been listed.

Page 41 – Additional detail was added to the Proposed Action describing the use of prescribed fire and targeted grazing.

Page 43 – A footnote about planting and seeding was added to the *Competitive Seeding / Planting* section of the Proposed and Revised Proposed Action, Categories 1 and 2. This footnote directs the reader to the planting / seeding information previously described in the *Integrated Invasive Plant Management* section.

Page 43 – The reduction in use of the four herbicides available under the No Action Alternative is quantified in the Proposed and Revised Proposed Actions.

Page 44 – Information was added to clarify how invasive species other than invasive annual grasses would be treated in Category 4, under the Proposed and Revised Proposed Actions.

Page 45 – Clarification about acreage overlap between treatment types in Categories 5 and 6 was added.

Pages 46 – Further information was provided about targeted grazing using cattle in Categories 5 and 6 (invasive annual grasses) under the Proposed and Revised Proposed Actions.

Page 48 – Table 2-7, *Annual Treatment Summary* was updated. It now includes 2015 data and herbicide use authorized under recent emergency stabilization and rehabilitation and fuels management NEPA analyses. Footnotes have been added to describe the fiscal year. In addition, a footnote about biocontrol data was added.

Page 49 – Sulfometuron methyl was removed from the list of herbicides made available by the Buzzard Complex Fire Emergency Stabilization and Rehabilitation Decision Record, as described in Table 2-8, *Summary of Existing NEPA Authorizing Invasive Plant Treatments.*

Page 49 – Table 2-8, *Summary of Existing NEPA Authorizing Invasive Plant Treatments* was updated to reflect recently completed documents. Additional edits because of these new analyses also occurs in numerous effects sections.

Pages 51-53 – In addition to the additions of aminopyralid, fluroxypyr, and rimsulfuron, changes to Table 2-9, *Herbicide Information* include:

- The maximum application rate for glyphosate under the No Action Alternative has been corrected.
- A column indicating which herbicide is available under each alternative is provided.
- Several footnotes were clarified.
- For formatting reasons, the column “General Constraints from the Label” was removed. This information is included in Appendix B, Table B-1, *General Constraints from Herbicide Labels.*

Pages 54-73 – Changes were made to Table 2-10, *Treatment Key* as follows:

- Aminopyralid, rimsulfuron, fluroxypyr, tank mixes including these herbicides, and a Revised Proposed Action were added.
- Under the No Action Alternative, a column was added for the percent of acres where treatment would be used in limited areas authorized under emergency stabilization and rehabilitation and fuels management NEPA analyses.
- Under the No Action Alternative for some invasive plant species, there is no effective control method available. This has been noted for the following species groups: African Rue, Annual Grasses, Hawkweeds, Perennial Mustards, Russian Knapweed / Canada Thistle, and Trees and Shrubs.
- In the Invasive Annual Grasses species group, treatment considerations/notes for targeted grazing (cattle) was clarified to indicate that targeted grazing would happen outside of permitted grazing use.
- Imazapic was added as a treatment method for Perennial Mustards
- Aquatic 2,4-D or glyphosate was added as a treatment method for Spurges.
- Treatments for Curly Dock were added.
- Several treatment considerations and footnotes were clarified.

Pages 74-76 – Table 2-11, *Estimated Treatment Acres over the Life of the Plan* was updated to include some changes made to the Treatment Key (Table 2-10) and to include tank mix information. Additional information was provided for Categories 2, 3 and 4 explaining why acres are unknown. The information about the estimated treatment acres for Category 1 acres over the life of the plan for each individual herbicide was moved to a new table (Table 2-12, page 69).

Pages 77-80 – The 2015 Annual Treatment Plan (Table 2-13) was updated with the 2016 Annual Treatment Plan.

Page 82 – In the *Alternatives Considered but Eliminated from Detailed Study* section, the alternative for limiting herbicide treatments to early detection rapid response was amended to clarify that non-herbicide treatments would continue.

Page 82 – In the *Alternatives Considered but Eliminated from Detailed Study* section, the alternative for using herbicides on non-invasive plants was retitled for clarification.

Chapter 3 – Affected Environment and Environmental Consequences

Pages 83 – The *Determination of Effects in this Environmental Analysis* section includes additional detail and information about effects and how their intensities (negligible, minor, moderate, etc.) are defined. A new footnote explains that no adverse or moderate effects are expected.

Pages 88-89 – Additional projects and details about the lead agency, locations, and timeframes were identified for Table 3-2, *Ongoing and Reasonably Foreseeable Actions*.

Invasive Plants

Page 90 – The title of Table 3-3, *Summary of Invasive Plants Mapped in NISIMS by Infestation Size*, was changed to indicate that the data comes from NISIMS.

Page 90 – An additional citation for invasive annual grass effects on wildfire was provided.

Page 91-92 – More detail about livestock grazing as a route of spread was added.

Page 94 – The scientific name of the stem mining weevil was corrected.

Page 96 – A sentence was added further describing when targeted grazing would occur.

Page 96-97 - Additional effects of herbicides on invasive plants were provided for chlorsulfuron and metsulfuron methyl.

Native Vegetation

Page 109 - A sentence specifying that prescribed fire would be used during the spring or fall when remnant native grasses are less likely to be killed was added.

Page 110 - An example was provided to illustrate how a plant community could change.

Page 110 - Table 3-11, *Effects of Herbicides (Native Vegetation)* was linked to risk ratings provided in Appendix C. This same note was added for each resource section with a similar table.

Page 116 – A paragraph describing how invasive annual grasses act as sources of carbon was rewritten.

Page 117 – Information about the effects of targeted grazing were added to the Proposed Action.

Page 120 - Recently completed grazing management area changes were added to the cumulative effects.

Special Status Plants

Page 127 – Locations of potential habitat for Macfarlane's four o'clock and Howell's spectacular thelopody were added.

Page 127 – Information stating that pre-project clearances would be done for projects with the potential to disturb Special Status plant habitat was added to the *Standard Operating Procedures and Mitigation Measures Relevant to Effects* section.

Page 128 - Information was added to the footnote saying that buffer distances based on herbicide, method of application, and condition of site are contained in Appendix A.

Page 128 – One Project Design Feature was clarified for how consultation will be addressed if ARBO II is not relevant. (Changes and additions to Project Design Features are also reflected in Appendix A.)

Page 128 - A Project Design Feature was added to apply Conservation Measures for Bureau Sensitive plants. Additional detail regarding this project design feature was included in the Effects of Treatment Methods section.

Pages 129-130 – Three figures were added explaining the Endangered Species Act consultation process and where species occur.

Soil Resources

Page 137 – The source of soil survey data was added to a footnote in the *Affected Environment* section.

Page 138 – How organic matter affects soil compaction was clarified.

Page 141 – 145 - The Soil Pesticide Interaction Screening Procedure rating was updated for diflufenzopyr, fluridone, and hexazinone.

Throughout *Soil Resources* section – Where the word significant was used as an adjective for "large quantities" (such as "significant rainfall"), a synonym was found to avoid confusion with a determination of significance.

Page 147 – More information was provided about how to determine if effects to soils are "apparent".

Riparian Habitats

Page 166 – Table 3-24, *Mapped Invasive Plants in Riparian Areas* was added.

Page 168 - Language about targeted grazing on armored streambanks was previously described in the *Effects* section is now characterized as a Project Design Feature.

Page 168 – A section about the effects of non-herbicide treatment methods was added.

Page 169 – Details were added about where some herbicides could be used.

Fish and Other Aquatic Species

Pages 176-177 – The description of the federal listing status of Snake River Chinook and bull trout were corrected. “Coterminous” was defined in a footnote.

Page 181 – Language about Essential Fish Habitat was added, including a footnote linking to the *Essential Fish Habitat Conservation Measures* section in Appendix A.

Page 182 – A Mitigation Measure (adopted by the 2007 and 2016 PEISs) that adopts Conservation Measures (intended for listed species) where needed for other Bureau Sensitive species was added to the text.

Page 182 – A Mitigation Measure (adopted by the 2007 PEIS) about buffers was added to the text.

Page 183 - Additional information about what treatments are or are not allowed under ARBO II was added to the Project Design Feature. This was also updated in Appendix F, *Aquatic Restoration Biological Opinion (ARBO II) Project Design Criteria.*

Page 187 – More information was provided about the assumptions used in Risk Assessments for metsulfuron methyl.

Wildlife

Page 193 – More information was provided for why ingestion or direct contact from herbicides by wildlife was not analyzed in detail.

Page 194 - A citation for the lack of habitat and transient nature of Canada lynx and grey wolves was added.

Page 200 – A Mitigation Measure (adopted by the 2007 and 2016 PEISs) that adopts Conservation Measures (intended for listed species) where needed for other Bureau Sensitive species was added to the text.

Page 204 – Language was added about why there is no concern for animals grazing on invasive annual grasses treated with imazapic.

Page 205 - A footnote was added saying risks to non-target species associated with herbicide use are often approximated via the use of surrogate species.

Livestock Grazing

Page 210 – Information about total Animal Unit Months on the Vale District was added to the *Affected Environment* section.

Pages 211-212 – Additional detail was added to the *Treatments Planned Relating to the Issues* section.

Page 212 – A Project Design Feature was added saying cattle would not graze a site until desired grasses are mature enough to withstand grazing without damage.

Page 212 – A Project Design Feature was added to include implementation monitoring for targeted grazing with cattle.

Pages 216-218 – Additional detail was added to the *Effects by Alternative* section that further describe the impacts of targeted grazing to livestock grazing.

Page 219 – Future grazing management changes were added to the cumulative effects discussion.

Wild Horses

Page 219-220 – More information was provided for why effects to wild horses and burros were not analyzed in detail.

Wildland Fire and Fuels Management

Page 220 – A citation and additional information was added to describe how invasive annual grasses have affected fire return intervals.

Air Quality

Page 229 – Information about the effect of wildfire to air quality was added.

Cultural Resources and Resources Important to Native American Tribes

Page 231 – The Burns Paiute and Shoshone Bannock Tribe of Fort Hall were added to the list of tribes with federally acknowledged reserved rights.

Special Management Areas

Page 251– A visual resources Standard Operating Procedure was added to the *Standard Operating Procedures and Mitigation Measures Relevant to Effects Analysis* section.

Page 251 – BLM policy allowing nonnative seeding in ACECs but not RNAs or any other special management area was corrected. Language was added saying treatments in Special Management Areas are subject to direction from planning documents.

Page 252 – Information was added about targeted grazing being limited in certain Research Natural Areas because of Oregon Greater Sage-Grouse Resource Plan Amendments.

Page 252 – A paragraph was added describing how treatments would be designed to be consistent with management policy.

Lands with Wilderness Characteristics

Page 253 – The number of inventory units with wilderness characteristics was corrected and detail about their spatial distribution was added.

Minerals

Page 264 – Information about mining leases was clarified and the number of current leases was updated.

Socioeconomics

Page 268 – information about a 2016 drought in Vale District counties was included.

Environmental Justice

Page 270-271 – Language was added to describe why the issue in the *Environmental Justice* section was not analyzed in detail.

Human Health and Safety

Page 276 – A sentence was added describing that more recent research for fire-volatilized herbicides has not been identified.

Page 280 – A Standard Operating Procedure to use protective equipment was added.

Page 280 – Information on glyphosate and the lack of carcinogenic risk was added.

Page 280 - A footnote saying that a Mitigation Measure prohibiting broadcast spraying of triclopyr would not be applied because of updated Risk Assessments was deleted.

Page 281 – A footnote was added noting that accidental spill scenarios were modeled for some herbicides. These accidental spill scenarios were also added to Table 3-52, *Human Health Herbicide Risk Summary*.

Page 282 – A personal communication citation was updated.

Appendices

Appendix A: Project Design Features, Standard Operating Procedures, Mitigation Measures, Conservation Measures, Prevention Measures, and Best Management Practices

Page 317 – An example of a Standard Operating Procedure that would not be necessary was updated to one more easily understood.

Page 349 – Information about how tank mixes are assessed for their effects on listed species was added.

Pages 355-359 – Bird and mammal Conservation Measures were added that were mistakenly left out of the EA.

Page 359 – The section titled Fish Conservation Measures was renamed to *Essential Fish Habitat Conservation Measures*. (Other fish Conservation Measures can be found in the *Aquatic Animals Conservation Measures* section.)

Appendix B - The Herbicides, Formulations, and Adjuvants

Pages 374-380 - Table B-3 (*Adjuvants Approved for Use on BLM Administered Lands*) was updated to the latest versions (September 30, 2015) of these lists.

Appendix C - Herbicide Risk Assessment Summaries

Pages 392-397 – Footnotes were added to Table C-6 *(Forest Service-Evaluated Herbicide Risk Categories for Vegetation*) and Table C-8 (*Forest Service-Evaluated Herbicide Risk Categories for Human Health*) to clarify that a maximum rate of 1.9 lbs./acre for 2,4-D is used for risk ratings and to note that four risk assessments were updated in 2011 and included in the table.

Appendix F – Aquatic Restoration Biological Opinion (ARBO II) Project Design Criteria

Pages 422-423 – General Conservation Measures and Project Design Criteria for All Terrestrial and Fish Species were added.

Other Changes

Pages 284 – The terms “Acid Equivalent”, “Mitigation Measures”, “Project Design Features”, “Conservation Measures”, and “Wildfire” were added to the *Glossary* and the definitions of ‘wilderness inventory’ and ‘wildfire’ were amended.

Additions or corrections were made to *Acronyms and Abbreviations* (inside front cover), *References* (EA:296-315), *List of Preparers* (EA:316), and *Review Opportunities* (EA:316).

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

Integrated Invasive Plant Management for the Vale District Environmental Assessment (Revised December 2016)

(DOI-BLM-ORWA-V000-2011-047-EA)

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

Vale District
100 Oregon Street
Vale, OR 97918

Acronyms and Abbreviations

ACEC	Area of Critical Environmental Concern
A.E.	Acid Equivalent
A.I.	Active Ingredient
ALS	Acetolactate synthase
APHIS	Animal and Plant Health Inspection Service
ARBO	Aquatic Restoration Biological Opinion
ATV	All-Terrain Vehicle
AUM	Animal Unit Month
BAR	Burned Area Rehabilitation
BEE	With triclopyr, butoxyethyl ester
BLM	Bureau of Land Management
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulation
CWA	Clean Water Act
CWMA	Cooperative Weed Management Area
DEQ	Department of Environmental Quality
DSL	Department of State Lands
EA	Environmental Assessment
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESU	Evolutionarily Significant Unit
FIAT	Fire and Invasives Assessment Tool
FEIS	Final Environmental Impact Statement
FLPMA	Federal Land Policy and Management Act
FONSI	Finding of No Significant Impact
GAP	Gap Analysis Program
GHMA	General Habitat Management Area
GLEAMS	Groundwater Loading Effects of Agricultural Management Systems
HUC	Hydrologic Unit Code
IM	Instruction Memorandum
INFISH	Inland Native Fish Strategy
K_{oc}	Soil Adsorption Value
LD_{50}	Lethal Dose to 50% of a population
LOC	Level of Concern
NEPA	National Environmental Policy Act
NISIMS	National Invasive Species Information Management System
NMFS	National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
OAR	Oregon Administrative Rule
ODA	Oregon Department of Agriculture
ODFW	Oregon Department of Fish and Wildlife
OHV	Off-Highway Vehicle
ONA	Outstanding Natural Area
Oregon FEIS	Vegetation Treatments Using Herbicides on BLM Lands in Oregon FEIS (2010)
ODF	Oregon Department of Forestry
ORV	Outstandingly Remarkable Value
PAC	Priority Areas of Conservation
PACFISH	Interim Strategies for Managing Anadromous Fish-producing Watersheds
PARP	Pesticide Adsorbed Runoff Potential
PEIS	Vegetation Treatments Using Herbicides on BLM Lands in 17 Western States Programmatic FEIS (2010)
PFC	Proper Functioning Condition
PHMA	Priority Habitat Management Area
pH	potential of Hydrogen (measure of acidity)
PLP	Pesticide Leaching Potential
POEA	Polyoxyethylenamine, a surfactant found in some glyphosate formulations
RMP	Resource Management Plan
RNA	Research Natural Area
SHPO	State Historic Preservation Office
TEA	With triclopyr, triethylamine salt
TEP	Federally listed as threatened or endangered, or proposed for such listing
TMDL	Total Maximum Daily Load
USDA	United States Department of Agriculture
USDI	United States Department of the Interior
UTV	Utility Terrain Vehicle
VRM	Visual Resource Management
WSA	Wilderness Study Area

Table of Contents

Consultation and Coordination

Tables

Figures

Appendices

Maps

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

Chapter 1 – Purpose and Need

Introduction

The Vale District manages just over 5 million acres of public lands[1] located primarily in Malheur and Baker Counties, with portions also in Harney, Grant, Wallowa, Union, Umatilla, and Morrow Counties, all in eastern Oregon, and in Asotin County in southeast Washington (see Map 1-1; maps are located in a separate downloadable file, available on the BLM Vale website or at the end of this printed document). The District is proposing to update its existing integrated noxious weed management program. The District currently controls noxious weeds following existing BLM policy and direction and a District-wide 1989 *Integrated Weed Control Plan and Environmental Assessment (EA)* and Decision Record, using a range of methods including manual, mechanical, biological control agents (mostly insects), targeted grazing, prescribed fire, and herbicides (2,4-D, dicamba, glyphosate, and picloram).[2] The District proposes to update and expand this program by:

- Increasing the kinds of plants controlled from noxious weeds to all invasive plants; and,
- Increasing the number of herbicides to be used from 4 to 17.

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

Invasive annual grasses like cheatgrass (not designated as noxious) are causing widespread ecological damage including damage to habitats for Special Status species such as Greater Sage-Grouse. The additional herbicides are generally more selective, provide better control, have fewer adverse environmental effects, are effective at lower doses, are better suited for controlling an increasing number of species of invasive plants and for managing the potential for herbicide resistance, and can be used to make associated non-herbicide methods (including prescribed fire) more available and more effective (USDI 2010b:19-25).

The additional herbicides, and their use on all invasive plants, were addressed in the 2010 Final Environmental Impact Statement (Oregon FEIS) and Record of Decision for *Vegetation Treatments Using Herbicides on BLM Lands in Oregon* (USDI 2010a, b)[3] and the 2016 Final Programmatic Environmental Impact Statement (2016 PEIS) and Record of Decision for *Vegetation Treatments Using Aminopyralid, Fluroxypyr, and Rimsulfuron* (USDI 2016a, b). A 1984 / 87 court injunction had limited the BLM to using only four herbicides and restricting their use to noxious weeds only (USDI 2010a:3). This injunction was amended following completion of the 2010 Oregon FEIS and Record of Decision to permit the use of additional herbicides and targeting additional species once site-specific EAs were completed, tiered to the Oregon FEIS, a similar 2007 western states EIS (USDI 2007a), or subsequent EISs[4].

[1] Approximately 14,000 acres in Morrow and Umatilla Counties officially within the Vale District are wholly administered by the Prineville District, as addressed in a 2003 Memorandum of Understanding between the Vale and Prineville Districts. These acres are included and analyzed in the 2016 Prineville District *Integrated Invasive Plant Management Revised EA* (USDI 2016d), and would be treated according to that analysis. All mapped invasive plant infestations on the Vale District, including acres administered by the Prineville EA, are included in tables and maps in this EA.
[2] Additional site-specific herbicide treatments have been authorized since 2010 for wildfire emergency stabilization and rehabilitation and fuels management. See description of the No Action Alternative in Chapter 2.
[3] For the portion of the District in Washington, the additional herbicides were addressed in the *Final Vegetation Treatments Using Herbicides on Bureau of Land Management Lands in 17 Western States Programmatic Environmental Impact Statemen*t (2007 PEIS, USDI 2007a).
[4] Such as the 2016 *PEIS for Vegetation Treatments Using Aminopyralid, Fluroxypyr, and Rimsulfuron*.

This EA examines the environmental effects of the proposal at a site-specific scale within the District. It will replace the 1989 *Vale District Integrated Weed Control Plan and Environmental Assessment*.

The Need

Fifty species of terrestrial and aquatic invasive plants now occupy over 197,781 acres in over 27,500 separate known locations[5], with individual locations ranging from a few plants to 5,000 and 10,000 acre sites of medusahead rye (*Taeniatherum caput-medusae*) and rush skeletonweed (*Chondrilla juncea*) respectively. Unmapped invasive annual grass infestations (medusahead rye, cheatgrass, and ventenata) occupy hundreds of thousands of additional acres within the District. In spite of the efforts of the existing noxious weed program, noxious weeds are continuing to spread at an estimated rate of 12 percent per year (USDI 2010a:133).[6] Adverse effects are loss or degradation of ecosystem function including displacement of native vegetation; reduction in habitat and forage for wildlife and livestock; loss of federally listed and other Special Status species' habitat; increased soil erosion; reduced water quality; reduced soil productivity; reduced wilderness and recreation values; and, changes in the intensity and frequency of fires (USDI 2010a:7).

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

More selective herbicides are now available to treat invasive plants. These herbicides can be used in lower quantities, and they pose less environmental and human health safety risk than the four herbicides currently being utilized (USDI 2010a:80 and others). In addition, if these additional herbicides were available, invasive plant treatment efficacy would improve from an estimated 60 percent to 80 percent (USDI 2010a:136).

Invasive plants may also spread to adjacent non-BLM-administered lands, increasing control costs for affected landowners and degrading land values. The BLM participates in cooperative public / private invasive plant control efforts such as the BLM-Malheur County Noxious Weed Partnership, the Jordan Valley Cooperative Weed Management Area (CWMA), and the Tri-County CWMA.[7] However, the BLM's current inability to use herbicides commonly used by cooperators on adjacent lands results in less effective control and / or coordination difficulties.

Executive Order 13112 (February 1999) requires Federal agencies to "(i) prevent the introduction of invasive species; (ii) detect and respond rapidly to and control populations of such species in a cost-effective and environmentally sound manner; (iii) monitor invasive species populations accurately and reliably; [and] (iv) provide for restoration of native species and habitat conditions in ecosystems that have been invaded…" Secretarial Order 3336 (January 2015) sets forth policies and strategies for the Department of the Interior for preventing and suppressing rangeland fire and for restoring sagebrush landscapes impacted by fire across the West. These actions are essential for conserving habitat for the Greater Sage-Grouse as well as other wildlife species and economic activity, such as ranching and recreation. The Order states, "The accelerated invasion of nonnative annual grasses, in particular cheatgrass and medusahead rye, and the spread of pinyon-juniper across the sagebrush-steppe ecosystem, along with drought and the effects of climate change, have created conditions that have led to the

[5] Summarized on Table 2-1 in Chapter 2.
[6] See also the rate of spread discussion in the *Invasive Plants* section early in Chapter 3.
[7] The Tri-County CWMA involves Baker, Union, and Wallowa Counties.

increased threat of rangeland fires." In addition, section 302(b) of the *Federal Land Policy and Management Act* of 1976 directs BLM to "take any action necessary to prevent unnecessary or undue degradation of the lands" (43 U.S.C. 1732(b)(2)).

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

The Purposes

The District proposes to update the existing noxious weed management program so it would more effectively:

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

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

Public Involvement

Scoping

External scoping for the EA was conducted June 22 through July 22, 2011, with letters sent to interested publics and legal notices published in the Baker City Herald, Argus Observer (Ontario), Malheur Enterprise (Vale), and the Humboldt Sun (Winnemucca). Scoping was reopened from September 12 through October 13, 2011 with an additional mailing to 676 addresses, because the original scoping mailing list was discovered to have been incomplete. Five scoping responses were received. These letters, along with other pertinent information, were used to help develop the *Purposes* and *Issues*. Internal BLM scoping and the Purposes examined in the Oregon FEIS also contributed to the *Purposes*.

Public Comments on the December 2015 EA

The EA was sent out for a 45-day public comment period on December 22, 2015. Notices were sent to interested parties and legal notices were published in the Baker City Herald, Argus Observer (Ontario) and the Malheur Enterprise (Vale). Eighteen public comment letters were received from individuals, organizations, businesses, and state and county government agencies. Substantive comments were identified and responses were developed by the BLM. Responses to these substantive comments are included in Appendix 1 of the Decision Record. Substantive comments were considered and, as appropriate, addressed in this Revised EA.

Public Comments on the September 2016 Revised EA

The EA was sent out for a 30-day public comment period on September 10, 2016. Notices were sent to interested parties and legal notices were published in the Baker City Herald, Argus Observer (Ontario), Malheur Enterprise (Vale), and the Humboldt Sun (Winnemucca, NV). Three public comment letters were received. Substantive comments were identified and responses were developed by the BLM. Responses to these substantive comments are included in Appendices 1 and 2 of the Decision Record. Substantive comments were considered and, as appropriate, addressed in this Revised EA.

Issues

The issues identified during internal (BLM) and external (public) scoping were used to guide the effects analysis in Chapter 3. In the list below, the issues have been framed as questions.

Issues are analyzed when:

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

Several issues identified during internal and external scoping were considered but not analyzed in detail in this EA. In general, the issues not analyzed in detail in this EA have already been addressed in documents to which this EA tiers and a) there is not enough difference between the alternatives relative to the issue for an analysis to aid the decision-maker and b) because of required Project Design Features (see Appendix A, *Project Design Features, Standard Operating Procedures, Mitigation Measures, Conservation Measures, Prevention Measures, and Best Management Practices*), there is negligible likelihood that detailed analysis of these issues would reveal a potentially significant effect to the human environment which hasn't already been disclosed in the documents to which this EA tiers. Further information about all issues in the list below is included in Chapter 3.

Invasive Plants

- How would the alternatives reduce the spread of noxious weeds and other invasive plants?
- How would the alternatives respond to a tendency for some populations of invasive plants to develop resistance to an herbicide?
- How would the alternatives affect the BLM's invasive plant management cooperators?

Native Vegetation

- How would the alternatives affect native plant communities?
- How would the alternatives address shifts in vegetation composition caused by climate change?

Special Status Plants

- How would the alternatives affect Special Status plant species?

Soil Resources

- How would the alternatives affect microbiotic soil crusts?
- Are there soils / conditions where particular herbicides included in the alternatives could be transported off site?
- What are the effects of herbicides on soils?
- How would targeted grazing of invasive annual grasses affect soils?
- What soil properties or limitations could inhibit the establishment of proposed seedings?

Water Resources

- How would the alternatives affect surface water quality including sediment, temperature, dissolved oxygen, and chemical contamination?
- How would the alternatives affect the safety of drinking, irrigation, or stock water?
- How would the alternatives affect bioaccumulation of herbicides in hydrologic systems including groundwater and streams?
- How would the alternatives affect stream channel stability and structural complexity?

Riparian Habitats

- How would the alternatives affect the health and function of riparian and wetland areas?
- How would the alternatives affect riparian vegetation?

Fish and Other Aquatic Species

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

Wildlife

- How would treatment disturbances (noise, presence of humans) and the timing of that disturbance affect migratory birds and Special Status wildlife species?
- How would large-area treatments affect smaller resident species and publicly important species such as mule deer, elk, pronghorn, and bighorn sheep?
- How would the alternatives affect habitat quality (forage and cover availability, quality, and quantity)?
- How would the alternatives affect pollinators?

Wildlife Issues Not Analyzed in Detail

- How would direct contact or ingestion of herbicides affect browse or prey species, especially smaller species that are unable to move away from treatments?
- How would the alternatives affect Canada lynx, gray wolves, and yellow-billed cuckoo on the District?

Livestock Grazing

- How would herbicide restrictions affect livestock grazing on BLM allotments?
- How would the alternatives affect livestock and their forage?
- How would targeted grazing of invasive annual species affect existing grazing permits?

Wild Horses (Not Analyzed in Detail)

- How would consumption of herbicide-treated vegetation affect wild horses?
- How would herbicide treatment activities affect wild horses?

Wildland Fire and Fuels Management

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

Air Quality

- How would the alternatives affect air quality?

Cultural Resources and Resources Important to Native American Tribes

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

Recreation

- How would the alternatives affect the recreating public? (see also *Human Health*)
- How would the alternatives affect access to recreation sites?
- How would the alternatives affect pets?

Visual Resources

- How would the alternatives affect visual resource objectives?

Special Management Areas

- How would the alternatives affect special management areas like Wilderness Areas, Wilderness Study Areas, Areas of Critical Environmental Concerns, Research Natural Areas, and those areas determined to be administratively suitable for national Wild and Scenic River designations?

Lands with Wilderness Characteristics

- How would the alternatives affect lands with wilderness characteristics?

Lands and Realty

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

Minerals

- How would the alternatives affect mineral development, operations, and reclamation for saleable, leasable, and locatable minerals?

Socioeconomics

- How would the alternatives affect adjacent landowners?
- How would the alternatives affect permitted land uses?

Environmental Justice (Not Analyzed in Detail)

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

Implementation Costs

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

Human Health and Safety

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

Human Health and Safety Issues Not Analyzed in Detail

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

Decision to be Made

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

Consultation

Tribes

Tribal consultation was initiated in June 2011 with letters to the Confederated Tribes of Umatilla Indian Reservation, Fort McDermitt Paiute-Shoshone, Burns Paiute, Nez Perce, Shoshone-Paiute Tribes of the Duck Valley Indian Reservation, Confederated Tribes of Warm Springs, and the Shoshone-Bannock Tribes of Fort Hall. The letters described the proposed EA, announced that scoping would begin in mid-June, and encouraged the tribes to enter into government-to-government consultation and be involved with the process. Another letter repeating the offer was sent in September 2013.

Following a delay in the preparation of this EA, these tribes were contacted in January 2015 with letters and phone calls. The letters described the proposed EA and encouraged the involvement of the tribes. All tribes received the EA during the December 2015 and September 2016 public comment periods and were invited to comment or consult.

Issues identified through consultation with the tribes, and resultant Project Design Features (mitigation measures), are addressed in detail in Chapter 3 of this EA under the *Cultural Resources and Resources Important to Native American Tribes* section.

State Historic Preservation Office (SHPO)

As part of BLM's requirements under Section 106 of the *National Historic Preservation Act*, consultation with SHPO would occur as appropriate on Annual Treatment Plans to determine how vegetation treatments could affect cultural resources.

In Oregon, the BLM will follow the 2015 State Protocol between the Oregon BLM and the Oregon SHPO regarding the manner in which the Bureau of Land Management will meet its responsibilities under the *National Historic Preservation Act* and the National Programmatic Agreement among the BLM, the Advisory Council on Historic Preservation, and The National Conference of State Historic Preservation Officers (Oregon SHPO and USDI 2015). Under this agreement, some treatments would be exempt from field survey and consultation with SHPO (for example, herbicide application where it would be unlikely to affect rock art images or traditional Native American plant gathering areas as determined in consultation with affected tribes).

In Washington, the BLM will follow 36 Code of Federal Regulations (CFR) Part 800, including necessary consultations with State Historic Preservation Officers and interested tribes.

National Marine Fisheries Service

The Revised Proposed Action could potentially affect the Middle Columbia and Snake River steelhead and their designated critical habitats, as well as the Snake River Chinook salmon spring / summer run and the fall run (all threatened) and their designated critical habitats and essential fish habitat. The effects from invasive plant control actions on these species were analyzed in the Aquatic Restoration Biological Assessment II (ARBA II) with a determination of "may affect, likely to adversely affect" and were provided *Endangered Species Act and Magnuson-Stevens Fishery Conservation Act* coverage under the National Marine Fisheries Service's Aquatic Restoration Biological Opinion (ARBO II, NMFS 2013).

In ARBO II, NMFS determined that the proposed action was not likely to jeopardize the continued existence of the Middle Columbia and Snake River steelhead, Snake River Chinook salmon spring / summer run and Snake River Chinook fall run, or result in the destruction or adverse modification of designated critical habitat. Project design criteria for invasive plant control outlined in NMFS's ARBO II were fully incorporated into Project Design Features of this EA (see Appendix F, *Aquatic Restoration Biological Opinion (ARBO II) Project Design Criteria*) and the extent of take authorized in ARBO II correlates to the extent of treated areas outlined in the Project Design Criteria of ARBO II (i.e. less than, or equal to, 10 percent of the acres in a riparian reserve within a 6th field HUC watershed/year).

ARBO II does not address aerial application of herbicides nor does it address the use of fluroxypyr, fluridone, hexazinone, or rimsulfuron (four of the 17 herbicides proposed for use under the Revised Proposed Action).

However, all other herbicide treatments included in ARBO II are consistent with those included in the Revised Proposed Action; therefore, ARBO II provides consultation coverage for most treatments. If aerial application or use of these four herbicides needed to occur in areas where treatments may have the potential to affect listed species or habitat, additional consultation with NMFS would occur[8]. Further details can be found in the *Fish and Other Aquatic Species* section.

U.S. Fish and Wildlife Service

There are two federally listed resident fish, the bull trout (threatened) and the Lahontan cutthroat trout (threatened), on the District. The effects to these species from invasive plant control actions were analyzed in the Aquatic Restoration Biological Assessment II (ARBA II) with a determination of "may affect, likely to adversely affect" and were provided *Endangered Species Act* coverage under the U.S. Fish and Wildlife Service's Aquatic Restoration Biological Opinion (ARBO II, USDI 2013a). In the ARBO II, the Fish and Wildlife Service determined that the proposed action was not likely to jeopardize the continued existence, or result in the destruction or adverse modification of designated critical habitat for bull trout and its critical habitat, and Lahontan cutthroat (no designated critical habitat).

There are three federally listed plants (the Spalding's catchfly (threatened), the Howell's spectacular thelypody (threatened), and the McFarlane's four-o'clock (threatened)) that are known or suspected on the District. These species are also addressed in ARBO II with a *"not likely to adversely affect"* determination.

Project design criteria for invasive plant control outlined in the Fish and Wildlife Service's ARBO II were fully incorporated into Project Design Features of this EA (see Appendix F, Aquatic Restoration Biological Opinion (ARBO II) Project Design Criteria). For federally listed resident fish, the extent of take authorized in ARBO II correlates to the extent of treated areas outlined in the Project Design Criteria of ARBO II (i.e. less than, or equal to, 10 percent of the acres in a riparian reserve within a 6th field HUC watershed/year). For federally listed plants, if a known site of a listed plant is within 0.25-mile of treatment site, or if suitable or potential habitat may be affected by a treatment, then Conservation Measures listed in Appendix A would apply.

Since ARBO II does not cover aerial applications or use of fluroxypyr, fluridone, hexazinone, or rimsulfuron, additional consultation with U.S. Fish and Wildlife Service would occur if these treatments have the potential to affect listed species or habitat[8,9].

There are two federally listed terrestrial animals, the yellow-billed cuckoo (threatened) and the Canada lynx (threatened). The last recorded observations of the yellow-billed cuckoo on the Vale District were in the 1940s. Although Canada lynx have been known to pass through the District, they are assumed an occasional visitor to the area. Not much is known about their populations. As there is no credible possibility for adverse effects to these species, formal consultation on the yellow-billed cuckoo and Canada lynx was not initiated. While the gray wolf is federally listed as endangered, the Northern Rocky Mountain population of gray wolf that occurs in the Vale District was delisted in 2009 as recovered.

Further details about these species can be found in the *Special Status Plants, Fish and Other Aquatic Species,* and *Wildlife* sections.

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[8] See Table 3-29, *Federally Listed Fish: No-Application Buffer Widths for Herbicides*, in the *Fish and Other Aquatic Species* section for more information about conditions where additional consultation may need to occur.
[9] See Figure 3-2, *Consultation Conditions for Federally Listed Plants*, in the *Special Status Plants* section for a flow chart that clarifies under which conditions additional consultation would need to occur.

Tiering and Reference

For its analysis of 14 herbicides, this EA tiers to the Oregon FEIS (USDI 2010a, b) in Oregon and to the *Final Vegetation Treatments Using Herbicides on Bureau of Land Management Lands in 17 Western States Programmatic Environmental Impact Statement* (USDI 2007a, c)[10] for lands in Washington. This EA also tiers to the *Final Programmatic EIS for Vegetation Treatments Using Aminopyralid, Fluroxypyr, and Rimsulfuron* (USDI 2016a, b) and to the 1985 / 87 Northwest Area Noxious Weed Control Program Final EIS and Supplement (USDI 1985, 1987) for non-herbicide treatments. In addition, this EA incorporates by reference elements of the 2007 *Vegetation Treatments on BLM Lands in 17 Western States Programmatic Environmental Report,* which describes the integrated vegetation management program and discloses the general effects associated with non-herbicide control methods (USDI 2007b). The EA also tiers to the Southeastern Oregon and Baker Resource Management Plans (USDI 2002, 1989b), which include invasive plant control activities in the full range of ongoing management activities for which environmental effects are described.

Conformance with Land Use Plans, Laws, Policies, and other Decisions

The *Federal Land Policy and Management Act* (1976) requires that all management decisions be consistent with the approved land use plan (43 CFR 1610.5-3). Management activities on the Vale District are covered by two Resource Management Plans, the *Southeastern Oregon Resource Management Plan and Record of Decision* (USDI 2002) and the *Baker Resource Management Plan Record of Decision* (USDI 1989b). These are the primary governing land use plans for the area. Both plans were amended by the 2015 Record of Decision and Oregon Greater Sage-Grouse Approved Resource Management Plan Amendments (USDI 2015c).

Southeastern Oregon Resource Management Plan and Record of Decision

The RMP provides goals and management direction related to noxious weed management in the following sections:

Relationship to Other BLM Planning Documents

"There are several existing activity plans that are acknowledged as current guidance. They will be updated or modified, as necessary, to include current information and / or to be in conformance with the approved RMP [Resource Management Plan]. These plans include […] noxious weed control […]" (USDI 2002:14).

Forest and Woodland Management

"The BLM will work with county, State, and Federal agencies to monitor the locations and spread of noxious weeds. Noxious weed control will be conducted in accordance with the integrated weed management guidelines and design features identified in the "Northwest Area Noxious Weed Control Program EIS" (USDI 1985). Control of noxious weeds will occur in Special Management Areas (SMAs), if needed, but may include certain restrictions to reduce potential effects on specific values. The BLM will assess land prior to acquisition to determine whether or not noxious weeds are present" (USDI 2002:11). (The Northwest Area Noxious Weed Control Program EIS design

[10] The Oregon FEIS tiers to the 2007 Vegetation Treatments Using Herbicides on Bureau of Land Management Lands in 17 Western States Programmatic Environmental Impact Statement (2007 PEIS) and the Oregon FEIS incorporates the 2007 PEIS in its entirety as its Appendix 1.

features have been effectively amended by the Standard Operating Procedures, Mitigation Measures, and other measures adopted by the Oregon Record of Decision (USDI 2010b).)

Rangeland Vegetation

Objective 3: Control the introduction and proliferation of noxious weed species and reduce the extent and density of established weed species to within acceptable limits.

Management Actions: "The distribution and density of noxious weeds will be reduced through the application of approved control methods in an integrated program in cooperation with the State of Oregon, Malheur County, Harney County, and other adjoining counties, adjoining private landowners, and other affected agencies and interests. Control methods will include preventive management to maintain competitive vegetation cover and reduce the distribution and introduction of noxious weed seed; manual and mechanical methods to physically remove noxious weeds; biological methods to introduce and cultivate factors that naturally limit the spread of noxious weeds; cultural practices; and application of chemicals. Target species will include those identified by county, State, and BLM weed priority lists" (USDI 2002:41).

Management Common to all ACECs

"Noxious weeds will be aggressively controlled using integrated weed management methods, such as biological control, site-specific spraying, and grubbing by hand, consistent with protection and enhancement of relevant and important values" (USDI 2002:68,73). For some ACECs, the limits of this consistency are defined. For example, the Toppin Creek Butte ACEC / RNA includes WSAs, and management direction includes "Noxious weeds will be aggressively controlled using limited methods, such as backpack hand sprayers, focusing on roads and other disturbed areas in and adjacent to the ACEC / RNA" (USDI 2002:101).

Monitoring

"A monitoring plan for each resource area would be developed during the implementation of the land use plan, and would include a monitoring and evaluation schedule. Monitoring has been or will be designed in conjunction with the activity plans, or as needed to monitor specific objectives" (USDI 2002:138).

Baker Resource Management Plan Record of Decision

This plan covers BLM-administered public land in Asotin County (Washington) and Morrow, Umatilla, Union, Wallowa, and Baker Counties (Oregon) on the Vale District. The RMP provides goals and management direction related to noxious weed management in the following sections:

Noxious Weed Control

"Infestations of noxious weeds are known to occur on some public lands in the planning area (refer to Figures 2 and 3). The most common noxious weeds are diffuse, spotted, and Russian knapweed, yellow starthistle, Canada thistle, whitetop, and yellow leafy spurge. Control methods will be proposed and subject to site-specific environmental analyses consistent with the Record of Decision on BLM's Northwest Area Noxious Weed Control Program EIS and EIS Supplement. Control methods will not be considered unless the weeds are confined to public lands or control efforts are coordinated with owners of adjoining infested non-public lands. Proper grazing management will be emphasized after control to minimize possible reinfestation. Coordination and cooperation with county weed control officers will continue on a regular basis" (USDI 1989b:50).

A new Baker Resource Management Plan is being prepared, but nothing in the draft of that plan conflicts with the Proposed or Revised Proposed Actions in this EA.

Oregon Greater Sage-Grouse Approved Resource Management Plan Amendment

The Oregon Greater Sage-Grouse Approved Resource Management Plan Amendment (USDI 2015a) amends all of the Resource Management Plans in place on the Vale District. The amendments include Greater Sage-Grouse habitat management direction that avoids and minimizes additional disturbance in Greater Sage-Grouse habitat management areas. Moreover, they target restoration of and improvements to the most important areas of habitat, including the following guidance:

Special Status Species

- Objective SSS 4: Manage land resource uses in GRSG habitat to meet the desired conditions described in Table 2-2, Habitat Objectives for Greater Sage-Grouse(USDI 2015a:2-4). Use the desired conditions to evaluate management actions that are proposed in GRSG habitat to ensure that habitat conditions are maintained if they are currently meeting objectives or habitat conditions move toward these objectives if the current conditions do not meet these objectives

- Management Direction SSS-13: All authorized actions in Greater Sage-Grouse habitat are subject to RDFs [Required Design Features] and BMPs [Best Management Practices] in Appendix C [of the Oregon Greater Sage-Grouse Approved Resource Management Plan Amendment (USDI 2015)].

  Relevant Required Design Features:

  - Common to All: Train all personnel and contractors on GRSG [Greater Sage-Grouse] biology, habitat requirements, and identification of local areas used by the birds

  - Noise (applicable to all activities): Limit noise at the perimeter of occupied or pending leks from two hours before to two hours after sunrise and sunset during the breeding season to less than 10 decibels above ambient sound levels.

Vegetation

- Goal VEG 3: Use integrated vegetation management to control, suppress, and eradicate invasive plant species per BLM Handbook H-1740-2. Apply ecologically based invasive plant management principles in developing responses to invasive plant species.

- Objective VEG 3: Reduce the area dominated by invasive annual grasses to no more than 5 percent within 4.0 miles of all occupied or pending leks. Manage vegetation to retain resistance to invasion where invasive annual grasses dominate less than 5 percent of the area within 4.0 miles of such leks.

- Objective VEG 6: Conduct vegetation treatments based on the following 10-year (decadal) acreage objectives within four miles of occupied and pending leks, using results of the fire and invasives assessment tool (FIAT; Fire and Invasive Assessment Team 2014[11]) to establish the priority PACs [Priority Areas of Conservation] and treatments within PACs.

- Objective VEG 8: Coordinate vegetation management activities with adjoining landowners.

[11] FIAT provides the BLM and other agencies with a mechanism to collaboratively identify and prioritize areas within sage-grouse habitat for potential treatment based on their resistance and resilience after long-term ecosystem shifts following a disturbance event, such as wildfire. It identifies areas, based on national datasets and scientific literature, where threats from conifer expansion and wildfire/invasive annual grass are highest.

Habitat Restoration

- Management Decision VEG 5: Vegetation management activities that are timing-sensitive for maximum effectiveness, such as herbicide application or seeding operations, can occur during the breeding season within 4.0 miles of occupied or pending leks. Limit operations to no more than 5 days and to the period beginning two hours after sunrise and ending two hours before sunset during the breeding and early brood rearing period. Conduct pre-treatment surveys for nests and do not damage or destroy identified nests during treatment operations. Conduct operations so as to minimize the risk of accidentally killing chicks. Breeding and early-brood-rearing typically occur from March 1 through June 30; use local information to further refine this period.

- Management Decision VEG 14: Allowable methods for vegetation treatment include mechanical, biological (including targeted grazing), chemical, or wildland fire or combinations of these general treatment categories.

Integrated Invasive Species Management

- Management Decision VEG 20: In Priority treatment areas for invasive annual grasses, apply early detection-rapid response principles on:
    - New infestations.
    - Satellite populations.
    - Isolated populations.
    - Where invasive annual grasses are still sub-dominant.
    - Edges of large infestations.
    - Where sites are frequently or commonly used for temporary infrastructure such as incident base camps, spike camps, staging areas, and helicopter landing areas.

- Management Decision VEG 21: Allowable methods of invasive plant control include mechanical, chemical, biological (including targeted grazing, biocides, and bio-controls), or prescribed fire or combinations of these methods. Treat areas that contain cheatgrass and other invasive or noxious species to minimize competition and favor establishment of desired species.

- Management Direction VEG 22: Use of approved herbicides, biocides, and bio-controls is allowed on all land allocations currently providing or reasonably expected to provide Greater Sage-Grouse habitat. Follow the guidance in the 2010 Record of Decision for Vegetation Treatments Using Herbicides on BLM Lands in Oregon and subsequent step-down decision records, when complete, or successor/subsequent decisions governing the use of additional herbicides and biocides.

Livestock Grazing/Range Management

- Objective LG 2: On BLM-managed lands, 12,083,622 [in Oregon] acres will continue to be available for livestock grazing in Greater Sage-Grouse habitat. In key RNAs [Research Natural Areas], 22,765 [in Oregon] acres will be unavailable to livestock grazing[12]. See Table 1-1, Key RNAs.

[12] Targeted grazing would not occur in these RNAs.

Table 1-1. Key RNAs

RNA Name	RNA Acres	RNA Acres Unavailable to Grazing	Estimated Reduction of AUMs [animal unit months]
Black Canyon	2,639	2,640	225
Dry Creek Bench	1,637	622	101
Lake Ridge	3,860	769	229
Mahogany Ridge	682	155	22
North Ridge Bully Creek	1,569	164	46
South Bull Canyon	790	747	89
South Ridge Bully Creek	621	397	166
Spring Mountain	996	995	137
Toppin Creek Butte	3,998	2,865	504

Invasive Plant / Noxious Weed Management

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

Integrated Vegetation Management (BLM Manual Handbook 1740-2)

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

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

This EA tiers to, and is consistent with, the Oregon FEIS and Record of Decision. The 2010 Record of Decision for *Vegetation Treatments Using Herbicides on BLM Lands in Oregon* requires, with few specific exceptions[13], the preparation of new site-specific analyses before herbicides other than 2,4-D, dicamba, glyphosate, or picloram can be used (USDI 2010b). This EA provides the site-specific analysis for the Vale District. All of the alternatives (including the No Action Alternative) must adhere to the existing Standard Operating Procedures and other elements adopted by the Oregon Record of Decision (USDI 2010b:30). The “other elements” are the 2007 Mitigation Measures from *the Vegetation Treatments Using Herbicides on BLM Lands in 17 Western States Programmatic FEIS* (PEIS) shown together with the Standard Operating Procedures in the *Oregon Record of*

[13] Exceptions include NEPA done for certain seed orchards in Western Oregon and an EA for Sudden Oak Death on the Coos Bay District (USDI 2010b:30).

Decision Attachment A (USDI 2010b:33), the Conservation Measures for Special Status species shown in Oregon Record of Decision Attachment B (USDI 2010b:47), and the Oregon Mitigation Measures[14] included in the Oregon Record of Decision (USDI 2010b:12-15), all included in Appendix A of this EA, as well as the typical and maximum application rates if they are less than those in the existing District *National Environmental Policy Act* (NEPA) documents (USDI 2010b:10-11).

Vegetation Treatments Using Aminopyralid, Fluroxypyr, and Rimsulfuron PEIS and Record of Decision

This EA tiers to, and is consistent with, the 2016 *Vegetation Treatments Using Aminopyralid, Fluroxypyr, and Rimsulfuron* PEIS and Record of Decision. This EA provides the site-specific analysis for the Vale District. All of the alternatives (including the No Action Alternative) must adhere to the Mitigation Measures and Conservation Measures adopted with this analysis, and these are all included in Appendix A of this EA.

Federal Strategy to Promote the Health of Pollinators

On June 20, 2014, the President issued a memorandum directing the establishment of a Pollinator Health Task Force, chaired by the Secretary of Agriculture and Administrator of the Environmental Protection Agency. The memorandum directs the creation of a national Pollinator Health Strategy with research, education, and public-private partnership objectives. It further directs agencies to develop plans and practices for increasing and improving pollinator habitat, including the use of pollinator-friendly species in future restoration and rehabilitation projects, following wildfires, and in landscaping. To support these habitat-focused efforts, the Department of Agriculture and the Department of the Interior issued a draft set of Pollinator-Friendly Best Management Practices for Federal Lands (USDA and USDI 2015), which include direction to identify and remove invasive species. Direction includes, "Management of invasive species may include felling by hand or machine, machine mulching, applying spot treatments of herbicide to bark, cut stumps, or leaves, controlled burning, mowing, or combinations of the approaches" (USDA and USDI 2015). The National Pollinator Health Strategy states that agencies "shall, as appropriate, take immediate measures to support pollinators during the 2014 growing season and thereafter. These measures may include avoiding the use of pesticides[15] in sensitive pollinator habitats through integrated vegetation and pest management practices."

Nothing about the Revised Proposed Action or the analysis in this EA conflicts with the objectives of this new direction. Memorandum-described pollinator direction, as it is developed, may supplement but is not expected to conflict with, treatments described in this EA. Standard Operating Procedures and Mitigation Measures for pollinators outlined in Appendix A conform with the Strategy. There is a long-term benefit from controlling invasive plants and allowing native vegetation to reestablish. Further information can be found in the *Wildlife, Special Status Species (Wildlife), and Migratory Birds* section.

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

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

Clean Water Act - Section 303(d)

Under Section 303(d) of the *Clean Water Act*, the Oregon Department of Environmental Quality establishes standards for the maximum amount of a pollutant that can be received by water quality limited waterbodies in the state of Oregon. The BLM develops water quality restoration plans to describe the actions the agency will take to restore water quality limited water bodies under their management to conditions that meet or exceed those standards. As plans are completed, the BLM will incorporate the goals, objectives and provisions into the Vale District integrated invasive plant management program.

Interim Strategies for Managing Anadromous Fish-producing Watersheds (PACFISH) and Inland Native Fish Strategy (INFISH)

The PACFISH / INFISH strategies (USDA and USDI 1995, USDA 1995) are intended to protect and restore habitat and populations of native anadromous salmon and steelhead (PACFISH), and native resident bull trout (INFISH) within the Vale District. PACFISH and INFISH define landscape-scale Riparian Management Objectives that establish measurable habitat parameters for assessing progress towards habitat health such as pool frequency, bank stability, bank angle, and large woody debris (USDA 1995, USDA and USDI 1995). Riparian Habitat Conservation Areas are portions of watersheds that maintain the integrity of aquatic ecosystems, and management activities within these watersheds are subject to specific standards and guidelines.

The goals outlined in PACFISH and INFISH align with the Purpose and Need of this EA. Goal five of the Riparian Management Goals is to “maintain or restore diversity and productivity of native and desired nonnative plant communities in riparian zones” (USDA 1995). One of the purposes of this EA is to control invasive plants to protect native ecosystems and the flora and fauna that depend on them. Further information can be found in the *Fish and Other Aquatic Species* section.

Burned Area Emergency Stabilization and Rehabilitation

This EA is consistent with BLM Manual Handbook H-1742-1, which provides specific guidance for policies, standards, and procedures used in the Burned Area Emergency Stabilization and Rehabilitation programs. This handbook states, “Chemical, manual, and mechanical removal of invasive species, and planting of native and nonnative species, restore or establish a healthy, stable ecosystem even if this ecosystem cannot fully emulate historical or pre-fire conditions” (USDI 2007d).

Chapter 2 – The Alternatives

Introduction

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

All of the alternatives address the dynamic nature of invasive plants[16] including increasing numbers of invasive plant species, different plant physiologies, and changing conditions of infestations. Due to the nature of invasive plants, the size of the land base involved, and the nature of multiple uses that take place on it, invasive plant control would remain an ongoing need. The intent is to manage invasive plants in order to minimize adverse ecological and economic effects.

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

Background – Invasive Plant Management

As noted in Chapter 1, the Proposed and Revised Proposed Actions would update the existing Noxious Weed Management Program by adding 10 (Proposed Action) or 13 (Revised Proposed Action) more herbicide active ingredients District-wide and adding nonnative invasive plants that are not noxious to the list of plant species that can be treated with herbicides. Because of these additional herbicides and additional invasive plants, the use of other treatment methods (such as targeted grazing, prescribed fire, and competitive seeding and planting), would increase. Other elements of the program (such as prevention and coordination) remain essentially the same. For context and a better understanding of the District's integrated invasive plant management program, information about the invasive plants on the District and the elements of the program that would remain unaffected by the alternatives are presented in this section. BLM's integrated weed management program is the product of decades of laws, Executive orders, and BLM and Department of the Interior policies and direction, grouped here by the goal statements in the BLM's *Partners Against Weeds, Final Action Plan for the BLM* (USDI 1996).

Prevention, Detection, Education, and Awareness

Prevention, detection, education, and awareness are the highest priority for the management of invasive plants. The District maintains a District Weed Prevention Schedule (see Appendix D) that outlines prevention steps that includes actions like cleaning vehicles and equipment before moving onto or from BLM-administered lands and helping with community invasive plant education events. Specific responsibilities are assigned for keeping administrative sites clear, reestablishing desirable vegetation on disturbed sites, inspecting gravel and other materials sites, and including invasive plant prevention measures in all planning documents, contracts, and leases. Other activities include the continuing education of employees, contractors, and the public. District staff, often in cooperation with local Cooperative Weed Management Areas (CWMA) and counties publish news articles and invasive plant identification booklets; sign major recreation sites; require weed-free forage for pack stock and weed-free seed for re-vegetation projects; and, coordinate invasive plant control and other activities with County, State, and other agency invasive plant control programs and transportation departments.

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

Additionally, BLM policy requires that planning for ground-disturbing projects, or projects that have the potential to alter plant communities, include an assessment of the risk of introducing or spreading noxious weeds (USDI 1992b:9015.8).[17] If there is a moderate or high risk of spread, actions to reduce the risk must be implemented and monitoring of the site (see *Monitoring* section below) must be conducted to prevent establishment of new infestations (USDI 1992b). A list of prevention measures applicable to projects or vegetation treatment actions is included in Appendix A, *Project Design Features, Standard Operating Procedures, Mitigation Measures, Conservation Measures, and Prevention Measures*.

Inventory

Invasive plant inventories[18] can be conducted District-wide, but particularly focus on road corridors and other rights-of-way, riparian / wetland areas, and public and permittee activity areas such as campgrounds, trailheads, mining and common materials sites, and livestock water developments where invasive plants are most likely to occur and to spread from. Often, when inventories occur on the District, new sites of invasive plants are discovered. Inventories are conducted routinely in these focus areas and as other resource projects demand.

In general, inventory (and hence, treatment) priorities may be summarized as follows:

1. High use areas with potential for new introductions.
2. Areas designated for planned disturbances.
3. Areas with potential for spread.
4. Areas with important value resources.
5. All remaining sites.

While certain inventories may be specific to invasive plants, inventories conducted for other purposes also record the presence of invasive plants. Such surveys include clearance surveys for Special Status species or cultural resources, inventories for special management areas, fire and post-fire emergency stabilization and rehabilitation monitoring, range trend and use monitoring, rangeland health assessments, mineral compliance inspections, and others.

Inventory results are uploaded to the BLM's National Invasive Species Information Management System (NISIMS), which links to the BLM planning and reporting systems. NISIMS records are regularly updated, the areas are regularly monitored, the invasive plant species at the site are recorded, and treatment options are identified. Former sites (sites where the species appears to have been controlled) are retained in NISIMS to guide future site monitoring.

Planning

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

- Eradication of new infestations of species previously unknown on the District, or of satellite infestations of plants that have spread to new locations, where the plant is a known ecologic and economic threat as determined by the Oregon Department of Agriculture (ODA) or the counties.

[17] Current handbook direction requires this assessment only for noxious weeds.
[18] Inventories are the first examination of an area to find invasive plants. Invasive plant searches on recently disturbed areas and previously treated invasive plant sites are considered monitoring.

- Control of existing infestations of invasive plants that are of known ecologic and economic threat in areas that have a high potential for spread such as along roads and trails, recreation sites, rivers and streams, mineral material sites, and other places where soil disturbance occurs.
- Containment and reduction of large invasive plant infestations, and rehabilitation as time and funding permit.

Within the above broad categories, setting treatment priorities is primarily driven by the resources that would be adversely affected by the invasive plants such as native plant community function, water, riparian areas, habitats for Special Status species, special management areas (such as Wilderness, Wilderness Study Areas, or Research Natural Areas), and resources or areas important to local tribes. Other considerations include: the risk of spread (e.g. if it is along a road or recreation site where it can be easily picked up and moved long distances, or if it is next to a site-disturbing activity into which it may spread); the species and its priority on State and county noxious weed control lists; the size of the infested area and whether the site is isolated or near others; whether the plants are unacceptably increasing the risk of wildfire; compliance with use permits or other occupancy authorizations; and, the control priorities of BLM neighbors and cooperators. Knowledge of the control methods that would work for each species and that are appropriate for the lands infested also informs the prioritization process.

Annual Treatment Plans - The District determines potential treatments based in part on available tools and funding, and develops a District-wide Annual Treatment Plan prior to the beginning of control treatments in the spring. In addition, specific area or project treatment plans are developed in coordination with partners who receive funding from BLM. Annual Treatment Plans help the District ensure that treatments conform to design and mitigation standards in the relevant NEPA documents, and that the required Pesticide Use Proposals, Biological Control Agent Release Proposals, and other authorizations are done in a timely manner. Every control treatment, however, is not always on the Annual Treatment Plan. Unexpected events such as increased or decreased funding, new invaders, wildfire, or weather conditions could alter implementation of the Annual Treatment Plan. Annual Treatment Plans are subject to an interdisciplinary team review.

Coordination

The Vale District works cooperatively with several entities, including local, State, and Federal agencies, tribal governments, and private landowners. Coordination includes the implementation of prevention and education activities, sharing of inventory and monitoring information, and developing annual treatment programs. The District works closely with the Tri-county CWMA, Wallowa Canyonlands Partnership, Malheur County, and Oregon Department of Agriculture through formalized cooperative agreements in which grant monies and BLM contributions help fund invasive plant treatments on BLM and adjacent ownerships.

Monitoring

Implementation Monitoring

Where the BLM uses herbicides, monitoring is required by various BLM manuals, the Environmental Protection Agency and the Oregon Department of Agriculture. Pesticide Use Proposals are completed prior to application, identifying the site, target species, herbicide and application rate, and anticipated effects to non-target species and susceptible areas. Pesticide Application Records are filled out within 24 hours of each application documenting environmental conditions at the time of treatment, plant species targeted, actual herbicide use, treatment method, applicator, and equipment used. Both documents have sufficient detail to determine if all planning and application requirements are met.

In addition, a Project Design Feature adopted with this analysis would require implementation monitoring to occur where BLM uses cattle for targeted grazing for the management of invasive annual grasses such as cheatgrass. The monitoring would determine the level of invasive annual grass infestation, the timing of the targeted grazing treatments, and the duration or length of time grazing occurs to aid in the control of invasive annual grasses or as a pre-treatment to improve the effectiveness of herbicide treatments.

Effectiveness Monitoring

Monitoring includes the regular checking of previously treated sites as well as recently disturbed sites including prescribed and wild fire areas, and maintaining results in NISIMS (see the *Inventory* section earlier in this Chapter). BLM policy requires new project areas with high likelihood of invasive plant introduction[19] to be monitored for the first three years after completion. Additionally, the Oregon Record of Decision (USDI 2010b) requires, for at least five years, that aerial application of acetolactate synthase (ALS)-inhibitors[20] conceivably affecting private lands or Special Status species be monitored for drift (USDI 2010b:17).

Other portions of the Oregon Record of Decision-adopted monitoring may be assigned to the Vale District as well. For example, the Oregon Record of Decision specifies that two large imazapic treatments would be examined approximately one year after treatment, and the resultant report circulated to other districts to help guide future planning with this newly-available herbicide (USDI 2010b:16-17). The Oregon FEIS, Appendix 3, describes BLM-required monitoring when toxic materials are introduced near sensitive areas such as residences or domestic water supplies. Suggested monitoring points include air, vegetation, soil, and water (USDI 2010a:474-5).

Integrated Invasive Plant Management

Direct control treatments addressed in this EA include manual (e.g., pulling and grubbing), mechanical (e.g., use of chainsaws, mowing, and weed eating), biological (including targeted grazing by domestic animals and classical biological control agents (usually insects)), prescribed fire, and herbicide application (using wands, wicks, handguns, boomless nozzles, booms, and aircraft), and the use of competitive seeding or plantings of desirable vegetation. See additional information about the treatment methods below.

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

Treatments are constrained by existing BLM Standard Operating Procedures and subject to PEIS and Oregon FEIS Mitigation Measures (Appendix A). Conservation measures can also apply to Special Status species (see Appendix A). These measures are designed to prevent adverse effects from invasive plant control treatments including those using herbicides.

Treatments would generally be done by BLM staff, contractors, or cooperators. However, grant holders and lessees are responsible for control of noxious weeds in their rights-of-way (see *Lands and Realty* section in Chapter 3).

[19] Generally any type of project resulting in ground disturbance, such as juniper cut / pile / burn units, timber harvest areas, areas burned by wildfire, and range improvements such as fences, spring developments, dams, and waterlines.
[20] See the *Invasive Plants* section in Chapter 3 for more information about ALS-inhibitors. The five ALS-inhibitors are imazapyr, imazapic, sulfometuron methyl, chlorsulfuron, and metsulfuron methyl.

Generally, control activities are subject to cultural resources and Special Status species clearance surveys prior to their implementation. Urgent treatments[21] of newly discovered satellite infestations may be made by personnel familiar with these sensitive resources. Such treatments would usually be manual (e.g. grubbing) or spot spraying on less than an acre, and are most likely to be near existing roads and other previously disturbed areas.

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

Mechanical Treatment Methods include weed whackers, chainsaws, disks, and mowers, including flail mowers and boom mowers. Some of these methods (e.g. chainsaws and weed whackers) can be more target-specific than others. Weed whacker and mowing methods are commonly used in recreation, communication, storage and administrative sites (such as fire guard stations) to prevent invasive plants from becoming a fire hazard and to maintain clear access. Mowing and disking are used to create fuel breaks in invasive annual grasses along roads in areas prone to wildfires. Treatments are restricted to areas where existing desirable vegetation would not be harmed.

Competitive Seeding and Planting occurs in conjunction with other treatments. Seeding is accomplished with hand spreaders, OHV spreaders, harrows, or drills, or is aerially seeded. Plugs or potted plants are planted using hand tools. Seeding with a rangeland drill entails the use of a tractor to pull a drill featuring a high-clearance reinforced frame, and single-disk openers that are independently suspended on trailing arms. The drill creates a shallow furrow, deposits seed and uses chains to drag soil to cover the seed. The depth of disturbance depends on the type of seed being planted. When drill seeding, it is critical to cover the seed properly and firm the soil once seed is placed between 0.25 and 0.50 inches below the surface (Shewmaker and Bohle, 2004). It is difficult to control seed depth and soil firming with broadcast seeding or a harrow, but not all sites are conducive to a rangeland drill operation. To ensure best results when broadcast seeding, increasing the seed rate by 30 to 100 percent is suggested to offset for poorly placed seed. Broadcasting in two directions perpendicular to one another is suggested.

The objective of competitive seeding and planting is to provide a desirable vegetative component to compete with invasive plants in treatment areas. BLM's Integrated Vegetation Management Handbook states, "Diverse, healthy, and resilient native plant communities provide the greatest opportunity to be successful in meeting multiple use objectives within BLM. [BLM is required to] set resource management objectives that can be met using native species for most situations. However, as a last resort, it may be necessary to introduce nonnative, non-invasive plant materials to break unnatural disturbance cycles or to prevent further site degradation by noxious or invasive plants" (USDI 2008a:87). There are potential treatment areas on the Vale District that have limited ecological site potential or are in such a degraded state that attempting to reintroduce exclusively native plants immediately following invasive plant treatments would be unsuccessful and would not meet the objective of the treatment. These sites tend to be low elevation, dry sites in Malheur County with less than eight inches of annual precipitation or in active or recently vacated mining areas.

[21] A need for urgent treatments can happen because the plant is about to go to seed; because, with over 5 million acres on the District, the site is so remote or difficult to access that an additional visit to treat a small site is not practical; or for other reasons.

In each treatment area proposed for seeding, environmental conditions such as average annual precipitation, elevation, aspect, soils, percent composition of desirable perennial species, site potential as identified in the ecological site description and the availability of desired seed are considered when determining appropriate seed mixes. If the environmental conditions indicate native species would not establish well after seeding to compete with invasive plants, a nonnative desirable species (such as Siberian wheatgrass or crested wheatgrass) is used. For example, medusahead monocultures in clay soils treated with herbicide would need to be seeded to keep the medusahead from reestablishing. There are currently no native species available that would thrive on these soils and compete well with medusahead; thus, a desirable species such as crested wheatgrass would be used. Another example of a harsh environmental condition that may warrant consideration of seeding with nonnative species is mining sites where the topsoil has been removed. Further information about seeding and planting can be found in Appendix G, *Process and Criteria Considered for Integrated Invasive Plant Management Utilizing Competitive Seeding and Planting.*

Biological Treatment Methods involve the intentional use of domestic animals, insects, nematodes, mites, or pathogens (agents such as bacteria or fungus that can cause diseases in plants) that weaken or destroy vegetation (USDI 2007b). Classical biological control refers to a subset of organisms that includes plant-eating insects, nematodes, mites, or pathogens. 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. Often, several biological control agents are used together to reduce the density of undesired vegetation but biological controls will seldom remove an invasive plant population entirely.

Biological controls are usually acquired from the same ecosystems from 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 will feed only on the target plant and not on crops, native flora, or endangered or threatened plant species. The Oregon Department of Agriculture's Noxious Weed Control Program coordinates releases and monitors populations. Since the biological control agents are not successful unless there are enough invasive plants for them to feed upon, typically only large infestations are targeted. Once large populations of invasive plants become unmanageable, other methods of control are not always economical or physically possible.

Targeted grazing[22] 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 plant or plants. Sheep, goats, and cattle can be used. In general, sheep and goats eat broadleaf plants, while cattle graze on grasses. Grazing can be seasonally timed for when the target plant is most palatable to livestock and to minimize effects to non-target plants and surrounding resources. Although targeted grazing can reduce invasive plant abundance and / or vigor at a particular site, grazing will rarely, if ever, eradicate invasive plants. Employing grazing prescriptions may be particularly useful in areas with limited access, steep slopes, or where herbicides cannot be applied (e.g. near water). As with many other treatments, targeted grazing with livestock can be most effective when used in combination with other treatments (USDI 2010a:75).

Prescribed fires are used for invasive plant control, and can be most effective when conducted just before flower or seed set, or at the young seedling / sapling stage. It may also be used in conjunction with other methods as a pre-treatment to an herbicide application, such as when the target invasive plants have gone to seed and there is a desire to remove the seed source or to remove thatch (the mat of un-decomposed plant material) in invasive annual grass stands. Like other treatments, timing is critical and is dependent on characteristics of the invasive plant, presence of desirable plants, soil moisture, and environmental conditions.

[22] Also referred to as directed livestock grazing, prescribed grazing, and others.

Herbicide Treatment Methods include ground-based methods (including hand-held wands, wicks, handguns, truck or OHV-mounted boomless nozzles or booms) and aerial methods.

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 impossible to remove with non-herbicide methods;[23]
- 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 saltcedar and Russian olive can be controlled by cutting stems close to the ground in the fall and then spraying or wiping the stems with an herbicide registered for this use).

Herbicides are applied only to lands and uses for which they are labeled and only by certified or licensed applicators or persons working under their direct supervision (USDI 2010a:85). A Pesticide Application Record is completed within 24 hours of the application documenting environmental conditions at the time of treatment as well as actual herbicide use. This record, kept in District files for 10 years, helps the BLM duplicate successes, change procedures that are not working as planned, and understand when and if unintended on or off-site effects occur.

Herbicide formulations (brands), as well as adjuvants to be used with them, must be on the BLM lists of approved herbicides and adjuvants at the time of application. The current lists are included in Appendix B, *The Herbicides, Formulations, and Adjuvants,* for information. For applications with a potential to enter streams, herbicides are limited to aquatic formulations. For applications with a potential to affect federally listed fish, aquatic-approved adjuvants[24] would also be used (see Appendix B).

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

Ground-based herbicide application is also accomplished from off-highway vehicles (OHV) with vehicle-mounted spraying systems using handguns, boom-less nozzles, or booms. Spray tank sizes generally vary from 15-40 gallons on an OHV to 100 or more gallons on a truck. Using a large tank provides the advantage of less mixing and loading of herbicides, which, in turn, leads to less risk of accidental spills of concentrated products. Most of these OHV / truck applications are done from an existing road, trail, or right-of-way. Most of these applications are spot treatments.

[23] For example, Canada thistle root fragments readily resprout.
[24] The "approved adjuvants" shown in Appendix B are from the U.S. Fish and Wildlife Service and National Marine Fisheries Service ARBO II biological opinions.

A small percentage of treatments are done by horseback. This is generally done in areas where OHV access is not appropriate or possible (e.g. Wilderness Areas, areas with steep terrain), but where a tank size larger than a backpack is needed.

Aerial herbicide applications can be conducted with helicopters or fixed-wing aircraft. Operation of helicopters is more expensive than operation of fixed-wing aircraft, but helicopters are more maneuverable and can fly closer to the ground over uneven terrain. Aerial application methods are generally used for control of large infestations, including the control of invasive annual grasses.

Categories

Tens of thousands of acres of invasive plant sites are known on the District. Additional undetected and / or undocumented invasive plants are also likely to occur on the Vale District. In particular, millions of acres infested with invasive annual grasses generally have not been mapped by the BLM, primarily because the infested acreage is vast, and because no control method selective to these grasses has been available to the District until recently. Treatments can vary for different invasive plant species and the management objectives that apply to their control. The following categories of known or estimated invasive plant sites are described to help clarify the alternatives and the analysis.

Category 1. Existing Known Sites

NISIMS (described in the *Inventory* section earlier in this Chapter) includes 12,544 acres of documented invasive plant sites on the Vale District. These are summarized on Table 2-1, and are displayed in Map 2-1.

An additional 185,237 acres of invasive plants sites are known, but infestation acres at each site are estimated. The location of both the NISIMS and project areas with their estimated acres are shown, by species and within broad complexes or smaller project area mapping units, on Tables E-1 through E-4 in Appendix E. These acres are also summarized on Table 2-1. Map E-1 shows the project areas and complexes. Treatments in this Category would focus both on control of existing infestations of invasive plants in areas that have a high potential for spread as well as the containment, reduction, and rehabilitation of large invasive plant infestations.

Table 2-1 includes 44,700 acres of medusahead rye and 1,875 acres of ventenata. These areas are often small, and are generally high priority for control treatments. Additional millions of acres infested with invasive annual grasses (primarily cheatgrass but also medusahead rye and ventenata) are known to exist throughout the District, and are discussed further under Categories 5 and 6.

Table 2-1. Summary of Known Invasive Plant Sites

Common Name ***Scientific Name***	**Noxious Weed Classification**[1]	**NISIMS Acres** ***sites***	**Estimated Project Area Acres**[3]	**Common Habitat**	**Primary Locations**
Armenian blackberry *Rubus armeniacus*	B	None	11 acres	Riparian, roadsides	Snake, South Fork Walla Walla Rivers
Black henbane *Hyoscyamus niger*	County Listed[4]	4 acres *37 sites*	9 acres	Uplands, riparian benches	Morgan Mountain
Bouncingbet *Saponaria officinalis*	NL[2]	None	3 acres	Benches above high water mark, roadsides	Snake and Grande Ronde Rivers
Buffalobur *Solanum rostratum*	B	12 acres *4 sites*	260 acres	Uplands	Oregon Trail Project Area
Bull thistle *Cirsium vulgare*	B	216 acres 288 sites	390 acres	Riparian, springs, seeps, forest	Widespread across the District

Common Name ***Scientific Name***	**Noxious Weed Classification**[1]	**NISIMS Acres** ***sites***	**Estimated Project Area Acres**[3]	**Common Habitat**	**Primary Locations**
Bur chervil *Anthriscus caucalis*	NL	None	110 acres	Riparian, moist forests	Snake River, Joseph Creek
Canada thistle *Cirsium arvense*	B	225 acres *387 sites*	719 acres	Riparian, springs, seeps, forest	Widespread across the District
Common bugloss *Anchusa officinalis*	B	<1 acre *1 site*	1 acre	Benches above high water mark	South Fork Walla Walla River
Common crupina *Crupina vulgaris*	B	None	100 acres	Uplands	Joseph Canyon
Common tansy *Tanacetum vulgare*	County Listed[4]	<1 acre *1 site*	5 acres	Benches above high water, gravel bars	Grande Ronde and Burnt Rivers
Dalmatian toadflax *Linaria dalmatica*	B	21 acres *165 sites*	384 acres	Uplands, roadsides	Snake River, Hwy 78, Castle Rock Rail Canyon, Durbin Crk.
Diffuse knapweed *Centaurea diffusa*	B	636 acres *549 sites*	1,788 acres	Roadsides, uplands, riparian benches	Widespread across the District
False indigo bush *Amorpha fruticosa*	B	None	34 acres	Riparian	Snake River
Field bindweed *Convolvulus arvensis*	B	12 acres *3 sites*	42 acres	Uplands, roadsides	Throughout the 84 Northeast Complex (Baker County)
Halogeton *Halogeton glomeratus*	B	6 acres *8 sites*	2,575 acres	Roadsides, disturbed areas	Widespread in Malheur County
Houndstongue *Cynoglossum officinale*	B	243 acres *360 sites*	375 acres	Uplands, riparian, roadsides	Widespread across Baker Resource Area, shaded areas
Jointed goatgrass *Aegilops cylindrica*	B	6 acres *38 sites*	241 acres	Roadsides, uplands	Widespread across the District
Kochia *Bassia scoparia / Kochia scoparia*	B	<1 acre *2 sites*	25 acres	Uplands, roadsides, disturbed areas	Throughout the District
Leafy spurge *Euphorbia esula*	B	98 acres *635 sites*	986 acres	Uplands, riparian benches	Alder Creek, Burnt River
Meadow hawkweed *Hieracium caespitosum*	B	<1 acre *2 sites*	5 acres	Riparian, meadows	Grande Ronde River
Mediterranean sage *Salvia aethiopis*	B	54 acres *89 sites*	598 acres	Uplands	Bald Mountain
Medusahead rye *Taeniatherum caput-medusa*	B	1,782 acres *279 sites*	44,700 acres	Uplands	Widespread across the District
Musk thistle *Carduus nutans*	B	<1 acre *1 site*	110 acres	Valley bottoms, disturbed areas	Highway 20, Antelope Flat
Myrtle spurge *Euphorbia myrsinites*	B	1 acre *7 sites*	12 acres	Roadsides, uplands	Lytle Blvd., Dixie Creek
Oregano *Origanum vulgare L.*	County Listed[4]	None	1 acre	Uplands, riparian	Grande Ronde River
Oxeye daisy *Leucanthemum vulgare*	County Listed[4]	2 acres *5 sites*	25 acres	Meadows, forests, roadsides, river benches, gravel bars	Grande Ronde River
Perennial pepperweed *Lepidium latifolium*	B	169 acres *177 sites*	4,393 acres	Uplands, riparian benches, valley bottoms	Widespread across the District
Poison hemlock *Conium maculatum*	B	None	85 acres	Riparian, dry benches	Snake River
Puncturevine *Tribulus terrestris*	B	44 acres *70 sites*	433 acres	Roadsides, recreation, administrative sites	Widespread across the District

Common Name ***Scientific Name***	**Noxious Weed Classification**[1]	**NISIMS Acres** ***sites***	**Estimated Project Area Acres**[3]	**Common Habitat**	**Primary Locations**
Purple loosestrife *Lythrum salicaria*	B	<1 acre *1 site*	1 acre	Riparian, springs, seeps	Snake River, Porcupine Spring
Rose campion *Lychnis coronaria*	NL	None	1 acre	Benches above high water mark	Grande Ronde River
Rush skeletonweed *Chondrilla juncea*	B	1,662 acres *17,986 sites*	73,531 acres	Uplands	Oregon Trail Area, Snake River breaks
Russian knapweed *Acroptilon repens*	B	189 acres *282 sites*	2,811 acres	Uplands, riparian benches, roadsides	Widespread across the District
Russian olive *Elaeagnus angustifolia*	NL	<1 acre *4 sites*	21 acres	Riparian, ephemeral streams	Widespread across the District
Scotch broom *Cytisus scoparius*	B	<1 acre *8 sites*	3 acres	Forests	Palmer Junction
Scotch thistle *Onopordum acanthium*	B	2,417 acres *2,204 sites*	29,843 acres	Uplands, loafing areas	Widespread across the District
Spiny cocklebur *Xanthium spinosum*	B	None	<1 acre	Meadows, forests, roadsides, disturbed areas	Twin Springs Road
Spotted knapweed *Centaurea stoebe (C. maculosa)*	B	68 acres *355 sites*	906 acres	Forests, roadsides, uplands, riparian benches	Widespread across the District
Squarrose knapweed *Centaurea virgate*	A	<1 acre *2 sites*	<1 acre	Uplands, roadsides	84 South Complex
St. Johnswort *Hypericum perforatum*	B	None	10 acres	Roadsides, riparian benches	Grande Ronde River
Sulfur cinquefoil *Potentilla recta*	B	7 acres *39 sites*	1,361 acres	Uplands, forest	Snake and Grande Ronde River breaks
Sweetbriar rose *Rosa rubiginosa*	NL	None	40 acres	Uplands, riparian, roadsides	Snake River, Wallowa County
Tamarisk / saltcedar *Tamarix ramosissima*	B	3,388 acres *285 sites*	6,367 acres	Riparian, ephemeral / seasonal streams, springs, seeps	Snake River, Owyhee River and tributaries
Tree of heaven *Ailanthus altissima*	B	None	7 acres	Roadsides, recreation, administration sites	Snake River
Ventenata / North Africa grass *Ventenata dubia*	NL	None	1,875 acres	Roadsides, uplands, valley bottoms	Widespread across the District
Whitetop *Cardaria draba (Lepidium draba)*	B	1,013 acres *2,608 sites*	18,471 acres	Uplands, valley bottoms, riparian, roadsides	Widespread across the District
Yellow flag iris *Iris pseudacorus*	B	7 acres *82 sites*	21 acres	Riparian	Snake River
Yellow starthistle *Centaurea solstitialis*	B	256 acres *572 sites*	4,055 acres	Uplands, valley bottoms	Widespread across the District
Yellow toadflax *Linaria vulgaris*	B	1 acre *6 sites*	5 acres	Roadsides, uplands	Mormon Basin
Yellow and white sweetclover *Melilotus officinalis, M. alba*	NL	None	31 acres	Uplands, disturbed sites	Virtue Flat, Highway 95

1. Noxious weeds are classified by the ODA for the purpose of prioritizing and implementing noxious weed control projects. ODA Noxious Weed Classifications:
   A. A weed of known economic importance that occurs in the state in small enough infestations to make eradication or containment possible.
   B. A weed of economic importance which is regionally abundant, but which may have limited distribution in some areas.
2. NL: Not listed on the ODA or county noxious weed lists.
3. Includes NISIMS acres. See Tables E-1 through E-4. *Estimated Project Area Acres*.
4. Listed as noxious by Baker and / or Wallowa Counties.

Category 2. Future Spread from Existing Sites

The 197,781 acres of known sites in Category 1 are increasing in size, particularly where current treatments are either marginally effective, not effective at all, or are presently not occurring. New sites generally arise from human activities such as vehicle use, recreation activities, and ground disturbing activities such as prescribed fires, wildfire suppression, and road maintenance. Livestock grazing and movement can transport invasive plant seed through their digestive system or on their hide. Natural vectors such as wind, watercourses, wildlife, and wildfire also contribute to invasive plants spreading from existing sites. Most of the new sites would occur along streams, along roads and other human travel and recreation sites, or would be within recently burned or newly disturbed sites (see Maps 2-2, A-C). Treatments in this Category would focus on preventing the establishment of additional populations of invasive plants, especially in areas where they would continue to spread.

Category 3. New Invaders

Species of invasive plants previously unknown on the District can be introduced at any time. Invasive plants may arrive via a variety of vectors, including people, vehicles, livestock, other animals, wind, in seed or forage, on other plants intentionally moved, in water, and other sources. Introductions can happen from none to a few times per year. New invaders may be terrestrial or aquatic. Initial infestations are usually less than one acre, but may become large before being discovered due to the vastness of the District and limited and / or difficult access to many areas. Species of concern currently not yet known to occur on the District but documented on adjacent lands are shown on Table 2-2. Management of invasive plants in Category 3 would be a high priority; treatments in this Category would focus on treating the species before it became established on the District.

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

Common Name	Scientific Name	Oregon Noxious Weed Classification	Table 2-10 (*Treatment Key*) Species Group
African rue	*Peganum harmala*	A	African Rue
Baby's breath	*Gypsophilia paniculata*	*(Listed in CA and WA, not OR)*	Baby's Breath
Cutleaf teasel	*Dipsacus laciniatus*	B	Common Teasel
Dyers woad	*Isatis tinctoria*	B	Perennial Mustards
Eurasian watermilfoil	*Myriophyllum spicatum*	B	Aquatic Plants
Flowering rush	*Butomus umbellatus*	A	Aquatic Plants
Garlic mustard	*Alliaria petiolata*	B	Perennial Mustards
Hydrilla	*Hydrilla verticillata*	A	Aquatic Plants
Knotweeds	*Polygonum*	B	Aquatic Plants
Orange hawkweed	*Hieracium aurantiacum*	A	Hawkweeds
Plumeless thistle	*Carduus acanthoides*	A	Biennial Thistles
Purple starthistle	*Centaurea calcitrapa*	A	Starthistle
Tansy ragwort	*Senecio jacobaea*	*B*	Common Tansy
Vipers bugloss	*Echium vulgare*	*(listed in ID, not OR)*	Borage
Water primrose	*Ludwigia*	B	Aquatic Plants
Yellow floating heart	*Nymphoides peltata*	A	Aquatic Plants

1. Noxious weeds are classified by the ODA for the purpose of prioritizing and implementing noxious weed control projects. ODA Noxious Weed Classifications

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

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

Category 4. Post-fire Emergency Stabilization and Rehabilitation

Category 4 areas are those areas where certain emergency stabilization treatments, including seeding, are conducted immediately following wildfires, in order to protect sensitive resources like soils from being lost to subsequent wind and rain events. Invasive plants of all kinds, but particularly the invasive annual grasses, readily invade these newly disturbed areas, inhibiting revegetation efforts. Fires open up niches for invasive plant establishment or spread and many vectors move plants from the unburned areas into the burned area. Annual wildfire acres from 1980 through 2015 ranged from 529 to 1,173,792 acres (Table 2-3 and Map 2-3), with an average of 103,295 acres per year. Annual wildfire acreage will likely increase in the future as invasive annual grasses become more widespread, and the climate becomes warmer and drier. Treatments in this Category would be done to prevent invasive plants, particularly invasive annual grasses, from overtaking an area and inhibiting revegetation efforts.

Table 2-3. Summary of Wildfires on BLM-Administered Lands (1980-2015) Larger Than 10 Acres

Fire Year	Number of Fires	Total Fire Acres	Average Fire Size
2015	19	240,752	12,671
2014	21	403,411	19,210
2013	29	136,689	4,713
2012	23	1,173,792	51,034
2011	16	30,570	1,911
2010	6	529	88
2009	8	2,002	250
2008	8	26,952	3,369
2007	29	134,350	4,633
2006	48	231,565	4,824
2005	18	39,307	2,184
2004	5	903	181
2003	14	9,045	646
2002	25	83,816	3,644
2001	32	105,080	4,203
2000	20	122,082	6,104
1999	22	9,422	428
1998	25	18,830	753
1997	19	5,965	314
1996	42	142,566	3,394
1995	14	39,159	2,797
1994	19	62,800	3,305
1993	3	3,140	1,047
1992	30	11,972	399
1991	11	9,357	851
1990	12	5,752	479
1989	18	25,049	1,392
1988	16	11,080	693
1987	24	9,687	404
1986	53	241,034	4,548
1985	50	173,031	3,461
1984	33	14,552	441
1983	25	75,986	3,039
1982	26	29,631	1,140
1981	30	38,910	1,297
1980	23	33,903	1,474
Total	**816**	**3,718,642**	**4,557**

Categories 5 and 6: Invasive Annual Grasses (By Pasture[25])

Categories 5 and 6 are distinguished by the severity of the infestation: Category 5 includes pastures within grazing allotments where perennial plant communities are *at risk due to the presence of* invasive annual grasses and Category 6 includes pastures within grazing allotments where perennial plant communities *are dominated by* invasive annual grasses.

[25] Invasive annual grasses are also treated / included in Category 1 (where mapped in NISIMS or estimated in project areas), Category 2 (spread from Category 1 sites), and Category 4 (as part of emergency stabilization and rehabilitation following a fire).

Invasive annual grasses on the District include medusahead rye, cheatgrass, and ventenata (see Table 2-4). Many invasive annual grass infested areas have only recently become high priority because of concerns around increased fire frequency and the threat to Greater Sage-Grouse habitat. Of the invasive annual grasses, only medusahead rye is listed as noxious, and only the non-selective herbicide glyphosate has been available to the BLM for control. Previously, invasive plants that were not listed as noxious were not formally recorded in NISIMS. These grasses (particularly cheatgrass) have now become widespread across as much as 80 percent of the District (approximately 4 million acres). Although most of these areas have not been recorded in NISIMS, other mapping data are available.

Table 2-4. Invasive Annual Grass Species Widespread on District

Common Name	*Scientific Name*	Noxious Weed Classification	Table 2-10 (*Treatment Key*) Species Group
Cheatgrass / downy brome	*Bromus tectorum*	County-Listed[1]	Annual Grasses
Medusahead rye	*Taeniatherum caput-medusa*	B[2]	
Ventenata / North Africa grass	*Ventenata dubia*	County-Listed[1]	

1. Listed as noxious in counties on the Vale District.
2. B: An invasive plant of economic importance which is regionally abundant, but which may have limited distribution in some areas.

In the Malheur Resource Area, remotely sensed Landsat Thematic Mapper[26] spectral imagery was used to acquire landscape cover levels for invasive annual grasses. The imagery was used to provide measures of chlorophyll during the growing period of annual grasses and again when annual grasses were in senescence periods (Peterson 2007). The data were analyzed, and subsequently field checked using 412 field plots. This data was then classified into five ranges: no detectable invasion, low invasion, moderate invasion, heavy invasion, and severe invasion[27]. Using this criterion, pastures were identified by the percentage of moderate, heavy, and severe by acres of BLM-administered land each possessed.

The Landsat Thematic Mapper spectral imagery data does not cover the Baker Resource Area. Therefore, information from the Draft Baker Field Office Resource Management Plan was used to map the location of nonnative annual grasses. BLM range specialists compiled data from monitoring and utilization reports, which identified areas infested with invasive annual grasses.

Although most of the areas in Categories 5 and 6 have not been recorded in NISIMS or included in the estimated acres by Project Area shown in Appendix E, areas likely to be dominated by invasive annual grasses have been determined as described above and are displayed by pasture in Map 2-4.

Approximately 750,000 acres of Categories 5 and 6 are invasive annual grass monocultures.[28] Soil surveys have been completed for 305,348 acres of these and approximately 100,000 acres have soil characteristics and adequate precipitation needed for a high to moderate expectation of success when seeding and planting. No data is currently available for 440,862 acres in the Malheur Resource Area; however, due to the semi desert environment, it is unlikely that the un-surveyed area would have more than 200,000 acres suitable for seeding. In areas having no soils data, a field inspection would occur to determine suitability of seeding prior to project development.

[26] Landsat is a joint effort of the U.S. Geological Survey (USGS) and the National Aeronautics and Space Administration (NASA).
[27] Low: acres where more than 0 percent to less than 6 percent of an acre is infested with invasive annual grasses; moderate: 6 to 10 percent; heavy: 11 to 25 percent; severe: greater than 25 percent.
[28] All acres in Category 6 and approximately 350,000 acres of Category 5 are monocultures. Monocultures in Category 5 are generally smaller (100 acres or less) and surrounded by areas of healthy native vegetation that has not been invaded.

Category 5. Perennial plant communities at risk due to the presence of invasive annual grasses

In Category 5 areas, native plant communities are still functioning ecologically, in spite of light to moderate levels of infestation. However, these native perennial plant communities are at risk of losing ecological function due to increasing invasive annual grass densities, the increased risk of wildfire these invasive annual grasses create, and the ability of these grasses to outcompete native plants following wildfires. These plant communities are still in a position to recover if the invasive annual grasses can be controlled.

Nonnative perennial plant communities such as existing crested wheatgrass seedings are also being invaded by invasive annual grasses and are in need of treatment similar to the native communities. While crested wheatgrass does not provide the breadth of ecological function that a native perennial plant community does, these areas serve as buffers between the native plant communities at risk and the communities that are already dominated by invasive annual grasses. Treating invasive annual grasses within these nonnative perennial communities protects adjacent native plants.

Category 5 pastures are those where at least 20 percent of the BLM acreage has an infestation level rated “moderate” or “heavy,” or where 20 to 50 percent of the pasture is in the “severe” range. Pastures in Category 5 are displayed in Map 2-4 and occur on approximately 3.5 million acres (approximately three-fourths of the Vale District). See Table E-6 in Appendix E for a list of Category 5 pastures.

With as much as three-fourths of the District infested, treatments in this Category would focus primarily on protecting special management areas, Special Status species habitats (including priority habitats for Greater Sage-Grouse), neighboring landowners (working with CWMAs or the neighbors directly), and culturally significant plants. The treatment goal would be to keep the invasive annual grasses at a low level to permit existing native vegetation to gain vigor and continue to dominate the ecological processes of the site.

Category 6. Perennial plant communities that are dominated by invasive annual grasses

Approximately 400,000 acres on the District are so infested with invasive annual grasses (see Table 2-4) that the native plant community[29], if it exists at all, has ceased to be the controlling factor for ecological function. The invasive annual grasses and their seed bank have dominated the site to the extent that their removal would be difficult and expensive, and / or the native plants on the site, if present, are in poor enough condition that they would not be able to naturally revegetate the site after invasive plants are controlled.

In the Baker Resource Area, all historic large areas of invasive annual grass monocultures have been seeded to more desirable perennial grass species (crested wheatgrass and intermediate wheatgrass). Therefore, none of the Baker Resource Area was classified as Category 6.

Category 6 pastures are those where more than 50 percent of the pasture’s BLM acreage is in the “severe” invasive annual grass range. See Table E-6 in Appendix E for a list of Category 6 pastures.

Restoration of these invasive annual grass monocultures would be desirable but usually low priority compared to other Categories because the chance of rehabilitating these sites is lower and costs are higher. The primary goal for this Category would be to reduce the scale and occurrence of invasive annual grasses in order to reduce their potential to invade and dominate neighboring sites.

[29] Or nonnative, non-invasive perennial plant community.

Category 7. Lower priority invasive plants

Additional invasive plants (other than those in the above six Categories) are known on the District but are generally not inventoried because they are currently a low priority for treatment (see Table 2-5). These plants do not tend to cause the ecologic or economic harm that the invasive plants in the other Categories do. However, in the future these plants may become problematic in specific conditions and would require treatments (e.g., common teasel could become a localized problem at a spring).

Table 2-5. Lower Priority Invasive Plants

Common Name	Scientific Name	Table 2-10 (*Treatment Key*) Species Group
Bur buttercup	*Ceratoephala testiculata*	Annual Broadleaves
Burdock	*Arctium minus*	Biennial Thistles
Chicory	*Chicorium intybus*	Rush Skeletonweed
Clasping pepperweed	*Lepidium perfoliatum*	Annual Broadleaves
Common cocklebur	*Xanthuim strumarium*	Annual Broadleaves
Common mullein	*Verbascum thapsus*	Biennial Thistles
Common teasel[1]	*Dipsacus fullonum*	Common Teasel
Curly dock	*Rumex crispus*	Curly Dock
Curlycup gumweed	*Grindelia squarrosa*	Annual Broadleaves
Field sow thistle	*Sonchus arvensis*	Annual Broadleaves
Flixweed	*Descurainia sophia*	Annual Broadleaves
Horehound	*Marrubium vulgare*	Oxeye Daisy
Lambsquarter	*Chenopodium berlandieri*	Chenopods
Poverty brome	*Bromus sterilis*	Annual grasses
Prickly lettuce	*Lactuca serriola*	Annual Broadleaves
Prickly sow thistle	*Sonchus asper*	Annual Broadleaves
Prostrate knotweed	*Polygonum aviculare*	Annual Broadleaves
Purple mustard	*Chorisporia tenella*	Annual Broadleaves
Red brome	*Bromus rubens*	Annual grasses
Redroot pigweed	*Amaranthus retroflexus*	Annual Broadleaves
Ripgut brome	*Bromus diandrus*	Annual grasses
Russian thistle	*Salsola iberica*	Chenopods
Soft brome	*Bromus hordeaceus*	Annual grasses
Tumble mustard	*Sisymbrium altissimum*	Annual Broadleaves
Wild oat	*Avena fatua*	Annual grasses
Perennial grasses such as bulbous bluegrass (*Poa bulbosa*), perennial ryegrass (*Lolium perenne)*, and reed canarygrass (*Phalaris arundinacea*).		Perennial Grasses

1. Common teasel is listed as noxious by Baker County. It is widespread on the District.

Description of the Alternatives

Three alternatives, the No Action Alternative, the Proposed Action, and the Revised Proposed Action are presented below. Under all alternatives, the treatment goal is control of invasive plants at a level where they are not adversely affecting desired resource values.

The No Action Alternative - Noxious Weed Management

The No Action Alternative would continue to implement the 1989 *Vale District Integrated Weed Control Program and Environmental Assessment* and associated *Decision Records* (USDI 1989a, 1994, and 1999), consistent with applicable Resource Management Plans and constrained by the herbicides and herbicide application rates listed on Table 2-9 (at the end of this section), and by Standard Operating Procedures, Mitigation Measures, and Conservation Measures listed in Appendix A.

Under this alternative, the District would also continue to implement invasive plant control treatments described in recent emergency stabilization and rehabilitation NEPA analyses tiered to the 2010 Oregon FEIS, as well as the *Mormon Basin / Pedro Mountain Fuels Management Project EA* (see Table 2-8 and Map 2-5). These documents include the same Standard Operating Procedures and other constraints listed above.

In addition to 2,4-D, dicamba, glyphosate and picloram available District-wide, chlorsulfuron, clopyralid, and imazapic would be available in limited areas[30] of the District. Treatment methods would also include manual methods such as pulling and grubbing, mechanical methods such as weed whackers, chainsaws, disks, and mowers, and targeted grazing using cattle, sheep, and goats. Further information on where and when these treatments would be used is provided in *Treatments under each Alternative, by Category* and in Table 2-10, *Treatment Key*.

The Proposed Action - Invasive Plant Management

The Proposed Action is similar to the No Action Alternative except it is expanded to allow herbicide use on all invasive plants (not just noxious weeds), and it is expanded to include the use of 14 herbicides District-wide rather than 4 (see Table 2-9).

The ability to treat invasive plants and the addition of herbicides selective to invasive annual grasses greatly increases the number of acres expected to be treated under this alternative. These changes were examined at the programmatic scale in the 2010 *Vegetation Treatments Using Herbicides on BLM Lands in Oregon FEIS* (USDI 2010a).

The Proposed Action treatments described below are intended to fully incorporate the invasive plant control treatments described in recent emergency stabilization and rehabilitation NEPA analysis tiered to the 2010 Oregon FEIS, as well as the *Mormon Basin / Pedro Mountain Fuels Management Project EA*.

In addition to herbicides, treatment methods would also include manual methods such as pulling and grubbing, mechanical methods such as weed whackers, chainsaws, disks, and mowers, prescribed fire, and targeted grazing using cattle, sheep, and goats. Prescribed fire and targeted grazing with sheep, goats, and cattle would be used in conjunction with herbicide treatments; for example, prescribed fire removes the thatch from areas with invasive annual grasses, while targeted grazing would break up thatch before herbicide is applied, as well as removing seed sources. Post-treatment seeding and planting may be used to establish desirable vegetation. Some seeding may occur with a rangeland drill. Further information on where and when these treatments would be used is provided in *Treatments under each Alternative, by Category* and in Table 2-10, *Treatment Key*.

As with the No Action Alternative, all treatments are constrained by the Standard Operating Procedures and other measures listed in Appendix A, by the herbicide application rates listed on Table 2-9, and by the other policy constraints described in the *Background* section earlier in this Chapter.

The Revised Proposed Action - Invasive Plant Management

The Revised Proposed Action is similar to the Proposed Action except it is expanded to include the use of 17 herbicides District-wide rather than 14 (see Table 2-9). The three additional herbicides were analyzed at the programmatic level in the 2016 *Vegetation Treatments Using Aminopyralid, Fluroxypyr, and Rimsulfuron PEIS* (USDI 2016a). Further information on where and when these treatments would be used is provided in *Treatments under each Alternative, by Category* and in Table 2-10, *Treatment Key*. As with the other alternatives, all treatments are constrained by the Standard Operating Procedures and other measures listed in Appendix A, by the herbicide application rates listed on Table 2-9, and by the other policy constraints described in the *Background* section earlier in this Chapter.

Treatments under each Alternative, by Category

The following differentiates activities anticipated under each alternative:

[30] Authorized under the emergency stabilization and rehabilitation and fuels management NEPA analyses listed in Table 2-8.

The No Action Alternative - Noxious Weed Management	***The Proposed Action - Invasive Plant Management***	***The Revised Proposed Action - Invasive Plant Management***
Category 1, Existing Known Sites and Category 2, Future Spread from Existing Sites		
Specific to the No Action Alternative:	***Common to the Proposed and Revised Proposed Actions:***	
There are 140,230 acres of noxious weeds in Category 1 for which there are control tools available,[31] as well as spread from those sites (Category 2). Past annual treatments in these two Categories have been limited by funding and staffing to an average of 3,000 acres per year (Table 2-7, *Annual Treatment Summary*).	There are 197,781 acres of invasive plants in Category 1, as well as spread from those sites (Category 2). Past annual treatments in these two Categories have been limited by funding and staffing to an average of 3,000 acres per year (Table 2-7, *Annual Treatment Summary*).	
Approximately half of the treatments in a given year would be re-treatments of areas treated previously (USDI 2010a:136).[32] These follow-up treatments are more likely to include pulling or other manual treatments and / or reduced herbicide use as the population at a given site is reduced or is made up of seedlings from a remaining seed bank.	It is expected that roughly one-quarter to one-third of the treatments would be re-treatments of areas treated previously (USDI 2010a:136).[32] These follow-up treatments are more likely to include pulling or other manual treatments and / or reduced herbicide use as the population at a given site is reduced or is made up of seedlings from a remaining seed bank.	
	<u>*Competitive Seeding / Planting Parameters*</u>: Individual seeding and / or planting areas would generally be less than 20 acres in size and could happen on approximately 15 sites a year. However, larger areas (on the order of a few hundred acres) may be seeded and / or planted where invasive plant species such as whitetop, rush skeletonweed, annual grasses, scotch thistle, or leafy spurge have taken over the site. The majority of seeded sites would be in upland areas. If available and appropriate, native species would be used for revegetation in these areas. Areas where desirable nonnatives may be replanted include sites that have been previously planted with a desirable nonnative species, sites where the topsoil has been removed (such as at a mining site), or monocultures of invasive plants where native plants are unlikely to	

[31] Of the 197,781 acres in Category 1 (Table 2-1), the No Action Alternative does not include an herbicide or other control method effective District-wide on medusahead rye (44,700), perennial pepperweed (4,393 acres), St. Johnswort (10 acres), or saltcedar (6,367 acres). Other invasive plants, such as Russian olive, cannot be treated because they are not listed as a noxious weed.

[32] Some species are killed with a single herbicide application while other species may only be suppressed, and are treated to keep them from setting seed or expanding. Larger sites often have a seed bank that keeps them returning on the same site for several to many years.

The No Action Alternative - Noxious Weed Management	***The Proposed Action - Invasive Plant Management***	***The Revised Proposed Action - Invasive Plant Management***
	be successful[33]. Further information about seeding and planting can be found in Appendix G, *Process and Criteria Considered for Integrated Invasive Plant Management Utilizing Competitive Seeding and Planting.*	
	Specific to the Proposed Action: When compared to the No Action Alternative, the additional herbicides available under the Proposed Action would reduce the use of 2,4-D by 12 percent, dicamba by 45 percent, glyphosate by 23 percent, and picloram by 32 percent (see Tables 2-11 and 2-12).	***Specific to the Revised Proposed Action:*** When compared to the No Action Alternative and the Proposed Action, the additional herbicides available under the Revised Proposed Action would reduce the use of 2,4-D by 65 and 59 percent, respectively; dicamba by 55 and 17 percent, respectively; glyphosate by 31 and 10 percent, respectively; and picloram by 76 and 64 percent, respectively (see Tables 2-11 and 2-12).

Category 3, New Invaders

Common to All Alternatives:

Treatment scenarios for species currently not known to occur on the District but present on neighboring lands (Table 2-2) are included in the *Treatment Key* (Table 2-10). For other, currently unknown Category 3 species, treatments would generally follow the treatment scenarios described for related invasive plant species. All new invaders would be high priority for treatment before they become established on the District. Treatments would typically total 0 to 10 acres per year.

Category 4, Post-fire Emergency Stabilization and Rehabilitation

Common to All Alternatives:

Annual Category 4 treatment levels would depend upon the sensitivity of the resources affected, the size, location, and intensity of the wildfire, the relative location of invasive plant seed sources, and available funding. Where invasive annual grasses are present in or near the burned area, treatments may eventually be required on much of the burned area because the fires open up niches for invasive plant establishment or spread, and many vectors move plants from the unburned areas into the burned area. Seeding of Category 4 areas is covered by the *Vale District Programmatic Fire Emergency Stabilization and Rehabilitation Environmental Assessment* (USDI 2005b).

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[33] As described in the *Integrated Invasive Plant Management* section earlier in this Chapter, there are potential treatment areas on the Vale District that have limited ecological site potential or are in such a degraded state that attempting to reintroduce exclusively native plants immediately following invasive plant treatments would be unsuccessful and would not meet the objective of the treatment. These sites tend to be low elevation sites with less than eight inches of annual precipitation.

<table>
<tr><th>The No Action Alternative - Noxious Weed Management</th><th>The Proposed Action - Invasive Plant Management</th><th>The Revised Proposed Action - Invasive Plant Management</th></tr>
<tr><td>***Specific to the No Action Alternative:***

Under the 1989 *Integrated Weed Control Plan and EA*, treatments would occur if there is a concern for invasion following a fire by invasive plant species other than annual grasses (for example, certain thistles) that are effectively treated with one of the four herbicides available District-wide under this alternative.

In addition, the invasive plant control treatments described in the recent emergency stabilization and rehabilitation NEPA tiered to the 2010 Oregon FEIS (Table 2-8, *Summary of Existing NEPA Authorizing Invasive Plant Treatments*) fall within this Category.</td><td colspan="2">***Common to the Proposed and Revised Proposed Actions:***

Invasive plants other than annual grasses that may spread following a fire (such as biennial thistles, perennial mustards, and Russian knapweed) would be treated as described in Category 2 (*future spread from existing sites*).

The District would treat invasive annual grasses and other invasive plants on recent (Table 2-8) and future wildfire areas as needed to meet emergency stabilization and rehabilitation objectives. The majority of these treatments would involve herbicide treatments using ground or aerial application methods (see Table 2-7*, Annual Treatment Summary*, as well as Table 2-3, *Summary of Wildfires (1980-2014) Larger Than 10 Acres* for past treatment and wildfire trends).</td></tr>
<tr><td>***Specific to the No Action Alternative:***

Glyphosate would be used for medusahead rye control following fires if collateral damage to native species is not an issue.</td><td>***Specific to the Proposed Action:***

Imazapic (selective to annual grasses) would be used the majority (95 percent or more) of the time on invasive annual grasses. Glyphosate may be used in areas (5 percent or less) where collateral damage to non-target plant species is not a concern (e.g. monocultures of invasive plants).</td><td>***Specific to the Revised Proposed Action:***

Imazapic and rimsulfuron would be used the majority (95 percent or more) of the time on invasive annual grasses. Rimsulfuron would be used in rotation with imazapic. Both imazapic and rimsulfuron can be applied at the pre-emergent stage in the fall or post-emergent in early spring, but temperature and moisture label restrictions may limit applications in some instances. Rimsulfuron has a one year grazing restriction post-application, to allow newly emerged grasses sufficient time to become established. Glyphosate may be used in areas (5 percent or less) where collateral damage to non-target plant species is not a concern (e.g. monocultures of invasive plants).</td></tr>
</table>

The No Action Alternative - Noxious Weed Management	***The Proposed Action - Invasive Plant Management***	***The Revised Proposed Action - Invasive Plant Management***

Categories 5 and 6: Invasive Annual Grasses (by pasture)

Specific to the No Action Alternative:

Direct control treatments in these Categories would happen rarely (few sites every few years) and would only occur on the noxious weed medusahead rye in isolated instances where targeted grazing using cattle or the non-selective herbicide glyphosate can be used, generally targeting small monocultures at risk of spreading.

Common to the Proposed and Revised Proposed Actions:

Invasive annual grass treatments in Categories 5 and 6 would be implemented as an integrated approach, generally through a sequence of treatments of prescribed fire or targeted grazing by cattle followed by herbicide application (imazapic in the Proposed Action or imazapic and rimsulfuron in the Revised Proposed Action), primarily applied through aerial application. Seeding or planting would follow treatments where remaining desirable vegetation is not vigorous enough to complete against the reestablishment of invasive plants. Typically, individual treatment projects with targeted grazing, prescribed fire, or seeding or planting would be approximately 20,000 acres per project, not to exceed 100,000 acres a year or 300,000 acres over the life of the plan. Herbicides may be applied on up to 100,000 acres annually, both in conjunction with the other treatment methods described in this Category or as the only method of treatment in Categories 5 and 6 (see Table 2-6).

Table 2-6. Treatments in Categories 5 and 6 (Invasive Annual Grasses)

Treatments	Typical Project Size[1]	Maximum / Year[1]	Maximum over 15 years[1]
Seeding / Planting	20,000	100,000	300,000
Targeted Grazing	20,000	100,000	300,000
Prescribed Fire	20,000	100,000	300,000
Herbicide applications	20,000	100,000	1,500,000

1. These different treatments may occur on the same site or on different sites than other treatments listed in this table.

Treatment projects that include targeted grazing using cattle would occur in areas dominated by invasive annual grasses. Targeted grazing would be prescribed at a rate that would allow for reduced biomass, density, and production of invasive annual grasses while also breaking up thatch layers. Targeted grazing prescriptions would occur during the growth stage when native and desirable nonnative species are resilient to grazing and when livestock preference is shifted towards consumption of targeted species (typically in early spring and fall/winter). Pre-treatment monitoring (adopted as a Project Design Feature as part of this analysis) would determine anticipated annual production of invasive annual grasses and species composition at a minimum, and may also consider timing (season), and intensity of targeted grazing treatment in order not to be detrimental to non-target vegetation, soils, etc. Monitoring plans for each targeted grazing prescription would be developed as part of the *Annual Treatment Plan*.

<table>
<tr><th>The No Action Alternative - Noxious Weed Management</th><th>The Proposed Action - Invasive Plant Management</th><th>The Revised Proposed Action - Invasive Plant Management</th></tr>
<tr><td></td><td colspan="2">Within Categories 5 and 6, treatment projects would occur in pastures within grazing allotments, which have existing grazing permits.[34] Prior to implementation of targeted grazing, the selected pastures would be identified in the District's Annual Treatment Plan and would be subject to a required interdisciplinary review. In some cases, additional NEPA may be required prior to implementing the treatment in order to address such things as unique site conditions, the need for additional public input, or conflicts between the proposed treatment and the existing grazing permit.

Options for implementing targeted grazing treatments could include contracts (e.g., stewardship or indefinite delivery/indefinite quantity) or permits (e.g., a free use permit[35]). If targeted grazing takes place under a permit (43 C.F.R 4100 Grazing Regulations), then a subsequent Decision would be issued. Targeted grazing treatments generally would be implemented under contract (separate from a grazing permit).

Category 5, Perennial plant communities at risk due to the presence of invasive annual grasses: In competitive reseeding, native species would be emphasized to retain the natural vegetative composition and increase the competitive opportunity of native species. These projects are likely smaller than projects in Category 6, given that Category 5 areas still contain a robust component of native plants (more information about seeding and planting can be found in Appendix G).

Category 6, Plant communities that are dominated by invasive annual grasses: Invasive plant treatments may be followed by competitive reseeding or planting of perennial species. These treatments could be large (around 20,000 acres), would occur in invasive annual grass monocultures, and would occur most often with a mix of native and nonnative species (more information about seeding and planting can be found in Appendix G). Because these areas are generally monocultures, targeted grazing prescriptions on invasive annual grasses may have heavier utilization prescriptions, with residual stubble heights of 3 inches or less (Mosley and Rosell 2006).</td></tr>
</table>

[34] Grazing permits grant permission to graze a specific number, kind, and class of livestock for a specified period on defined Federal rangeland. Grazing permits are issued to those that have *preference*, which is a superior or priority position against others for the purposes of receiving a grazing permit. *Preference* is attached to base property owned or controlled by the grazing permittee.

[35] A free use permit could be authorized under the following circumstances (43 C.F.R. 4130.5):

1) the primary objective of authorizing use is for the management of vegetation to meet resource objectives other than the production of livestock forage;
2) the primary purpose of grazing is for scientific research or administrative studies; or,
3) the primary purpose of grazing use is the control of noxious weeds.

The No Action Alternative - Noxious Weed Management	***The Proposed Action - Invasive Plant Management***	***The Revised Proposed Action - Invasive Plant Management***
	Specific to the Proposed Action (Categories 5 and 6): When herbicides are part of the treatment plan, imazapic would be used.	***Specific to the Revised Proposed Action (Categories 5 and 6):*** When herbicides are part of the treatment plan, rimsulfuron would be used in rotation with imazapic. Both imazapic and rimsulfuron can be applied at the pre-emergent stage in the fall or post-emergent in early spring, but temperature and moisture label restrictions may limit applications in some instances. Rimsulfuron has a one year grazing restriction post-application, to allow newly emerged grasses sufficient time to become established.
Category 7, Lower Priority Invasive Plants		
Specific to the No Action Alternative: Plants in this Category (Table 2-5) would not be treated.	***Common to the Proposed and Revised Proposed Actions:*** Plants in this Category (Table 2-5) would not be treated except in conjunction with treatments of species in other Categories on the same site.	

Table 2-7. Annual Treatment Summary

Fiscal Year[1]	Acres Inventoried[2]	Herbicide Treatment Acres				Biocontrol Releases[4]	Acres Manual	Acres Mechanical
		1989 NEPA		Post 2010 NEPA[5]				
		Total[3]	Air[3]	Total[3]	Air[3]			
2015	515,000	845	0	17,906	17,906	5	10	0
2014	809,000	992	13	0	0	34	5	0
2013	613,615	2,406	1,275	0	0	2	10	0
2012	722,105	2,239	0	0	0	150	22	0
2011	837,749	2,309	452	0	0	45	33	0
2010	808,300	2,324	605	0	0	2	20	0
2009	621,768	4,593	1,325	0	0	155	41	0
2008	201,753	3,559	2,134	0	0	50	30	0
2007	493,870	1,144	75	0	0	50	47	0
2006	486,500	1,112	0	0	0	2	12	5
2005	620,300	1,404	0	0	0	9	10	6
2004	693,980	1,029	300	0	0	6	15	7
2003	886,500	5,578	600	0	0	1	12	0
2002	unknown	3,610	350	0	0	2	20	0

1. The Federal fiscal year runs from October 1 – September 30.
2. Areas are inventoried for invasive plants. If invasive plants are found, acres are treated (if possible), monitored for re-growth and spread in subsequent years. Column provided for information; it is not part of the Alternatives.
3. Ground and aerial acreage is included in total.
4. One biocontrol release is counted as treating one acre. Biocontrols may not spread across an entire acre or may spread much further than one acre. Numbers differ from Table 3-6, *Biocontrol Releases on the Vale District*; numbers in this Table reflect biocontrol releases done on BLM-administered lands by ODA staff and collections and re-releases by BLM staff, whereas Table 3-6 shows ODA releases on or near BLM-administered lands.
5. Herbicides authorized under emergency stabilization and rehabilitation and fuels management NEPA analyses.

Table 2-8. Summary of Existing NEPA Authorizing Invasive Plant Treatments

NEPA Authorizing Treatments	Invasive Plant Treatments[1]	Potential Invasive Plant Species	Treatment Area[3] *Project Area*	Location	Categories
Owyhee Canyon Fire Emergency Stabilization and Rehabilitation Plan Environmental Assessment and Decision Record (USDI 2016f)	Integrated noxious weed management including manual controls, biocontrols, seeding/planting, and herbicide applications with 2,4-D, glyphosate, picloram, and dicamba, chlorsulfuron, clopyralid, imazapic and rimsulfuron.	Invasive annual grasses and other noxious weeds	21,747 acres of invasive annual grasses 25-55 acres of noxious weeds *21,747 acres (project area)*	Malheur County	4
Juntura Complex Fires Emergency Stabilization and Rehabilitation Plan Environmental Assessment and Decision Record (USDI 2016g)	Integrated noxious weed management including manual controls, biocontrols, seeding/planting, and herbicide applications with 2,4-D, glyphosate, picloram, and dicamba, chlorsulfuron, clopyralid, and imazapic.	Invasive annual grasses and other noxious weeds	16,310 acres of invasive annual grasses 35-65 acres of noxious weeds *23,141 acres (project area)*	Northern Malheur County	4

NEPA Authorizing Treatments	Invasive Plant Treatments[1]	Potential Invasive Plant Species	Treatment Area[3] *Project Area*	Location	Categories
Bendire Complex Fire Emergency Stabilization and Rehabilitation Integrated Invasive Plant Management Plan Environmental Assessment and Decision Record (USDI 2016c)	Integrated noxious weed management including manual controls, biocontrols, seeding/planting, and herbicide applications with 2,4-D, glyphosate, picloram, and dicamba, chlorsulfuron, clopyralid, and imazapic.	Invasive annual grasses and other noxious weeds	28,760 acres of invasive annual grasses 70-100 acres of noxious weeds *53,733 acres (project area)*	NW Malheur County	4
Leslie Gulch Fire Emergency Stabilization and Rehabilitation Plan Environmental Assessment and Decision Record (USDI 2015d)	Seeding and herbicides including imazapic, chlorsulfuron, and clopyralid.	Invasive annual grasses, thistles, and mustards	6,000 acres *7,850 acres (project area)*	North of Jordan Valley, Oregon	4
Mormon Basin/Pedro Mountain Fuels Management Project EA (USDI 2015b)	Imazapic to control invasive annual grass in existing sagebrush	Invasive annual grasses. (Control of other noxious weeds would continue to occur under the 1989 EA.)	2,300 acres *(estimated)* *15,289 acres (project area)*	25 miles SE of Baker City	5
Buzzard Complex Fire Emergency Stabilization and Rehabilitation Plan Environmental Assessment and Decision Record[4] (USDI 2014)	Seeding and herbicides including imazapic, chlorsulfuron, and clopyralid.	Invasive annual grasses, Canada thistle, perennial pepperweed, Mediterranean sage, biennial thistles, Russian knapweed	43,500 acres *224,000 acres (project area)*	25 miles south of Juntura	4
Noxious Weed Control Program Environmental Assessment and Decision Record (USDI 1989a)	Integrated noxious weed management, including manual and mechanical methods, targeted grazing, biocontrols, and herbicides (2,4-D, glyphosate, picloram, and dicamba)	Noxious weeds (*see Table 2-1*)	Annual average: 3,000 acres[2] *Over 5 million acres (project area)*	Entire District	1, 2, 3, some 4 - 7

1. Only invasive plant treatments listed. Other vegetation treatments may be authorized.
2. Based on previous funding. (If more funding was available, more acres would be treated.)
3. Numbers shown may be overlapping treatments or spot treatments (e.g., spot herbicide treatments on located noxious weeds).
4. The following fire emergency stabilization and rehabilitation plans did Determinations of NEPA Adequacy tiered to the analysis done in the Buzzard EA: Jaca (southwest of Jordan Valley; 13,000 gross acres) and Soda (northeast of Jordan Valley; 28,000 gross acres).

Selection of the Treatment Method

Working within the priorities and constraints described in the *Planning* section under *Background – Invasive Plant Management* earlier in this Chapter, the identification of what treatments to use and, where applicable, the actual herbicide to be used, would follow the criteria presented in the *Treatment Key* (Table 2-10, at the end of this section). The No Action Alternative would be limited to the herbicides described in their respective NEPA documents. The *Treatment Key* is a guide based on best current science and the experience of invasive plant control professionals.

On the *Treatment Key*, the percent of time each treatment method would be used under each alternative has been estimated, based on current information about known and estimated invasive plant sites. Follow-up treatments to control plants surviving previous treatments may use different treatments than the original direct method of control. Where treatment sites are near water bodies, an aquatic herbicide formulation may be specified to meet site protection objectives. Otherwise, treatments would be used as dictated by the soil, season, and other criteria included in Table 2-10, or when Standard Operating Procedures, Mitigation Measures, or other measures in Appendix A preclude the use of the first choice because of the presence of humans, livestock, or other resources that would be put at risk. For example, a Mitigation Measure precludes the use of 2,4-D in wild horse Herd Management Areas during peak foaling season (see Appendix A).

Table 2-11 provides an estimate of the amount of acres to be treated, organized by alternative and Category. This estimate is based off of known or projected acres of invasive plants (see Categories 1 - 7, described previously in this Chapter) combined with invasive plant treatments described in the *Treatment Key* (Table 2-10). Table 2-11 treatments include herbicide tank mixes. Table 2-12 shows total acres of each herbicide used for Category 1 species, regardless of whether applied in a tank mix or individually.

Table 2-9. Herbicide Information

Herbicide: Representative Trade Names[1] *Common Targets*	**Alternatives** *No Action District-Wide*	*No Action Limited Areas*[13]	*Proposed Action*	*Revised Proposed Action*	**Selective to Plant Types** Pre / post emergent *Point of application*	**Areas Where Registered Use is Appropriate**[14] *Rangeland*	*Forest and Woodland*	*Riparian / Seasonal Wetland*	*Aquatic / Wetland*	*Oil, Gas, & Mineral Sites*	*Rights-of-Way*	*Recreation & Cultural Sites*	**Application Rate**[15] **(lbs. / acre / year)** Typical	Max[2]	**Aerial Spray**[11]	**Half-life in Soils**[4] **(days)**
2, 4-D: Many, including Amine, HardBall, Unison, Saber, and Aqua-Kleen. *Used in combination with other herbicides to control broadleaf plants*	✓	✓	✓	✓	**broadleaf** Post *Foliar*	✓	✓	✓	✓	✓	✓	✓	1	(1.9)	Yes	10
Aminopyralid[3]**:** Milestone. *Starthistles, thistles, knapweeds, rush skeletonweed*				✓	**broadleaf** Post *Soil or foliar*	✓	✓	✓		✓	✓	✓	0.078	0.11	Yes	32 - 533
Chlorsulfuron[3]**:** Telar. *Used in combination with 2,4-D to control biennial thistles, perennial mustards, toadflax, Mediterranean sage*		✓	✓	✓	**broadleaf** Pre and early post *Soil or foliar*	✓		✓		✓	✓	✓	0.047	0.141[8]	Restricted[5]	40
Clopyralid[3]: Transline, Stinger, Spur. *Used in combination with 2,4-D to control hawkweeds, knapweed, Mediterranean sage, biennial thistles, starthistles*		✓	✓	✓	**broadleaf** Post *Foliar*	✓	✓	✓		✓	✓	✓	0.35	0.5	Yes	40
Dicamba: Vanquish, Banvel, Diablo, Vision, Clarity *Used in combination with 2,4-D to control perennial mustards, biennial thistles, field bindweed, halogeton, puncturevine*	✓	✓	✓	✓	**broadleaf, woody plants** Pre and post *Foliar*	✓		✓		✓	✓	✓	0.3	2[10]	Yes	14
Diflufenzopyr + Dicamba: Overdrive, Distinct *Field bindweed, oxeye daisy, St Johnswort*			✓	✓	**broadleaf** Post *Foliar*	✓				✓	✓	✓	0.2625	0.4375	No	14
Dicamba													0.1875	0.25		
Diflufenzopyr													0.075	0.1		
Fluridone: Avast!, Sonar *Aquatic plants*			✓	✓	**submersed plants** Post *Aquatic*				✓				0.15	(1.3)	Yes	21
Fluroxypyr: Comet, Vista. *Kochia, mustards, spurge, blackberry.*				✓	**broadleaf** Post *Foliar*	✓	✓	✓		✓	✓	✓	0.26	0.5	Yes	7 - 23

Herbicide: Representative Trade Names[1] *Common Targets*	**Alternatives**				**Selective to Plant Types** Pre / post emergent *Point of application*	**Areas Where Registered Use is Appropriate[14]**							**Application Rate[15] (lbs. / acre / year)**		**Aerial Spray[11]**	**Half-life in Soils[4] (days)**
	No Action District-Wide	*No Action Limited Areas[13]*	*Proposed Action*	*Revised Proposed Action*		*Rangeland*	*Forest and Woodland*	*Riparian / Seasonal Wetland*	*Aquatic / Wetland*	*Oil, Gas, & Mineral Sites*	*Rights-of-Way*	*Recreation & Cultural Sites*	Typical	Max[2]		
Glyphosate[3]: Many, including Rodeo, Mirage, Roundup, Mad Dog Plus, and Honcho. *Grasses, trees and shrubs, yellow flag iris*	✓	✓	✓	✓	**no** Post *foliar*	✓	✓	✓	✓	✓	✓	✓	2	3 or 7[7, 12]	Restricted[9]	47
Hexazinone: Velpar *Annual grasses in rights-of-way, sulfur cinquefoil*			✓	✓	**grasses, broadleaf, woody plants** Pre and post *Soil or foliar*	✓	✓			✓	✓	✓	2	(4[12])	Restricted[9]	90
Imazapic[3]: Plateau, Panoramic *Annual grasses such as medusahead rye, cheatgrass, and ventenata*		✓	✓	✓	**some broadleaf and grasses** Pre and post *Soil*	✓	✓	✓		✓	✓	✓	0.0313	0.1875	Yes	120-140
Imazapyr[3]: Arsenal, Stalker, Habitat, Polaris *Starthistles, trees and shrubs, yellow flag iris*			✓	✓	**no** Pre and post *Soil or foliar*	✓	✓	✓	✓	✓	✓	✓	0.45	1.25[10]	Yes	25-141
Metsulfuron methyl[3]: Escort, Patriot, PureStand. *Used in combination with 2,4-D to control trees and shrubs, perennial mustards, St. Johnswort, biennial thistles*			✓	✓	**broadleaf, woody plants** Post *Soil or foliar*	✓	✓	✓		✓	✓	✓	0.03	0.15[6,10]	Restricted[5]	30
Picloram[3]: Triumph, OutPost, Tordon. *Used in combination with 2,4-D to control rush skeletonweed, leafy spurge, field bindweed, knapweed, St. Johnswort, starthistles, biennial thistles*	✓	✓	✓	✓	**broadleaf, woody plants** Pre and post *Foliar*	✓	✓			✓	✓	✓	0.35	1	Yes	20-300
Rimsulfuron: Matrix. *Annual grasses such as medusahead rye, cheatgrass, and ventenata*				✓	**annual grasses** Pre and post *Soil*	✓	✓	✓		✓	✓	✓	0.0469	0.0625	Yes	5 - 40
Sulfometuron methyl[3]: Oust, Spyder *Annual grasses, African rue*			✓	✓	**no** Pre and post *Soil or foliar*		✓	✓		✓	✓	✓	0.14	0.38	No	20

Herbicide: Representative Trade Names[1] *Common Targets*	**Alternatives**				**Selective to Plant Types** Pre / post emergent *Point of application*	**Areas Where Registered Use is Appropriate[14]**							**Application Rate[15] (lbs. / acre / year)**		**Aerial Spray[11]**	**Half-life in Soils[4] (days)**
	No Action District-Wide	*No Action Limited Areas[13]*	*Proposed Action*	*Revised Proposed Action*		*Rangeland*	*Forest and Woodland*	*Riparian / Seasonal Wetland*	*Aquatic / Wetland*	*Oil, Gas, & Mineral Sites*	*Rights-of-Way*	*Recreation & Cultural Sites*	Typical	Max[2]		
Triclopyr[3]: Garlon, Renovate, Element *Purple loosestrife, trees and shrubs*			✓	✓	**broadleaf, woody plants** Post *Foliar*	✓	✓	✓	✓	✓	✓	✓	1	(10[12])	No	46

1. See Table B-2 (*Herbicide Formulations Approved for use on BLM-Administered Lands*) in Appendix B for the full list of herbicide trade names approved for use on lands managed by the BLM in Oregon, including formulations with two or more active ingredients.
2. Maximums are determined by herbicide product label and information analyzed in Risk Assessments. In cases where these two rates differ, the lower of the two rates is the maximum that can be applied on BLM-administered lands. Parentheticals denote herbicides that are limited by PEIS Mitigation Measures to typical application rates where feasible. See Table 2-10, *Treatment Key,* for application rates.
3. These, and sethoxydim, are approved for use by the Forest Service in Oregon and Washington (USDA 2005b).
4. See the *Soils Resources* section for more information.
5. Only allowed when no other means of application are possible.
6. Metsulfuron methyl is limited to a maximum rate of 0.0625 lbs. per acre on rangeland.
7. 3 lbs. / acre acid equivalent for the No Action Alternative and 7 lbs. / acre under the Proposed and Revised Proposed Actions. The 1989 *Integrated Weed Control Plan and EA* relies on a 1985 glyphosate Risk Assessment that analyzes glyphosate at 3 lbs. / acre acid equivalent, based on the maximum application rate on a Rodeo © label. The 2011 glyphosate Risk Assessment analyzes a maximum rate of 7 lbs. / acre. Maximum rates on formulated products listed in Table B-2 (Appendix B) range from 7 lbs. / acre to 14 lbs. / acre.
8. Do not apply more than 0.0611 lbs. / acre per year in pasture or rangeland.
9. 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" and "Livestock / Wild Horses and Burros: Where feasible, limit glyphosate and hexazinone to spot applications in rangeland"
10. Mitigation Measures adopted by the Oregon Record of Decision state, "where there is a potential for herbivore [including wild horse and burro] consumption of treated vegetation, apply dicamba, imazapyr, and metsulfuron methyl at the typical, rather than maximum, application rate to minimize risks."
11. Conservation Measures (see Appendix A) provide additional restrictions near Special Status species.
12. PEIS Mitigation Measures specify "Minimize potential risks to livestock by applying glyphosate at the typical application rate where feasible" and "Minimize potential risks to wild horses and burros by applying glyphosate, hexazinone, and triclopyr at the typical application rate, where feasible, in areas associated with wild horse and burro use."
13. Herbicides authorized under emergency stabilization and rehabilitation and hazardous fuels management NEPA analyses.
14. 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., only certain formulations of glyphosate and 2,4-D are allowed in aquatic habitat).
15. Actual application rates can be found in Table 2-10, *Treatment Key*.

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

For each species group, the preferred treatment method is listed first, with second and third choices (and so on) listed subsequently. Factors that could lead to the preferred (and subsequent) methods not being appropriate are listed in the *Treatment Considerations / Notes* column, and includes information such as plant life cycle, soil types, plant resistance to herbicides, infestation size, herbicide selectivity to neighboring desirable vegetation, weather conditions, and Standard Operating Procedures or label restrictions that limit areas an herbicide could be used in.

Species Group [Categories] *Category 1 species and acres*	**Treatment Methods[1]**	**Formulated Product Per Acre[2]**	**Lbs. / Acre[3]**	**Percent of Acres where Treatments Would be Used [4]**				**Treatment Considerations / Notes[5]**
				Revised Proposed Action	**Proposed Action**	**No Action Alternative: District - wide**	**No Action Alternative: Limited Areas[9]**	
African rue [3]	Imazapyr	2 qt.	1	Unknown[6]	Unknown[6]	NA	NA	African rue is documented on neighboring lands, but not known to occur on the Vale District
	Sulfometuron methyl	3 to 8 oz.	0.14 to 0.38	Unknown[6]	Unknown[6]	NA	NA	
	No effective control method available[10]			NA	NA	100%	NA	
Annual Broadleaves [1, 2, 4, 7] *spiny cocklebur, yellow / white sweetclover <2 acres*	Manual control			20%	20%	20%	NA	Hand pulling can be effective on single plants or small infestations.
	Mechanical control			5%	5%	5%	NA	Annual broadleaves can be controlled with mowing or weed whackers, but those methods can adversely affect desirable neighboring species.
	Aminopyralid	3 to 7 oz.	0.047 to .11	30%	NA	NA	NA	Early post-emergence when plants are small and rapidly growing
	Fluroxypyr	12 oz.	0.263	10%	NA	NA	NA	Post-emergence when plants are growing rapidly.
	Chlorsulfuron + 2,4-D	1 oz. + 1 qt.	0.047 + 0.95	10%	45%	NA	NA	Invasive annual broadleaves often develop resistance, especially to sulfonylureas[7]. This combination adds a second mode of action.
	Metsulfuron methyl + 2,4-D	1 oz. + 1 qt.	0.0375 + 0.95	10%	10%	NA	NA	Harder on some wet-meadow grass species than chlorsulfuron.
	Dicamba + Diflufenzopyr (Overdrive)	8 oz.	0.35	10%	10%	NA	NA	Use to control species along roads or in disturbed areas.
	Rimsulfuron	2 to 4 oz.	0.03125 to 0.0625	5%	NA	NA	NA	Known to work on prickly lettuce (a low priority species), but may also be effective on other annual broadleaves.
	Dicamba + 2,4-D	1 pt. + 1 qt.	0.5 + 0.95	< 1%	10%	75%	NA	Effective on many of the invasive broadleaves but it offers minimal residual control.
	Targeted grazing (sheep and goats)			< 1%	less than 1%	less than 1%	NA	Some species can be controlled through targeted grazing.

Species Group [Categories] *Category 1 species and acres*	**Treatment Methods**[1]	**Formulated Product Per Acre**[2]	**Lbs. / Acre**[3]	**Percent of Acres where Treatments Would be Used** [4]				**Treatment Considerations / Notes**[5]
				Revised Proposed Action	**Proposed Action**	**No Action Alternative**		
						District - wide	**Limited Areas**[9]	
Annual grasses [1, 2, 4[11], 5[11], 6[11], 7] *jointed goatgrass, medusahead rye, ventenata* *46,816 acres*	Imazapic	6 oz.	0.09	38%	75%	NA	98%	Apply at the pre-emergent stage when other grasses and forbs are dormant in the fall.
	Rimsulfuron	2 to 4 oz.	0.03125 to 0.0625	37%	NA	NA	NA	Pre-emergence (fall) to early post-emergence (early spring). Rotate with imazapic. Perennial grasses are tolerant to fall applications. Rimsulfuron has a one year grazing restriction post-application, to allow newly emerged grasses sufficient time to become established.
	Imazapic + Glyphosate	6 oz. + 4 oz.	0.09 + 0.125	10%	10%	NA	0%	If some germination has started, this treatment could be considered, if desirable plants are not present.
	Glyphosate	1 pt.	0.5	1%	1%	less than 1%	1%	Appropriate at the seedling stage. Care would be taken to minimize damage to non-targets. Consider location of treatment to minimize collateral damage.
	Sulfometuron methyl	0.75 to 1.5 oz.	0.035 to 0.07	2%	2%	NA	less than 1%	Fairly safe on native perennial grasses- an advantage in re-vegetation use. Hard on forbs. Cannot be aerially sprayed, and label prohibits use in rangeland (can be used on rights-of-way and forest and woodlands).
	Hexazinone	1.5 qt.	0.75	1%	1%	NA	NA	Primarily for use on road rights-of-way but could be used on rangelands.
	Sulfometuron methyl + Chlorsulfuron (Landmark)	1.5 oz.	0.035 + 0.0176	1%	1%	NA	NA	May be used when rangeland has become severely infested with invasive plant species. 12-month grazing restriction and 12 month re-plant interval.
	Targeted grazing (cattle)			5%	5%	1%	1%	Would be used in conjunction with imazapic or rimsulfuron and reseeding where necessary. Targeted grazing treatments with cattle occur in the late fall / early winter or early spring to reduce the seeds, annual production, and residual biomass of invasive annual grasses.
	Prescribed Fire			5%	5%	less than 1%	0%	Prescribed burns to eliminate thatch to improve effectiveness of herbicide (imazapic or rimsulfuron). Seeding would follow herbicide, if necessary.
	Manual control			< 1%	< 1%	< 1%	0%	One small site is controlled through hand pulling.
	No effective control method available[10]			NA	NA	> 99%	NA	

Species Group [Categories] *Category 1 species and acres*	**Treatment Methods[1]**	**Formulated Product Per Acre[2]**	**Lbs. / Acre[3]**	**Percent of Acres where Treatments Would be Used [4]**				**Treatment Considerations / Notes[5]**
				Revised Proposed Action	**Proposed Action**	**No Action Alternative**		
						District - wide	**Limited Areas[9]**	
Aquatic Plants [3]	Manual control			Unknown[6]	Unknown[6]	Unknown[6]	NA	Hand pulling can be effective on single plants or small infestations.
	Mechanical control			Unknown[6]	Unknown[6]	Unknown[6]	NA	Tractor can be effective but difficult to get entire plant.
	Aquatic Glyphosate	1.5% solution (2 oz. / gallon)	minimal (0.02lbs / gallon)	Unknown[6]	Unknown[6]	Unknown[6]	NA	The preferred treatment is plant and location specific. Invasive aquatic plants other than yellow flag iris (discussed separately) are not currently known on the District.
	Fluridone	1 qt.	1	Unknown[6]	Unknown[6]	NA	NA	
	Triclopyr	8 qt.	6	Unknown[6]	Unknown[6]	NA	NA	
	Imazapyr	1 qt.	0.5	Unknown[6]	Unknown[6]	NA	NA	
Baby's Breath [3]	Aminopyralid + Metsulfuron methyl (Opensight)	2.5 to 3 oz.	0.0125 + 0.00175 to 0.0165 + 0.00231	Unknown[6]	NA	NA	NA	Pre-emergence in the fall, or post-emergence when target plants are in the seedling to rosette stage.
	Chlorsulfuron + 2,4-D	1 oz. +1 qt.	0.047 + 0.95	Unknown[6]	Unknown[6]	NA	NA	Apply to spring growth on bolting plants with green basal leaves.
	Imazapic + 2,4-D	8 oz. + 1 qt.	0.125 + 0.95	Unknown[6]	Unknown[6]	NA	NA	Apply to spring growth on bolting plants with green basal leaves.
	Dicamba + 2,4-D	1.5 pt. + 1 qt.	0.75 + 0.95	Unknown[6]	Unknown[6]	Unknown[6]	NA	Apply to spring growth on bolting plants with green basal leaves.
	Aquatic Glyphosate	1.5% solution (2 oz. / gallon)	minimal (0.02lbs / gallon)	Unknown[6]	Unknown[6]	Unknown[6]	NA	Apply post-emergence to spring growth or to bolting plants with green basal leaves.
	Manual control			Unknown[6]	Unknown[6]	Unknown[6]	NA	Hand pulling must sever below thickened root crown and rhizome.
Biennial Thistles [1, 2, 3, 4, 7] bull thistle, musk thistle, Scotch thistle *30,343 acres*	Manual control			9%	9%	10%	9%	Grubbing can be effective in controlling existing plant, but will not be effective on seed bank. Would only be used on small infestations.
	Aminopyralid	5 to 7 oz.	0.078 to 0.11	50%	NA	NA	NA	Preferred treatment method. Longer soil residual than clopyralid. 90 percent control if applied at the bud stage.
	Chlorsulfuron	1 oz.	0.047	5%	10%	NA	10%	Treatment at the rosette to bud stage. This treatment is particularly useful when Canada thistle occurs in the infestation mix.

Species Group [Categories] *Category 1 species and acres*	**Treatment Methods[1]**	**Formulated Product Per Acre[2]**	**Lbs. / Acre[3]**	**Percent of Acres where Treatments Would be Used [4]**				**Treatment Considerations / Notes[5]**
				Revised Proposed Action	**Proposed Action**	**No Action Alternative**		
						District - wide	**Limited Areas[9]**	
	Clopyralid + 2,4-D	1 pt. + 1 qt.	0.375 + 0.95	5%	10%	NA	10%	Treatment for young plants (actively growing thru flowering).
	Metsulfuron methyl	1 oz.	0.0375	5%	10%	NA	NA	Good choice at the rosette to bud stage. It is harder on some wet-meadow grass species than chlorsulfuron.
	Chlorsulfuron + 2,4-D	1 oz. + 1 qt.	0.047 + 0.95	5%	10%	NA	10%	Combination to consider using when burn-down to prevent seed formation / set is needed or where resistance to sulfonylureas[7] is a concern. It adds a second mode of action.
	Chlorsulfuron + Clopyralid + 2,4-D	1 oz. + 1 pt. + 1 qt.	0.047 + 0.375 + 0.95	5%	35%	NA	35%	Great choice when there is an established seed bank at site, treat from rosette to flowering. Also good on Canada thistle.
	Chlorsulfuron + Picloram	1 oz. + 1 qt.	0.047 + 0.5	5%	5%	NA	5%	Use when there is an established seed bank at site, treat from rosette to flowering, where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse effects to desirables can be minimized.
	Dicamba + 2,4-D	1 pt. + 1 qt.	0.5 + 0.95	< 1%	5%	65%	15%	Appropriate if treatment occurs at spring and fall rosette stage.
	Fluroxypyr + Picloram	6 oz. + 8 oz.	0.131 + 0.125	10%	NA	NA	NA	Post-emergence to rapidly growing weed from flower to bud stage. Most effective in fall treatments.
	Picloram + 2,4-D	1 pt. + 1 qt.	0.25 + 0.95	< 1%	5%	17%	5%	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 desirables can be minimized.
	Picloram + 2,4-D + Dicamba	1 pt. + 1 qt. + 1pt.	0.25 + 0.95 + 0.5	< 1%	less than 1%	3%	< 1%	Apply to rosettes in areas where residual control is desired.
	Mechanical control			1%	1%	5%	1%	Thistles can be controlled with mowing or weed whackers, but can adversely affect desirable neighboring species.
	Targeted grazing (goats)			< 1%	< 1%	< 1%	< 1%	Goats will eat young plants.

Species Group [Categories] *Category 1 species and acres*	**Treatment Methods[1]**	**Formulated Product Per Acre[2]**	**Lbs. / Acre[3]**	**Percent of Acres where Treatments Would be Used [4]**				**Treatment Considerations / Notes[5]**
				Revised Proposed Action	**Proposed Action**	**No Action Alternative**		
						District - wide	**Limited Areas[9]**	
Black Henbane [1, 2, 4] *9 acres*	Manual control			5%	5%	10%	NA	Hand pulling, digging, or hoeing can be effective on single plants or small infestations.
	Metsulfuron methyl + Chlorsulfuron	0.5 oz. + 1.3 oz.	0.01875 + 0.0611	70%	70%	NA	NA	Apply post-emergence from bolting to early flowering.
	Metsulfuron methyl	0.5 oz.	0.01875	10%	10%	NA	NA	Apply post-emergence from bolting to early flowering.
	Dicamba + 2,4-D	1 pt. + 1 qt.	0.5 + 0.95	10%	15%	90%	NA	Appropriate from the seedling to flowering stage.
	Fluroxypyr	15 to 22 oz.	0.328 to 0.481	5%	NA	NA	NA	Post-emergence before flowering to prevent seed production and dispersal. Best applied from rosette to bolting stage.
Borage [1, 3] common bugloss, houndstongue *376 acres*	Manual control			10%	10%	10%	NA	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.
	Chlorsulfuron + 2,4-D	1 oz. + 1 qt.	0.047 + 0.95	75%	75%	NA	NA	Combination to consider using when burn-down to prevent seed formation / set is needed or where resistance to sulfonylureas[7]is a concern. This combination adds a second mode of action.
	Metsulfuron methyl + 2,4-D	1 oz. + 1 qt.	0.0375 + 0.95	5%	5%	NA	NA	Combination to consider using when burn-down to prevent seed formation / set is needed or where resistance to sulfonylureas[7]is a concern. This combination adds a second mode of action. Less expensive than chlorsulfuron but is harder on some wet meadow grass species.
	Dicamba + 2,4-D	1 pt. + 1 qt.	0.5 + 0.95	5%	5%	90%	NA	Appropriate from the seedling to flowering stage. Option to prevent resistance to sulfonylureas[7].
	Picloram + 2,4-D	1 qt. + 1 qt.	0.5 + 0.95	5%	5%	0%	NA	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.
	Aquatic Glyphosate or 2,4-D	1 to 2 qt.	0.95 to 1.9	<1%	< 1%	< 1%	NA	Would be used where treatments could get into the water.
Bouncingbet [1] *3 acres*	Dicamba + 2,4-D	1 pt. + 1 qt.	0.5 + 0.95	95%	95%	NA	NA	Appropriate from the seedling to flowering stage.
	Manual control			5%	5%	NA	NA	Hand pulling must get entire taproot. Can be effective on single plants in loose soils.

Species Group [Categories] *Category 1 species and acres*	**Treatment Methods**[1]	**Formulated Product Per Acre**[2]	**Lbs. / Acre**[3]	**Percent of Acres where Treatments Would be Used** [4]				**Treatment Considerations / Notes**[5]
				Revised Proposed Action	**Proposed Action**	**No Action Alternative**		
						District - wide	**Limited Areas**[9]	
Buffalobur [1] *260 acres*	Metsulfuron methyl + Dicamba + 2,4-D	0.5 oz. + 1 pt. + 2 qt.	0.01875 + 0.5 + 1.9	35%	35%	NA	NA	Apply to actively growing plants.
	Manual control			5%	5%	5%	NA	Hand pulling or digging can be effective on single plants or small infestations.
	Dicamba + 2,4-D	1 pt. + 1.5 qt.	0.5 + 1.425	30%	30%	60%	NA	Apply at the rosette stage.
	Picloram + 2,4-D	1 pt. to 1 qt. + 1 qt.	0.25 to 0.5 + 0.95	30%	30%	35%	NA	Apply at the rosette stage.
Bur chervil [1] *110 acres*	Manual control			5%	5%	NA	NA	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.
	Chlorsulfuron	0.5 to 1 oz.	0.0235 to 0.047	45%	45%	NA	NA	Apply in fall to seedlings.
	Imazapyr	1.5 to 3 pt.	0.75	20%	25%	NA	NA	Rate per acre depends on the product chosen. Ground sterilant at least at higher rates
	Aquatic Glyphosate	1.5% solution (2 oz. / gallon)	minimal (0.02lbs / gallon)	20%	25%	NA	NA	Would be used where treatments could get into the water.
	Aminopyralid + Metsulfuron methyl (Opensight)	3.3 oz.	0.0165 + 0.00231	10%	NA	NA	NA	Apply post-emergence in spring.
Chenopods [1, 7] halogeton, kochia *2,600 acres*	Manual control			5%	5%	10%	5%	Hand pulling is effective for small infestations.
	Mechanical control			5%	5%	10%	5%	Can be controlled with mowing or weed whackers, but can adversely affect desirable neighboring species.
	Fluroxypyr	6 to 12 oz.	0.131 to 0.263	20%	NA	NA	NA	Post-emergence from seedling to bloom stage.
	Dicamba + Diflufenzopyr (Overdrive)	8 oz.	0.35	10%	10%	NA	NA	Use where resistance to sulfonylureas[7] is a concern or when burn-down to prevent seed formation / set is needed. Primarily on roadsides.
	Chlorsulfuron + 2,4-D	1.3 oz. + 1 qt.	0.0611 + 0.95	40%	50%	NA	80%	Apply from rosette to flowering, where soils are not sandy or gravelly, and where treatments are within labeled distances from water or wells.

Species Group [Categories] *Category 1 species and acres*	**Treatment Methods**[1]	**Formulated Product Per Acre**[2]	**Lbs. / Acre**[3]	**Percent of Acres where Treatments Would be Used** [4]				**Treatment Considerations / Notes**[5]
				Revised Proposed Action	**Proposed Action**	**No Action Alternative**		
						District - wide	**Limited Areas**[9]	
	Aminopyralid + Metsulfuron methyl (Opensight)	1.5 to 3.3 oz.	0.0075 + 0.00105 to 0.0165 + 0.0023	5%	NA	NA	NA	Post-emergence in the late spring or early summer when seedlings have emerged and are growing rapidly, generally 1-3 inches tall
	Dicamba + 2,4-D	1 qt. + 1 qt.	0.95 + 1	5%	5%	80%	10%	Apply from rosette to flowering.
	Metsulfuron methyl + 2,4-D	1.5 oz. + 1 qt.	0.05625 + 0.95	5%	25%	NA	NA	Treatment will set back current year's growth if treatment occurs at spring and fall rosette stage.
	Rimsulfuron	2 to 4 oz.	0.03125 to 0.0625	5%	NA	NA	NA	Pre-emergence or post-emergence to small plants.
Common Crupina [1] *100 acres*	Manual control			5%	5%	5%	NA	Hand pulling or digging can be effective on single plants or small infestations.
	Aminopyralid	7 oz.	0.11	50%	NA	NA	NA	Better residual than clopyralid and more targeted than picloram.
	Picloram	1 pt.	0.25	10%	60%	95%	NA	Do not apply near trees or young grass seedlings.
	Clopyralid	5 oz.	0.11719	20%	20%	NA	NA	Most effective on young plants.
	Clopyralid + Picloram	1 pt. + 1 qt.	0.375 + 0.5	15%	15%	NA	NA	Appropriate from rosette to flowering, and would be considered for use where there are seed banks and where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse effects to desirables can be minimized.
Common Tansy [1,3] *5 acres*	Manual control			5%	5%	15%	NA	With small infestations, hand pulling is effective when soils are moist (wear gloves).
	Aminopyralid + Metsulfuron methyl (Opensight)	2.5 oz.	0.125 + .00175	35%	NA	NA	NA	Post-emergence, when plants are at bud or later.
	Chlorsulfuron + 2,4-D	1 oz. + 1 qt.	0.047 + 0.95	35%	65%	NA	NA	Combination to consider using when burn-down to prevent seed formation / set is needed or where resistance to sulfonylureas[7] is a concern. This combination adds a second mode of action.

Species Group [Categories] *Category 1 species and acres*	**Treatment Methods[1]**	**Formulated Product Per Acre[2]**	**Lbs. / Acre[3]**	**Percent of Acres where Treatments Would be Used [4]**				**Treatment Considerations / Notes[5]**
				Revised Proposed Action	**Proposed Action**	**No Action Alternative**		
						District - wide	**Limited Areas[9]**	
	Metsulfuron methyl + 2,4-D	1 oz. + 1 qt.	0.0375 + 0.95	10%	10%	NA	NA	Combination to consider using when burn-down to prevent seed formation / set is needed or where resistance to sulfonylureas[7] is a concern. This combination adds a second mode of action. Is less expensive than chlorsulfuron but is harder on some wet meadow grass species.
	Dicamba + Picloram	1 to 2 qt. + 1 qt.	1 to 2 + 0.5	5%	10%	10%	NA	Works from early bud to bloom, 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 desirables can be minimized.
	Aquatic Glyphosate	2 qt.	2	10%	10%	75%	NA	Apply post-emergence to rapidly growing plants before flowering. Glyphosate will not kill seeds or inhibit germination the following season.
	Mechanical control			< 1%	< 1%	< 1%	NA	Mowing will not kill established plants, but mowing shortly before bloom can reduce seed production.
Common Teasel [7]	Manual control			< 1%	< 1%	NA	NA	With small infestation, digging or hand pulling before flowering are effective controls.
	Aminopyralid	5 to 7 oz.	0.078 to 0.11	40%	NA	NA	NA	Provides over 90 percent control when applied to rosettes. Longer soil residual activity.
	Chlorsulfuron	1.3 oz.	0.0611	30%	40%	NA	NA	Apply post-emergence from rosette to bolting stage.
	Fluroxypyr	11 oz.	0.241	10%	NA	NA	NA	Post-emergence from rosette to beginning of bolting, or fall rosette stage. Safe for most grasses.
	Metsulfuron methyl	1 oz.	0.0375	5%	5%	NA	NA	Apply post-emergence from rosette to bolting stage.
	Clopyralid	1.33 pt.	0.5	5%	5%	NA	NA	Treatments effective for young plants.
	Aquatic 2,4-D	1.5% solution (2 oz. / gallon)	minimal (0.03lbs / gallon)	10%	50%	NA	NA	Apply to rosettes in spring in wet situations.
Curly Dock [7]	2,4-D + chlorsulfuron + dicamba	1 qt. + 1 oz. + 1 qt.	0.95 + 0.047 + 1	50%	50%	NA	NA	Preferred treatment in rangelands.
	Metsulfuron methyl + 2,4-D + dicamba	1 oz. + 1 qt. + 1 qt.	0.0375 + 0.95 +1	45%	45%	NA	NA	Preferred treatment near roads.
	Dicamba + diflufenzopyr (Overdrive)	8 oz.	0.35	5%	5%	NA	NA	Use for smaller plants. Higher rates can treat larger plants, but will adversely affect grasses.
	No effective control method available[10]			NA	NA	100%	NA	

Species Group [Categories] *Category 1 species and acres*	**Treatment Methods**[1]	**Formulated Product Per Acre**[2]	**Lbs. / Acre**[3]	**Percent of Acres where Treatments Would be Used** [4]				**Treatment Considerations / Notes**[5]
				Revised Proposed Action	**Proposed Action**	**No Action Alternative**		
						District - wide	**Limited Areas**[9]	
Field Bindweed [1] *43 acres*	Manual control			1%	1%	1%	NA	Hand pulling can be effective on seeding or young adults but is not effective when the plant has developed a deep, extensive system.
	Dicamba + Diflufenzopyr (Overdrive)	8 oz.	0.35	25%	25%	NA	NA	Preferred treatment in disturbed areas, particularly on roadsides.
	Metsulfuron methyl + 2,4-D	1 oz. + 1 qt.	0.0375 + 0.95	40%	40%	NA	NA	Apply from seedling to flower.
	Picloram + 2,4-D	1 qt. + 1 qt.	0.5 + 0.95	4%	9%	14%	NA	Apply from seedling to full bloom.
	Dicamba + 2,4-D	1 pt. + 1 qt.	0.5 + 0.95	20%	20%	80%	NA	Appropriate from the seedling to flowering stage.
	Aquatic Glyphosate	1.5% solution (2 oz. / gallon)	minimal (0.02lbs / gallon)	5%	5%	5%	NA	Would be used where treatments might get in the water.
	Fluroxypyr + Picloram	6 oz. + 8 oz.	0.131 + 0.125	5%	NA	NA	NA	Apply post-emergence when target plants are growing rapidly.
	Targeted grazing (sheep and goats)			< 1%	< 1%	< 1%	NA	Targeted grazing reduces growth but does not affect roots.
Hawkweeds [1, 3] *meadow hawkweed 5 acres*	Manual control			1%	1%	1%	NA	Hand pulling is effective for small infestations.
	Aminopyralid	5 oz.	0.078	40%	NA	NA	NA	Apply from seedling to full bloom in spring.
	Triclopyr + Clopyralid (Redeem R&P)	0.75 to 1 qt.	0.4 to 0.6 + 0.14 to 0.19	5%	30%	NA	NA	Preferred for meadow hawkweed; apply rosette to early bolt. Triclopyr not necessary unless seed set is imminent.
	Clopyralid	0.66 to 1.33 pt.	0.2475 to 0.5	45%	60%	NA	NA	For meadow hawkweed, apply up to bloom stage. For orange hawkweed, apply in the spring before bolting. Good on orange hawkweed.
	Dicamba + 2,4-D	1 pt. + 1 qt.	0.5 + 0.95	8%	8%	40%	NA	Appropriate from the seedling to flowering stage.
	Picloram	1 pt. to 1 qt.	0.25 to 0.5	1%	1%	9%	NA	Apply in spring before plant bolts.
	No effective control method available[10]			NA	NA	50%	NA	

Species Group [Categories] *Category 1 species and acres*	**Treatment Methods**[1]	**Formulated Product Per Acre**[2]	**Lbs. / Acre**[3]	**Percent of Acres where Treatments Would be Used** [4]				**Treatment Considerations / Notes**[5]
				Revised Proposed Action	**Proposed Action**	**No Action Alternative**		
						District - wide	**Limited Areas**[9]	
Hemlock [1] *poison hemlock* *85 acres*	Imazapyr	1 qt.	0.5	10%	10%	NA	NA	Non-selective. Apply pre-emergence or in the rosette stage.
	Chlorsulfuron + 2,4-D	1 oz. + 1 qt.	0.047 + 0.95	60%	65%	NA	NA	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	1.78 oz.	0.06675	10%	10%	NA	NA	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.)
	Aquatic Glyphosate or 2,4-D	1 to 2 qt.	1.0 to 2.0	10%	10%	100%	NA	Use where treatments could contact water. For glyphosate, apply to rosettes before they bolt.
	Metsulfuron methyl + Dicamba + 2,4-D	0.5 oz. + 1 pt. + 2 qt.	0.01875 + 0.5 + 1.9	5%	5%	NA	NA	Appropriate for use in rights-of-way.
	Aminopyralid + Metsulfuron methyl (Opensight)	2.5 to 3.3 oz.	0.0125 + 0.00175 to 0.0165 + 0.00231	5%	NA	NA	NA	Pre-emergence in fall, or post-emergence in the seedling to rosette stage.
	Biological control agents			< 1%	< 1%	< 1%	NA	Used in remote areas where waterways are inaccessible.
Knapweed [1, 3] *diffuse, spotted, and squarrose knapweed* *2,695 acres*	Manual control			2%	20%	20%	20%	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.
	Biological control agents			38%	40%	40%	40%	Seven biological controls are active against diffuse and spotted knapweed on the District. Would only be used on large uncontrollable infestations.
	Aminopyralid	5 to 7 oz.	0.078 to 0.11	40%	NA	NA	NA	One of the most effective herbicides for knapweeds. Apply post-emergence, bud stage to senescence. Applications can be made into winter if conditions permit.

Species Group [Categories] *Category 1 species and acres*	**Treatment Methods**[1]	**Formulated Product Per Acre**[2]	**Lbs. / Acre**[3]	**Percent of Acres where Treatments Would be Used**[4]				**Treatment Considerations / Notes**[5]
				Revised Proposed Action	**Proposed Action**	**No Action Alternative**		
						District - wide	**Limited Areas**[9]	
	Clopyralid + 2,4-D	1 pt. +1 qt.	0.375 + 0.95	10%	30%	NA	30%	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	1 pt. + 1 qt.	0.5 + 0.95	5%	5%	35%	5%	Apply post-emergence from rosette to beginning of bolting, or autumn rosette. Optimal at early flowering stage.
	Picloram + 2,4-D	1 qt. + 1 qt.	0.5 + 0.95	2%	2%	3%	2%	Treat plants from rosette to flowering. It also offers residual control for late season applications to kill fall rosettes and to inhibit seedling growth the following year. Appropriate at sites where soils are not sandy or gravelly.
	Aquatic Glyphosate	1.5% solution (2 oz. / gallon)	minimal (0.02lbs / gallon)	3%	3%	2%	3%	Appropriate from rosette to flowering, where there are seed banks and where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse effects to desirables can be minimized. Used where treatments could get into the water.
Mediterranean Sage [1] Mediterranean sage, rose campion *599 acres*	Manual control			5%	50%	50%	50%	With small infestations, hand pulling or digging is effective.
	Biological control agents			< 1%	< 1%	<1%	< 1%	Infestations are not large enough for the biological control agent to be effective.
	Aminopyralid	5 to 7 oz.	0.078 to 0.11	45%	NA	NA	NA	Post-emergence from the rosette to young bolting stage.
	Chlorsulfuron + 2,4-D	1 oz. + 1 qt.	0.047 + 0.95	25%	25%	NA	29%	Combination to consider using when burn-down to prevent seed formation / set is needed or where resistance to sulfonylureas[7] is a concern. This combination adds a second mode of action.
	Metsulfuron methyl + 2,4-D	1.7 oz. + 1 qt.	0.06375 + 0.95	15%	15%	NA	NA	Use if treating from rosette to flowering. It ensures burn-down and additional mode of action to reduce resistance. Less expensive than chlosufuron+2,4-D.
	Picloram + 2,4-D	1 qt. + 1 qt.	0.5 + 0.95	4%	4%	50%	15%	Use when seed bank is extensive.

Species Group [Categories] *Category 1 species and acres*	**Treatment Methods**[1]	**Formulated Product Per Acre**[2]	**Lbs. / Acre**[3]	**Percent of Acres where Treatments Would be Used** [4]				**Treatment Considerations / Notes**[5]
				Revised Proposed Action	**Proposed Action**	**No Action Alternative**		
						District - wide	**Limited Areas**[9]	
	Clopyralid	1.33 pt.	0.5	1%	1%	NA	1%	Appropriate from rosette to flowering, where there are seed banks and where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse effects to desirables can be minimized.
	Clopyralid + 2,4-D (Curtail)	4 qt.	0.375 + 1.9	5%	5%	NA	5%	Appropriate from rosette to flowering, where there are seed banks and where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse effects to desirables can be minimized. Would be used when bloom has begun to fade.
Oxeye Daisy [1] oxeye daisy, oregano *25 acres*	Manual control			9%	9%	9%	NA	Grubbing is effective on small plants in small infestations.
	Aminopyralid	5 to 7 oz.	0.078 to 0.11	40%	NA	NA	NA	In winter to early spring for pre-emergence and seedling treatments; in spring up to flower bud stage. Can be applied in fall in cold winter areas.
	Dicamba + Diflufenzopyr (Overdrive)	8 oz.	0.35	10%	30%	NA	NA	Good combination to consider using where resistance to sulfonylureas[7] is a concern or when burn-down to prevent seed formation / set is needed. Primarily on roadsides.
	Metsulfuron methyl	0.5 to 1 oz.	0.01875 to 0.0375	10%	30%	NA	NA	Apply at the rosette to bolting stage.
	Clopyralid	4 to 11 oz.	0.09375 to 0.2578	20%	20%	NA	NA	Apply at the rosette to bolting stage.
	Picloram + 2,4-D	1 pt. + 1 qt.	0.25 + 0.95	10%	10%	90%	NA	Use when seed bank is extensive.
	Mechanical control			1%	1%	1%	NA	Mowing can control infestations.
	Targeted grazing (sheep and goats)			<1%	<1%	<1%	NA	Palatable, but does not completely control.
Perennial Grasses [7]	Imazapyr	1.8 pt.	0.45	60%	60%	NA	NA	Apply early spring when reed canarygrass is just sprouting and before other species germinate or emerge.
	Glyphosate	3 qt.	3	10%	10%	NA	NA	Appropriate at the seedling stage. Care would be taken to minimize damage to non-targets. Carefully consider location of treatment to minimize collateral damage. Use aquatic formulations near water.

Species Group [Categories] *Category 1 species and acres*	**Treatment Methods**[1]	**Formulated Product Per Acre**[2]	**Lbs. / Acre**[3]	**Percent of Acres where Treatments Would be Used** [4]				**Treatment Considerations / Notes**[5]
				Revised Proposed Action	**Proposed Action**	**No Action Alternative**		
						District - wide	**Limited Areas**[9]	
	Sulfometuron methyl	3 oz.	0.14	25%	29%	NA	NA	Apply pre-emergence or early post-emergence from autumn to early spring. Most effective control is with early post-emergence treatment after seedlings have emerged.
	Rimsulfuron	2 to 4 oz.	0.03125 to 0.0625	4%	NA	NA	NA	Pre-emergence in fall to early post-emergence in early spring
	Manual control			1%	1%	NA	NA	Only practical for very small infestations.
Perennial Mustards [1, 3, 4] *perennial pepperweed, whitetop* *22,864 acres*	Chlorsulfuron + 2,4-D	1.3 oz. + 1 qt.	0.0611 + 0.95	25%	25%	NA	70%	Combination to consider using where resistance to sulfonylureas[7] is a concern. It adds a second mode of action. Aquatic 2,4-D would be used in riparian areas.
	Chlorsulfuron + Dicamba + 2,4-D	1.3 oz. + 8 oz. + 1 pt.	0.011 + 0.25 + 0.475	40%	40%	NA	8%	Combination to consider using where resistance to sulfonylureas[7] is a concern. Aquatic 2,4-D would be used in riparian areas. Will not harm non-target susceptible grasses.
	Metsulfuron methyl + Dicamba + 2,4-D	1.78 oz. + 8 oz. + 1 pt.	0.06675 + 0.25 + 0.475	10%	10%	NA	NA	Combination to consider using where resistance to sulfonylureas[7] is a concern. Aquatic 2,4-D would be used in riparian areas. Will not harm non-target susceptible grasses.
	Chlorsulfuron	1.3 oz.	0.0611	5%	5%	NA	7%	Preferred treatment at the flowering stage, although it is very effective over a wide phenologic range (seedling to flowering stage). This treatment is particularly useful when Canada thistle occurs in the infestation mix.
	Aminopyralid + Metsulfuron methyl (Opensight)	3.3 oz.	0.0165 + 0.00231	5%	NA	NA	NA	Optimum timing is when the plants are in the bloom stage.
	Metsulfuron methyl	1.78 oz.	0.06675	5%	5%	NA	NA	Treatment good at the flowering stage, although it is very effective over a wide phenologic range (seedling to flowering stage). This treatment is particularly useful when Canada thistle occurs in the infestation mix.
	Metsulfuron methyl + 2,4-D	1.78 oz. + 1 qt.	0.06675 + 0.95	5%	5%	NA	NA	Combination to consider using where resistance to sulfonylureas[7] is a concern. Aquatic 2,4-D would be used in riparian areas.

Species Group [Categories] *Category 1 species and acres*	**Treatment Methods**[1]	**Formulated Product Per Acre**[2]	**Lbs. / Acre**[3]	**Percent of Acres where Treatments Would be Used**[4]				**Treatment Considerations / Notes**[5]
				Revised Proposed Action	**Proposed Action**	**No Action Alternative**		
						District - wide	**Limited Areas**[9]	
	Dicamba + 2,4-D	1 pt. + 1 qt.	0.5 + 0.95	3%	8%	15%	13%	Reduces seed set but not effective control. Could be used in meadows where susceptible grasses are the main desirable species.
	Glyphosate	3 qt.	3	<1%	<1%	<1%	< 1%	Use aquatic formulation on perennial pepperweed in standing water.
	Imazapic	10 oz.	0.15	<1%	<1%	NA	NA	Post-emergence from seedling to flowering stage. Most effective from the bud to the late flowering stage. Care should be taken near non-target perennial grasses. May suppress desirable introduced wheatgrasses or remove Timothy and brome grass. Native bluebunch wheatgrass would likely be suppressed and might show unacceptable yellowing.
	Mechanical control			2%	2%	NA	2%	Shallow disking (2 to 3 in.) may be used in conjunction with herbicide use on perennial pepperweed to disturb the soil surface where heavy infestations have created an allelopathic calcium layer resistant to revegetation (deeper disking would cause the infestation to spread).
	No effective control method available[10]			NA	NA	85%	NA	
Puncturevine [1] *433 acres*	Chlorsulfuron	2 oz.	0.094	5%	5%	NA	5%	Apply pre-emergent in early spring.
	Manual control			35%	45%	50%	45%	Hand pulling or grubbing can be effective in loose soils.
	Chlorsulfuron + 2,4-D	1.3 oz. + 1 qt.	0.0611 + 0.95	40%	40%	NA	40%	Combination to consider using where resistance to sulfonylureas[7] is a concern. It adds a second mode of action. Aquatic 2,4-D would be used in riparian areas.
	Fluroxypyr	22 oz.	0.481	10%	NA	NA	NA	Post-emergence before budding when plants are still small and rapidly growing.
	Dicamba + 2,4-D	1 qt. + 1 qt.	1.0 + 0.95	10%	10%	50%	10%	Would control current year's growth if treatment occurs prior to seed formation. Does not provide any residual control.
	Rimsulfuron	2 to 4 oz.	0.03125 to 0.0625	<1%	NA	NA	NA	Pre-emergent; requires moisture to activate

Species Group [Categories] *Category 1 species and acres*	**Treatment Methods**[1]	**Formulated Product Per Acre**[2]	**Lbs. / Acre**[3]	**Percent of Acres where Treatments Would be Used** [4]				**Treatment Considerations / Notes**[5]
						No Action Alternative		
				Revised Proposed Action	**Proposed Action**	**District - wide**	**Limited Areas**[9]	
Purple Loosestrife [1] *[1 acre]*	Manual control			1%	1%	5%	NA	Hand pulling or digging can be effective on single plants.
	Biological control agents			34%	34%	45%	NA	Effective on populations large enough to support the agent.
	Triclopyr	6 qt.	4.5	60%	60%	NA	NA	Preferred treatment. Use aquatic formulations. It can be used at all stages but primarily at the flowering stage.
	Aquatic Glyphosate	1.5% solution (2 oz. / gallon)	minimal (0.02lbs / gallon)	5%	5%	50%	NA	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.
Rush Skeletonweed [1, 4, 7] *73,596 acres*	Aminopyralid	7 oz.	0.11	75%	NA	NA	NA	In spring from rosette through flowering stage. Can be applied in fall in cold conditions. Use when plant is at its most visible – broadcast in immediate area around plants.
	Picloram	1 qt.	0.5	10%	20%	20%	20%	Inhibits sprouting of new shoots from roots.
	Picloram + 2,4-D	1 qt. + 1 qt.	0.5 + 0.95	10%	50%	80%	50%	One of the preferred herbicide treatments, apply on spring and fall rosettes.
	Clopyralid	0.66 to 1 pt.	0.2475 to 0.375	5%	30%	NA	30%	Apply at the rosette stage in spring or fall.
Russian Knapweed / Canada Thistle [1] *3,530 acres*	Biological control agents			10%	10%	5%	10%	Several biological controls are currently being used successfully to control Canada thistle. New biocontrols for Russian knapweed are available but are not widely used, as Russian knapweed infestations on the District are too widespread and infestations are too small to support the biocontrols.
	Mechanical control			2%	2%	NA	2%	Mowing in conjunction with herbicide is effective control on infestations. Shallow disking (2 to 3 in.) may be used in conjunction with herbicide use on Russian knapweed to disturb the soil surface where heavy infestations have created an allelopathic calcium layer resistant to revegetation (deeper disking would cause the infestation to spread).

Species Group [Categories] *Category 1 species and acres*	**Treatment Methods[1]**	**Formulated Product Per Acre[2]**	**Lbs. / Acre[3]**	**Percent of Acres where Treatments Would be Used [4]**				**Treatment Considerations / Notes[5]**
				Revised Proposed Action	**Proposed Action**	**No Action Alternative**		
						District - wide	**Limited Areas[9]**	
	Aminopyralid	5 to 7 oz.	0.078 to 0.11	50%	NA	NA	NA	One of the most effective herbicides for knapweeds. Apply post-emergence, bud stage to senescence. Applications can be made into winter if conditions permit.
	Clopyralid	1.33 pt.	0.5	20%	20%	NA	20%	One of the preferred herbicide treatments, post-frost.
	Picloram	1 qt.	0.5	1%	8%	10%	8%	One of the preferred herbicide treatments, post-frost.
	Clopyralid + 2,4-D	1.33 pt. + 1 qt.	0.50 + 0.95	10%	25%	NA	25%	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 desirables can be minimized. Adding 2,4-D is helpful if treatment occurs at the bud to flowering stage.
	Picloram + 2,4-D	1 pt. + 1 qt.	0.25 + 0.95	1%	20%	25%	20%	Appropriate at sites where there is a known seed bank, where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse effects to desirables can be minimized. Adding 2,4-D is helpful if treatment occurs at the bud to flowering stage.
	Aquatic Glyphosate	1.5% solution (2 oz. / gallon)	minimal (0.02lbs / gallon)	1%	10%	20%	10%	Would be used where treatments could get into the water.
	Chlorsulfuron	1.3 oz.	0.0611	5%	5%	NA	5%	Can be used for Canada thistle at any stage.
	Targeted grazing (goats)			<1%	<1%	<1%	<1%	Russian knapweed can be controlled with targeted grazing of goats.
	No effective control method available[10]			NA	NA	40%	NA	
Spurges [1] leafy and myrtle spurge *998 acres*	Biological control agents			25%	25%	25%	NA	Several available, including flea beetles (*Aphthona* ssp.) and *Oberea erythrocephala*
	Mechanical control			10%	10%	NA	NA	Mowing or weed whacking in conjunction with herbicide is effective control on infestations.
	Imazapic	8 oz.	0.125	50%	50%	NA	NA	Apply after summer dry period when plants begin to grow.
	Picloram + 2,4-D	1 qt. + 1 qt.	0.5 + 0.95	5%	5%	60%	NA	Apply at bloom stage.
	Picloram	1 to 2 qt.	0.5 to 1.0	5%	5%	10%	NA	Apply at bloom stage.

Species Group [Categories] *Category 1 species and acres*	**Treatment Methods**[1]	**Formulated Product Per Acre**[2]	**Lbs. / Acre**[3]	**Percent of Acres where Treatments Would be Used** [4]				**Treatment Considerations / Notes**[5]
				Revised Proposed Action	**Proposed Action**	**No Action Alternative**		
						District - wide	**Limited Areas**[9]	
	Aquatic Glyphosate or 2,4-D	1.5% solution (2 oz. / gallon)	minimal (glyphosate: 0.02lbs / gallon; 2,4-D: 0.03lbs / gallon)	5%	5%	5%	NA	Use where treatments could contact water.
	Targeted grazing (goats)			<1%	<1%	<1%	NA	Targeted grazing in spring can control spurges.
St. Johnswort [1] *10 acres*	Manual control				<1%	<1%	NA	Only for very small infestations. Not effective control.
	Biological control agents			70%	85%	85%	NA	Agents are currently active and controlling infestations.
	Aminopyralid	5 to 7 oz.	0.078 to 0.11	20%	NA	NA	NA	Post-emergence to rapidly growing plants before bloom.
	Metsulfuron methyl + 2,4-D	1.7 oz. + 1 qt.	0.06375 + 0.95	5%	5%	NA	NA	Good treatment for large infestation in rangelands.
	Dicamba + Diflufenzopyr (Overdrive)	8 oz.	0.35	<1%	<1%	NA	NA	Primarily for use on roadsides.
	Glyphosate	2 qt.	2	<1%	<1%	5%	NA	Use aquatic formulations near water.
	Picloram + 2,4-D	1 qt. + 1 qt.	0.50 + 0.95	5%	10%	10%	NA	Apply from rosette to flowering. Use where there are seed banks, soils are not sandy or gravelly, treatments are within labeled distances from water or wells, and where adverse effects to desirables can be minimized.
Starthistle [1, 3] *yellow starthistle* *4,055 acres*	Manual control			10%	10%	10%	10%	Hand pulling or grubbing is effective control for small infestations.
	Biological control agents			25%	25%	40%	25%	Used on large infestations and remote rugged terrain with poor access.
	Aminopyralid	5 to 7 oz.	0.078 to 0.11	45%	NA	NA	NA	Post-emergence and pre-emergence. Post-emergence applications are most effective when applied to plants from the seedling to the mid-rosette stage. Earlier applications (fall) may not provide full season control, and later applications (bolting to early spiny stage) will require higher rates.

Species Group [Categories] *Category 1 species and acres*	**Treatment Methods**[1]	**Formulated Product Per Acre**[2]	**Lbs. / Acre**[3]	**Percent of Acres where Treatments Would be Used** [4]				**Treatment Considerations / Notes**[5]
				Revised Proposed Action	**Proposed Action**	**No Action Alternative**		
						District - wide	**Limited Areas**[9]	
	Clopyralid + 2,4-D	1 pt. + 1 qt.	0.375 + 0.95	5%	30%	NA	30%	Apply from seedling to bud where treatments are within labeled distances from water or wells.
	Clopyralid + Picloram	1 pt. + 1 qt.	0.375 + 0.5	5%	20%	NA	20%	Appropriate from rosette to flowering, and would be considered for use where there are seed banks and where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse effects to desirables can be minimized.
	Picloram + 2,4-D	1 qt. + 1 qt.	0.50 + 0.95	5%	10%	50%	15%	Appropriate from rosette to flowering, and would be considered for use where there are seed banks and where soils are not sandy or gravelly, where treatments are within labeled distances from water or wells, and where adverse effects to desirables can be minimized.
	Imazapyr	1 qt.	0.5	5%	5%	NA	NA	Appropriate from dormant to pre-emergent. Use where infestations occur near water.
	Targeted grazing (sheep and goats)			<1%	<1%	<1%	<1%	High intensity short duration grazing can be implemented when starthistles have bolted but before they produce spiny heads.
Sulfur Cinquefoil [1] *1,361 acres*	Manual control			2%	5%	10%	NA	Grubbing is effective on single plants (hand pulling is not effective).
	Aminopyralid	5 to 7 oz.	0.078 to 0.11	46%	NA	NA	NA	Apply post-emergence, when plants are in spring rosette to pre-bud stage. Treatments done in bloom do not show results until fall. Very effective treatment
	Picloram	1 pt.	0.25	40%	40%	90%	NA	Apply pre-bud stage or during fall regrowth. Very effective treatment.
	Triclopyr	1 pt.	0.375	5%	20%	NA	NA	Apply at the rosette stage. No residual and good for riparian areas
	Hexazinone	4 qt.	2	5%	15%	NA	NA	Apply pre-emergence in the fall.
	Chlorsulfuron	1.5 oz.	0.0705	2%	20%	NA	NA	Apply at the rosette stage (not ideal control)

Species Group [Categories] *Category 1 species and acres*	**Treatment Methods**[1]	**Formulated Product Per Acre**[2]	**Lbs. / Acre**[3]	**Percent of Acres where Treatments Would be Used** [4]				**Treatment Considerations / Notes**[5]
				Revised Proposed Action	**Proposed Action**	**No Action Alternative: District - wide**	**No Action Alternative: Limited Areas**[9]	
Toadflax [1] *Dalmatian and yellow toadflax 389 acres*	Manual control			5%	5%	5%	5%	Hand pulling is effective on seedlings before plants become established and the root system develops.
	Biological control agents			80%	80%	90%	80%	One biological control agent is well established on Dalmatian toadflax. It is very effective. Treatment with herbicides would not happen unless it is a lone plant or two with no biocontrol agents around it.
	Chlorsulfuron	2 oz.	0.094	5%	5%	NA	5%	Preferred application would be made post-emergence in the fall, typically after frost, but could also be used when plants are growing rapidly in the bud to bloom stage.
	Chlorsulfuron + 2,4-D	1.3 oz. + 1 qt.	0.0611 + 0.95	5%	5%	NA	5%	Preferred application would be made post-emergence in the fall but could also be used when plants are growing rapidly in the bud to bloom stage.
	Picloram + 2,4-D	1 qt. + 1 qt.	0.50 + 0.95	5%	5%	5%	5%	Apply post-emergence when plants are growing rapidly or in the fall.
Trees and Shrubs [1, 7] Armenian blackberry, false indigo bush, Russian olive, Scotch broom, sweetbriar rose, saltcedar, tree of heaven *6,483 acres*	Manual control			5%	5%	5%	NA	Grubbing can effectively control Scotch broom.
	Mechanical control			10%	10%	5%	NA	Weed whackers and boom mowers can control some plants and chainsaws can be used on larger trees.
	Biological control agents			25%	25%	15%	NA	Biological control agents are active on saltcedar.
	Imazapyr	2 qt.	1	20%	25%	NA	NA	Preferred treatment applied to actively growing foliage during flowering. Use formulations labeled for aquatic use if treatments might get into the water.
	Triclopyr	Undiluted	<10	25%	25%	NA	NA	Would be used primarily as a cut stump treatment. Use formulations labeled for aquatic use if treatments might get into the water.
	Glyphosate	3.3 qt.	3.3	5%	10%	25%	NA	Could be used as a cut stump treatment. Broadcast treatments would be made in late summer. Aquatic formulations would be used near water.
	Aminopyralid	5 to 7 oz.	0.078 to 0.11	5%	NA	NA	NA	Post-emergence to plants after full leaf expansion, generally around flowering period. Pre-emergence control can also be achieved on seedlings.
	Fluroxypyr	23 oz.	0.504	5%	NA	NA	NA	Could be used on blackberry, post-emergence when plants are growing rapidly.
	Targeted grazing (goats)			<1%	<1%	<1%	NA	Goats are effective on blackberries.
	No effective control method available [10]			NA	NA	50%	NA	

Species Group [Categories] *Category 1 species and acres*	**Treatment Methods**[1]	**Formulated Product Per Acre**[2]	**Lbs. / Acre**[3]	**Percent of Acres where Treatments Would be Used** [4]				**Treatment Considerations / Notes**[5]
				Revised Proposed Action	**Proposed Action**	**No Action Alternative**		
						District - wide	**Limited Areas**[9]	
Yellow flag Iris [1] *21 acres*	Imazapyr	1 qt.	0.5	95%	95%	NA	NA	Apply post-emergence to plants at pre-bloom stage or to late season plants in autumn.
	Aquatic Glyphosate	1 qt.	1	3%	3%	98%	NA	Apply post-emergence to foliage when plants are growing rapidly, but before flowering in late spring or early summer. Can also apply in fall.
	Manual control			1%	1%	1%	NA	Hand pulling can be effective on single plants.
	Mechanical control			1%	1%	1%	NA	Tractor can be effective but difficult to get entire rhizome.

NA: Herbicide not available under the alternative or not a noxious weed; non-noxious invasive plants would not be treated with herbicides under the No Action Alternative.

1. Many treatments are suggested by Weed Treatments in Natural Areas in the Western United States (DiTomaso et al. 2013) and the Pacific Northwest Weed Management Handbook (OSU 2009).
2. Amounts listed are averages. Actual formulations may vary slightly, depending on mixes of herbicides and / or surfactants, timing, and other factors that could increase effectiveness on individual plants. Competitive planting and seeding using manual methods may also occur to revegetate areas in conjunction with other treatment methods.
3. Lbs. / acre calculated from the rates per acre column, and can vary based on formulation. Typical and maximum application rates are listed on Table 2-9, *Herbicide Information*.
4. Within each species group, and by alternative, these add up to 100% and show how often a treatment method would be used when a species is found. For example, under the Proposed Action, yellow flag iris would be controlled with imazapyr 95% of the time, treated with aquatic glyphosate 3% of the time, and otherwise treated with manual or mechanical methods (1% of the time each). These estimates are generally based on known sites. These percentages are based on acres treated, not on number of sites treated. For example, if 20 one-acre sites had invasive plants that were manually pulled, and one 20-acre site is sprayed with clopyralid, manual and clopyralid would both be 50% each.
5. This includes common treatment considerations and is not an exhaustive list.
6. Not currently known on the District, so estimates are unavailable.
7. The sulfonylureas are chlorsulfuron, metsulfuron methyl, rimsulfuron, and sulfometuron methyl. The Oregon FEIS states that sulfonylureas can quickly confer resistance to plant populations, particularly where they are used extensively as the primary invasive plant control method in cropping systems (USDI 2010a:145).
8. Drill or aerial seeding may also occur to revegetate areas in conjunction with other treatment methods.
9. Herbicides and locations authorized under emergency stabilization and rehabilitation and hazardous fuels management NEPA analyses.
10. Indicates percent of acres that cannot be controlled under the No Action Alternative because an effective control method is unavailable.
11. Invasive annual grasses would be treated as described in the *Treatment Key* for Categories 1 and 2 (and 7, if treatments occur). Under the Proposed and Revised Proposed Actions, in Categories 4, 5, and 6, invasive annual grasses would be treated with targeted grazing, prescribed fire, competitive seeding and planting, imazapic, rimsulfuron, or glyphosate, as described under the *Description of the Alternatives*.

Table 2-11. Estimated Treatment Acres (by Alternative and Category)

Treatment Methods	Category 1 (over the life of the EA)				Category 2		Category 3	Category 4		Categories 5 and 6 (annually)			Category 7	
	No Action		Proposed Action	Revised Proposed Action	No Action	Proposed and Revised Proposed Actions	All Alternatives	No Action	Proposed and Revised Proposed Actions	No Action	Proposed Action	Revised Proposed Action	No Action	Proposed and Revised Proposed Actions
	District-Wide	Limited Areas[1]												
Herbicides Available under All Alternatives District-Wide					*Invasive plants are estimated to spread 12 percent each year. Treatments of spread would correspond to treatments in Category 1.*	*Invasive plants are estimated to slow to an average spread rate of 7 percent each year. Treatments of spread would correspond to treatments in Category 1.*	*Rare (on the order of 0-10 acres a year).*	*Fires that had emergency stabilization and rehabilitation NEPA previous to this EA were subsequently inventoried, and those acres are included in the Category 1 count, and are currently treated in limited areas on the District.*	*Future fire locations and sizes are unknown, and hence acres to be treated are unknown.*				*Low priority species would not be treated.*	*Low priority species would only be treated in conjunction with treatments of other similar species at the same site.*
2,4-D[2]	67	0	29	29						0	0	0		
Dicamba[2]	0	0	0	0						0	0	0		
Dicamba + 2,4-D	26,933	398	3,765	1,104						0	0	0		
Dicamba + Picloram	1	0	1	0						0	0	0		
Glyphosate[2]	8,198	0	1,610	963						0	0	0		
Picloram[2]	16,492	14	15,656	7,999						0	0	0		
Picloram + 2,4-D	68,064	150	39,678	7,846						0	0	0		
Picloram + 2,4-D + Dicamba	910	0	0	0						0	0	0		
Herbicides Available in Limited Areas under the No Action Alternative and District-Wide under the Proposed and Revised Proposed Actions														
Chlorsulfuron[2]		243	4,717	2,955							0	0		
Chlorsulfuron + 2,4-D		1,073	10,734	8,951							0	0		
Chlorsulfuron + Clopyralid + 2,4-D		531	10,620	1,517							0	0		
Chlorsulfuron + Dicamba + 2,4-D		91	9,146	9,146							0	0		
Chlorsulfuron + Picloram		76	1,517	1,517							0	0		
Clopyralid[2]	NA	36	22,819	4,419						NA	0	0		
Clopyralid + 2,4-D		299	5,972	2,372							0	0		
Clopyralid + Picloram		41	826	218							0	0		
Imazapic[2]		27,528	35,611	18,289							100,000	50,000		
Imazapic + 2,4-D		0	0	0							0	0		
Imazapic + Glyphosate		0	4,682	4,682							0	0		
Herbicides Available District-Wide under the Proposed and Revised Proposed Actions														
Dicamba + Diflufenzopyr			278	273							0	0		
Fluridone[2]			0	0							0	0		
Hexazinone[2]	NA		672	536						NA	0	0		
Imazapyr[2]			1,879	1,550								0		

Treatment Methods	Category 1 (over the life of the EA)				Category 2		Category 3	Category 4		Categories 5 and 6 (annually)			Category 7	
	No Action		Proposed Action	Revised Proposed Action	No Action	Proposed and Revised Proposed Actions	All Alternatives	No Action	Proposed and Revised Proposed Actions	No Action	Proposed Action	Revised Proposed Action	No Action	Proposed and Revised Proposed Actions
	District-Wide	Limited Areas[1]												
Metsulfuron methyl[2]	NA		4,194	2,672	*Estimated to spread 12 percent each year. Treatments would correspond to treatments in Category 1.*	*Estimated to slow to a spread rate of 7 percent each year. Treatments would correspond to treatments in Category 1.*	*Rare (on the order of 0-10 acres a year).*	*Fires that had emergency stabilization and rehabilitation NEPA previous to this EA were subsequently inventoried, and those acres are included in the Category 1 count, and are currently treated in limited areas on the District.*	*Future fire locations and sizes are unknown, and hence acres to be treated are unknown.*	NA	0	0	*Low priority species would not be treated.*	*Low priority species would only be treated in conjunction with treatments of other similar species at the same site.*
Metsulfuron methyl + 2,4-D			1,920	1,400							0	0		
Metsulfuron methyl + Chlorsulfuron			6	6							0	0		
Metsulfuron methyl + Dicamba + 2,4-D			2,382	2,382							0	0		
Sulfometuron methyl[2]			936	936							0	0		
Sulfometuron methyl + Chlorsulfuron			468	468							0	0		
Triclopyr[2]			1,894	1,689							0	0		
Triclopyr + Clopyralid			2	0							0	0		
Herbicides Available District-Wide under the Revised Proposed Action														
Aminopyralid[2]	NA			76,321						NA		0		
Aminopyralid + Metsulfuron methyl				1,290								0		
Fluroxypyr[2]				888								0		
Fluroxypyr + Picloram				3,036								0		
Rimsulfuron[2]				17,452								50,000		
Non-Herbicide Treatments (Under All Alternatives)														
Biological controls	4,458	138	4,635	4,580						0	0	0		
Fire	0	0	2,341	2,341						0	20,000	20,000		
Manual control	5,295	216	4,777	3,938						0	0	0		
Mechanical control	2,102	48	1,710	1,710						0	0	0		
Targeted grazing (sheep and goats)	80	0	210	210						0	0	0		
Targeted grazing (cattle)	468	281	2,341	2,341						600	20,000[7]	20,000[7]		
Acres of seeding	0	Note[3]	4,500[5]	4,500			0	Unknown[6]		0	20,000[7]	20,000[7]	NA	
Acres not controlled *(No effective control method available)*	70,438	NA			(see above)	NA	Unknown	100%	NA	100%	NA			
Total Acres of Invasive Plants	140,230	Note[4]	197,781	197,781	Varies by year		Rare	Unknown. Based on fire size.		600 / year	Generally 100,000 / year		unknown	
Annual Average Treatment Acres	Based on previous funding, approximately 3,000. (If more funding was available, more acres would be treated.)							Unknown. Based on fire size.		600	100,000		unknown	

NA: Not available under this alternative

1. See Table 2-8, *Summary of Existing NEPA Authorizing Invasive Plant Treatments*, for a list of NEPA covering these limited areas.
2. Single herbicide only; not as part of a tank mix.
3. Seeding is covered by other NEPA and is described in Table 2-8, *Summary of Existing NEPA Authorizing Invasive Plant Treatments.*
4. Acres described in Table 2-8, *Summary of Existing NEPA Authorizing Invasive Plant Treatments.*
5. Approximately 15 sites a year, generally less than 20 acres per site, over the life of the plan (assumed 15 years).
6. Done as part of emergency stabilization and rehabilitation that may not be related to invasive plant management. NEPA analysis covered by USDI 2005b (Vale District's Programmatic Fire Emergency Stabilization and Rehabilitation EA.)
7. 20,000 acres per project, not to exceed 100,000 acres a year or 300,000 acres over the life of the plan. This annual average is calculated by dividing 300,000 acres over the life of the plan (assumed 15 years).

Table 2-12. Estimated Total Treatment Acres for Each Herbicide for Category 1 Acres over the Life of the Plan.

Herbicide Treatment Methods[1]	Category 1 Acres Over the Life of the Plan.			
	No Action		Proposed Action	Revised Proposed Action
	District-Wide	Limited Areas		
Herbicides Available under All Alternatives District-Wide				
2,4-D	95,975	2,542	84,245	34,747
Dicamba	27,843	490	15,292	12,631
Glyphosate	8,198	0	6,292	5,645
Picloram	84,557	280	57,678	20,617
Herbicides Available in Limited Areas under the No Action Alternative and District-Wide under the Proposed and Revised Proposed Actions				
Chlorsulfuron	NA	2,014	37,208	24,560
Clopyralid		906	40,238	8,527
Imazapic		27,528	40,293	22,971
Herbicides Available District-Wide under the Proposed and Revised Proposed Actions				
Dicamba + Diflufenzopyr	NA		278	273
Fluridone			0	0
Hexazinone			672	536
Imazapyr			1,879	1,550
Metsulfuron methyl			8,503	7,751
Sulfometuron methyl			1,404	1,404
Triclopyr			1,896	1,690
Herbicides Available District-Wide under the Revised Proposed Action				
Aminopyralid	NA			77,612
Fluroxypyr				3,925
Rimsulfuron				17,452

1. includes herbicide treatments done as part of a tank mix or single herbicide only; e.g., triclopyr acres under the Proposed Action include 1,894 acres applied as a single herbicide and 2 acres applied as part of a tank mix with clopyralid.

The 2016 Annual Treatment Plan

Invasive plant control activities planned for the Vale District in 2016 are summarized on Table 2-13. The information is summarized here to present an example of implementing the priorities and treatments described in the alternatives. Some of the listed control projects would be conducted under the completed Owyhee Canyon, Juntura Complex, Bendire, Buzzard Complex, Leslie Gulch, and Mormon Basin / Pedro Mountain EAs, which were tiered in part to the 2010 Oregon FEIS.

Table 2-13. 2016 Treatment Plan Summary

Project Name	Done By	Action[2]	Acres[1]	Resource Area	Comment	Category
2016 Projects (done under all alternatives)						
Burned Area Rehabilitation Funded Emergency Stabilization and Rehabilitation	Malheur Co. Assistance Agreement	Monitor / Treatment	62,360	Malheur	Fiscal Years 2013, 2014, 2015 Fire areas; survey, treat and monitor. Long term investment to protect seedings, etc.	1,2
Rush skeletonweed	ODA, Tri-County CWMA	Survey / Treatment	500,000	Malheur, Baker	Survey and treatment on known infestations. Long term investment to protect Special Status species, other resources and private landowners.	1,2

Project Name	Done By	Action[2]	Acres[1]	Resource Area	Comment	Category
South Malheur County / Upper Owyhee Wild and Scenic River	ODA	Survey / Treatment	950,000	Malheur	Survey and treatment. Long term investment.	1,2
Owyhee Wild and Scenic River whitetop and perennial pepperweed	ODA	Survey / Treatment	50,000	Malheur	Survey and treat lower Owyhee Wild and Scenic River corridor. Long-term investment.	1,2
District Early Detection Rapid Response	ODA	Survey / Treatment	500,000	District-wide	Survey and treat new invaders District-wide.	3
Biocontrol	ODA	Biocontrol	45	District-wide	Collection and relocation of biocontrol agents Districtwide; minimal herbicide if best option. Long term investment.	1,2
Highway 20 North	Malheur Co. Assistance Agreement	Survey / Monitor / Treatment	150,000	Malheur	Juntura, Westfall, Castle Rock roads and drainages: thistles, knapweeds, perennial mustards.	1,2
Sage Creek, Amelia, Pascual yellow starthistle	Malheur Co. Assistance Agreement	Monitor / Treatment	3,000	Malheur	Containment within original boundaries. Long-term investment.	1,2
Roadside invasive plant control	Malheur Co. Assistance Agreement, Tri-County CWMA, BLM	Treatment	300	District-wide	Spot treatment of invasive plants District-wide.	1,2
Grande Ronde River	Tri-County CWMA, Wallowa Resources Assistance Agreement, ODA, U.S. Forest Service	Survey / Monitor / Treatment	200	Baker	Spot treatment of invasive plants from Minam to Rogersberg.	1,2,3
Baker Habitat	Tri-County CWMA	Survey / Treatment	100	Baker	Invasive plant survey and treatment in hazardous fuels reduction project	1,2
Alder Creek, Burnt River leafy spurge	Tri-County CWMA	Survey / Monitor / Biocontrols / Treatment	300	Baker	Biocontrols, Spot treatments	1,2
Mining Areas	Tri-County CWMA, BLM	Monitor/ Treatment	100	Baker	Invasive plant control in abandoned and proposed mining areas	1,2
Rogersberg	Wallowa Resources Assistance Agreement	Monitor / Treatment	100	Baker	Spot treatment of invasive plants above high water line	1,2
Pine Creek Mediterranean sage	BLM	Monitor / Treatment	20	Baker	Spot treatment, only known site of Mediterranean sage in area	1

Project Name	Done By	Action[2]	Acres[1]	Resource Area	Comment	Category
Elk Creek knapweed	BLM	Monitor / Treatment	7	Baker	Spot treatment, protect private lands downstream	1
Juniper Canyon, Echo Meadows	Umatilla Co. Assistance Agreement, BLM	Monitor / Treatment	100	Baker	Spot treatments. Protection of adjacent private lands, wildlife area and Oregon Trail segment	1,2
Soda Fire Emergency Stabilization and Rehabilitation	Malheur Co. Assistance Agreement	Survey / Treatment	15,000	Malheur	Survey and ground treatment on perennial pepperweed, Russian knapweed and assorted other noxious weeds	4
Soda Fire Emergency Stabilization and Rehabilitation	Contract	Treatment	30,400	Malheur	Aerial imazapic treatment of invasive annual grasses	4
Soda Fire Emergency Stabilization and Rehabilitation	BLM (Vale)	Drill seed / Fuel breaks / Shrub plantings[3]	4,215 seeding 1,800 planting	Malheur	Long term monitoring and treatments of burned area	4
Saddle Draw Burned Area Rehabilitation	Contract	Treatment	8,000	Malheur	Aerial imazapic treatment of invasive annual grasses	4, 5
Bendire Fire Emergency Stabilization and Rehabilitation	Malheur Co. Assistance Agreement	Survey / Treatment	20,100	Malheur	Survey and ground treatment on whitetop, Scotch thistle, spotted, Russian knapweed and assorted other noxious weeds	4
Bendire Fire Emergency Stabilization and Rehabilitation	Contract	Treatment	12,000	Malheur	Aerial imazapic treatment of invasive annual grasses	4
Bendire Fire Emergency Stabilization and Rehabilitation	BLM (Vale)	Drill seed / Monitor / Fencing / Shrub plantings[3]	7,480 seeding 4,764 planting	Malheur	Multi-year rehabilitation and protection for burned area	4
Leslie Gulch Fire Emergency Stabilization and Rehabilitation	Malheur Co. Assistance Agreement, BLM (Vale)	Survey / Treatment	3,026	Malheur	Survey and ground treatment on whitetop, Scotch thistle, spotted, Russian knapweed, rush skeletonweed and assorted other noxious weeds	4
Leslie Gulch Fire Emergency Stabilization and Rehabilitation	BLM (Vale)	Drill seed[3]	260 seeding	Malheur	Multi-year rehabilitation and protection for burned area	4
Jaca Reservoir Fire Emergency Stabilization and Rehabilitation	Malheur Co. Assistance Agreement	Treatment / Monitor	13,000	Malheur	Multi- year survey, monitoring and treatments	4
Jaca Reservoir Fire Emergency Stabilization and Rehabilitation	BLM (Vale)	Drill seed and Shrub planting[3]	360 seeding 1,000 planting	Malheur	Multi- year survey, monitoring and treatments	4
Lime Hill Fire Emergency Stabilization and Rehabilitation	Tri-County CWMA	Survey	1,000	Baker	Monitor	4

Project Name	Done By	Action[2]	Acres[1]	Resource Area	Comment	Category
Windy-Cornet Fire Emergency Stabilization and Rehabilitation	Tri-County CWMA	Survey	13,425	Baker	Monitor	4
Keating Medusahead rye	Contract	Survey	25,000	Baker	All invasive plants recorded. Would use to plan and prioritize future treatments as part of large scale revegetation project in cooperation with NRCS, SWCD and private landowners	1,2,5,6
Burned Area Rehabilitation Funded Fires	Malheur Co. Assistance Agreement	Monitor / Survey / Treatment	36,525	Malheur	Follow-up monitoring, treatment of FY15 -17 Fires (Soda, Jaca, Bendire, Leslie Gulch)	4, 5,6
Snake River Reservoirs Yellow flag iris	Tri-County CWMA	Monitor / Survey / Treatment	100	Baker	Spot treatment above water line	1,2
Owyhee Canyon Fire Emergency Stabilization and Rehabilitation	BLM (Vale)	Drill and aerial seed[3] / Treatment (aerial and ground)	25,000	Malheur	Multi-year survey, monitoring, aerial and ground and treatments on invasive grasses, Scotch thistle, whitetop, perennial pepperweed and Russian knapweed	4
Owyhee Canyon Fire Emergency Stabilization and Rehabilitation	BLM (Vale	Drill and aerial seed [3]	25,000	Malheur	Ground and aerial seeding	4
Mormon Basin Fuels	BLM (Vale)	Treatment (aerial) / fuels thinning[3]	1,000	Baker	Multi-year monitoring and treatments for Fuels projects beginning in 2017 or 2018	5,6
NW Malheur Fuels and Sage Grouse	BLM (Vale)	Treatment (aerial) / heavy fuels thinning[3]	7,000	Malheur	Multi-year monitoring and treatments for Fuels and GRSG projects beginning in 2017 or 2018	5,6
Dry Gulch Fire Emergency Stabilization and Rehabilitation	ODF, BLM (Vale) and U.S. Forest Service (Wallowa Whitman)	Seeding and planting, survey, treatment, monitor[3]	10,000 (BLM); 18,000 (total)	Baker	Ground treatment on rush skeletonweed, myrtle spurge and assorted other noxious weeds	4
Additional Treatments Analyzed in the Proposed and Revised Proposed Actions of this EA						
Roadside invasive plants	Malheur Co. Assistance Agreement	Treatment	100	Malheur	Isolated sites of ventenata and medusahead rye to protect uninfested rangeland	1,2
Trout Creeks / Louse Canyon whitetop	Malheur Co. Assistance Agreement	Treatment	50	Malheur	Small sites of *Lepidium* species to protect relatively invasive plant-free areas	1,2
Keating area whitetop and annual grass treatments	Tri-County CWMA, Contract	Treatment	200,000	Baker	Projects over several years. Containment / control of infestations to protect Special Status species habitat and investments on adjacent lands.	1,2,5,6

1: Acres represent the gross area to be surveyed; net area to be treated will be determined post-survey.
2: Treatment methods will be identified after surveys identify species present. Specific information about treatments can be found in the *Treatment Key* (Table 2-10).

3. Seeding, planting, fuel breaks, and some other actions may be covered by other NEPA. For example, seeding and planting of Category 4 areas is covered by the Vale District Programmatic Fire Emergency Stabilization and Rehabilitation Environmental Assessment (USDI 2005b) or other Emergency Stabilization and Rehabilitation NEPA.

Alternatives Considered but Eliminated from Detailed Study

No Herbicides

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

No Aerial Herbicide Application

An alternative was considered that would be the same as the Revised Proposed Action, except it would not use aircraft for any herbicide application. This alternative was eliminated from detailed study because it was considered in the 2007 and 2016 PEISs and, as described in the Oregon FEIS, was rejected because large expanses of invasive annual grasses and other invasive plants in remote areas or areas with rugged terrain would be difficult and cost-prohibitive to treat without the use of aircraft. In addition, using ground-based methods in rugged terrain would increase injury and herbicide exposure risks for workers (USDI 2010a:34). It would also limit the ability to conduct large-scale treatments with minimal disturbance in sensitive areas such as Wilderness Study Areas and cultural sites, where other ground equipment would not be allowed or would cause unacceptable levels of ground disturbance.

Use Fewer of the Herbicides Approved for Consideration

An alternative was considered that would remove one or more herbicides from consideration for various reasons including stated risks or apparent lack of need. This alternative was eliminated from detailed study because all of the herbicides have specific species or conditions for which they are the most suitable control. Having a larger range of herbicides available helps applicators select the most appropriate one for site conditions, timing, and management objectives, and helps to avoid resistance of targeted species to specific herbicides. Specific treatments and treatment considerations are shown in the *Treatment Key* (Table 2-10) and effects are analyzed in Chapter 3. For any herbicide or use, the Decision-maker could modify the selected alternative to remove an herbicide or modify its use; however, nothing in the EA analysis indicated a need to remove any of the herbicides.

The herbicides included in the Proposed Action are the same as those examined in the Oregon FEIS for Alternative 3, the FEIS alternative that addresses invasive plants and is most like the Proposed Action in this EA. The three additional herbicides approved nationally by the 2016 PEIS are included in the Revised Proposed Action.

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

This alternative was not considered because existing Department of the Interior policy, applicable to all alternatives, states that, "Bureaus will accomplish pest management through cost-effective means that pose the least risk to humans, natural and cultural resources, and the environment" and requires bureaus to "Establish site management objectives and then choose the lowest risk, most effective approach that is feasible for each pest management project" (USDI 2007c), and "Determine, for each target pest, the possible courses of action and evaluate relative merits for controlling the pest with the least adverse effects on the environment" (USDI 1992a). By definition, invasive plants are difficult to control and herbicide applications may be necessary to prevent undue degradation and promote land health.

Given the continued spread of invasive plants and an increasing emphasis on protecting threatened habitats, it is unlikely the need for effective invasive plant control would decrease in the foreseeable future (USDI 2010a:139).

Limit Herbicide Treatments to Early Detection Rapid Response

An alternative was considered that used the 17 herbicides included in the Revised Proposed Action, but their use would be limited to early detection rapid response-type treatments[36] of new sites or new species. Non-herbicide treatments of invasive plant sites would continue, but no large-scale herbicide treatments would be implemented and existing invasive plant sites would not be actively controlled with herbicides.

This alternative was eliminated from detailed analysis because the BLM considers active control of established infestations essential to preventing or reducing ecologic and economic degradation, and controlling many of these sites cannot be achieved without herbicides. Preventing invasive plant spread to uninfested areas is cost-effective and consistent with current laws, administrative direction, and the Resource Management Plans and plans that tier to them.

Include the Use of Herbicides for Native Plants and Use Additional Herbicides

General Road and Administrative Site Maintenance

An alternative was considered that would make all 17 herbicides from the Oregon Record of Decision available and allow them to be used on both invasive and ***native*** vegetation to meet safety and operations objectives (clearing) along roads and around administrative sites. The Oregon Department of Transportation and others responsible for road maintenance use herbicides to maintain site clearances and protect infrastructure, for example. This alternative was eliminated from detailed analysis because the *Need* for more effective road and site maintenance tools is different from the invasive plant control *Need* for this EA and is thus outside the scope of this analysis.

Fuels and Habitat Management

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

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

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

Chapter 3 – Affected Environment and Environmental Effects

This Chapter describes the natural, cultural, and social environment of public lands on the Vale District that would potentially be affected by the alternatives under consideration. It focuses on resource issues that were identified during scoping, and presents the consequences of the No Action, Proposed Action, and Revised Proposed Action Alternatives relative to those issues.

Determination of Effects in this Environmental Analysis

The individual resource sections in this Chapter cite various risk ratings from the Risk Assessment tables in Appendix C, *Herbicide Risk Assessment Summaries*. These serve as indicators of a potential adverse effect from an herbicide application. The analysis sections then reference key Standard Operating Procedures and Mitigation Measures, describe the proposed applications, describe the potential for their resource to experience the Risk Assessment-modeled exposure scenarios, and draw conclusions as to whether the alternatives have the potential for significant adverse effects at the site-specific scale. Effects are also based on estimates of the amount of acres to be treated with each herbicide and treatment method as shown on Table 2-11, *Estimated Treatment Acres*. The individual resource sections also tier to the Oregon FEIS and 2016 PEIS. Anticipated herbicide treatments on BLM-administered lands in Oregon were analyzed in the Oregon FEIS at the programmatic scale.

Effects and their intensities can be described using terms such as negligible, minor, moderate, major, long-term, short-term, adverse, beneficial, and local. The definitions of these terms vary by resource and are defined at the start of each resources' *Environmental Consequences* section. Terms are only defined if they are used in the section; a resource that has no moderate effects would have no moderate effects definition. For example, a major effect to wildlife would be defined as "Changes to wildlife would be measurable, have substantial consequences, and be noticed regionally. Mitigating measures would be necessary, and their success would be uncertain." However, no major effects[37] to wildlife are expected under any alternative, so this definition is not included in the *Wildlife* section.

Human Health and Ecological Risk Assessments

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

One of the Purposes identified in Chapter 1 is *Prevent control treatments from having unacceptable adverse effects to applicators and the public, to desirable flora and fauna, and to soil, air, and water*. To help address this Purpose, the EA and the Oregon FEIS and 2016 PEIS that it tiers to for herbicides rely on BLM and / or U.S. Forest Service-prepared Human Health and Ecological Risk Assessments for the 17 herbicides included in this EA. The Risk Assessments are used to quantitatively evaluate the probability (i.e. risk) that herbicide use in wildland settings might pose harm to humans or other species in the environment. As such, they address many of the risks that would be faced by humans, plants, and animals, including Special Status species, from the use of the herbicides.

37 No adverse major or moderate effects to any resource are expected under any alternative. Further information can be found in the effects analysis later in Chapter 3.

The level of detail in the Risk Assessments for wildland use exceeds that normally found in the Environmental Protection Agency (EPA)'s registration examination. Court decisions and others affirmed that although the BLM can use EPA toxicology data, it is still required to do an independent assessment of the safety of pesticides rather than relying on *Federal Insecticide, Fungicide and Rodenticide Act* registration alone.

Risk is defined as the likelihood that an effect (skin or eye irritation, leaf damage, mortality, and so forth) may result from a specific set of circumstances. Risks to non-target species associated with herbicide use are often approximated via the use of surrogate species, as toxicological data does not exist for most native non-target species. Survival, growth, reproduction, and other important processes of both terrestrial and aquatic non-target species were considered. The Risk Assessments considered acute and chronic toxicity data. Exposures of receptors[38] to direct spray, surface runoff, wind erosion, and accidental spills were analyzed.

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

A summary of the risk ratings from the various Risk Assessments, along with an explanation of how the risk ratings were derived, is included in Appendix C.

The risk ratings are the source for much of the individual herbicide information, including the high-moderate-low risk ratings, presented in this Chapter.

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

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

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

Relationship of Effects to the Standard Operating Procedures and Mitigation Measures

Standard Operating Procedures have been identified to reduce adverse effects to environmental and human resources from vegetation treatment activities based on guidance in BLM manuals and handbooks, regulations, and standard BLM and industry practices (listed in Appendix A, *Project Design Features, Standard Operating Procedures, Mitigation Measures, Conservation Measures, Prevention Measures, and Best Management Practices*).[39] The list is not all encompassing, but is designed to give an overview of practices that would be considered when designing and implementing a vegetation treatment project on public lands (USDI 2007c:2-29). Effects described in this EA are predicated on application of the Standard Operating Procedures or equivalent, unless an on-site determination is made that their application is unnecessary to achieve their intended purpose or protection. For example, the Standard Operating Procedure to "use herbicides of low toxicity to wild horses and

[38] A biological entity such as a human, fish, plant, or mollusk.
[39] Manual-directed Standard Operating Procedures and other standing direction may be referred to as best management practices in resource management and other plans, particularly when they apply to water.

burros, where feasible" would not need to be applied to treatments where wild horses and burros are not expected to occur.

PEIS Mitigation Measures were identified for all potential adverse effects identified for herbicide applications in the 2007 *Vegetation Treatments Using Herbicides on Bureau of Land Management Lands in 17 Western States* and the 2016 *Vegetation Treatments Using Aminopyralid, Fluroxypyr, and Rimsulfuron Programmatic Environmental Impact Statements* (USDI 2007a, USDI 2016a), and adopted by their Records of Decision (also listed in Appendix A). In other words, no potentially significant adverse effect identified in the PEIS analyses remained at the programmatic scale after the Mitigation Measures were adopted. Like the Standard Operating Procedures, application of the Mitigation Measures is assumed in the analysis in this EA, and on-site determinations can decide if their application is unnecessary to achieve the intended purpose or protection.

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

Cumulative Effects

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

Reasonably Foreseeable Actions

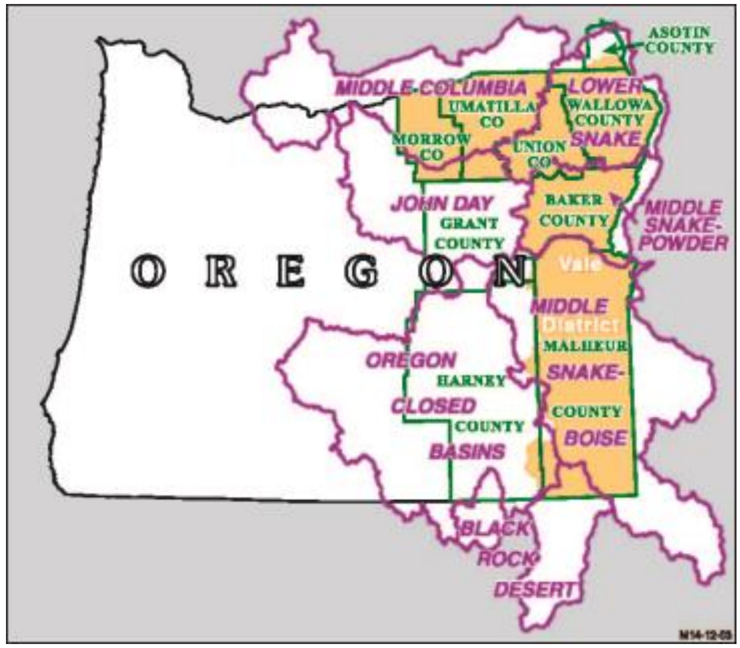
Neighboring Lands Pesticide Use

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

Over 90 percent of the BLM-administered lands on the Vale District lie within the Middle Snake - Boise, Middle Snake - Powder, and Black Rock Desert[40] drainage basins (see Figure 3-1). The Middle Snake - Boise Basin and most of the Black Rock Desert Basin roughly correlate with Malheur County, and the Middle Snake - Powder Basin closely correlates with Baker County. Thus, a rough comparison between pounds of pesticides used under each alternative and pounds of pesticides used in these basins as a whole is possible.

[40] A subpart of the Great Basin.

Figure 3-1. Middle Snake / Boise, Middle Snake / Powder, and Black Rock Desert Water Basins



More than 60 percent of these three water basins (and two counties) are lands managed by the Vale District. For 2008, 2,046,784 pounds of pesticides (including herbicides) were reported used in these three basins. Under the various Alternatives in this EA, the pounds of herbicides used annually by the BLM would be approximately 2,342 (No Action), 5,304 (Proposed Action) and 5,209 (Revised Proposed Action).This calculation assumes typical rates and current budgets for Categories 1, 2, and 3[41] (approximately 3,000 acres / year), and 100,000 acres per year in Categories 5 and 6 (under the Proposed and Revised Proposed Actions). This represents about 1 / 4th of one percent or less of the pounds of pesticides used in the basins, on more than 60 percent of the lands in those basins. These numbers do not necessarily represent an acreage difference, however, because many soil fumigants are used in tens of pounds per acre on private croplands, while the BLM proposes to use imazapic, for example, at about 6 ounces per acre on tens of thousands of acres of invasive annual grasses.

A direct comparison of specific herbicides between the BLM and the rest of the basins is possible only for glyphosate (e.g. Roundup®), and then only roughly. In the State report, the basin-specific data shows pounds by pesticide only for the top five most used pesticides. Most of the pesticides used in these basins are soil fumigants and other farm pesticides not proposed for use in this EA. Based on numbers for glyphosate that are reported in two of the three basins, total 2008 glyphosate use in the three basins is about 55,000 to 60,000 pounds. Glyphosate use by BLM in the No Action, Proposed Action, and Revised Proposed Action Alternatives in this EA are 249, 191, and 171 pounds respectively. This is less than ½ of one percent of the glyphosate used in these basins, on more than 60 percent of the lands in the basins.

The herbicides currently used under the No Action Alternative are the only pesticides currently used by the BLM in these basins. The insecticides carbaryl and diflubenzuron have been used in the past to control Mormon crickets and / or grasshoppers in cooperation with adjacent cropland owners, but this has not taken place on the Vale District for at least five years. Cumulative effects between these materials and the herbicides addressed in this EA are unlikely because of their differing modes of action and target species (USDI 2010a:118, EPA 2002).

The 2010 Oregon FEIS to which this EA tiers suggests the use of herbicides on lands adjacent to lands managed by the BLM could conceivably decrease as BLM and cooperative invasive plant treatments become more effective, reducing the number of private land invasive plant infestations originating from BLM-administered lands (USDI 2010a:118). Indeed, treating medusahead rye adjacent to uninfested private lands is included in the Proposed and Revised Proposed Action as a priority.

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[41] As noted in Chapter 2, current budgets limit treatments in Categories 1, 2, and 3 to about 3,000 acres per year. If all 197,781 Category 1 acres, plus an estimated 203,000 Category 2 and 3 acres, were treated in the next 15 years, herbicide pounds used annually would be 13,873 pounds under the Revised Proposed Action, 22,490 pounds under the Proposed Action, and 20,855 pounds under the No Action Alternative, or approximately 1 percent or less of the pounds of pesticides used in the basins.

Other Federal or State Lands

Forest Service

Forest Service administered lands in the project area are within the Wallowa-Whitman, Umatilla, and Malheur National Forests (see Map 1-1). A 2002 court decision prohibited the use of herbicides or biological control agents for invasive plant control until recently. Environmental impact statements authorizing the use of herbicides, manual, mechanical, biological control agents, mulching or seeding to treat invasive plants were completed for the three forests in 2015, 2010, and 2015 respectively. Herbicide treatments would be part of the initial prescription for most sites, with the ongoing goal to reduce reliance on herbicides over time as control objectives are met and populations become small enough to effectively treat manually or mechanically. Species of concern include bugloss, Canada thistle, yellow starthistle, diffuse knapweed, spotted knapweed, houndstongue, Dalmatian toadflax, common St. Johnswort, whitetop, Scotch thistle, medusahead, and rush skeletonweed.

In order to determine if the herbicide treatments proposed by the Forest Service would contribute cumulative effects to resources, the BLM compared a map of subbasins (4th field watersheds, see Map 3-4) with BLM administered lands with the Forest Service's invasive plants treatment project area map. The National Forest System has 38,939 acres of invasive plants in subbasins that flow into, or also contain lands administered by the Vale District, all within the northern third of the District (See Table 3-1). Most of these subbasins have only small, isolated pockets of BLM-administered land, and contain more Forest Service or private lands. Since the Forest Service has not had effective invasive plant treatment methods available until recently, increased efforts at invasive plant control by the Forest Service would prevent populations from spreading to neighboring lands managed by BLM within these subbasins.

Forest Service project design features, herbicide use buffers, and treatment caps are likely to prevent herbicides from reaching streams in measurable or harmful concentrations. Any herbicide reaching the stream would be quickly diluted as it moved downstream (USDA 2015a:178). Herbicides entering surface water through surface runoff are also expected to be minimal, since targeted spot spraying techniques or hand application techniques would be used to apply herbicide within 100 feet of surface water (USDA 2010a:301). Most 5th field watersheds have less than 1 percent of the Forest Service land identified as infested with invasive plants (USDA 2010a:274, USDA 2010b:208). The same is also true for 4th field watersheds, as shown in Table 3-1.

Table 3-1. Subbasins with both BLM and Forest Service Lands

Subbasin	Acres	% BLM	% Forest Service	Forest Service Invasive Plant Acres	% of Subbasin Potentially Treated by Forest Service
Burnt	703,170	21.67	28.29	3,105	0.44
Brownlee Reservoir	409,641	27.87	33.35	844	0.21
Imnaha	543,962	0.10	70.54	8,652	1.59
Lower Grande Ronde	844,363	2.54	42.97	4,358	0.52
North Fork John Day	459,378	3.49	62.80	6,174	1.34
Powder	1,092,267	12.05	32.50	3,343	0.31
Upper Grande Ronde	1,046,623	0.42	45.62	4,251	0.41
Umatilla	1,616,053	0.26	11.39	5,002	0.31
Upper Malheur	515,739	58.28	0.02	287	0.06
Willow	485,845	0.01	2.55	49	0.01
Walla Walla	307,102	0.90	18.34	1,140	0.37
Wallowa	610,211	0.38	46.27	1,735	0.28

(Source: USDA 2010a:275-277, USDA 2010b:234-235, USDA 2015a:358)

Oregon Department of State Lands

The Oregon Department of State Lands (DSL) works in conjunction with the Jordan Valley CWMA and Harney County CWMA to treat DSL Trust lands in conjunction with adjacent private lands. Invasive plant treatments primarily target medusahead, perennial pepperweed, and whitetop. DSL uses Plateau (imazapic) for medusahead when patches are in open rangeland areas and Landmark (sulfometuron methyl + chlorsulfuron) on roadways. Telar (chlorsulfuron) is used for perennial pepperweed. Total annual treatments average 1,000 acres, depending on funding levels and wildfires that may require additional treatments (R. Wiest, DSL, 2015 personal communication).

Other Foreseeable Actions

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

Table 3-2. Ongoing and Foreseeable Actions on or near the Vale District Potentially Relating to Cumulative Effects[1]

Name of Action	Lead Agency or Proponent	Location	Timeframe
Boardman to Hemingway 500-kV transmission line	Idaho Power Company	Morrow, Umatilla, Baker, Union, Malheur Counties	Future (EIS planned for release in 2016)
Saddle Butte Wind Park	Saddle Butte Wind, LLC	Morrow County	Ongoing, Future
Wheatridge Wind Energy Facility	Wheatridge Wind Energy, LLC	Morrow County and Umatilla County	Future
Ward Butte Wind Farm	American Wind	Umatilla County	Future
Butter Creek Projects (1-9)	Intelligent Wind Energy	Morrow County and Umatilla County	Future
Perennial Wind Chaser Station	Perennial Power Holdings, Inc.	Umatilla County	Future
Antelope Ridge Wind Farm	Antelope Ridge Wind Power Project	Union County	Ongoing, Future
Additional route designations of the Oregon Trail	National Park Service	Umatilla County	Future
Northwest Malheur Habitat Restoration and Fuels Treatment projects	Vale District BLM / Malheur Resource Area	Malheur County (northwest)	Future (EA under way)
Baker Habitat Restoration and Fuels Treatment projects	Vale District BLM / Baker Resource Area	Baker County, 7 to 25 air miles southwest of Baker City	Ongoing
Fire year 2012 Emergency Stabilization and Rehabilitation (Continued management, Long Draw and Holloway fire restoration)	Vale District BLM	Across Vale District, interstate with Nevada	Continued monitoring and *Endangered Species Act* coordination
Mormon Basin Fuels Treatment[2]	Vale District BLM	North Malheur County	Ongoing
High Bar / Upper and Lower Pine Creek Placer Mining Project	High Bar Mining, LLC	Baker County, near the town of Hereford, OR	Ongoing
Malheur Queen Placer	Eldorado Resources, LLC	North central Malheur County	Ongoing
Neal Hot Springs Geothermal	US Geothermal, Inc.	NW of Vale approximately 20 miles	Existing, with possible expansion
Geothermal Expansion	Vale District BLM	NE Malheur County	Unknown

Name of Action	Lead Agency or Proponent	Location	Timeframe
Grassy Mountain Gold	Paramount Gold	North central Malheur County	Future
2014 Buzzard Complex Fire Emergency Stabilization and Rehabilitation[2]	Vale and Burns Districts, BLM	Boundary of Burns / Vale, south of Riverside, Oregon	2014-2016
Tri-State Fuels Project	Boise (lead) and Vale Districts BLM	SE Malheur County, SW Owyhee County	Future
Powder River Canyon, Keating, Lookout Mountain, Burnt River, Pedro Mountain, Homestead, Louse Canyon (West Little Owyhee), Bully Creek, Soldier Creek, and Pritchard Creek Standards and Guidelines Evaluations and potential grazing management changes	Vale District BLM	Across Vale District (in areas where allotments do not meet rangeland health standards if current livestock management is found to be a causal factor)	Ongoing, Future
Grazing management changes in response to Greater Sage-Grouse Resource Management Plan Amendments	Vale District BLM	Portions of Black Canyon, Dry Creek Bench, Lake Ridge, Mahogany Ridge, North Ridge Bully Creek, South Bull Canyon, South Ridge Bully Creek, Spring Mountain and Toppin Creek Butte research Natural Areas.	Future
Annual Plans of Operation, mining	Vale District BLM	SW Baker County	Ongoing
Jaca Fire Emergency Stabilization and Rehabilitation	Vale District BLM	East central Malheur County	Fall, 2015-2018
Leslie Gulch Fire Emergency Stabilization and Rehabilitation	Vale District BLM	East central Malheur County	Fall, 2015-2018
Soda Fire Emergency Stabilization and Rehabilitation	BLM (Vale and Boise)	Oregon / Idaho, Malheur and Owyhee Counties	Fall, 2015-2018
El Dorado Fire Emergency Stabilization and Rehabilitation	Oregon Department of Forestry and Department of State Lands	Northwest Malheur County	Fall, 2015-2018
Windy-Cornet Fire Emergency Stabilization and Rehabilitation	BLM (Vale) and U.S. Forest Service (Wallowa Whitman National Forest)	South central Baker County	Fall, 2015-2018
Dry Gulch Fire Emergency Stabilization and Rehabilitation	Oregon Department of Forestry, BLM (Vale) and U.S. Forest Service (Wallowa Whitman National Forest)	North central Baker County	Fall, 2015-2018
Owyhee Canyon Fire Emergency Stabilization and Rehabilitation	BLM (Vale)	Central Malheur County	2016 Fire; Emergency Stabilization and Rehabilitation Plan in Development
East Face Vegetation Management	BLM (Vale) and U.S. Forest Service (Wallowa Whitman National Forest)	Western Baker and Union Counties	2016 and Future
Greater Sage-Grouse Habitat Management and Restoration Projects	BLM (Vale) and private and Federal partners	Vale District-wide	2016 and Future

1. Projects could include juniper removal, silvicultural treatments, plantings and seedings, and herbicide applications, among other actions.
2. The invasive plant treatments in these EAs are included in all alternatives. These EAs are listed because of other projects included in these EAs.

Invasive Plants

Issues

- How would the alternatives reduce the spread of noxious weeds and other invasive plants?
- How would the alternatives respond to a tendency for some populations of invasive plants to develop resistance to an herbicide?
- How would the alternatives affect the BLM's invasive plant management cooperators?

Affected Environment

Chapter 2 describes the District's integrated invasive plant management program, information about the invasive plants on the District and the elements of the program that would remain unaffected by the alternatives. The information presented under the descriptions of the seven Categories in Chapter 2 describes current conditions of invasive plants on the District. This section will further describe methods whereby invasive plants are spreading on the District, factors that influence / assist in spread, and challenges in managing invasive plants.

The susceptibility of plant communities to infestation by invasive plants is influenced by many factors, including community structure, proximity to currently infested areas, and the biological traits of the invading species. The factors of spread are highly variable. The amount of pre-existing invasive plants, on-site precipitation, disturbance, slope, aspect, and seed viability all have contributing influences from site to site. In general, vegetation types with frequent gaps in plant cover, such as sagebrush-steppe rangelands, woodlands, and dry forests, are more susceptible to invasive plant establishment than vegetation types with relatively closed plant cover.

Table 3-3. Summary of Invasive Plants Mapped in NISIMS by Infestation Size

Infestation Size (in Acres)	Number of Sites *(percent of total sites)*		Total Acres *(percent of total acres)*	
< 0.1	24,423	*89%*	1,442.14	*12%*
0.1 to < 0.5	2,172	*8%*	459.67	*4%*
0.5 to < 1	379	*1%*	291.37	*2%*
1 to < 5	351	*1%*	779.84	*7%*
5 to < 20	179	*1%*	1,705.69	*15%*
20 to <100	46	*0%*	1,893.89	*16%*
100 to < 500	11	*0%*	2,510.69	*21%*
> 500	1	*0%*	2,616.50	*22%*

The Vale District has 50 known invasive plant species[42] occupying approximately 197,781 acres (Table 2-1, *Summary of Known Invasive Plant Sites*). These sites are primarily located along roads, in riparian areas, recreation sites, mining areas, livestock water development sites, and previously disturbed areas. Most of these documented sites (Category 1) on the Vale District are relatively small (see Table 3-3 and Table E-5, *Invasive Plants Mapped in NISIMS by Infestation Size* in Appendix E). In a typical year, the majority of treatments occur on small sites (less than 10 acres each) but more acres are treated cumulatively on fewer larger sites (greater than 100 acres each).

The District has identified specific areas where **invasive annual grasses** are prominent as well as areas at risk for invasion. Estimates show more than 3.5 million acres where invasive annual grasses are the dominant understory grass (Category 5), and an additional 400,000 acres where invasive annual grasses already dominate (Category 6). Cheatgrass is present throughout the District, ranging from low density to monoculture. Where invasive annual grass densities are high, there is an increase in the frequency and severity of rangeland wildfires, which in turn threatens sagebrush and other native habitats, and promotes further spread of invasive annual grasses (Whisenant 1990, Miller and Tausch 2001, Pellant et al. 2004, Chambers et al. 2007, Boyte et al. 2016) (see Table 2-3).

[42] Not counting cheatgrass, which is discussed below.

Medusahead rye is the most problematic of the invasive annual grasses on the District. Where infestations have become well established, they tend to be very competitive. These "core" infestations tend to be surrounded by a halo of low to moderate infestation that can be quite extensive. Existing sites are spreading at the edges, and new satellite populations are created by seed.

The current spread rate for noxious weeds is estimated to be about 12 percent annually (USDI 2010a:133,594)[43] and new sites are found on the District with each invasive plant survey. These plants could be new locations of invasive plants that already exist on the District or new invaders, which could be present on adjacent lands (Category 3) before they spread onto the BLM-administered lands. For example, Japanese knotweed is present near the Grande Ronde River on adjacent State of Oregon administered land, but has yet to be detected on BLM-administered lands. The District works with numerous entities to coordinate early detection activities across jurisdictional boundaries and educate the public about new invasive plants that are invading the area.[44]

Routes of Invasive Plant Spread

Routes of invasive plant spread on the District include roads and mineral material sites, utility corridors and water developments, recreation sites and waterways, as well as by wind, water, animals, and humans through vehicle and foot traffic. Invasive plants can spread quickly and over great distances because they are transported by several means: off-road and other vehicles, camping and other recreation equipment (including contaminated OHVs), hay and other feed crops, construction and road maintenance equipment, mining equipment, gravel, as intentionally moved plants, or inadvertently within the soils of other transplanted vegetation (USDI 1996a). Livestock, wild horses, and wildlife (including birds) can introduce invasive plant seeds from their coats and feces. Linear disturbances such as roads and fences can serve as corridors for invasive plant spread (USDI 2010a:132). Some invasive plant species such as diffuse knapweed, Mediterranean sage, and Russian thistle are often found along fences, against sagebrush, or in narrow canyons because they have the ability to break off from the root crown and tumble across the rangelands, often several miles from the original site. Infestations begin mostly on disturbed sites such as roads and trails, burned areas, wildlife or livestock concentration areas, mining areas, and recreation sites. Hoof action by large herbivores like cattle and wild horses can contribute to invasive plant establishment by exposing bare soil and by selectively removing native plants that are more palatable (which reduces competition for invasive plants).

Roads are the primary pathway for spread on the District. Many existing sites of species for which there are no effective selective herbicides currently available such as whitetop and medusahead rye are being spread along roads by maintenance equipment annually. However, because roadsides are a priority for surveys, invasive plants are often found along roads when just a single plant has appeared.

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, packstock and pets where roads, trails, and waterways converge. Invasive plants can be easily transported from one site to other areas on the District and beyond.

Livestock grazing: Due to the amount of acres open to livestock grazing, the potential exists for cattle to be a primary vector of invasive plant spread across the District. Although the majority of the District (4.9 million acres) is allotted for cattle grazing, they are not present on all of these acres at once nor are they present on every acre

[43] The 2010 Oregon FEIS examined a variety of sources and concluded the spread rate for noxious weeds in Oregon was about 12 percent (USDI 2010a:594-5). Since available herbicides and other control methods have been essentially constant for 30 years, the 12 percent spread rate is assumed to apply to the No Action Alternative.
[44] See *Prevention, Detection, Education, and Awareness* section early in Chapter 2 for more information about cooperators.

within a particular pasture for which they are assigned. Cattle congregate around water and mineral sources and in transport/loading areas. These congregation areas often are infested with invasive plants due to the frequent soil disturbance and/or reduced vigor of existing desirable plants. Cattle also tend to like to rest in areas that are relatively flat, such as benches or in valley bottoms. These areas are under increased pressure and stress from grazing and trampling and become sites that are more conducive to invasive plant introduction and establishment.

Mineral material sites such as quarries (saleable), placer deposits (locatable) and oil and gas, and geothermal (leasable) areas can become sources of invasive plants because they tend to be places that are continuously disturbed, and may have numerous users. Following productive use, reclamation may be incomplete. Because the soil was completely disturbed[45], primary succession may need to occur and seeded species can be the only vegetation for long periods. It is difficult to keep invasive plants out, because the site will persist in a low seral stage for many years.

Hazardous Fuels Reduction: The District has many landscape level fuels reduction projects (see Table 3-4). When possible, these projects are planned to avoid the known areas of invasive plants, but can also be projects designed either to remove invasive plants that create a fire hazard or to create fuel breaks. The removal of invasive plants may also be one of many objectives in the overall project goal(s), such as in restoration projects. However, these activities can contribute to the spread of invasive plants. Table 3-4 outlines fuels treatment projects for the last 10 years. Thinning, cutting, piling, disking and mowing treatments create ground disturbance (e.g. machine track marks) which can encourage the spread of invasive plants. Pile burning results in severely burned spots occupying approximately 5 percent of the treated acres. Pile burn spots, jackpot, and broadcast burn areas can be susceptible to colonization by invasive plants, providing an avenue for introduction to the landscape.

Table 3-4. Hazardous Fuels Program Summary, by Acres

Year	Thinning	Cutting	Machine Pile and Burn	Hand Pile and Burn	Jackpot Burn	Broadcast Burn	Lop and Scatter	Mowing	Disking	Total
2005	-	1,750	-	-	2,431	782	-	2,111	687	7,560
2006	-	3,510	-	-	2,310	1,006	-	1,214	888	8,928
2007	-	1,403	149	69	1,438	62	-	2,803	888	4,886
2008	-	1,629	-	49	554	425	-	4,640	687	7,983
2009	-	6,252	-	387	490	579	84	727	521	9,039
2010	-	8,523	248	214	1,547	-	22	1,097	1,042	12,692
2011	-	12,302	-	-	1,088	-	-	1,129	1,033	15,552
2012	-	6,421	86	161	571	-	394	1,069	888	9,591
2013	-	-	-	-	-	-	-	1,069	852	1,922
2014	210	14,440	-	11	521	-	-	947	201	16,330

Table 3-5. Post Wildfire Activity Summary

Year	Acres Inventoried	Acres Treated
2007	120,800	2,611
2008	46,640	1,124
2009	82,035	1,849
2010	83,720	563
2011	900	31
2012	19,700	124
2013	334,460	1,671
2014	250,985	290
2015	118,864	17,966

Where **wildfires** have occurred, Emergency Stabilization and Rehabilitation (Category 4) activities occur. See Table 3-5 for number of acres of invasive plants treated using herbicide following a wildfire by year. Emergency Stabilization and Rehabilitation Plans propose invasive plant treatments and adequate funding is requested. Most of these treatments have been on rush skeletonweed, Scotch thistle, yellow starthistle and halogeton infestations.

[45] Mining and use of locatable, salable, and leasable minerals often removes vegetation and top soil.

Since the 2010 Oregon Vegetation Management EIS was completed, six EAs have authorized the use of additional herbicides, the *Owyhee Canyon Fire Emergency Stabilization and Rehabilitation Plan EA, Juntura Complex Fires Emergency Stabilization and Rehabilitation Plan EA, Bendire Complex Fire Emergency Stabilization and Rehabilitation Integrated Invasive Plant Management Plan, the Leslie Gulch Fire Emergency Stabilization and Rehabilitation Plan EA*, *Mormon Basin / Pedro Mountain Fuels Management EA* and the *Buzzard Complex Fire Emergency Stabilization and Rehabilitation Plan EA*. Treatments focused primarily on invasive annual grasses using imazapic have been conducted in the Buzzard Fire area over 4,432 acres (see Table 2-8). Imazapic treatments also occurred on acres under the Jaca Reservoir Fire and Soda Emergency Stabilization and Rehabilitation Plans and their Determinations of NEPA Adequacy. All emergency stabilization and rehabilitation treatments have focused on 1) areas with adequate desirable vegetation to respond positively to the treatment; 2) treating buffers along roads to prevent spread and to break the landscape up into more manageable treatment units; and 3) to protect and enhance areas that were seeded following the fires.

Project Design Feature Adopted for this Analysis

- Monitoring will be done to determine anticipated production of invasive annual grasses and targeted grazing use rates and implementation timing. Monitoring plans for each targeted grazing prescription would be developed as part of the Annual Treatment Plan[46]. The monitoring plan and associated monitoring efforts would determine the biomass of the invasive annual grass infestation, the timing of the targeted grazing treatments, and the level of grazing needed to aid in the control of invasive annual grasses or as a pre-treatment to improve the effectiveness of herbicide treatments.

Environmental Consequences

This analysis defines levels of effects on invasive plants as follows:

Negligible: The introduction and / or spread of invasive plants would not be appreciably affected by management actions, including those that would increase or decrease ground disturbance, or those that have the potential to introduce or prevent the introduction of invasive plants. Negligible effects would be difficult to detect and it would not be clear that a particular management action was responsible for increasing or decreasing the level of invasive plants.

Minor: The introduction and / or spread of invasive plants would be slight due to management actions, including those that would increase or decrease ground disturbance, or those that have the potential to introduce or prevent the introduction of invasive plants. Effects would be small but detectable. The likelihood of being able to restore an affected area to a desired, pre-infestation condition would be high. Beneficial effects would result in conditions where existing invasive plants are contained and new introductions are reduced. Adverse effects would result in conditions where existing invasive plants cannot be completely controlled, infestations are spreading, and new introductions occur.

Effects of Treatment Methods

Non-Herbicide Treatments

The non-herbicide treatment methods including how and in what situations they would be appropriately used is primarily described in Chapter 2 under the *Integrated Invasive Plant Management* section; additional information

[46] Further information on minimum monitoring techniques for integrated weed management treatments with targeted grazing can be found in Appendix H.

about biological treatment methods is included below. The intent of all the application methods is to adversely affect targeted invasive plants. All treatment methods may have unintended adverse consequences to desirable plants. For example, in the process of treating invasive plants, laborers and their equipment may trample vegetation and disturb soil, providing isolated but prime conditions for re-invasion by the same or other invasive plants.

Biological Control

Twenty-nine biological control agents (all insects) are actively used on 15 different noxious weeds on the Vale District (see Table 3-6).

Table 3-6. Biocontrol Releases[1] on the Vale District

Biocontrol	**Target**	1980-89	1990-99	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	**total**
Stem gall fly *Urophora cardui*	Canada thistle	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	**1**
Stem mining weevil *Mecinus janthiniformis*	Dalmatian toadflax	-	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-	**2**
Seed feeding weevil *Larinus minutus*	diffuse knapweed	-	1	-	-	-	3	-	-	-	-	-	-	-	-	-	-	**4**
Seed feeding fly *Urophora affinis*		3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**3**
Root boring beetle *Sphenoptera jugoslavica*		-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**1**
Seed feeding weevil *Bangasternus fausti*		-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	**4**
Leaf and bud galling mite *Aceria malherbae*	field bindweed	-	-	-	1	1	-	-	-	-	-	-	-	1	-	-	-	**3**
Root feeding flea beetle *Aphthona nigriscutis*	leafy spurge	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**4**
Foliar feeding flea beetle *Aphthona cyparissiae*		-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**5**
Foliar feeding flea beetle *Aphthona czwalinae*		-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**1**
Root feeding flea beetle *Aphthona lacertosa*		-	5	1	2	2	-	-	5	-	3	2	-	-	-	-	-	**20**
Bud gall midge *Spurgia esulae*		-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**2**
Root boring beetle *Oberea erythrocephala*		-	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	**2**
Root crown mining weevil *Phrydiuchus tau*	Mediterranean sage	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**1**
Seed feeding weevil *Rhinocyllus conicus*	musk thistle	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**1**
Seed feeding weevil *Microlarinus lareynii*	puncturevine	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	**2**
Stem mining weevil *Microlarinus lypriformis*		1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**1**
Foliar feeding beetle *Galerucella pusilla*	purple loosestrife	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	**2**
Foliar feeding beetle *Galerucella calmariensis*		-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	**1**

Biocontrol	**Target**	1980-89	1990-99	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	**total**
Root feeding weevil *Hylobius transversovittatus*		-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	**1**
Seed feeding weevil *Nanophyes marmoratus*		-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	**1**
Root feeding moth *Bradyrrhoa gilveolella*	rush skeletonweed	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2	**4**
Leaf feeding beetle *Diorhabda elongata*	saltcedar	-	-	-	-	-	1	-	2	9	4	8	5	-	-	-	-	**29**
Seed feeding weevil *Rhinocyllus conicus*	Scotch thistle	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**2**
Seed feeding weevil *Larinus obtusus*	spotted knapweed	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	**1**
Seed head gall fly *Urophora sirunaseva*	yellow starthistle	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**6**
Seed feeding weevil *Eustenopus villosus*	yellow starthistle	-	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	**3**
Seed feeding fly *Chaetorellia australis*	yellow starthistle	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	**2**

1. Total releases per year vary from Table 2-7,*Annual Treatment Summary* in Chapter 2; numbers in Table 2-7 reflect biocontrol releases done on BLM-administered lands by ODA staff and collections and re-releases by BLM staff, whereas this table shows ODA releases on or near BLM-administered lands.

Historically, Dalmatian toadflax was widespread and expanding on the District, particularly in northern Malheur County and in Baker County along the Snake River. *Mecinus janthiniformis* introductions began in the 1990s along the Snake River and the agent can now be found anywhere that Dalmatian toadflax exists. The BLM considers Dalmatian toadflax “managed” at an acceptable background level on the District.

Similar to Dalmatian toadflax, diffuse knapweed was widespread and expanding on the District until *Larinus minutus* was released. Releases of *Larinus minutus* on BLM-administered land began in the 1990s. One of the primary target locations for initial release was along the Grande Ronde River in habitat for federally listed Chinook salmon and steelhead. Since then, the District has actively participated in collections and redistributions of these agents to other diffuse knapweed infestation locations across the District. Although the insect has been successful at keeping diffuse knapweed from expanding, it has not reduced the knapweed population to the extent that the toadflax agent has. Thus, the BLM continues to treat diffuse knapweed along the road network with herbicides to prevent spread to new areas.

In 2003, U.S. Fish and Wildlife Service approved a caged release of *Diorhabda elongata* (saltcedar beetle) - since renamed *D. carinulata*, on saltcedar at Haystack Rock, near the Owyhee River below the dam. After two years of monitoring in the cages, open field releases were approved in late July 2005. Additional releases occurred in 2006, 2007 and 2008. By July 2008, beetle numbers had markedly increased, visible defoliation was evident, and by August, many trees were entirely defoliated. Repeated defoliation occurred in 2009, resulting in die-off of individual trees after only 2 years. Collections were made on-District and relocated to other sites on the District in 2008 and 2009. Beetles were at their highest numbers in 2009, but crashed in 2010 to roughly 2007 levels. In 2010, ceding to pressure from a lawsuit brought against them in 2009, APHIS terminated its interstate permits. Because of this action, the District had no source for beetles to augment dwindling populations. It is not clear whether the crash was due to normal fluctuations in insect populations, predation from ants and birds, or incompatibility with a nonnative leafhopper. Release sites continue to be monitored and *Diorhabda* is currently either not present or exists in very low numbers.

Targeted Grazing

Cattle are currently being used on a limited basis for targeted grazing of invasive annual grasses on the Vale District under the season of use identified in current grazing permits. Cattle readily eat cheatgrass from fall green-up through early spring when it is palatable. Medusahead rye appears less palatable than cheatgrass because it has courser awns and concentrates silica. Targeted grazing would occur during the growth stage when native grass species are resilient to grazing and when livestock preference is shifted towards consumption of the targeted species, which occur in the early spring and fall (Stroud et al. 1985, Ganskopp 1988, Vallentine and Stevens 1994, Brewer et al. 2007, Diamond et al. 2009). Utilizing goats for targeted grazing on perennial, rhizomatous invasive plants such as leafy spurge, Russian knapweed, and perennial pepperweed, in conjunction with follow-up herbicide treatments and seeding can provide much better management of the target invasive plants than any treatment by itself (USDA 2006b). Typically, a full-time herder is required to keep the grazing focused on the target areas and species. Currently, goats are used only in the Baker Resource Area for invasive plants in fenced urban administrative sites. Should the need arise in the future to use goats or sheep in unfenced wildland areas, the locations would be coordinated with ODFW to minimize the risk of introducing disease to big-horn sheep herds (see *Recommendations for Domestic Sheep and Goat Management in Wild Sheep Habitat* by the Western Association of Fish and Wildlife Agencies (Wild Sheep Working Group 2012:11-16)).

Herbicide Treatments

Table 3-7. Effects of Herbicide Treatments (Invasive Plants)

Herbicides available under all alternatives	
2,4-D	2,4-D is effective on a wide range of broadleaf invasive plants while not affecting most grasses. 2,4-D can help inhibit seed production, prevent herbicide resistance, and effectively treat multiple invasive plant species when a variety are encountered in a particular treatment area. While having additional herbicides available can allow for more target specific control, having one herbicide that controls a vast range of vegetation can be beneficial when an area is dominated by a variety of invasive broadleaved plants. In addition, adding a small amount of 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.
Dicamba	Dicamba has been used extensively on thistles and in combination with 2,4-D on perennial mustards (including whitetop) and knapweeds. Use would drop under the Proposed and Revised Proposed Actions, and chlorsulfuron and metsulfuron methyl would be used for the majority of mustard treatments. However, dicamba provides control right up to seed set, which extends the treatment window.
Glyphosate	Glyphosate is used on broadleaf invasive plants and woody species and has been used to treat medusahead rye on the District. However, it is a non-selective herbicide and can harm desirable plants, so use has been limited to areas where this is an acceptable treatment. Glyphosate and 2,4-D have been the only two aquatic herbicides available to the District for the past 30 years, and their use would decrease if more herbicides labeled for use in aquatic and riparian / wetland situations became available.
Picloram	Picloram is effective on knapweeds, toadflax, Mediterranean sage, rush skeletonweed, leafy spurge, and thistles, and provides good residual control. Use would decrease under the Proposed and Revised Proposed Action, and clopyralid, which is more selective, would likely be used instead in most situations.
Herbicides available in limited areas under the No Action Alternative and District-wide under the Proposed and Revised Proposed Actions	
Chlorsulfuron	Chlorsulfuron is an ALS-inhibitor that is especially effective on broadleaf plants such as whitetop, perennial pepperweed, Mediterranean sage, and thistles. It is often mixed with 2,4-D to reduce the likelihood of developing plant resistance and to deter seed production. It can also be used on toadflax and houndstongue. Some grass species can be damaged by this herbicide, particularly wet meadow grass species such as meadow foxtail, some brome species, and timothy.
Clopyralid	Clopyralid targets many of the same species as picloram, but is more selective. It is particularly effective on knapweeds and Canada thistle, while minimizing risk to surrounding desirable brush, grass, and trees.
Imazapic	Imazapic, an ALS-inhibitor, is used for treatment of invasive annual grasses such as cheatgrass and medusahead rye. It is selective for these grasses at low rates, leaving the perennial herbaceous species critical for restoration unharmed. Use of imazapic has occurred on the District in select locations since 2014 (see Table 2-8, *Summary of NEPA Authorizing Invasive Plant Treatments*).

Additional herbicides available under the Proposed and Revised Proposed Actions	
Dicamba + Diflufenzopyr	Diflufenzopyr + Dicamba would be used for many of the same species as dicamba. It can be used in a mixture with picloram, triclopyr, and clopyralid, allowing for a reduced rate of those herbicides. It is applied in the fall when native plants are dormant.
Fluridone	Fluridone is an aquatic herbicide that requires prolonged plant contact, so it can only be used on aquatic plants in still water. There are currently no invasive aquatic plants on the District that would be controlled with this herbicide. If the need arose, treatments would be contracted out to applicators with experience in this type of application (such as the ODA).
Hexazinone	Hexazinone is effective on annual grasses, broadleaf and woody plants, both pre- and post- emergent. It could also be used to treat new invaders to the District where appropriate. Common targets could include invasive annual grasses and invasive annual broadleaf plants.
Imazapyr	Imazapyr is an ALS-inhibitor that is very effective on brushy and woody species such as saltcedar and Russian olive. It is also used to treat yellow flag iris, purple loosestrife, leafy spurge, knotweeds (Japanese, giant), and African rue. Imazapyr may be used for the control of aquatic invasive plants 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 perennial pepperweed, whitetop and other mustards, as well as thistles, Mediterranean sage, and houndstongue.
Sulfometuron methyl	Like imazapic, sulfometuron methyl, an ALS-inhibitor, is effective on cheatgrass and medusahead rye and can be selective for annuals at low rates. It has a shorter half-life than imazapic, which speeds restoration efforts. At typical and maximum rates, sulfometuron methyl will control many annual and perennial grass and broadleaf species. It is not appropriate for large-scale treatments on rangelands because it is not labeled for use on rangelands (unless it is combined with chlorsulfuron in *Landmark*), cannot be applied aerially, and has a one-year grazing restriction following application.
Triclopyr	Triclopyr is effective on woody plants, and would be used on saltcedar, Russian olive, and other trees and shrubs. The aquatic formulations are also the most effective herbicide for treatment of purple loosestrife. Triclopyr BEE, the ester formulation, is more effective at smaller doses, but is more toxic to fish. It is often used as a cut-stump treatment, in addition to foliar applications.
Herbicides available only under the Revised Proposed Action	
Aminopyralid	Aminopyralid is effective at controlling yellow starthistle, Russian knapweed, various thistles, rush skeletonweed, and other invasive plants of rangelands (DiTomaso and Kyser 2006, Enloe et al. 2008, Bell et al. 2012). Other species controlled by aminopyralid include oxeye daisy, Mediterranean sage, and Japanese and other large knotweeds (DiTomaso et al. 2013). 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). In mixtures with other active ingredients, it can be used on hard-to-control species like poison hemlock (DiTomaso et al. 2013).
Fluroxypyr	Fluroxypyr is effective on annual and biennial invasive plants, particularly when tank-mixed with another herbicide such as 2,4-D, dicamba, metsulfuron methyl, or triclopyr. It would be used to manage species such as kochia, mustards, pricklypear, ragweed, leafy spurge, and blackberry. Fluroxypyr has been shown to have a synergistic effect when mixed with 2,4-D to control certain broadleaf invasive plants (Smith and Mitra 2006), and to improve control of leafy spurge when mixed with picloram (Peterson 1989). Fluroxypyr has been identified as an option for addressing invasive plants that are resistant to herbicides with different modes of action. Its uses would likely include administrative sites and rights-of-way where resistance to currently approved herbicides could be a problem. For instance, kochia that is resistant to ALS-inhibiting herbicides can be treated with fluroxypyr, although kochia can also develop a resistance to fluroxypyr (Montana State University Extension 2011).
Rimsulfuron	Rimsulfuron is effective against cheatgrass in the fall pre-emergence, or post emergence in the fall or spring. It provides a longer window of control than imazapic, although it must be used at the highest label rates for effective spring applications. Rimsulfuron can also be used to control larger cheatgrass plants than imazapic (Beck, No date). The effectiveness of rimsulfuron at controlling cheatgrass and medusahead rye has been documented (Zhang et al. 2010), although there is conflicting evidence about its effectiveness relative to currently approved active

	ingredients (primarily imazapic). Some studies with rimsulfuron indicate that it is not as effective at controlling cheatgrass as imazapic or sulfometuron methyl (Clements and Harmon 2013). However, there is also evidence that rimsulfuron is more effective than imazapic under certain conditions (Hirsch et al. 2012). As with sulfometuron methyl, rimsulfuron has a one-year grazing restriction.

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

Effects by Alternative

No Action Alternative

Continued use of 2,4-D, dicamba, glyphosate, picloram, and selected use of chlorsulfuron, clopyralid, and imazapic, along with non-herbicide methods would continue to slow the spread of noxious weeds within the District. However, certain noxious weeds and most of the other invasive plants would continue to spread. For example, the spread of perennial pepperweed and whitetop can be slowed but not adequately controlled under this alternative; available treatments for these species only reduce the vigor or delay seed development. Invasive annual grasses (including the noxious weed medusahead rye) cannot be effectively treated outside of the limited areas listed in Table 2-8 because there is no herbicide available District-wide that is selective to these grasses. Treatments under this alternative are estimated to effectively control small populations about 60 percent of the time (USDI 2010a:136),[47] and at the current 12 percent annual spread rate, the 197,781 acres of known Category 1 sites (see Table 2-1, *Summary of Known Invasive Plant Sites*) would be expected to spread to approximately 1,082,567 acres in 15 years. Cooperative partners within the District (such as the Tri-County CWMA) find projects with the BLM to be difficult because many of the herbicides they routinely use are not available for use on BLM-administered lands. Herbicides would be used as a follow up or maintenance treatment in conjunction with mechanical treatments or post wildfire rehabilitation treatments, to further reduce the fuels hazard and to help control new or existing invasions from occurring or spreading.

Herbicide resistance[48] is the evolved capacity of a susceptible invasive plant population to withstand an herbicide application to which the original populations were susceptible and complete its lifecycle. Where invasive plant infestations have been sprayed annually with the same herbicides with low likelihood of effective control, a concern is that plant populations could become herbicide resistant. Most plant populations showing herbicide resistance are in agriculture settings; however, resistance has been documented in wildland vegetation management settings and invasive plant programs (University of Idaho 2011). Resistance can result from repeated use of the same herbicides, or several herbicides with the same site of action.

Given the short list of herbicides from which to choose in the No Action Alternative, and the limited areas in which some additional herbicides may be used, some species (perennial mustards, Canada thistle, medusahead rye) would continue to expand and outcompete native plants. The effects on the invasive plants that would be readily

[47] Primarily because the currently available treatment methods (including four herbicides) do not kill or effectively control certain species, like perennial pepperweed, whitetop, and Canada thistle.
[48] 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.

controlled by the available herbicides are expected to be adverse but existing invasive plant infestations would persist and spread, and the development of herbicide resistance is likely. Although there would be beneficial effects to some native plant communities under this alternative, they would be minor in the long-term as the overall landscape continues to be invaded by invasive plants.

Proposed Action

The more selective herbicides chlorsulfuron and metsulfuron methyl could be used to effectively control the perennial mustards that the District has been battling for nearly 30 years (see Table 2-10, *Treatment Key*). In combination with clopyralid, infestations of Canada thistle, Mediterranean sage, and houndstongue can be effectively treated with minimal damage to desirable vegetation.

With the addition of imazapyr and triclopyr, species such as saltcedar, Russian olive, yellow flag iris and purple loosestrife could be controlled in riparian / wetland settings. The District would also have the ability to better manage species currently unknown but with the potential for introduction (Category 3). The herbicides listed above, along with fluridone, would allow control of invasive aquatic plants as well. Water primrose, and yellow floating heart, along with Elodea, hydrilla, and Eurasian watermilfoil have become more common across Oregon, but have not been found on the District.

Imazapic, hexazinone, and sulfometuron methyl would be used as pre-emergents to prevent invasive annual grass species primarily as part of post-fire emergency stabilization after large catastrophic fires (Category 4) along with seeding and other emergency stabilization efforts. The addition of these herbicides would give the District the ability to manage the invasive annual grass species where they have become problematic. Infestations are still relatively small in a number of areas such as the Oregon Canyon Mountains and Trout Creek Mountains but there are vast expanses of rangeland at risk for invasion or already dominated by invasive annual grasses. Treatments with these herbicides along roads where invasive annual grasses are prominent could replace disking to maintain existing fuel breaks, providing for less ground disturbance and reducing the likelihood of sweeping, unchecked wildfires.

Imazapic treatments that target invasive annual grass infestations benefit sage-grouse Priority Habitat Management Areas and General Habitat Management Area. The U.S. Fish and Wildlife Service identified invasive plants, especially annual grasses, and shortened fire-return intervals as a threat to sagebrush / forb plant communities in their *12-Month Finding for Petitions to List the Greater Sage-Grouse (Centrocercus urophasianus) as Threatened or Endangered* (75 Federal Register 13910, March 23, 2010). Treatments would help provide and protect successful nesting and reproduction habitat.

The use of additional herbicides would help prevent herbicide resistance by adding chemicals that control the plants through different modes (sites) of action. The additional herbicides available under this alternative would permit more effective rotation of herbicides (see Table 3-8), that when coupled with integrated invasive plant management, would help prevent the development of herbicide resistance. Many of the ALS-inhibitors (such as chlorsulfuron and metsulfuron methyl) recommend tank-mix partners and / or sequential herbicide applications that have different modes of action.

Table 3-8. Guide for Herbicide Rotation[1]

Herbicide Group	Herbicide Chemical Family	Herbicide Common Name	Resistant Plants	States with Resistant Plants
ALS Inhibitors	imidazolinones	imazapic	none	none
		imazapyr	none	none
	sulfonylureas	chlorsulfuron	Prickly lettuce Kochia Russian thistle Italian ryegrass Mayweed chamomile Small-seed false flax	Idaho, Oregon, Washington Idaho, Oregon, Washington Idaho, Oregon, Washington Oregon Idaho, Washington Oregon
		metsulfuron methyl	Prickly lettuce Kochia Russian thistle Small-seed false flax	Idaho, Oregon Oregon Oregon Oregon
		rimsulfuron	none	none
		sulfometuron methyl	none	none
Synthetic auxins	phenoxy acetic acids	2,4-D	Prickly lettuce	Washington
	benzoic acids	dicamba	Kochia prickly lettuce	Idaho Washington
	pyridines	aminopyralid	none	none
		clopyralid	none	none
		fluroxypyr	none	none
		picloram	Yellow starthistle	Washington
		triclopyr	none	none
ESPS synthase inhibitors	glycines	glyphosate	Italian ryegrass Kochia	Oregon Oregon, Idaho

To avoid selecting for herbicide-resistant invasive plants, rotate to a different group every year if possible. Avoid using herbicides from the same group more than once every three years.
1. Adapted from *Herbicide-Resistant Weeds and Their Management* (University of Idaho 2011)

Non-herbicide methods could be more focused where they are most reasonable and effective, or used in conjunction with herbicides. Using spread calculations developed for Alternative 3 in the 2010 Oregon FEIS, (the alternative similar to the Proposed Action in this EA), the 197,781 acres of documented sites (Category 1) are predicted to spread to 545,684 acres over 15 years, or 536,883 acres less than under the No Action Alternative (USDI 2010a:596, Table A7-4). The annual spread rate is estimated to decrease from 12 to 7 percent over that same period (USDI 2010a:596, Table A7-4). As in the No Action Alternative, herbicides would be used as a follow up or maintenance treatment in conjunction with mechanical or prescribed fire treatments or post wildfire rehabilitation treatments, to further reduce the fuels hazard and to help control new or existing invasions from occurring or spreading.

The wider range of herbicides from which to choose would increase the effectiveness of the average treatment to an estimated 80 percent (USDI 2010a:136). Although some level of retreatment would still take place, the additional herbicides would substantially improve the chances the invasive plant would be controlled with fewer retreatments (USDI 2010a:135-136). With additional herbicides available, this alternative could effectively control all of the types of invasive plant species known to be within the District, as well as provide control of invasive annual grasses needed for habitat protection and rehabilitation projects.

Revised Proposed Action

Under the Revised Proposed Action, aminopyralid would be the primary herbicide used to control rush skeletonweed, which currently infests 73,531 acres on the Vale District. It would also be used on biennial thistles, sulfur cinquefoil, Mediterranean sage, and starthistles, among other species. Because of the addition of aminopyralid, the use of all of the herbicides available under the Proposed Action would either remain the same (fluridone and sulfometuron methyl) or drop (all others). Specifically, 2,4-D use would decrease by 65 percent when compared to the No Action, and 59 percent when compared to the Proposed Action, and picloram would decrease by 76 and 64 percent. Compared to the Proposed Action, clopyralid would drop by 79 percent, and chlorsulfuron by 34 percent. Rimsulfuron (selective to annual plants) would be used in rotation with imazapic where return to grazing is at least one year post-application to control invasive annual grasses under Categories 4, 5, and 6. Fluroxypyr is effective on annual and biennial invasive plants and would be used to manage species such as kochia, mustards, leafy spurge, and blackberry.

Other effects would remain as described under the Proposed Action. It is generally not expected that treatment effectiveness would change (from an estimated 80 percent), when compared to the Proposed Action, but rather that having more herbicides would provide more opportunity to select one less likely to harm non-target flora and fauna, further reducing the likelihood of adverse effects. One exception would be that effectiveness of treatments on rush skeletonweed would greatly increase. Currently the window for treating this species is limited, with picloram, picloram + 2,4-D, or clopyralid use on spring or fall rosettes. Once rosettes bolt, those herbicides are minimally effective. Plants are not always visible or easily identified at the rosette stages. Aminopyralid extends the treatment window into the flowering stage, when plants are more visible. This also effectively stops seed set and windborne seed, which is this species' major mode for establishing satellite populations large distances from the parent plant.

Cumulative Effects

Common to All Alternatives

As described in the *Affected Environment* section above, many on-going District activities such as recreation, hazardous fuels reduction, mining (including the transport of mineral materials around the District), and fuel break mowing have the potential to inadvertently introduce invasive plants and facilitate establishment when soil and vegetation are disturbed. This invasive plant spread is reduced not just by treatments described in the alternatives, but also by the prevention measures described early in Chapter 2. The Vale District has a Weed Prevention Schedule (see Appendix D) that prescribes prevention measures for various programs and activities. Additionally, risk assessments are done on proposed projects and prevention measures are prescribed (USDI 1992b). The risk assessments consider the likelihood and consequences of invasive plant introduction and spread, and would result in project modification and / or monitoring if the risk is moderate or high. Even with these measures in place, it is likely that introduction and spread of invasive plants would continue.

The BLM works closely with numerous partners to control invasive plants on adjacent lands. Treatments that have taken place off BLM-administered lands recently are shown on Table 3-9.

Table 3-9. Projects and Estimated Acres Treated Adjacent to BLM Managed Lands

Zone / Complex (see Tables E-1-4)	**Year**	**Project Title**	**Targeted Invasive Plants**	**Project Acres**
Malheur County CWMA				
26N	2001 -ongoing	Willow Creek / Amelia	leafy spurge, yellow starthistle, diffuse knapweed, spotted knapweed	135
20N	2000 -ongoing	Castle Rock	Russian knapweed, Scotch thistle, Canada thistle, Dalmatian toadflax	15
26N / 20S	1998 -ongoing	Vale N&S rush skeletonweed	rush skeletonweed	960
Hwy 20 N & 20 S	2004-ongoing	Jonesboro rush skeletonweed (with ODA)	rush skeletonweed	55
95SE	2001-2011	Eigurien Ranch / Anderson Res	Russian knapweed	160
Malheur Resource Area Owyhee River E	2008-2012	Lower Succor Creek Springs Ranch	Russian knapweed	300

Zone / Complex (see Tables E-1-4)	**Year**	**Project Title**	**Targeted Invasive Plants**	**Project Acres**
Jordan Valley Project (Malheur County / ODOT / BLM partnership)				
Owyhee River E; Owyhee W&S NE & SE; Saddle Butte; Hwy 95SE & SW;	1996-2014	Hwy 95 and 78	knapweed complex, Dalmatian toadflax, yellow starthistle, thistles, perennial pepperweed, whitetop ssp.	90
Owyhee Wild and Scenic River NE	1996-2012	Danner Loop / Cow Lakes	perennial pepperweed, thistles whitetop, knapweed complex	150
Owyhee Wild and Scenic River SE	1996-2014	Soldier Creek Loop Road / Antelope Reservoir road system	thistles, knapweed complex, whitetop ssp.	65
Owyhee River E; Owyhee Wild and Scenic River NE	1996-2012	Jordan Craters Road	thistles, knapweed complex, whitetop, puncturevine	15
Owyhee River E	1996-2011	Leslie Gulch / Succor Creek Roads	thistles, whitetop ssp., knapweed complex, jointed goatgrass	15
Owyhee River E	1996-2011	Rockville / Sagehen Basin Roads	knapweed complex, thistles, whitetop ssp.	10
Owyhee Wild and Scenic River SE	1996-2009	Chicken Creek / Parsnip Peak	whitetop, thistles, Russian knapweed	15
Owyhee Wild and Scenic River NE	1996-2011	Hole-in-the-Ground Loop / Bogus / Biscuit Butte Roads	whitetop, perennial pepperweed, thistles, Russian knapweed	15
Saddle Butte	1996-2009	Saddle Butte Roads	Russian knapweed, whitetop ssp., halogeton, thistles, perennial pepperweed	3
Hwy 95 SW	1996-2011	N Ryegrass / Bone Canyon Roads	spotted knapweed, whitetop, thistles	3
95 SW	1996-2012	Whitehorse Road	thistles, whitetop, perennial pepperweed, halogeton, black henbane	15
95 SE	1996-2010	Jackson Grade / Tent Creek Roads	Scotch thistle, whitetop ssp., Russian knapweed	3
Hwy 95 SW	1996-2012	Opalite / Disaster Peak	whitetop, perennial pepperweed, thistles, knapweed complex, halogeton	5
Hwy 95 SW	1996-2012	Trout Creek / Oregon Cyn Mountain Roads	whitetop, halogeton, thistles	3
Hwy 95 SE	1996-2009	Bowden / Overshoe / Potomac Roads	whitetop, Russian knapweed, thistles, perennial pepperweed, halogeton	30
Hwy 95 SE	1996-2008	Blue Gate / Rockhouse Reservoir Roads	whitetop, knapweeds, thistles	5
Owyhee River E	1996-2010	Glover Place	Scotch thistle, whitetop	15
Hwy 95 SE	1996-2010	Owyhee Canyon	thistles, Russian knapweed, whitetop ssp.	20
Jordan Valley CWMA				
Owyhee W&S NE	2004-ongoing	Arock / Dowell's (with Malheur County)	yellow starthistle, diffuse knapweed, Russian knapweed, Scotch thistle	45
Owyhee W&S NE	2011-ongoing	Arock Irrigation canals (with Malheur County)	Scotch thistle	15
Juntura CWMA				
Hwy 20 S	2006-ongoing	Mainstem Malheur River	perennial pepperweed, Scotch thistle	300
Hwy 20 N	2006- ongoing	North Fork Malheur River	perennial pepperweed, Scotch thistle	300
Hwy 20 N	2006 - 2012	Beulah BOR	perennial pepperweed, Scotch thistle, Russian knapweed	75
Oregon Division of State Lands				
Owyhee Wild and Scenic River SE	2003- ongoing	Lodge, Brown Ridge	medusahead rye	4,500
Hwy 20S	2013	Jonesboro	medusahead rye	600

Zone / Complex (see Tables E-1-4)	Year	Project Title	Targeted Invasive Plants	Project Acres
Tri-county CWMA				
Burnt River	1996-ongoing	Alder Creek	leafy spurge	35
Upper Snake	2009- ongoing	Snake River Reservoirs	yellow flag iris	21
Upper Snake	1994- ongoing	Snake River West	rush skeletonweed	223
Wallowa Canyonlands Partnership (Washington Department of Fish and Wildlife)				
Lower Snake	2002- ongoing	Snake River Canyonlands / Rogersberg	yellow starthistle, rush skeletonweed, Scotch thistle	50
Wallowa Canyonlands Partnership (Nez Perce Tribe / Rockin' J Ranch)				
Lower Grande Ronde	2002- ongoing	Joseph Canyon	yellow starthistle, rush skeletonweed, Scotch thistle	200
Wallowa Canyonlands Partnership (Umatilla and Wallowa-Whitman National Forests, Oregon Parks and Recreation, Washington Department of Fish and Wildlife)				
Upper Grande Ronde	2000- ongoing	Grande Ronde River Canyonlands (Minum and Palmer Junction to Troy)	yellow starthistle, rush skeletonweed, leafy spurge, meadow hawkweed, knapweeds	20
Middle Grande Ronde	2001- ongoing	Grande Ronde River Canyonlands (Troy to Boggans)	yellow starthistle, rush skeletonweed, leafy spurge, knapweeds, medusahead	200
Lower Grande Ronde	2001- ongoing	Grande Ronde River Canyonlands (Boggans to mouth)	yellow starthistle, rush skeletonweed, leafy spurge, knapweeds, Scotch thistle	200
Umatilla National Forest				
Walla Walla	2000- ongoing	South Fork and North Fork Walla Walla Rivers	knapweeds, new invaders	3
Wallowa Whitman National Forest				
Lower Snake	1992- ongoing	Snake River Canyonlands	rush skeletonweed, others	150
Baker and Wallowa Counties	1992- ongoing	General treatment forest wide	noxious weeds	1,620

No Action Alternative

The limited effectiveness of the four herbicides available District-wide under the No Action Alternative would continue to contribute to invasive plant problems on adjacent lands, increasing the need for herbicide use on those lands, potentially affecting BLM resources, and frustrating adjacent landowner control efforts. Infestations on adjacent lands would likely expand and spread onto BLM administered land (see *Changes in Herbicide Use on Adjacent Non-BLM Lands Resulting From the BLM Alternatives* in the Oregon FEIS, USDI 2010a:118). There would be some beneficial effect to the management of invasive plants but the effects would be minor in the long term as some of the most problematic species (whitetop, medusahead rye) continue to expand due to the limited effectiveness of the available herbicides. Existing invasive plant infestations would not be controlled and would spread rapidly to neighboring lands.

Proposed and Revised Proposed Actions

Under the Proposed and Revised Proposed Actions, the same activities, off-site forces, and agency policies as the No Action Alternative would occur. The wider array of herbicides and the greater efficacy and selectivity they provide under these alternatives would improve the District's ability to manage invasive plants as described in this section. The spread rate of invasive plants is expected to decrease to 7 percent once these more effective control measures become available. The gain comes from controlling new species, new or small populations, advancing edges of larger populations in order to keep invasive plants from infesting the new areas. These treatments keep populations in the introduction phase where their spread rate is lower. Control efforts in the introduction and early establishment phase can prevent future infestations on exponentially more acres then are actually controlled and reduce the overall spread rate (USDI 2010a).

The Vale District would be able to utilize many of the same herbicides that are used on adjacent lands and become an equal partner in cooperative invasive plant management projects. Invasive plant populations would be slowed, and overall herbicide use could decrease, as BLM invasive plant spread onto adjacent lands is reduced. Long-term effects to the management of invasive plants on BLM and adjacent lands would result in locations where existing invasive plants would be nearly or completely controlled, new introductions would be nearly or completely eliminated, and areas would be restored to desired conditions.

Native Vegetation

Issues

- How would the alternatives affect native plant communities?
- How would the alternatives address shifts in vegetation composition caused by climate change?

Affected Environment

Of the roughly 5 million acres on the Vale District, approximately 74 percent supports shrub dominated plant communities. Approximately 2 percent of the land base supports tree dominated forest and woodlands, less than 1 percent is water-influenced riparian and wetland vegetation, while almost 20 percent is monocultures of nonnative grass species. The following discussion breaks down these Categories into plant communities (see Table 3-10 and Map 3-1). Information contained in Table 3-10 was obtained through the Oregon Gap Analysis Program (GAP) to determine vegetation communities. There are limitations of using the GAP analysis. The recent spread of modified grasslands may be underestimated because the GAP data was based on 1990 Landsat images and subsequent large wildfires have converted large areas into modified grasslands. The extent of riparian areas may also be underrepresented due to their small patch size (see discussion under *Plant Communities*). To improve the accuracy of modified grassland estimates, the BLM overlaid GAP data with data from the more recent Fire and Invasive Annual Grass Assessment Tool (FIAT) that was developed to identify areas where sage-grouse habitat restoration activities should be prioritized.

Table 3-10. Plant Communities

Plant Community	Acres *Percent*	Description
		Shrub Steppe / Sagebrush Steppe
Big sagebrush shrub / grassland	2,821,103 *56%*	Plant community dominated by one of three subspecies of big sagebrush: Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), mountain big sagebrush (*A. tridentata* ssp. *vaseyana*), or basin big sagebrush *(A. tridentata* ssp. *tridentata*). These communities occur as a mosaic with other shrub-steppe communities over much of the foothills and valley floors. Native grasses range from rare to abundant, depending on site history and soil / water relationships. Native perennial bunchgrasses include bluebunch wheatgrass (*Pseudoroegneria spicata*), Sandberg's bluegrass (*Poa secunda*), Idaho fescue (*Festuca idahoensis*), Great Basin wildrye (*Leymus cinereus*), junegrass (*Koeleria macrantha*), needle-and-thread grass (*Achnatherum hymenoides*), Thurber's needlegrass (*Achnatherum thurberianum*), western needlegrass (*Achnatherum occidentale*), and, in more disturbed areas, bottlebrush squirreltail (*Elymus elymoides*). Native annual grasses known on the District include small fescue (*Vulpia macrostyachys)* (frequently used in restoration), sixweeks fescue (*V. octoflora)*, annual hairgrass (*Deschampsia danthonioides*), rough barnyardgrass (*Echinochloa muricata var. microstachya*) , teal lovegrass (*Eragrostis*

Plant Community	**Acres** *Percent*	**Description**
		hypnoides), sixweeks lovegrass (*Eragrostis lutescens*), tufted lovegrass (*Eragrostis pectinacea*), bearded sprangletop (*Leptochloa fusca ssp. fascicularis*), and annual muhly (*Muhlenbergia minutissima*). Nonnative grasses are primarily invasive annual cheatgrass (*Bromus tectorum*) and planted perennial crested wheatgrass (*Agropyron cristatum*).
Low and black sagebrush shrub / grassland	782,882 *15%*	Low sagebrush (*Artemisia arbuscula*) communities are found throughout eastern Oregon, generally on areas with shallow, clayey soils of basalt origin. Sandberg's bluegrass is the most common grass. Other associated grasses are bluebunch wheatgrass, Idaho fescue, and bottlebrush squirreltail. Low sagebrush is usually the dominant vegetation in shallow soil and soils with an impervious layer that excludes the root formation of big sagebrush and other shrub types. The sites have extensive areas of exposed rock and often do not have enough vegetation to support wildland fires. These areas are often rich in forbs. Black sagebrush (*Artemisia nova*) communities are similar to low sagebrush in shrub height, soil depth (shallow), dominant grass, and sparse vegetation that typically does not carry a fire.
Salt desert scrub / grassland	22,368 *< 1%*	Occurs in the alkaline playa lake basins of the northern Great Basin. These are low to tall shrub communities comprised of dispersed alkali-tolerant vegetation. Salt desert scrub is a broad term that describes several different environments. On the most saline, seasonally flooded sites, black greasewood *(Sarcobutus vermiculatus)* is dominant, and winterfat *(Krascheninnikovia lanata)* is usually associated with droughty soils with high carbonate content on alluvial fans and toeslopes. Sites with better drainage support a variety of shrubs and several salt tolerant plants, such as shadscale *(Atriplex confertifolia*), hopsage *(Grayia spinosa)*, budsage *(Artemisia spinescens)*, rubber rabbitbrush *(Ericameria nauseosa*), and grasses such as saltgrass *(Distichlis spicata),* bottlebrush squirreltail *(Elymus elymoides),* and basin wildrye (*Leymus cinereus*). Salt desert scrub is surrounded by big sagebrush or sagebrush steppe cover types. The most extensive areas are associated with the large, ephemeral lakes of the region. However, there are numerous small pockets of this cover type scattered throughout southeastern Oregon (Anderson 1998, Kagan and Caicco 1996).
Modified grassland	1,018,065[1] *20%*	Areas dominated by invasive annual grasses (i.e., cheatgrass, medusahead rye and ventenata) do not meet the qualitative Rangeland Health assessment standard for Watershed Function-Uplands that examines soil infiltration and permeability, moisture storage and stability that are appropriate to soil, climate and landform. Extensive grasslands in southeastern Oregon that formerly were composed of native perennial bunchgrasses have been planted with crested wheatgrass (a nonnative perennial bunchgrass historically planted as cattle forage) and / or been infested by invasive annual grasses such as cheatgrass, medusahead rye, and ventenata. Native forbs commonly found in this community include yarrow (*Achillea millefolium)*, milkvetch (*Astragalus* sp.), arrowleaf balsamroot (*Balsamorhiza sagittata)*, and spreading phlox(*Phlox diffusa*). The ecological integrity of such sites is low, especially over large areas, because plant and wildlife diversity is low and wildlife corridors are disrupted.
Unvegetated ground	230,278 *5%*	Wetland playas that are seasonally wet and dry, bare rock areas, open water, recent burns, barren lava fields or sand dunes, cliffs, ash and tuff badlands and areas where no data is available.
Miscellaneous shrub / grassland	7,714 *< 1%*	Usually consists of mountain mahogany (*Cercocarpus ledifolis*), bitterbrush (*Purshia tridentata*), and snowberry (*Amelachier sp.*)communities with bunchgrass understory; they are often found on steep slopes or in association with western juniper (*Juniperus occidentalis*).
Silver sagebrush shrub / grassland	1,689 *< 1%*	The silver sagebrush (*Artemisia cana*) community is usually found in playas, which are moist, semi-alkaline flats or valley bottomlands. Some of the playas are quite extensive. Silver sagebrush occurs in playas because it tolerates the alkalinity and standing water. This shrub community is moderately- to widely-spaced. It grows in areas that have been deflated (eroded by wind) and subsequently partially filled with sediment. Although rhizomatous species such as creeping wildrye (*Elymus triticoides*), milkvetch (*Astragalus*), and cress (several mustard species) occasionally occur, the understory can be dominated by widely-spaced bunchgrasses, such as Sandberg's bluegrass, mat muhly (*Muhlenbergia richardsonis*),

Plant Community	Acres *Percent*	Description
		and alkali grass (*Sporobolus airoides*). Silver sagebrush is the dominant and characteristic shrub of this community; however, green rabbitbrush (*Chrysothamnus viscidiflorus*) is a common associate.
		***Forests and Woodlands / Eastern Forest*[2]**
Western juniper woodland	67,657[2] *1%*	Areas of open-canopy woodland with western juniper as primary tree species; understory vegetation often includes sagebrush species, bunchgrasses, and forbs. Relict old growth juniper is primarily confined to rocky surfaces or ridges, or pumice sands with sparse vegetation and infrequent fires. Juniper has also expanded its historic range into sagebrush habitats, riparian areas and the lower edges of Ponderosa pine forests.
Ponderosa pine forest	18,973 *< 1%*	Widespread forest type in eastern Oregon; usually found in the foothills margin bordering the mixed conifer forest on the national forests; widely spaced, pines dominate diverse shrub and forb layers.
Quaking aspen	11,116 *< 1%*	Widely scattered throughout the coniferous forest and sagebrush grasslands of eastern Oregon. Typically in isolated pockets with denser grasses and forbs.
Mixed conifer forest	70,602 *1%*	A close-canopied, upper montane forest type that includes several plant communities dominated by pine and fir species and a variety of understory shrubs, grasses, and forbs.
		Riparian and Wetland Vegetation / Eastside Riparian
Riparian and wetlands	11,737[3] *< 1%*	Highly productive and valuable; the variety of shrubs, grasses, and forbs present depends on the degree and duration of wetness and shade. Most riparian areas and wetland areas are small (1-10 acres) and are scattered throughout the landscape. Further information can be found in the *Riparian Habitats* section.

1. The number reported is a total of nonnative perennial grass seedings and Category 6 invasive annual grass stands. There are 442,158 acres of Category 6 invasive annual grass monocultures, 324,152 acres of invasive annual grass monocultures not meeting the criteria of Category 6 and 251,152 acres of nonnative perennial grass plantings.
2. The number reported is for Phase II (mid-successional) and III (complete occupation) stands. The District has hundreds of thousands of acres of Phase I (early encroachment) juniper stands where sagebrush ecosystem function has little or no observable change. Phase I stands are captured in the sagebrush community types.
3. The acreage of riparian is underestimated due to coarse mapping capacity of the satellite imagery used in the GAP analysis. The *Riparian Habitats* section states that there are approximately 32,492 acres of riparian habitat on the District.

Climate Change and Vegetation Composition

Climate change has the potential to alter species composition, favoring invasive plant species. However, current understanding on this subject is not clear. A study conducted by Bradley (2009) shows two differing scenarios for the Vale District. Under the worst-case scenario, with decreased summer precipitation, the majority of the land base within the Vale District is suitable for invasive annual grasses expanding into native plant stands. The highest modeled summer precipitation quantity drastically reduces the land base that would be suitable for invasive annual grasses. The amount of summer precipitation is uncertain due to complex topography and the difficulty in modeling El Niño. However, the past four years the District has experienced below average summer precipitation, which leads the BLM to believe that future climate change would result in conditions suitable for the expansion of invasive annual grass into native plant stands for the majority of the District. Therefore, it is expected that invasive annual grasses will expand at a greater rate in the future because of climate change.

Treatments Planned Relating to the Issues

No Action Alternative

Manual controls would continue to be used to control invasive plants on an average of 375 acres per year. Biological controls would be used on a similar amount of acres. Only noxious weeds would be treated with the four available herbicides. According to estimates calculated from the treatments described on Table 2-10 (see Table 2-11, *Estimated Treatment Acres*), 2,4-D would be the most used herbicide, followed by dicamba, glyphosate, and picloram. Medusahead rye, an annual grass, would be treated where targeted treatments of non-selective glyphosate leave enough surrounding desirable plants to revegetate the site.

Most herbicide applications would be spot spraying to directly target the noxious weeds. Broadcast applications would be limited to sites where selective herbicides (2,4-D, dicamba, and picloram) are used on broadleaf plants, or non-selective glyphosate would be used on monocultures of noxious weeds. Invasive plants not listed as noxious, like cheatgrass, would not be controlled with herbicides. Invasive annual grasses in Categories 5 and 6 may receive minimal treatment with targeted grazing. In limited areas (see Map 2-5), imazapic, chlorsulfuron, and clopyralid would be used for emergency stabilization following a wildfire or for fuels management.

Seeding and planting are widespread on the District for reasons other than noxious weed control, but are not part of the No Action Alternative.

Proposed and Revised Proposed Action

For the next 10 to 15 years, a combined total of 30,000 to 45,000 acres of Categories 1, 2 and 3[49] would be treated with the full range of methods shown on Table 2-10, *Treatment Key*. Annual treatment levels in these Categories would be similar to the No Action Alternative, but the use of the four No Action Alternative herbicides would decrease because other herbicides would be available. Non-herbicide methods would be used on an estimated 100 to 700 acres in Categories 1, 2, and 3 per year (see Table 2-11, *Estimated Treatment Acres*).

The amount of acres that would be treated annually in Category 4 is unknown since treatments would be directly linked to the severity of the fire season. The Proposed Action would allow the use of imazapic on annual invasive grasses (estimated to be used for 95 percent of treatments) using ground or aerial application methods; under the Revised Proposed Action, rimsulfuron may be used in addition to imazapic.

Individual treatment projects with targeted grazing, prescribed fire, and/or seeding or planting would occur on 20,000 acres per project. Targeted grazing, prescribed fire, and seeding or planting would not to exceed 100,000 acres a year, per treatment type, or 300,000 acres over the life of the plan, per treatment type (see Table 2-6). Under the Proposed Action, imazapic may be applied on up to 100,000 acres annually in Categories 5 and 6; under the Revised Proposed Action, these treatments would primarily be done with imazapic and rimsulfuron. These treatments would be in conjunction with other treatment methods or as the only method of treatment.

Standard Operating Procedures and Mitigation Measures Relevant to Effects

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

- Establish appropriate (herbicide-specific) buffer zones (Tables A-1 and A-2 in Appendix A) around downstream water bodies, habitats, and species/populations of interest. Consult the Risk Assessments for more specific information on appropriate buffer distances under different soil, moisture, vegetation, and application scenarios.
- Use Table A-5 (Appendix A) to establish herbicide-specific buffer zones around downstream water bodies, and associated habitats and non-target plant species/populations of interest for aminopyralid, fluroxypyr,

[49] Category 3 treatments for newly detected invasive plant species are unknown, but likely to be fewer than 10 acres per year.

and rimsulfuron. Consult the Risk Assessments for more specific information on appropriate buffer distances under different soil, moisture, vegetation, and application scenarios.

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

Environmental Consequences

In this analysis, the intensity of effects on vegetation is defined as follows:

Negligible: The effects on native vegetation would be at or below the level of detection, and the changes would be so slight that they would not be of any measurable or perceptible consequence to individuals or the population as a whole.

Minor: The effects on native vegetation would be detectable but localized, small, and of little consequence to the population of any species. Mitigating measures, if needed to offset adverse effects, would be simple and successful.

Effects of Treatment Methods on Native Vegetation

Non-Herbicide Treatments

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

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

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

Prescribed fire may be used as a pretreatment for herbicide treatments in invasive annual grasses. It is normally used for invasive plant control only on heavily infested sites, because fire is non-selective, removing both desirable and invasive plants. Prescribed fire can be most effective if followed by herbicide treatments to control germinating or young plants. Seeding is often necessary to prevent the reestablishment of invasive plants. Native species adapted to fire or seasonally senescent may remain, and the herbicides selected for use following prescribed burning would be designed to minimize damage to these remaining native plants, where possible. Possible adverse effects to native vegetation include injury, mortality, nutrient flush or loss of nutrients, reduced shading, and potential increases of invasive plants. Prescribed fire would be used during the spring or fall when remnant native grasses are less likely to be harmed.

Targeted grazing can effectively reduce the vigor and seed production of invasive plants while having no adverse effects to native forage species (Stroud et al. 1985, Ganskopp 1988, Vallentine and Stevens 1994, Brewer et al. 2007, Diamond et al. 2009). However, targeted grazing alone is not likely to provide long-term control of invasive plants (Vallentine and Stevens 1994). In addition, disturbance from targeted grazing (hoof action) could provide positive benefits by preparing a seedbed for seeding competitive native species (Winkel and Roundy 1991).

Seeding or planting is used to restore vegetation following invasive plant treatments when the existing desirable plants are not expected to fully occupy the site. Additionally, seeding is used following wildfire to stabilize the soil and provide competition against the reestablishment of invasive plants. The effect of these treatments varies from simply supplementing the existing vegetation to overwhelming it. Typically, a rangeland drill is used to seed where topography and soil conditions allow, with only minor damage to existing plants. Successful re-vegetation using seed can be particularly difficult in sagebrush steppe due to arid and semiarid conditions. Sometimes minimal seedbed preparation is necessary to maintain existing native vegetation. Native seed collected on site protects the genetic integrity of local alleles. Seed from other locations could alter locally evolved adaptations; however, nonnative seed may be used, primarily to protect the soil resource and subsequent site potential, if native seed is not available, if the habitat is so degraded by invasive annual grasses that successful reintroductions are unlikely to be successful, or if the site conditions (soils, elevation, precipitation) would not support native seedings.

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

Herbicide Treatments

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

However, measures taken to limit exposure such as selective application methods (e.g., spot applications, wiping and hand directed spraying), maximum and typical application rates (that are often less than the maximum allowed on the label (Table 2-9, *Herbicide Information*)), droplet size and drift reduction agents, and application restrictions based on environmental conditions (wind speed, precipitation, temperature, etc.), all reduce the risk of off-target movement of herbicides. Standard Operating Procedures and Mitigation Measures (Appendix A) are designed to minimize risk to non-target plants including crops.

Certain plants or groups of plants are more susceptible to specific herbicides (see Table 2-9, *Herbicide Information*), and collateral damage to non-target plants would depend upon their susceptibility to a particular herbicide. For example, 2,4-D, dicamba and picloram are selective and target broadleaf plants, so damage to perennial grasses would not be expected during normal use. Appendix C, *Herbicide Risk Assessment Summaries* summarizes the Ecological Risk Assessments concerning the potential effects to non-target plants, by herbicide.

Herbicide treatments to control invasive plants would not affect plant communities to the extent that one community changes to another, such as from big sagebrush shrub to low sagebrush shrub. Although infestation of sagebrush communities by invasive annual grasses has caused conversions to grassland. Treatment effects to plant communities would typically relate to improvements in condition. Selective broadleaf herbicides applied aerially would have the most adverse effect on forbs.

Table 3-11. Effects of Herbicides (Native Vegetation)
Additional information about the risk ratings discussed below can be found in Appendix C, *Herbicide Risk Assessment Summaries*.

Effects of herbicides selective for broad leaved plants	
Herbicides available under all alternatives	
2,4-D	2,4-D is a selective herbicide that kills broadleaf plants but not grasses. It has a long history of use and is relatively inexpensive. Direct spraying of non-target plant species is the highest potential for damage due to 2,4-D application. Drift could damage non-target species close to the application site (much less than 100 feet). 2,4-D poses a high risk at typical and maximum rates from direct spraying or drift to broadleaf forbs and shrubs, although there is no risk to grasses and other tolerant (non-susceptible) plants. Risk to susceptible plants from offsite drift from broadcast treatments is low, although drift from aerial applications was not evaluated. Risk scenarios indicate that there is no risk to susceptible plants from offsite drift associated with hand directed foliar applications or surface runoff. Plant communities would benefit from the reduction of invasive broadleaf plants from 2-4,D, which is expected to increase vigor of perennial grasses, forbs, and shrubs. 2,4-D is also used to prevent herbicide resistance when mixed with herbicides with other modes of action. 2,4-D may affect fungi; one study determined that 2,4-D could affect some species of ectomycorrhizal fungi in laboratory experiments (Estok et al. 1989).
Dicamba	Dicamba is a selective, systemic herbicide that can affect some annual, biennial, or perennial broadleaf and woody species. Dicamba poses a high risk to non-target terrestrial forbs from direct spray and drift scenarios; a moderate risk to terrestrial forbs from off-site drift and no risk from surface runoff or wind erosion (although wind erosion may cause effects in arid regions)(SERA 2004g). The greatest risks to aquatic plants are associated with runoff, but are highly site-specific. Drift may cause damage to susceptible species at distances less than 100 feet from the application site. Vaporized or volatilized dicamba can affect non-target plants. Vaporization does affect vegetation, but much more study on air concentration-duration relationships needs to be done to quantify the level of effects. Vaporization potential is dependent on atmospheric stability and temperature. Dicamba vapor has been known to drift for several miles following application at high temperatures (Cox 1994). Dicamba is not labeled for use in forest and woodlands.
Picloram	Picloram poses substantial risks to non-target (broadleaf and woody) plants (EPA 1995). Picloram is highly soluble in water, resistant to biotic and abiotic degradation processes, and mobile under both laboratory and field conditions. The EPA fact sheet for picloram states that there is a high potential to leach to groundwater in coarse textured soils with low organic material. Plant damage could occur from drift, runoff,

	and off-site movement where contaminated ground water is used for irrigation or is discharged into surface water (EPA 1995). However, the contribution from irrigation is considered inconsequential relative to off-site drift and runoff (SERA 2003b). Picloram is a restricted-use herbicide and can only be purchased and applied by licensed applicators. Additional requirements on the label prevent the use of this herbicide on coarse textured soils, above fractured bedrock and within no-spray buffers surrounding waterbodies. Because picloram persists in soil, non-target plant roots can take up picloram (Tu et al. 2001), which could affect revegetation efforts. Additionally, animals can pass sufficient quantities of picloram in urine from treated sites to damage susceptible non-target plants (primarily legumes, such as alfalfa) for up to one year (Lym et al. 1998). According to the Risk Assessment (Appendix C, *Herbicide Risk Assessment Summaries*), picloram poses a high risk to susceptible plants from direct spray scenarios, and a low to moderate risk for tolerant (non-susceptible) plants at typical and maximum rates respectively. Offsite drift poses a high risk to susceptible plants from ground and aerial applications. The risk from offsite drift from hand directed backpack spraying is moderate for susceptible plants. Risk from surface runoff is low at the typical rate and moderate at the maximum rate for susceptible plants, legumes in particular (SERA 2011c). Ponderosa pines may experience decreased canopy volume and variable growth patterns associated with picloram use, but risk of injury can be decreased with dormant-season applications (Wallace et al. 2012). A label restriction prevents picloram from being applied within the root zone of desirable trees unless such injury can be tolerated.
Herbicides available in limited areas under the No Action Alternative and District-wide under the Proposed and Revised Proposed Actions	
Chlorsulfuron	Chlorsulfuron selectively controls pre-emergent and early post-emergent broadleaf plants (see Table 2-9, *Herbicide Information*). It is effective at very low dosages (half ounce to a few ounces per acre). Because of its high potency and longevity, chlorsulfuron can pose a particular risk to non-target plants. Off-site movement of even small concentrations of these herbicides can result in extensive damage to surrounding plants, and damage to non-target plants may result at concentrations lower than those reportedly required to kill target invasive plants (Fletcher et al. 1996). It poses a high risk to non-target terrestrial forbs from direct spray at typical and maximum rates, a moderate risk to non-target terrestrial forbs from offsite drift at typical and maximum rates, and no risk to terrestrial plants from runoff or wind erosion. Adverse effects to forbs are likely although they are expected to be less in magnitude than the benefit of removing invasive plants.
Clopyralid	Clopyralid is selective for broadleaf plants and poses a high risk to forbs and shrubs from direct spray at typical and maximum rates. Offsite drift risk from broadcast applications to susceptible plants is low at the typical rate and moderate at the maximum rate. Drift from aerial applications of clopyralid poses a moderate risk at the typical rate and a high risk at the maximum rate. There is no risk for even susceptible plants from runoff. Clopyralid is more selective and less persistent than picloram. Clopyralid is relatively non-toxic to aquatic plants; however, accidental spills may result in temporary growth inhibition of aquatic plants. As with picloram, clopyralid has little effect on grasses and members of the mustard family. Adverse effects to non-target plants from normal application of clopyralid are likely to be limited to susceptible plant species in or very near the treatment area.
Herbicides available under the Proposed and Revised Proposed Actions	
Diflufenzopyr	Diflufenzopyr would be used only in combination with dicamba and would be used to selectively control broadleaf forbs, such as knapweeds. Diflufenzopyr + dicamba poses a high risk to terrestrial forbs at the maximum rate and a moderate risk at the typical rate. It poses no risk to forbs from offsite drift, surface runoff, or wind erosion. Diflufenzopyr + dicamba would be used mainly along roads and in disturbed areas as an alternative to dicamba. It is selective for annual broadleaf plants and can suppress perennials. Although diflufenzopyr is a weak herbicide, it can reduce the amount of herbicide needed from 1-2 pounds per acre of dicamba alone to 0.26-0.35 pounds per acre of diflufenzopyr + dicamba. Diflufenzopyr would beneficially affect all plant communities by reducing the amount of herbicides applied to control invasive broadleaf plants, which would be expected to increase the vigor of perennial grasses and forbs.
Imazapyr	Imazapyr is non-selective, posing a high risk to susceptible plants and a low risk to tolerant (non-susceptible) plants in direct spray scenarios (SERA 2011b). Effects would be limited to the immediate application area.
Metsulfuron methyl	Metsulfuron methyl is selective for broadleaf and woody plants (see Table 2-9, *Herbicide Information*) and poses a high risk from direct spray to susceptible plants at the typical and maximum rate, and a low to moderate risk to tolerant (non-susceptible) plants at the typical and maximum rate respectively. Risk from offsite drift from broadcast spraying is low to moderate for susceptible plants from ground applications and

	moderate to high for aerial applications for typical and maximum rates respectively. Some grass species can be damaged by this herbicide, particularly wet meadow grass species such as meadow foxtail, some brome species, and timothy.
Triclopyr	Triclopyr is a selective systemic herbicide used on broadleaf and woody species. Susceptible species could be affected by drift from 100 feet (typical rate) to 1,000 feet (maximum rate) (SERA 2003c). Two forms of triclopyr could be used with differing degrees of effects. Triclopyr BEE (butoxyethyl ester) is more toxic to plants than triclopyr TEA (triethylamine salt). The triclopyr BEE form is more apt to damage plants from runoff than other forms (SERA 2003c). Direct spray scenarios indicate a high risk for susceptible plants and a low risk for tolerant (non-susceptible) plants at the maximum rate. Risk from offsite drift is low to moderate for susceptible plants at the typical and maximum rates respectively (SERA 2011d). Either formulation may be proposed for use on woody species in an upland environment but may be used in wetlands and riparian areas that go dry for part of the year. Only the aquatic form may be used over water. Triclopyr may affect fungi; triclopyr BEE was found to inhibit growth of some types of ectomycorrhizal fungi in laboratory experiments (Estok et al. 1989). Busse et al. (2003) found no inhibition of ectomycorrhizal formation in a laboratory experiment using this active ingredient. Newmaster et al. (1999) reported that moss and lichen abundance and richness were not or nearly not affected at six months, one year, or two years after treatment except when very high rates of triclopyr were used.
Herbicides available under the Revised Proposed Action	
Aminopyralid	Because aminopyralid is used to manage weedy broadleaf species, it poses a risk to non-target native forbs and other desirable species in treatment areas. Key flowering plant families that are affected by aminopyralid include the Asteraceae (aster), Fabaceae (legume), and Polygonaceae (buckwheat) families. Aminopyralid may effect non-target broadleaf plants indirectly if urine or manure from animals that graze on treated pasture within 3 days of the herbicide application comes into contact with these plants (Iowa State University 2006). Therefore, 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. Aminopyralid is persistent in plant materials, and may remain in undigested remains of treated vegetation for more than 2 years (Oregon State University 2009, Dow AgroSciences 2014). Risks for adverse effects to terrestrial plants would be high if there was direct exposure to aminopyralid as a result of a direct spray (as part of a treatment or accidental) or an accidental spill. For non-target aquatic plants, however, Risk Assessments predicted no risk under direct spray or spill scenarios. Aminopyralid is not approved for aquatic uses. These risk assessment results indicate that use of aminopyralid right up to the water's edge would not harm aquatic plants (AECOM 2015). Apart from direct spray scenarios, risks to terrestrial plants would generally be low. Risks associated with off-site drift decrease as the distance from the treatment site increases and the application height gets lower. For aerial applications, the smallest modeled distance at which no risk was predicted ranges from 1,200 to 1,800 feet, depending on the application rate and type of aircraft used. Distances for ground applications are much lower, ranging from 25 to 400 feet. For surface runoff, root-zone groundwater flow, and wind erosion scenarios, no risks to non-target terrestrial or aquatic plants were predicted under the majority of the evaluated conditions (AECOM 2015).
Fluroxypyr	Fluroxypyr is a selective herbicide that controls broadleaf species. Therefore it poses a risk to non-target forbs, as well as desirable woody species in treatment areas. Because fluroxypyr is often tank-mixed with other active ingredients, its risk for non-target effects should be considered in conjunction with those of the other active ingredients. Risks for adverse effects to terrestrial plants would be high if there was direct exposure to fluroxypyr as a result of a direct spray (as part of a treatment or accidental) or an accidental spill. In the case of aquatic habitats, direct spray into a pond or a stream would not pose a risk to non-target aquatic plant species. However, an accidental spill of a large quantity of fluroxypyr into a pond would pose a risk to non-target aquatic plants. Risks to terrestrial plants from off-site drift are generally low. No risks to terrestrial plants were predicted for surface runoff exposure scenarios. For wind erosion scenarios, no risks were predicted for non-target terrestrial plants under the majority of the evaluated conditions (AECOM 2014a).

Herbicides that can be selective for invasive annual grasses	
Herbicides available in limited areas under the No Action Alternative and District-wide under the Proposed and Revised Proposed Actions	
Imazapic	Imazapic would be primarily used to control pre-emergent invasive annual grasses when native plants are dormant in fall. At the low rates used to select for invasive annual grasses, imazapic poses a low risk to other terrestrial plants. At the maximum rate, imazapic poses a moderate risk to non-target terrestrial forbs and some grasses. Terrestrial plants are not at risk from off-site drift, surface runoff or wind erosion of imazapic. When used to control invasive annual grasses, imazapic did not affect perennial forb cover. However, it reduced the cover of native annual forbs, and Sandberg's bluegrass (*Poa secunda*) for at least three years post-treatment (Pyke et al. 2014). Susceptibility of native perennial plants as adults or seedlings is unknown for many species and soil types; thus, there is some uncertainty about the retention of native perennials when this herbicide is used as a selective herbicide for invasive annual grasses, and about the success of revegetation efforts immediately following herbicide applications. Native annual plants, if they emerge at the same time as invasive annual grasses, may be susceptible and harmed by imazapic applications (Pyke 2011). Imazapic applied to reduce cheatgrass fuel continuity has been successful and has not reduced some perennial grasses (Shinn and Thill 2004, Miller 2006, Davison and Smith 2007). Imazapic used at low rates (typically 6 oz. per acre) would reduce invasive annual grass cover and fire risk in the sagebrush steppe, forest, and woodland communities.
Herbicides available under the Proposed and Revised Proposed Actions	
Hexazinone	Hexazinone controls grasses and broadleaf and woody plants, both pre- and post- emergent. Hexazinone has little effect on seed germination. Direct spray is likely to damage both tolerant and susceptible plant species (high risk). Applications conducted at low wind speeds and under conditions in which vegetation at or immediately adjacent to the application site would limit off-site drift, damage due to drift should be inconsequential or limited to the area immediately adjacent to the application site. Wind erosion is not likely to result in exposures of concern (SERA 2005c). Hexazinone has differential toxicity to plants and is effective against woody species. Adverse effects from hexazinone are limited as the estimate of proposed use is about 20 acres per year and Mitigation Measures limit where it can be applied.
Sulfometuron methyl	Sulfometuron methyl is non-selective and is not available for use on rangelands. It is registered for use on rights-of-way, forests and woodlands, and recreation sites. There would be low risk to sagebrush steppe plants at maximum application rates on those sites. Sulfometuron methyl would not be applied in windy conditions, as drift could cause extensive damage to vegetation at a substantial distance from the application site. Sulfometuron methyl would be used in terrestrial settings to control dense stands of invasive annual grass species. During applications of sulfometuron methyl, a drift prevention agent would be used, and the current registration does not permit it to be applied through aerial application. Busse et al. (2004) demonstrated that this herbicide does not alter the capability of mycorrhizal fungi to infect roots even at concentrations detrimental to seedling growth.
Herbicides available under the Revised Proposed Action	
Rimsulfuron	Rimsulfuron is a selective herbicide that targets annual species and has minimal effects on perennial species. There is some evidence that application of rimsulfuron can result in an increase in perennial grass cover at treatment sites, compared to no discernable effect by imazapic (Hergert et al 2012). The Risk Assessments indicate that rimsulfuron poses a high risk to non-target terrestrial plants under direct spray scenarios. An accidental direct spray of rimsulfuron into an aquatic habitat (stream or pond), or a spill of rimsulfuron into a pond, would pose a high risk for adverse effects to non-target aquatic plants. Non-target terrestrial vegetation would be at a low risk for adverse effects from off-site drift of rimsulfuron from treatment sites. There are no predicted risks to non-target terrestrial or aquatic plants in streams as a result of surface runoff of rimsulfuron from a nearby treatment site. In the pond setting, however, chronic exposures to surface runoff of this herbicide could potentially affect aquatic plants under certain site conditions. For wind erosion scenarios, no risks were predicted for non-target terrestrial plants under the majority of the evaluated conditions (AECOM 2014b).
Non-selective Herbicides	
Herbicides available under all alternatives	
Glyphosate	Glyphosate is a non-selective, systemic herbicide that can damage all groups or families of non-target plants to varying degrees, most commonly from off-site drift. Plants highly susceptible to glyphosate can be damaged by drift up to 100 feet from the application site if applied at the maximum rate. Species that are more tolerant are likely to be damaged at distances up to 25 feet (SERA 2003a). Non-target species are not

	likely to be affected by runoff or absorption from soil or wind erosion. Glyphosate strongly adsorbs to soil particles, which prevents it from being taken up from the soil by plant roots (Tu et al. 2001, SERA 2003a). Field studies conducted using glyphosate found no effects to plant diversity in an 11-year study on site preparation using herbicides, though the structural composition and perennial species' presence were changed (Miller et al. 1999). Glyphosate poses a high risk to grasses, forbs, shrubs, and trees from direct spray scenarios at typical and maximum rates. Some plants are tolerant of glyphosate, and these are at low to moderate risk from direct spray at typical and maximum rates respectively. The risk from offsite drift for susceptible plants is high for aerial applications, moderate for low boom, and low to moderate for hand directed foliar applications (SERA 2011a). Glyphosate is the only herbicide effective on grasses in the No Action Alternative. However, because it is non-selective, it would only be used in spot treatments or where monocultures of invasive plants are present (see *Treatments Planned Relating to the Issues* section above). Glyphosate may affect fungi; glyphosate was found to inhibit growth of some types of ectomycorrhizal fungi in laboratory experiments (Estok et al. 1989). Houston et al. (1998) documented responses of below-ground fungal community structure (richness, diversity, composition) were similar in untreated and treated (with glyphosate and triclopyr) stands although total fungal abundance was not changed, isolation frequencies (the abundance measure used) in organic soil of two fungal species decreased when samples were collected two years after herbicide treatments.
Herbicides available under the Proposed and Revised Proposed Actions	
Fluridone	Fluridone is a non-selective, slow-acting herbicide that could be used in low concentrations to control submerged and emergent invasive plants in ponds or reservoirs, lakes and canals where long-term contact with the target plants can be maintained (not flowing waters). When used on aquatic invasive plants, any native plants present would be adversely affected. Terrestrial plants would not be treated with fluridone; hence, none of the described plant communities would be affected. (There are currently no known aquatic invasive plants on the Vale District that would be controlled with fluridone.)

Except as noted above, few studies were found on the effect of herbicides to fungi. In studies using rates similar to amounts proposed for use on BLM-administered lands, fungi seem relatively unaffected by herbicides (Busse et al. 2003, Houston et al. 1998). The risk to wild edible mushrooms (e.g., chanterelles, matsutakes, porcinis) is further reduced since the proposed herbicide use would be focused primarily on invasive plants infestations and rights-of–way, rather than healthy forests where these species are dependent on the roots of conifer trees.

Effects of Invasive Plants on Vegetation Composition

Native plant communities have been invaded by more than 40 noxious weed species and 8 other invasive plants that compete with the native species for light, moisture, and space. An estimated 4 percent of the BLM-administered lands on the Vale District are infested with Category 1 invasive plants and an estimated 79 percent are infested with Categories 5 and 6 invasive annual grasses. Some plant communities have been transformed from shrub dominated to invasive grass dominated communities, often following wildfire.

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

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

Invasive plants can adversely influence succession and alter historic disturbance regimes. For example, one of the greatest threats to big sagebrush plant communities is the invasion of cheatgrass, which has modified big sagebrush sites throughout the Great Basin by providing a fine-textured, early-maturing fuel that increases the frequency and extends the season of wildfires. Adverse effects include increased fire risk, reduced biodiversity and forage for livestock and wildlife, degraded water quality, reduced recreational and aesthetic values, and economic losses. Historically, wildfire frequency was estimated at 60 to 100 years in the sagebrush / bunchgrass vegetation type (Whisenant 1990), and virtually absent from the salt desert shrub type (Billings 1994). Fire return intervals have decreased to as little as 5 years in all of these vegetation types since the invasion of cheatgrass, red brome (*Bromus rubens* L.), and other invasive plants (Whisenant 1990). In lower elevation sagebrush habitat, fire return intervals have decreased dramatically (from 50 to 100, to less than 10 years) due to invasion by annual grasses, causing loss of perennial bunchgrasses and shrubs. Subsequent loss of sagebrush can result in a conversion of shrubland to grassland (Crawford et al. 2004) that is difficult or impossible to reverse.

The International Union for the Conservation of Nature ranks invasive species as one of the top 10 threats to currently threatened species (IUCN 2008). Many invasive plants modify invaded sites so that the site becomes inhospitable to the original plant community. For example, knapweeds and starthistles are known to increase sheet erosion and produce chemicals that prevent other species from germinating (Boersma et al. 2006) and invasive annual grasses may outcompete and displace native annuals (Beatley 1969, Link et.al. 1990, Nagel et.al. 2004, Salo et.al. 2005).

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

Effects by Alternative

No Action Alternative

The risk of adverse effects to desirable plants would be similar to those that have occurred in the past 10 years. Risks to native plants include trampling (by foot or vehicle), herbicide overspray, and continued spread of invasive plants that compete with natives. Although there is a potential for adverse effects to non-target plants from some herbicides under some conditions, Standard Operating Procedures and Mitigation Measures minimize the effects to negligible. On the other hand, noxious weeds are expected to spread to an additional 536,883 acres over 15 years, compared to the Proposed and Revised Proposed Actions.[50]

The availability of four herbicides for use only on noxious weeds increases the likelihood that some noxious weeds would become resistant to those herbicides and available controls would no longer be effective, eventually leading

[50] See *Invasive Plants* section earlier in this Chapter. The 197,781 acres of currently known invasive plant sites, Category 1, are estimated to be spreading at 12 percent, to 1,082,567 acres in 15 years. With a projected spread rate of 7 percent, the Proposed and Revised Proposed Actions would result in 545,684 acres over 15 years. These estimates are based on noxious weed spread and do not include the hundreds of thousands of acres currently infested with cheatgrass.

to a higher rate of spread. Glyphosate could be used on medusahead rye, but since it is a non-selective herbicide, would also effect any intermixed desirable vegetation. As a result, it would only be used to control small monocultures, leaving thousands of acres of Categories 5 and 6 largely untreated.

Additionally, some noxious weeds, such as perennial pepperweed, are suppressed (but not killed) with the current herbicides. Their density and reproduction can be limited, but the infestation is not eliminated. Perennial pepperweed, known to occur on 4,393 acres, has the potential to form dense stands that displace desirable vegetation and wildlife. It deposits salts on the soil surface, inhibiting the germination and growth of native plants susceptible to salts (DiTomaso et al. 2013). Given enough time, perennial pepperweed can convert riparian sites to salt desert scrub.

The degree to which these effects apply to the alternatives is directly proportional to the number of acres that would become infested under each alternative. Under the No Action Alternative, noxious weeds are projected to spread at the rate of 12 percent annually (see *Invasive Plants* section earlier in this Chapter), with cheatgrass likely spreading faster. The 197,781 acres of known sites (Category 1) would spread to an estimated 1,082,567 acres in 15 years. Additionally, the more than 400,000 acres of Category 6 would continue to spread essentially unchecked under this alternative. This increases the likelihood of important sagebrush steppe plant communities transforming into less diverse nonnative annual grasslands.

Targeted grazing has been used on a limited scale on the Vale District primarily to control invasive annual grass, perennial pepperweed to a much lesser degree, and indirectly for yellow starthistle. The effects from these treatments varied from negligible and adverse to minor and beneficial to vegetation resources. Targeted grazing using sheep, goats, and cattle would be used on just over 500 acres over the life of the plan in Categories 1, 2, and 3. An increase in early successional native grass density and an increase in ground cover would be expected in these areas. However, these improvements would take between 10-20 years to be realized and would have minor beneficial effects.

In the past four years, the Vale District, primarily in the Malheur Resource Area, has experienced lower than average summer precipitation. Large wildfires have accelerated expansion of Category 6 acreage and reduced native grass vigor in Category 5, leading to increased density of invasive annual grass within burned areas. Under the No Action Alternative, the only treatments available have resulted in little progress towards improving rangeland health and the basic physical functions of upland soils that support plant growth, the maintenance or development of plant populations and communities, and promote dependable flows of quality water from the watershed.

Research studies have shown that invasive annual grass monocultures are carbon sources, releasing more carbon than what is taken in through photosynthesis, whereas native plant communities are carbon sinks, taking in more carbon than released through respiration and decomposition (Prater et al. 2006). To date there have only been a few studies that attempt to quantify the strength of the invasive annual grass carbon source. One laboratory study documented, under near ideal conditions, yearly carbon loss to the atmosphere could be upwards of 0.7 tons per acre (Verburg et al. 2004) and a field trial in the Great Basin reported a carbon source of 0.07 tons per acre (Prater et al. 2006). To quantify the yearly carbon source strength, the field study from the Great Basin was applied since climatic conditions are similar to the Vale District. Currently, the additional area expected to convert to invasive annual grass monoculture within 15 years is a carbon sink taking in an estimated 450,000 more tons of carbon per year than what is being released (Prater et al. 2006). Once this area is converted to invasive annual grasses, it will be transferred into a carbon source releasing 1,080,000 more tons of carbon into the atmosphere than what is taken in.

Proposed Action

Under this alternative, use of the four herbicides available in the No Action Alternative would decrease and herbicides generally less toxic to various classes of plants would be used. The use of picloram would decrease by 30 percent, primarily in favor of clopyralid. The use of 2,4-D would decrease 60 percent (see Table 2-11, *Estimated Treatment Acres*). Having more herbicides provides more opportunity to select one less likely to damage adjacent desirable plants, further reducing the likelihood of adverse effects described above for each herbicide. Noxious weed spread is projected to be 536,883 acres less in 15 years under this alternative compared to the No Action Alternative, and the annual spread rate is predicted to decrease to 7 percent (see *Invasive Plant* section earlier in this Chapter). With more target-effective herbicides, plants such as perennial pepperweed and cheatgrass could be controlled, and restoration actions would have more potential for success.

The Proposed Action would enable the selective treatment of medusahead rye and cheatgrass in sagebrush steppe and other native plant communities. In areas recently burned by wildfire (Category 4), treatments with imazapic would give residual native perennials time to recover and regrow before the medusahead or cheatgrass re-establishes. The majority of the herbicide use under this alternative to treat invasive annual grasses across Categories (1, 2, 4, 5, and 6) would be imazapic. Most native perennial bunch grasses are tolerant to imazapic at typical rates. Due to the potentially large treatment areas, imazapic would primarily be applied aerially. Since imazapic is an herbicide selective for annual grasses, the effect of aerial spraying at the typical rate on non-targeted native vegetation would be negligible.

Targeted grazing could be applied to as many as 300,000 acres of invasive annual grasses over the life of the plan within the Vale District. Grazing would occur during growth stages when native grass species are resilient to grazing and when livestock preference is shifted towards consumption of the targeted species in the early spring and fall (Stroud et al. 1985, Ganskopp 1988, Vallentine and Stevens 1994, Brewer et al. 2007, Diamond et al. 2009). Targeted grazing using cattle would generally occur as a pretreatment followed by herbicide application and seeding, if needed. There would be no net effect (increase or decrease) in preference permits / leases and associated animal unit months (AUMs) as a result of targeted grazing. Field observations would occur to make sure that livestock grazing ceases before invasive annual grasses become non-palatable to livestock. Research has shown that this type of grazing can reduce the production of invasive annual grass and seeds while promoting growth and establishment of native grass species (Vallentine and Stevens 1994, Diamond et al. 2009). In areas dominated by medusahead rye, targeted grazing would be used to break up the thatch layer allowing the herbicide to penetrate the soil surface, thus increasing the effectiveness of the treatment.

Prescribed fire would be used as a pretreatment tool to improve herbicide contact by removing the buildup of thatch in invasive annual grass stands. In the areas where prescribed fire would be applied, most of the native vegetation has been lost and nonnative grasses are the dominate vegetation. Prescribed fire would be used during the spring or fall when remnant native grasses are less likely to be killed. Therefore, direct effects of burning would have negligible adverse effects to the native plant species. Prescribed fire would increase the effectiveness of herbicide treatments and lead to beneficial effects to native vegetation.

The objective of competitive seeding and planting is to provide a vegetative component to compete with invasive plants in treatment areas where existing native plants are unlikely to establish in sufficient quantity or quickly enough to prevent undesirable vegetation from taking over a site. BLM's Integrated Vegetation Management Handbook states, "Diverse, healthy, and resilient native plant communities provide the greatest opportunity to be successful in meeting multiple use objectives within BLM. [BLM is required to] set resource management objectives that can be met using native species for most situations. However, "as a last resort, it may be necessary to introduce nonnative, non-invasive plant materials to break unnatural disturbance cycles or to prevent further site degradation by noxious or invasive plants" (USDI 2008a:87).

Reestablishing vegetation with native seed mixtures can be challenging depending on site conditions. One study in the Great Basin found nearly 50 percent of the sites seeded with native species failed to meet restoration objectives (Hull 1973). Other studies found poor results especially in lower precipitation zones (less than 11 inches annually), lower elevations (less than 4,000 feet), in drought years, and in areas that are already dominated by nonnative perennial grasses and weedy annual grass (i.e. high competition environments) (Knutson et al. 2014). Native seedings are more likely to meet management objectives in higher precipitation zones (greater than 11 inches), at higher elevations, in non-drought years when normal or above normal winter and spring precipitation results in increased germination and establishment, and in areas that had more intact native plant communities that existed prior to the treatment (i.e. not weedy sites).

There are potential treatment areas on the Vale District that have limited ecological site potential or are in such a degraded state that attempting to reintroduce exclusively native plants immediately following invasive plant treatments would be unsuccessful and would not meet the objective of the treatment. These sites tend to be low elevation, dry sites in Malheur County with less than 8 inches of annual precipitation or in active or recently vacated mining areas.

Some of the non-invasive nonnative species like crested wheatgrass are effective competitors against invasive annual grasses, but also can outcompete native species that are sown in the same mix (Knutson et al. 2014) or native grasses and forbs that try to recolonize seeded sites (Miles and Karl 1995, Pellant and Lysne 2005). Areas seeded with nonnative grasses, especially forage species like Siberian and crested wheatgrass have largely been successful but can result in monocultures of nonnative forage grasses, usually with lowered species diversity than what was observed prior to the disturbance.

The development of efforts such as the Great Basin Restoration Initiative (1999) and the Great Basin Native Plant Project (2015) is improving the science and cultural practices of seeding native grasses and forbs and reestablishing shrubs like sagebrush. There is a high probability that native seeding in low elevation low precipitation areas with high levels of invasive annual grasses would continue to have mixed success. However, using selective herbicides like imazapic in these areas will reduce competition of invasive annual grasses and allow the native seed to establish.

Areas burned by wildfire (Category 4) on the Vale District are assessed by an interdisciplinary team to identify whether and where there is a need to implement Emergency Stabilization and Rehabilitation projects. The assessment includes looking at the need to implement competitive seeding to prevent increases in (or spread from) existing invasive plants. Seeding objectives are identified and multiple factors are assessed to recommend seeding treatment needs. Factors analyzed include burn intensity, vegetative community, and risk of invasive plants. Seed mixes are developed by analyzing the pre-fire vegetation community; adjacent, unburnt vegetation communities; site potential; seed availability; and, annual precipitation. Seeding methods are chosen based on topography, rockiness, accessibility, and size of area to be seeded. These assessment considerations are noted in the *Integrated Invasive Plant Management, Competitive Seeding and Planting Methods* section of Chapter 2. In Categories 5 and 6, the same assessment process would be used to design competitive seeding for invasive plant control purposes in unburned and / or historically burned areas.

The Proposed Action authorizes the use of herbicides that are effective at reducing the competitive advantage of the targeted plant species. Reducing the competitive advantage greatly improves the success of native plant seeding or planting projects. See Appendix G for more information about competitive seeding.

Plantings would occur in small project areas (generally smaller than 20 acres) with the most common species being sagebrush and bitterbrush. Selective herbicides (available under the Proposed Action) would reduce the competitive advantage of targeted species, which is likely to improve the survival rate of the planted species, albeit only by 5 to 10 percent (Roger Ferriel, Baker Field Office Botanist, 2015 personal communication).

The BLM would have effective herbicides to reduce the threat of recently burned areas being infested with invasive annual grasses, and to treat existing Category 5 stands. The Vale District expects that the Proposed Action would reduce the amount of spread from Category 5 and 6 stands by 500,000 acres within the next 10 to 15 years. Where possible and applicable, drought resistant seed mixtures would be utilized, which could include both native and nonnative species. Reducing the threat of conversion of Category 5 into Category 6 and seeding with drought resistant seed mixtures would result in a District-wide beneficial effect to native vegetation.

Under the Proposed Action, the BLM would be able to treat invasive plants within forested communities with herbicides less harmful to seedlings and saplings than what is currently authorized under the No Action Alternative. Reducing the risk of injury or death to non-targeted tree species would have a beneficial effect to native vegetation communities, albeit minor due to the limited forested area on the District.

As described under the No Action Alternative, research studies have shown that invasive annual grass monocultures are carbon sources, releasing more carbon than what is taken in through photosynthesis, whereas native plant communities are carbon sinks, taking in more carbon than released through respiration and decomposition (Prater et al. 2006). Under the Proposed Action, it is estimated that the current invasive annual grass monocultures in Category 6 would release 370,000 tons of carbon into the atmosphere per year. This is three times less carbon release than under the No Action Alternative (or one-third of the carbon release). However, as in the No Action Alternative, untreated acres of Category 6 would remain a carbon sink under the Proposed Action, taking in an estimated 450,000 tons of carbon per year.

Revised Proposed Action

Under this alternative, the use of herbicides available under the Proposed Action remains the same (fluridone and sulfometuron methyl) or drops (all others) when compared to the No Action Alternative and Proposed Action. Most noticeably, 2,4-D use would decrease by 65 percent when compared to the No Action, and 59 percent when compared to the Proposed Action, and picloram (high risk from drift from typical and maximum rates) would decrease by 76 and 64 percent. Compared to the Proposed Action, clopyralid (moderate risk from drift under maximum rates) would drop by 79 percent, and chlorsulfuron (moderate risk from drift under typical and maximum rates) by 34 percent. Rimsulfuron would be used in rotation with imazapic to control invasive annual grasses under Categories 4, 5, and 6. Risk Assessments indicate that aminopyralid, rimsulfuron, and fluroxypyr all have low risk from off-site drift to non-target vegetation under both typical and maximum rates, and no (0) risk from surface run-off or wind erosion scenarios. Rimsulfuron is selective to annual plants, and may affect non-target annual broadleaves if directly sprayed. Following label direction, Standard Operating Procedures, and Mitigation Measures should limit effects to negligible.

Other effects, including the benefits of controlling invasive plants, would remain as described under the Proposed Action.

Cumulative Effects

Managing vegetation is an integral part of BLM-administered land management on the Vale District. In the past, present, and reasonably foreseeable future, there have been and would continue to be projects and activities within the Vale District that cause both beneficial and adverse effects to native plants and their habitats. Planned and ongoing actions include juniper cutting and / or burning, fuel break mowing, mining, livestock grazing, energy development, transmission line construction, and seeding and planting (especially as part of fire rehabilitation). Noxious weed control, as described under the No Action Alternative, is also an ongoing activity.

Current and planned juniper treatments on 356,000 acres have included cutting, burning, or both. Cutting reduces soil moisture use by juniper, making it available for other plants. Burning removes existing, aboveground biomass in the burned area, followed by seed germination and regrowth of plants existing on the site. Juniper treatments are designed to improve rangeland health in sagebrush steppe, forests, and riparian areas; these treatments typically cause short-term negative effects to vegetation that would be counteracted by long-term increased vigor of understory plants.

Ongoing wildfire emergency stabilization and rehabilitation projects would result in beneficial effects to native vegetation as soil erosion decreases, desirable perennial plant cover increases, and the abundance of invasive plants is reduced.

Livestock grazing has occurred on most of the Vale District for decades and has resulted in changes in plant communities, especially in the sagebrush steppe and riparian areas. Grazing has a direct effect on herbaceous plants through selective cropping of palatable plants, some trampling and deposition of urine and feces, and soil compaction. In some grazing allotments, current livestock management has resulted in conditions that do not meet rangeland health standards. The Vale District is in the process of changing livestock management in allotments not meeting rangeland health standards where livestock are identified as a causal factor. Since 2005, the Vale District has issued NEPA decisions changing livestock management within the Lookout Mountain (USDI 2009b), Burnt River, (USDI 2005c) Pedro Mountain (USDI 2011b), Homestead (USDI 2006b), Pritchard Creek (USDI 2008e), Powder River Canyon Geographic Units totaling approximately 95,000 acres. In addition to the 95,000 acres of rangeland improvement, past Determinations of NEPA Adequacy on the Grande Ronde, Oregon Trail, and Blue Mountain Geographic Units have shown past and current livestock management is consistent with meeting rangeland health on an additional 53,000 acres. Past and reasonably foreseeable actions that change grazing management are expected to result in long-term beneficial effects to native vegetation.

Past fuel-break mowing on 10,900 acres adjacent to roadways has little direct effect on native plant communities, as those areas have already been altered by invasive plants. Where these can prevent unnatural fire frequency, native plant communities primarily in sagebrush steppe benefit from the longer fire return interval, which would result in long-term minor beneficial effects to native vegetation.

Mining and use of locatable, salable, and leasable materials causes visible widespread and chronic vegetation disturbance in some areas, and typically removes soil A horizons (the topsoil) so re-vegetation is slow or non-existent. Past and present mining has resulted in highly localized adverse effects but minor long-term adverse effects to native vegetation across the District.

Currently there are 16 energy projects including transmission lines, geothermal, windmill farms and substations proposed on BLM or private lands within the Vale District's administrative boundary (predominately in Category 5 areas). Mitigation Measures would be applied to projects on BLM-administered lands to reduce the threat of converting existing native plant stands into Category 6 monocultures of invasive annual grasses. However, these measures may not be applied to the projects occurring on private lands. Invasive annual grass cover may increase within disturbed areas, but would not elevate large areas to Category 6.

Given the new policies on native seeding in the Great Basin (Secretarial Order 3336; Interagency National Seed Strategy 2015, and the interest in sagebrush restoration for the Greater Sage-Grouse), there is a high probability that the level of native grass, and especially native forb seedings for habitat restoration will increase compared to historic levels, and should result in beneficial effects on the native vegetation. Severely degraded areas, especially at lower elevations and in low precipitation zones may continue to be seeded with nonnative species, and would result in areas having low species diversity and composition.

Small plantings of sagebrush and bitterbrush will continue. The BLM expects that future plantings will be similar in size to past projects (ranging from 1 to 100 acres in size) and that the mortality rate will be similar to the current level (30 percent).

Special Status Plants

Issues

- How would the alternatives affect Special Status plant species?

Affected Environment

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

The Final Oregon / Washington State Director Special Status Species List (July 27, 2015) lists 77 documented and 75 suspected Special Status plant species located on the Vale District. A search of the BLM Geographic Biotic Observations (GeoBOB) database on March 3, 2015 shows 1,027 mapped sites, totaling 10,282 acres of Special Status plant species throughout the District. There is one federally threatened species, Spalding's catchfly (*Silene spaldingii*), documented on the Vale District, and two federally threatened plant species, Howell's spectacular thelypody (*Thelypodium howellii* ssp. *howellii*) and MacFarlane's four o'clock (*Mirabilis macfarlanei*), suspected to occur due to proximity of known locations to BLM-administered land. A complete list of Special Status plant species documented or suspected on the Vale District is provided in Table 3-12.

Table 3-12. Special Status Plants

Species Code	Family	Scientific Name	Common Name	Life Cycle	Documented or Suspected	Acres[1]	Number of Sites[1]
ABTU	*Nyctaginaceae*	*Abronia turbinata*	transmontane sand verbena	Annual, Perennial	Documented	0.1	1
AGGU	*Asteraceae*	*Agastache cusickii*	Cusick's giant-hyssop	Perennial	Documented	-	-
ALOC2	*Chenopodaceae*	*Allenrolfea occindentalis*	iodine bush	Perennial	Documented	-	-
ALBI7	*Pottiaceae*	*Aloina bifrons*	moss	-	Documented	-	-
AMCA8	*Boraginaceae*	*Amsinckia carinata*	Malheur Valley fiddleneck	Annual	Documented	32.5	45
ANKI2	*Scrophulariaceae*	*Antirrhinum kingii*	King snapdragon	Annual	Documented		
ARCR	*Brassicaceae*	*Arabis crucisetosa*	wetsoil rockcress	Perennial	Documented	622.7	9
ARMU	*Papaveraceae*	*Argemone munita*	prickly-poppy	Annual, Perennial	Documented	0.1	1
ARARL3	*Asteraceae*	*Artemisia arbuscula ssp. longicaulis*	Lahontan sagebrush	Perennial	Documented	33.3	1
ARPA16	*Asteraceae*	*Artemisia papposa*	Owyhee sage	Perennial	Documented	10.3	12
ASAR8	*Fabaceae*	*Astragalus arthurii*	waha milkvetch	Perennial	Documented	183.0	10
ASAS11	*Fabaceae*	*Astragalus asotinensis*	Asotin milkvetch	Perennial	Documented	25.1	3
ASCA9	*Fabaceae*	*Astragalus calycosus*	Torrey's milkvetch	Perennial	Documented	11.8	4

Species Code	Family	Scientific Name	Common Name	Life Cycle	Documented or Suspected	Acres[1]	Number of Sites[1]
ASCUC2	*Fabaceae*	*Astragalus cusickii var. cusickii*	Cusick's milkvetch	Perennial	Documented	104.0	8
ASCUS2	*Fabaceae*	*Astragalus cusickii var. sterilis*	Barneby barren milkvetch	Perennial	Documented	249	102
ASGE	*Fabaceae*	*Astragalus geyeri var. geyeri*	Geyer's milkvetch	Annual, Biennial	Documented	0.1	1
ASMU	*Fabaceae*	*Astragalus mulfordiae*	Mulford's milkvetch	Perennial	Documented	310.0	100
ASPL3	*Fabaceae*	*Astragalus platytropis*	broadkeel milkvetch	Perennial	Documented	0.1	1
BODA99	*Brassicaceae*	*Boechera davidsonii*	Davidson's rockcress	Perennial	Documented	-	-
BOOR	*Saxifragaceae*	*Bolandra oregana*	northern false coolwort	Perennial	Documented	0.5	1
BRCO13	*Pottiaceae*	*Bryoerythrophyllum columbianum*	moss	-	Documented	-	-
BUAM2	*Apiaceae*	*Bupleurum americanum*	American thorow wax	Annual	Documented	10.8	1
CAPU16	*Onagraceae*	*Camissonia pusilla*	Washoe suncup	Annual	Documented	-	-
CAMAM	*Liliaceae*	*Calochortus macrocarpus var. maculosus*	Nez Perce Mariposa lily	Perennial	Documented	1,251.4	23
CARO	*Portulacaceae*	*Calyptridium roseum*	rosy pussypaws	Annual	Documented	0.1	1
CACO81	*Cyperaceae*	*Carex cordillerana*	Cordilleran Sedge	Perennial	Documented	117.3	46
CAFLR	*Scrophulariaceae*	*Castilleja flava var. rustica*	country Indian paintbrush	Perennial	Documented	64.8	1
CACRG	*Brassicaceae*	*Caulanthus crassicaulis var. glaber*	thickstem wild cabbage	Biennial Perennial	Documented	0.3	3
CAPI4	*Brassicaceae*	*Caulanthus pilosus*	hairy wild cabbage	Annual, Biennial, Perennial	Documented	-	-
CAMAN	*Brassicaceae*	*Caulanthus major var. nevadensis*	slender wild cabbage	Perennial	Documented	-	-
CHXA	*Asteraceae*	*Chaenactis xantiana*	desert chaenactis	Annual	Documented	-	-
CHWH	*Asteraceae*	*Chaetadelpha wheeleri*	Wheeler's skeletonweed	Perennial	Documented	0.1	1
CHFE	*Pteridaceae*	*Cheilanthes feei*	slender lipfern	Perennial	Documented	336.6	2
CHHA	*Brassicaceae*	*Chlorocrambe hastata*	spearhead	Perennial	Documented		
CORE10	*Polemoniaceae*	*Collomia renacta*	Barren Valley collomiat	Annual	Documented	8.4	6
CYACG	*Apiaceae*	*Cymopterus acaulis var. greeleyorum*	Greeley springparsley	Perennial	Documented	0.1	1
CYIB	*Apiaceae*	*Cymopterus ibapensis*	Ibapah springparsley	Perennial	Documented	0.1	1
DICU99	*Phrymaceae*	*Diplacus cusickii*	Cusick's monkeyflower	Annual	Documented	1.5	5
DOPUS2	*Primulaceae*	*Dodecatheon pulchellum var. shoshonense*	darkthroat shootingstar	Perennial	Documented	0.1	1
ELBR5	*Elatinaceae*	*Elatine brachysperma*	shortseed waterwort	Annual	Documented	1.8	1
ELBO	*Cyperaceae*	*Eleocharis bolanderi*	Bolander's spikerush	Perennial	Documented	9.9	5
ERDI3	*Asteraceae*	*Erigeron disparipilus*	white cushion fleabane	Perennial	Documented	2.4	1
EREND	*Asteraceae*	*Erigeron davisii*	Davis' fleabane	Perennial	Documented	6.8	1
ERLA14	*Asteraceae*	*Erigeron latus*	broad fleabane	Perennial	Documented	11.4	7

Species Code	Family	Scientific Name	Common Name	Life Cycle	Documented or Suspected	Acres[1]	Number of Sites[1]
ERCH6	*Polygonaceae*	*Eriogonum chrysops*	bitterroot buckwheat	Perennial	Documented	55.0	6
ERHO6	*Polygonaceae*	*Eriogonum hookeri*	Hooker's buckwheat	Annual	Documented	0.5	3
ERPR9	*Polygonaceae*	*Eriogonum prociduum*	prostrate buckwheat	Perennial	Documented	6.5	1
ERSA8	*Polygonaceae*	*Eriogonum salicornioides*	saltwort buckwheat	Annual	Documented	0.3	2
ERIN99	*Phrymaceae*	*Erythranthe inflatula*	disappearing monkeyflower	Annual	Documented	0.1	1
ERPA99	*Phyrmaceae*	*Erythranthe patula*	Stalk-leaved monkeyflower	Annual	Documented	-	-
HACR4	*Boraginaceae*	*Hackelia cronquistii*	Cronquist's stickseed	Perennial	Documented	524.0	147
HAHIH	*Boraginaceae*	*Hackelia hispida var. hispida*	showy stickseed	Perennial	Documented	32.3	3
HAOP2	*Boraginaceae*	*Hackelia ophiobia*	three forks stickseed	Perennial	Documented	-	-
HECU3	*Boraginaceae*	*Heliotropium curassavicum*	salt heliotrope	Annual, Perennial	Documented	0.1	2
HYCOC	*Asteraceae*	*Hymenoxys cooperi var. canescens*	Cooper's goldflower	Annual, Biennial, Perennial	Documented	0.4	2
IVRHR	*Rosaceae*	*Ivesia rhypara var. rhypara*	grimy mousetail	Perennial	Documented	28.5	6
IVSH	*Rosaceae*	*Ivesia shockleyi*	Shockley's mousetail	Perennial	Documented	0.2	3
LEDA2	*Brassicaceae*	*Lepidium davisii*	Davis' pepperweed	Perennial	Documented	225.0	14
LOBE4	*Apiaceae*	*Lomatium bentonitum*	bentonite biscuitroot	Perennial	Documented	-	-
LOFOF	*Apiaceae*	*Lomatium foeniculaceum ssp. fimbriatum*	desert biscuitroot	Perennial	Documented	0.2	2
LORO2	*Apicacea*	*Lomatium rollinsii*	Rollins' biscuitroot	Perennial	Documented	461.2	19
LOSE2	*Apiaceae*	*Lomatium serpentinum*	sweetscented biscuitroot	Perennial	Documented	34.7	2
LULEC7	*Fabaceae*	*Lupinus lepidus var. cusickii*	Cusick's lupine	Perennial	Documented	429.5	10
LUNE	*Fabaceae*	*Lupinus nevadensis*	Nevada lupine	Perennial	Documented	-	-
MASO	*Asteraceae*	*Malacothrix sonchoides*	sowthistle desertdandelion	Annual	Documented	0.3	3
MECO2	*Loasaceae*	*Mentzelia congesta*	united blazingstar	Annual	Documented	0.1	1
MEMO2	*Loasaceae*	*Mentzelia mollis*	soft blazingstar	Annual	Documented	69.3	27
MEPA5	*Loasaceae*	*Mentzelia packardiae*	Packard's blazingstar	Annual	Documented	47.8	17
MUMI2	*Poaceae*	*Muhlenbergia minutissima*	Swallen annual muhly	Annual	Documented	14.8	1
OECAM 4	*Onagraceae*	*Oenothera caespitosa ssp. marginata*	tufted evening primrose	Perennial	Documented	4.8	8
OXSES	*Fabaceae*	*Oxytropis sericea var. sericea*	silvery oxytrope	Perennial	Documented	0.1	1
PEPE12	*Scrophulariaceae*	*Penstemon perpulcher*	Beautiful penstemon	Perennial	Documented	-	-
PECAC2	*Rosaceae*	*Petrophytum caespitosum var. caespitosum*	Rocky Mountain rockspirea	Perennial	Documented	123.5	1
PHIN3	*Hydrophyllaceae*	*Phacelia inundata*	playa yellow scorpionweed	Annual	Documented	0.1	1
PHLUM	*Hydrophyllaceae*	*Phacelia lutea var.*	Mackenzie's	Annual	Documented	-	-

Species Code	Family	Scientific Name	Common Name	Life Cycle	Documented or Suspected	Acres[1]	Number of Sites[1]
		mackenzieorum	phacelia				
PHSP10	*Portulacaceae*	*Phemeranthus spinescens*	Spinescent fameflower	Perennial	Documented	-	-
PHCH2	*Hydrophyllaceae*	*Physaria chambersii*	Chambers' twinpod	Perennial	Documented	-	-
PIAL	*Pinaceae*	*Pinus albicaulis*	whitebark pine	Perennial	Documented	829.9	23
POFL17	*Lamiaceae*	*Pogogyne floribunda*	mesamint	Annual	Documented	0.1	1
PODI	*Potamogetonaceae*	*Potamogeton diversifolius*	waterthread pondweed	Perennial	Documented	0.1	2
PREX	*Asteraceae*	*Prenanthella exigua*	brightwhite	Perennial	Documented	0.1	1
PYRA2	*Asteraceae*	*Pyrrocoma radiata*	ray goldenweed	Perennial	Documented	2602	69
PYSC4	*Asteraceae*	*Pyrrocoma scaberula*	Palouse goldenweed	Perennial	Documented	81.3	4
RICEC	*Grossulariaceae*	*Ribes cereum var. colubrinum*	wax currant	Perennial	Documented	21.9	1
RUBA	*Rosaceae*	*Rubus bartonianus*	Barton's raspberry	Perennial	Documented	631.3	1
SEER4	*Asteraceae*	*Senecio ertterae*	Ertter's ragwort	Annual	Documented	284.2	56
SISP2	*Caryophyllaceae*	*Silene spaldingii*	Spalding's silene	Perennial	Documented	0.0	1
STCO2	*Brassicaceae*	*Stanleya confertiflora*	Oregon princesplume	Annual, Biennial	Documented	66.0	55
SYLO	*Caprifoliaceae*	*Symphoricarpos longiflorus*	desert snowberry	Perennial	Documented	28.7	3
TOSC	*Asteraceae*	*Townsendia scapigera*	tufted townsend daisy	Perennial	Documented	-	-
TRLE	*Fabaceae*	*Trifolium leibergii*	Leiberg's clover	Perennial	Documented	0.8	1
TROW	*Fabaceae*	*Trifolium owyheense*	Owyhee clover	Perennial	Documented	240.4	77
ACWA	*Poaceae*	*Achnatherum wallowaense*	Wallowa ricegrass	Perennial	Suspected	-	-
ACROT99	*Rosaceae*	*Acomastylis rossii ssp. turbinatum*	slender-stemmed avens	Perennial	Suspected	-	-
ALGEG	*Lilliaceae*	*Allium geyeri var. geyeri*	Geyer's onion	Perennial	Suspected	-	-
ANJU	*Antheliaceae*	*Anthelia julacea*	liverwort	-	Suspected	-	-
ASVI10	*Aspleniaceae*	*Asplenium viride*	green spleenwort	Perennial	Suspected	-	-
BALY	*Jungermanniaceae*	*Barbilophozia lycopodioides*	liverwort	-	Suspected	-	-
BOAS2	*Ophioglossaceae*	*Botrychium ascendens*	upward-lobed moonwort	Perennial	Suspected	-	-
BOCA5	*Ophioglossaceae*	*Botrychium campestre*	prairie moonwort	Perennial	Suspected	-	-
BOCR	*Ophioglossaceae*	*Botrychium crenulatum*	crenulate moonwort	Perennial	Suspected	-	-
BOHE5	*Ophioglossaceae*	*Botrychium hesperium*	western moonwort	Perennial	Suspected	-	-
BOLI7	*Ophioglossaceae*	*Botrychium lineare*	slender moonwort	Perennial	Suspected	-	-
BOLU	*Ophioglossaceae*	*Botrychium lunaria*	moonwort	Perennial	Suspected	-	-
BOMO	*Ophioglossaceae*	*Botrychium montanum*	mountain grape-fern	Perennial	Suspected	-	-
BOPA9	*Ophioglossaceae*	*Botrychium paradoxum*	twin-spiked moonwart	Perennial	Suspected	-	-
BOPE4	*Ophioglossaceae*	*Botrychium pedunculosum*	stalked moonwort	Perennial	Suspected	-	-
CANI	*Lilliaceae*	*Calochortus nitidus*	broad-fruit mariposa-lily	Perennial	Suspected	-	-
CAAT8	*Cyperaceae*	*Carex atrosquama*	blackened sedge	Perennial	Suspected	-	-
CACA12	*Cyperaceae*	*Carex capillaris*	hairlike sedge	Perennial	Suspected	-	-
CAGY2	*Cyperaceae*	*Carex gynocrates*	yellow bog sedge	Perennial	Suspected	-	-
CAID	*Cyperaceae*	*Carex idahoa*	Idaho sedge	Perennial	Suspected	-	-
CALAA	*Cyperaceae*	*Carex lasiocarpa var.*	slender sedge	Perennial	Suspected	-	-

Species Code	Family	Scientific Name	Common Name	Life Cycle	Documented or Suspected	Acres[1]	Number of Sites[1]
		americana					
CAME9	*Cyperaceae*	*Carex media*	intermediate sedge	Perennial	Suspected	-	-
CAMI16	*Cyperaceae*	*Carex micropoda*	Pyrenaean sedge	Perennial	Suspected	-	-
CANA2	*Cyperaceae*	*Carex nardina*	Spikenard sedge	Perennial	Suspected	-	-
CAPE5	*Cyperaceae*	*Carex pelocarpa*	new sedge	Perennial	Suspected	-	-
CARE4	*Cyperaceae*	*Carex retrorsa*	retrorse sedge	Perennial	Suspected	-	-
CASU7	*Cyperaceae*	*Carex subnigricans*	dark alpine sedge	Perennial	Suspected	-	-
CAVE5	*Cyperaceae*	*Carex vernacula*	native sedge	Perennial	Suspected	-	-
CAFR8	*Scrophulariaceae*	*Castilleja fraterna*	fraternal paintbrush	Perennial	Suspected	-	-
CARU8	*Scrophulariaceae*	*Castilleja rubida*	purple alpine paintbrush	Perennial	Suspected	-	-
CHFE	*Pteridaceae*	*Cheilanthes feei*	Fee's lip-fern	Perennial	Suspected	-	-
CRRO4	*Boraginaceae*	*Cryptantha rostellata*	beaked cryptantha	Annual	Suspected	-	-
CRST2	*Boraginaceae*	*Cryptogramma stelleri*	Steller's rockbrake	Perennial	Suspected	-	-
CYLUL	*Cyperaceae*	*Cyperus lupulinus ssp. lupulinus*	a cyperus	Perennial	Suspected	-	-
CYFA	*Orchidaceae*	*Cypripedium fasciculatum*	clustered lady's-slipper	Perennial	Suspected	-	-
ERPY99	*Onagraceae*	*Eremothera pygmaea*	dwarf evening-primrose	Annual	Suspected	-	-
ERHY99	*Phrymaceae*	*Erythranthe hymenophylla*	membrane-leaved monkeyflower	Annual	Suspected	-	-
JUHO	*Juncaceae*	*Juncus howellii*	Howell's rush	Perennial	Suspected	-	-
JUTRA2	*Juncaceae*	*Juncus triglumis var. albescens*	three-flowered rush	Perennial	Suspected	-	-
JUPO3	*Jungermanniaceae*	*Jungermannia polaris*	liverwort	-	Suspected	-	-
KOMY	*Cyperaceae*	*Kobresia myosuroides*	Bellard's kobresia	Perennial	Suspected	-	-
KOSI2	*Cyperaceae*	*Kobresia simpliciuscula*	simple kobresia	Perennial	Suspected	-	-
LIBO4	*Orchidaceae*	*Listera borealis*	northern twayblade	Perennial	Suspected	-	-
LIAR6	*Cyperaceae*	*Lipocarpha aristulata*	Aristulate lipocarpha	Annual	Suspected	-	-
LOER2	*Apiaceae*	*Lomatium erythrocarpum*	red-fruited lomatium	Perennial	Suspected	-	-
LOGI3	*Jungermanniaceae*	*Lophozia gillmanii*	liverwort	-	Suspected	-	-
LYCO3	*Lycopodiaceae*	*Lycopodium complanatum*	ground cedar	Perennial	Suspected	-	-
MIMA2	*Nyctaginaceae*	*Mirabilis macfarlanei*	Macfarlane’s four-o’clock	Perennial	Suspected	-	-
OPPU3	*Ophioglossaceae*	*Ophioglossum pusillum*	adder's-tongue	Perennial	Suspected	-	-
PASP	*Poaceae*	*Pappostipa speciosa*	desert needlegrass	Perennial	Suspected	-	-
PEBR5	*Pteridaceae*	*Pellaea bridgesii*	Bridges' cliff-brake	Perennial	Suspected	-	-
PEQU7	*Monosoleniaceae*	*Peltolepis quadrata*	liverwort	-	Suspected	-	-
PEDEV2	*Scrophulariaceae*	*Penstemon deustus var. variabilis*	variable hot-rock penstemon	Perennial	Suspected	-	-
PHMI7	*Hydrophyllaceae*	*Phacelia minutissima*	dwarf phacelia	Annual	Suspected	-	-
PHHE9	*Polemoniaceae*	*Phlox hendersonii*	Henderson's phlox	Perennial	Suspected	-	-
PHMU3	*Polemoniaceae*	*Phlox multiflora*	many-flowered phlox	Perennial	Suspected	-	-
PHDID	*Brassicaceae*	*Physaria didymocarpa var. didymocarpa*	common twinpod	Perennial	Suspected	-	-
PLOB	*Orchadiaceae*	*Platanthera obtusata*	small northern bog-orchid	Perennial	Suspected	-	-
PLOR3	*Poaceae*	*Pleuropogon oregonus*	Oregon	Perennial	Suspected	-	-

Species Code	Family	Scientific Name	Common Name	Life Cycle	Documented or Suspected	Acres[1]	Number of Sites[1]
			semaphoregrass				
PRQU2	*Marchantiaceae*	*Preissia quadrata*	liverwort	-	Suspected	-	-
PTPU2	*Ptilidiaceae*	*Ptilidium pulcherrimum*	liverwort	-	Suspected	-	-
RIOXI	*Grossulariaceae*	*Ribes oxyacanthoides ssp. irriguum*	Idaho gooseberry	Perennial	Suspected	-	-
ROCO3	*Brassicaceae*	*Rorippa columbiae*	Columbia cress	Perennial	Suspected	-	-
SAFA	*Saliaceae*	*Salix farriae*	Farr's willow	Perennial	Suspected	-	-
SAWO	*Saliaceae*	*Salix wolfii*	Wolf's willow	Perennial	Suspected	-	-
SAADO2	*Saliaceae*	*Saxifraga adscendens ssp. oregonensis*	Wedge-leaf saxifrage	Perennial	Suspected	-	-
SCCI5	*Grimmiaceae*	*Schistidium cinclidodonteum*	moss	-	Suspected	-	-
SPPE	*Poaceae*	*Spartina pectinata*	prairie cordgrass	Perennial	Suspected	-	-
TESA	*Caliciaceae*	*Texosporium sancti-jacobi*	lichen	-	Suspected	-	-
THAL	*Ranunculaceae*	*Thalictrum alpinum*	alpine meadowrue	Perennial	Suspected	-	-
THHOS2	*Brassicaceae*	*Thelypodium howellii ssp. spectabilis*	Howell's spectacular thelypody	Biennial, Perennial	Suspected	-	-
SUVI	*Saxifragaceae*	*Suksdorfia violacea*	Violet suksdorfia	Perennial	Suspected	-	-
THEU	*Brassicaceae*	*Thelypodium eucosmum*	arrow-leaf thelypody	Biennial, Perennial	Suspected	-	-
TOMO	*Asteraceae*	*Townsendia montana*	mountain townsendia	Perennial	Suspected	-	-
TOPA2	*Asteraceae*	*Townsendia parryi*	Parry's townsendia	Biennial, Perennial	Suspected	-	-
TRDO	*Fabaceae*	*Trifolium douglasii*	Douglas' clover	Perennial	Suspected	-	-
TRLAA2	*Ranunculaceae*	*Trollius laxus ssp. albiflorus*	American globeflower	Perennial	Suspected	-	-
UTMI	*Lentibulariaceae*	*Utricularia minor*	lesser bladderwort	Perennial	Suspected	-	-

1. A dash denotes no locations are recorded in GeoBOB. For documented species, this may be a result of data being added to the database after the March 3, 2015 query.

Federally Listed Plant Species

The only documented federally listed species on the District, Spalding's catchfly, has been documented on 0.1 acres of land in the northern portion of the Vale District. The site is not currently affected by invasive plants, but diffuse knapweed, ventenata, cheatgrass, and St. Johnswort occur in close proximity and could potentially spread to the site. The recovery plan for Spalding's catchfly identified control of invasive plant species as part of the delisting criteria for the species. Criteria #5 states:

> "Invasive nonnative plants with the potential to displace *Silene spaldingii* have been continually controlled or eradicated within 100 meters (328 feet) of all *S. spaldingii* populations within key conservation areas (Factor A). Certain invasive plants that are established and difficult to eradicate…may be controlled within 25 meters (82 feet) of *S. spaldingii* populations" (USDI 2007g:65).

Additionally, the recovery plan lists general recovery actions that would occur across the range of the species. These actions include:

- Conduct invasive plant control and management measures at all key conservation areas and other populations as needed.
- Ensure invasive plant control and management measures are coordinated with appropriate agencies.
- Conduct surveys for *Silene spaldingii* before invasive plant control measures are implemented.
- Develop and implement guidelines for herbicide applications around *Silene spaldingii* plants.

- Monitor and evaluate the response of *Silene spaldingii* to invasive plants.

Macfarlane's four-o'clock (*Mirabilis macfarlanei*) and Howell's spectacular thelypody (*Thelypodium howellii* ssp. *spectabilis*) are federally threatened plants suspected to occur on the Vale District. Both of these species are known to occur close to the Vale District and potential habitat occurs on the District.

The recovery plan for Macfarlane's four-o'clock lists herbicide spraying as a reason for decline and a current threat: "spraying vegetation in areas where *M. macfarlanei* occurs could potentially have an adverse effect on this species if weed control activities are not carefully implemented and monitored" (USDI 2000a:10). The recovery plan also identifies invasive plant species, specifically yellow starthistle and cheatgrass, as a serious threat to the species. The U.S. Fish and Wildlife Service recommends that invasive plant control within a 1-kilometer (about 0.5 mile) radius of all populations should be managed to avoid adverse effects to this species and potential pollinators. "In some cases, selective herbicide use may be desirable to enhance *M. macfarlanei* habitat or control invasive plant species. Appropriate methods for application of pesticides and herbicides within the vicinity of *M. macfarlanei* sites should be implemented. For example, carefully controlled hand application rather than aerial spraying could be used adjacent to *M. macfarlanei* habitat" (USDI 2000b: 25-26). The Imnaha River 5th-field watershed has potential habitat within the Vale District. If locations of Macfarlane's four-o'clock are confirmed on the Vale District, specific control measures for the location would be developed in coordination with the U.S. Fish and Wildlife Service.

Similar to Macfarlane's four o'clock, the recovery plan for Howell's spectacular thelypody lists herbicide use and invasive plant species as threats, as well as mowing. Recovery actions listed in the plan include the control of invasive plant species. Teasel, bull thistle, Canada thistle, and yellow sweet clover threaten the survival of this species at all sites (USDI 2000b). The Service recommends that appropriate methods for invasive plant control should be developed and implemented to manage these invasive plants within populations while reducing effects to Howell's spectacular thelypody. The Upper Willow Creek and Big Creek-Burnt River 5th-field watersheds have potential habitat within the Vale District (Kagan 1991). If locations of Howell's spectacular thelypody are confirmed on the Vale District, specific control measures for the location would be developed in coordination with the U.S. Fish and Wildlife Service.

Standard Operating Procedures and Mitigation Measures Relevant to Effects

Projects that have the potential to disturb Special Status plant habitat require pre-project clearances, including review for potential habitat and / or project site surveys (USDI 2008b).[51]

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

General

- Survey for Special Status species if project may impact them.

Prescribed Fire

- Minimize direct impacts to Special Status species, unless studies show that species will benefit from fire.

Mechanical

- Minimize use of ground-disturbing equipment near Special Status species of concern.

[51] Results would be entered into BLM's Oregon / Washington GeoBOB (Geographic Biotic Observations) database.

Competitive Seeding and Planting

- Use native or sterile plants for revegetation and restoration projects [near Special Status plant habitat] to compete with invasive plants until desired vegetation establishes.
- Use plant stock or seed from the same seed zone and from sites of similar elevation when conducting revegetation activities [near Special Status plant habitat].

Targeted Grazing

- Survey for Special Status species of concern if project could impact these species.

Chemical

- Consider impacts to Special Status species when designing herbicide treatment programs.
- Use a selective herbicide and a wick or backpack sprayer to minimize risk to Special Status plants.
- Avoid treating vegetation during time-sensitive periods (e.g. susceptible life stages) for Special Status species in areas to be treated.
- Refer to the herbicide label when planning revegetation to ensure that subsequent vegetation would not be injured following application of the herbicide.
- When necessary to protect Special Status plant species, implement all conservation measures for plants presented in the 2007 *Vegetation Treatments on Bureau of Land Management Lands in 17 Western States* and 2016 *Vegetation Treatments Using Aminopyralid, Fluroxypyr, and Rimsulfuron* Programmatic Biological Assessments (see Appendix A, *Project Design Features, Standard Operating Procedures, Mitigation Measures, Conservation Measures, Prevention Measures, and Best Management Practices*).[52]

Project Design Features Adopted for This Analysis

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

- If locations of Macfarlane's four-o'clock or Howell's spectacular thelypody are located on the Vale District near invasive plant treatments, site-specific control measures would be developed in coordination with the U.S. Fish and Wildlife Service.
- For projects with the potential to affect listed plant populations, all Project Design Criteria outlined in the Aquatic Restoration Biological Opinions II (ARBO II, USDI 2013a) from the U.S. Fish and Wildlife Service would be applied (see Appendix F). If project cannot be covered by ARBO II (see Figures 3-2 and 3-4), additional consultation with U.S. Fish and Wildlife Service would occur before treatment.
- Apply Conservation Measures as appropriate for Bureau Sensitive plants (see Figure 3-3).

[52] The exact conservation measures adopted would depend on the method of treatment, the Special Status plant species, and the environmental conditions of the site. These decisions would be made during preparation of the Annual Treatment Plan (see Chapter 2, *Planning / Annual Treatment Plans* for more information). Plant Conservation Measures include buffer distances based on herbicide, method of application, and condition of site. These are contained in Appendix A. See also the Bureau Sensitive plant Project Design Feature adopted for this analysis. The Project Design Feature provides site-specific clarification on Conservation Measures for non-listed plants.

Figure 3-2. Federally Listed Species Consultation Conditions
Applies to Proposed Projects in areas where the Potential Exists for Federally Listed Plant Habitat

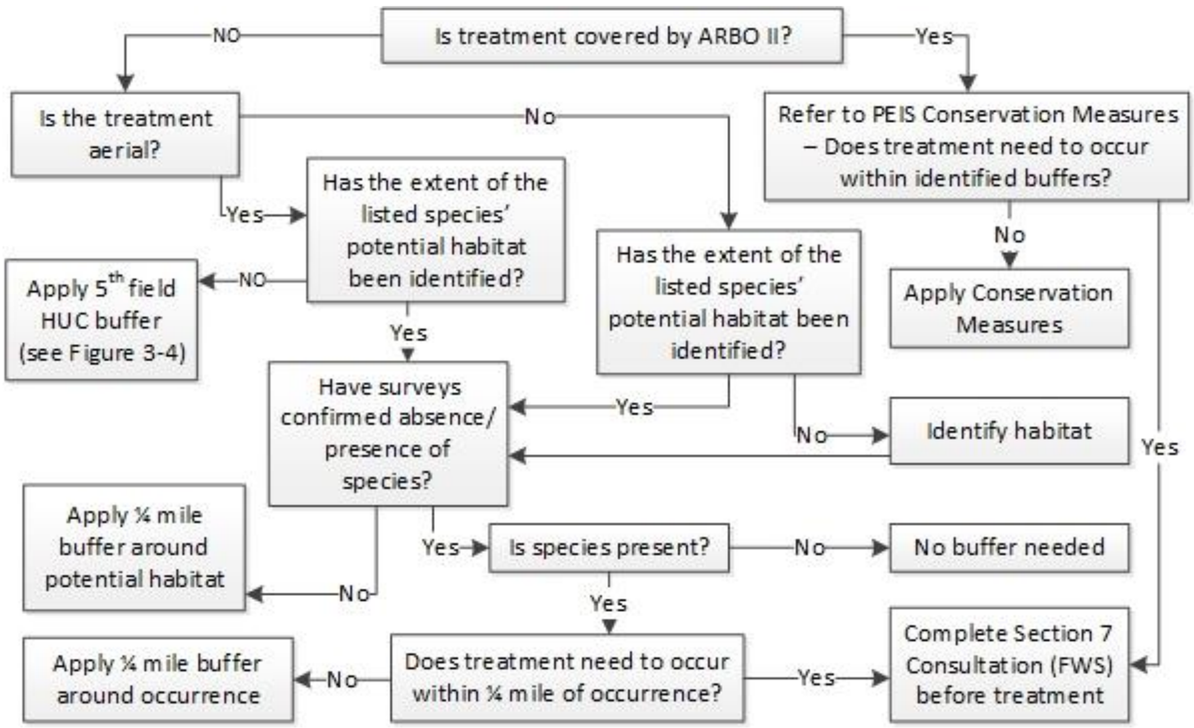
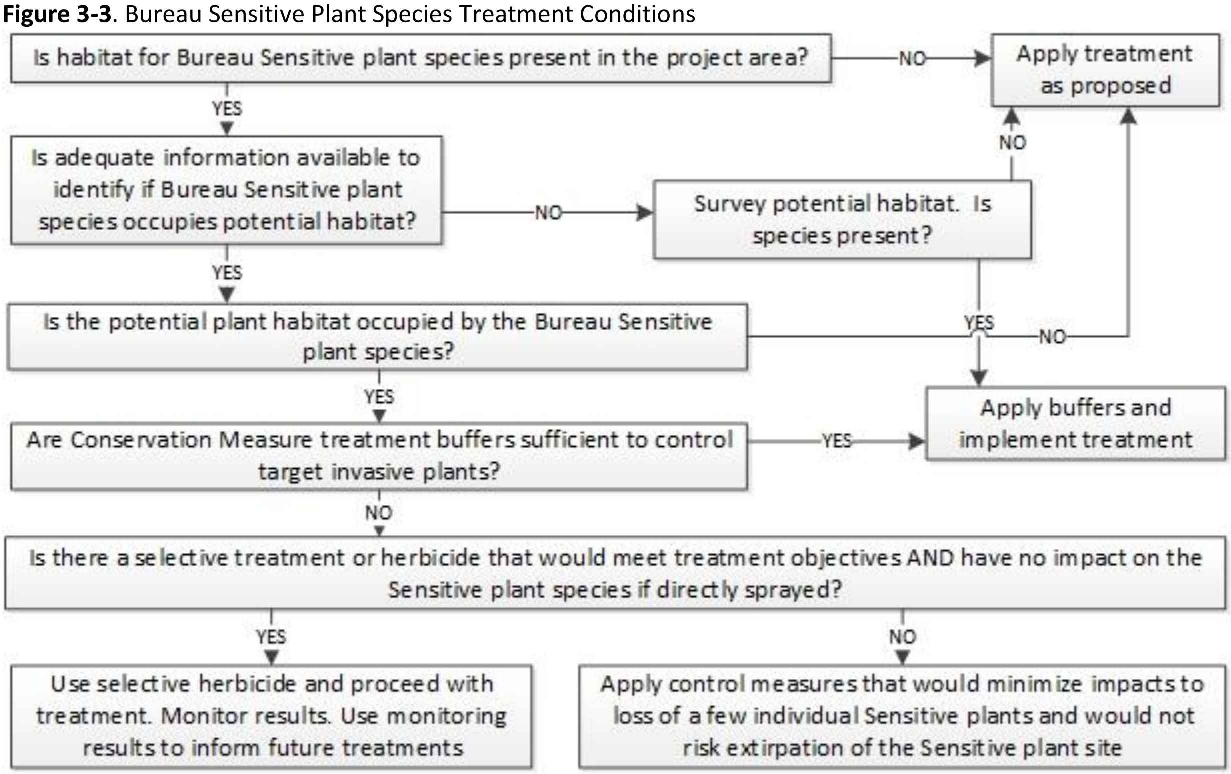
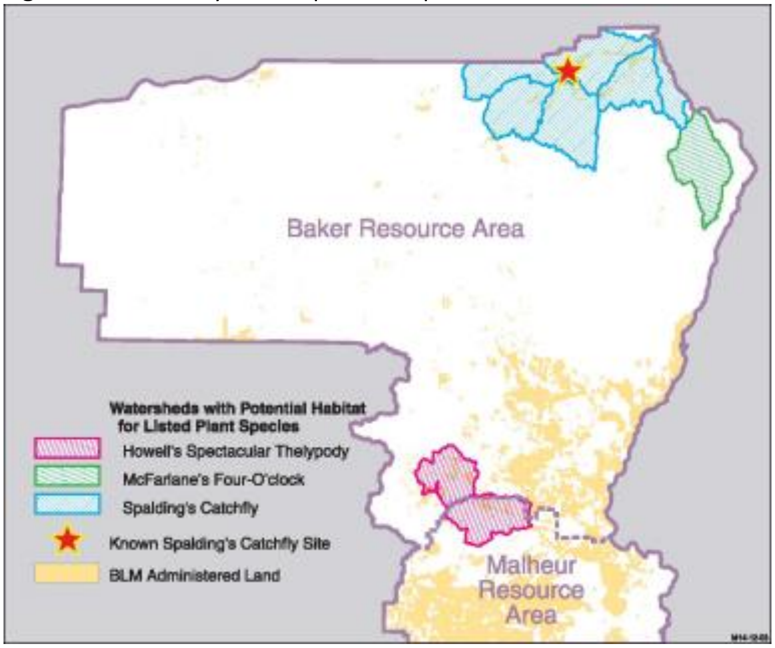


Figure 3-3. Bureau Sensitive Plant Species Treatment Conditions



Process assumes using least impactful but successful method for invasive plant treatment
All herbicide applications would follow herbicide labels, standard operating procedures, and mitigation measures

Figure 3-4. Federally Listed Species Map



Environmental Consequences

Effects to Special Status plants are quantified where possible. In absence of quantitative data, the best professional judgment based upon a review of the scientific literature and BLM data was used. Effects are sometimes described using ranges of potential effects or in qualitative terms, if appropriate. The intensities of effects are also described, where possible, using the following guidance:

Negligible: The effects on Special Status plants would be at or below the level of detection, and the changes would be so slight that they would not be of any measurable or perceptible consequence to individuals or the population as a whole.

Minor: The effects on Special Status plants would be detectable but localized, small, and of little consequence to the population of any species. Mitigating measures, if needed to offset adverse effects, would be simple and successful.

The duration of effects to Special Status species are defined as follows:

Short-term: A change in a resource or its condition would generally last less than a single year or season.

Long-term: A change in a resource or its condition would last longer than a single year or season.

Effects of Treatment Methods

The treatment of invasive plants would have no effect or discountable effects to individuals or populations of federally listed plants because of ARBO II project design criteria (adopted as part of this analysis), and Conservation Measures adopted with the Biological Opinions for the 2016 and 2007 PEISs.

It is expected that treatment of invasive plants could cause incidental loss of individual Bureau Sensitive plants, as there will be instances in which invasive plants are threatening a Sensitive plant occurrence. In these instances, it would be necessary to treat within the Conservation Measures buffers (see Appendix A and Figures 3-3). This may cause loss of individuals or a portion of the occurrence, which is a short term effect, but provides a long term benefit for the occurrence and species. With the implementation of Standard Operating Procedures, Mitigation Measures, and Conservation Measures, BLM anticipates minor effects from actions proposed in all alternatives. Treatments under any alternative would improve conditions for Bureau Sensitive plants and would not trend Bureau Sensitive species toward listing. The additional herbicides available under the Proposed and Revised Proposed Actions include more species-specific chemicals, which are less likely to damage nearby non-target plants.

The Proposed and Revised Proposed Actions reduce the rate of spread and the amount of non-selective (or less selective) herbicides applied to the ground compared to the No Action Alternative. The use of more selective herbicides, such as imazapic, in these alternatives poses less risk to Special Status plants. The wider array of selective herbicides in the Proposed and Revised Proposed Actions would give land managers more options to choose an herbicide that is effective in treating the invasive plants while having the least effect on Special Status plants, thus these alternatives have a greater benefit and less risk to Special Status plants.

Non-Herbicide Treatments

Common to All Alternatives

Control of invasive plants using manual, mechanical, and other non-herbicide methods could directly affect non-target plants. Direct adverse effects could include mortality of individuals, reduced vigor due to trampling or removal of above ground plant parts, and reduced seed production. These effects would be minor with manual control and mechanical control using weed whackers. However, there would be less ability to target individual plants with mowing, which would result in adverse effects to Special Status plants in the treated area. Therefore, mowing is not normally used as a treatment method near Special Status plant populations.

Biological control agents are rigorously tested for host specificity and approved by APHIS prior to release in the United States. Agents demonstrated to have direct adverse effects on non-target organisms are not released. There is a slight risk that an approved agent could attack a closely related non-target plant species. However, no close relationships have been identified between the target invasive plants and the Special Status plants of the Vale District; therefore, effects would be negligible. The District is currently using biocontrol insects on leafy spurge, yellow starthistle, Dalmatian toadflax, saltcedar, Russian knapweed, diffuse knapweed, spotted knapweed, and St. Johnswort.

Targeted grazing could affect Special Status plants through herbivory or trampling of individual plants. A Standard Operating Procedure requiring surveys for Special Status species prior to implementing targeted grazing, coupled with project designs to reduce the effects, would provide protection measures which would reduce adverse effects to negligible for Special Status populations. The Annual Treatment Plan would identify specific protection measures for each proposed targeted grazing treatment.

Proposed and Revised Proposed Actions

Manual, mechanical, and biocontrol treatments would be used under all alternatives (see Table 2-11). Prescribed burning is an effective method to prepare an annual grass treatment site for herbicide application. Competitive seeding and planting is often used after treatment to establish a desirable perennial species in the treatment area. Under the Proposed and Revised Proposed Actions, BLM would see an increase in the number of acres of prescribed burning and competitive planting or seeding for invasive plant treatment. However, because of Standard Operating Procedures and Mitigation Measures protecting Special Status plant sites, it is anticipated the action alternatives would have less adverse effects on Special Status plants than the No Action Alternative.

Prescribed fire has the potential to harm Special Status plant populations that are not ecologically adapted to fire. Pre-project clearance requirements would identify if fire susceptible species were present. If they are present, protection measures (Standard Operating Procedures, Mitigation Measures, Conservation Measures, etc.) such as burning during the dormant period, reducing fuels around the population, or excluding fire from the population would be implemented to reduce the adverse effects of prescribed fire to minor.

Competitive seeding and to a lesser extent competitive planting, are ground disturbing activities that may disturb the soil and hence, the existing vegetation. If this treatment was to occur in a Special Status plant population, individual plants or the entire population could be harmed. Surveying for and creating “no treatment” buffers around Special Status plants would reduce the adverse effect to negligible for these species. Only native or sterile species would be used around Special Status plant populations to maintain native diversity around these sites.

Herbicide Treatments

Common to All Alternatives

Special Status species are at risk from herbicides because their populations are often limited in geographic scope, and damage to individuals may have population implications. Pre-project clearances and protection of occupied, or assumed-occupied habitats as required by Special Status Species Program direction, should prevent most or all adverse effects. The majority of treatments can be designed to reduce or eliminate adverse effects to these species; however, adverse effects could occur under any alternative for some treatment methods on some individuals. Some projects would have short-term adverse effects to individual plants in order to gain long-term benefits for the species. For example, the reduction of competition from invasive plants may injure individual plants, but in the long term, the benefit of reduced invasive plants in or around the population is greater than the loss of a few individuals. In most cases, effects to individuals would be minor due to Standard Operating Procedures, Mitigation Measures, and Conservation Measures from the 2007 and 2016 PEISs Biological Assessments, e.g., no-herbicide buffers, timing of treatments, use of selective herbicides, exclosures, spot treatments that avoid Special Status plants, or avoiding or prohibiting aerial applications (see Appendix A, *Project Design Features, Standard Operating Procedures, Mitigation Measures, Conservation Measures, Prevention Measures, and Best Management Practices*). In addition, project design considerations made part of the Annual Treatment Plan would minimize risks to non-target plants. Design considerations include the abundance and distribution of target versus non-target plant species, stage of growth (phenology) of plants, and the size of the treatment area, as well as physical features like soil moisture, timing of precipitation, air temperature, wind speed, and other factors.

Herbicide effects to non-target plants would be the same as those described in the *Native Vegetation* section. Standard Operating Procedures and Mitigation Measures (Appendix A) are designed to minimize risk to non-target species including Special Status plants. In general, plants in the sunflower, legume, and mustard families tend to be more susceptible to broadleaf herbicides, like 2,4-D or dicamba. Therefore, there may be increased risk from these herbicide treatments for Special Status plant species such as Wheeler's skeletonweed, broad fleabane, sowthistle desertdandelion, Ertter's senecio, and Snake River goldenweed of the sunflower family; Asotin milkvetch, Mulford's milkvetch, Cusick's lupine, and Owyhee clover in the legume family; and, cross-haired rockcress and Davis' peppergrass of the mustard family.

Any herbicide treatments that would occur within or adjacent to federally listed species would be coordinated with the U.S. Fish and Wildlife Service and designed to prevent injury to individual plants and the population. Herbicide treatments may affect federally listed species, but Project Design Features, Standard Operating Procedures, Mitigation Measures, and Conservation Measures from the PEISs Biological Assessments would reduce effects and prevent long-term damage to the populations.

No Action Alternative

Under this alternative, 2,4-D, dicamba, glyphosate, and picloram are available for treatment of noxious weeds. The Forest Service Risk Assessment ratings and discussions for *susceptible plants* (Appendix C, *Herbicide Risk Assessment Summaries*) are assumed to represent Special Status plants. All four herbicides present a high risk of damage to Special Status plants under direct spray scenarios. Under surface run-off scenarios, picloram presents a high risk of damage to Special Status plants and the remaining three herbicides pose zero risk of damage. 2,4-D presents low risk with low boom application and zero risk with backpack direct foliar application for off-site drift scenarios. Depending on the method of application, glyphosate, picloram, and dicamba present high to zero risk of damage to Special Status plants for off-site drift scenarios, with aerial application at maximum rate having the highest risk and backpack directed foliar application at typical rate having the lowest risk to Special Status plants and populations.

Proposed Action

In addition to the four herbicides available District-wide under the No Action Alternative, 10 additional herbicides would be used for vegetation treatments under this alternative. With the exception of imazapic, which has a low risk at the typical application rate (see Table C-3 in Appendix C), these herbicides present a high risk of damage to Special Status plants through direct spray scenarios. Fluridone was not evaluated for direct spray in the Risk Assessments. The additional herbicides include more species-specific chemicals (those less likely to damage nearby non-target plants can more often be used).

Fluridone, an aquatic herbicide, kills target plants by preventing them from synthesizing food; however, at low concentrations native pondweeds may escape harm (Farone and McNabb 1993). It is used primarily to control Eurasian watermilfoil and hydrilla, neither currently known to occur on the Vale District. Fluridone must remain in contact with target aquatic species for an extended period for effective control. It poses only low risk from a spill at maximum application rate to plants in a pond making this an essential herbicide for treating invasive plants in aquatic Special Status plant sites. Risks to terrestrial plants could not be evaluated due to lack of toxicity testing.

ALS-Inhibitors: The ALS-inhibiting herbicides chlorsulfuron, metsulfuron methyl, and sulfometuron methyl (sulfonylureas) and imazapyr (imidazolinones) are highly active, and extremely low concentrations could injure Special Status plants. Because of their high potency and longevity, these herbicides can pose a particular risk to non-target plants. Off-site movement of even small concentrations of these herbicides can result in extensive damage to surrounding plants, and damage to non-target plants may result at concentrations lower than those reportedly required to kill target invasive plants (Fletcher et al. 1996). Chlorsulfuron may cause severe reduction in seed production of some non-target crops, specifically cherries, if they are exposed at critical stages of development (Fletcher et al. 1993). The study suggests that fruit development on native plants may also be severely reduced if exposed to chlorsulfuron. Rare or susceptible annual plants in particular may suffer if they are unable to produce seed due to exposure to chlorsulfuron. Metsulfuron methyl is known to be harmful to commercial onion crops of the lily family, so other plants in that family, like Nez Perce mariposa lily, may be more readily affected by this herbicide. Imazapic, another ALS-inhibitor, presents low to medium risk for direct spray scenarios depending on application rate. The planned treatments utilizing imazapic that are likely to affect Special Status plants target the invasive annual grasses. The benefits of reducing invasive annual grasses within Special Status populations are expected to exceed any adverse effects to perennial Special Status plant populations. Existing Mitigation Measures (see Appendix A) including those requiring buffers and doing treatments when non-target plants are dormant would reduce the likelihood of adverse effects to Special Status plants and populations.

Synthetic Auxins: Clopyralid has little effect on grasses and members of the mustard family. Overall effects to non-target plants from normal application of clopyralid are likely to be limited to susceptible plant species in or very near the treatment area. These chemicals would be useful for managing invasive plants within or near the populations of Special Status plants such as annual muhly and cross-haired rockcress, a grass and mustard respectively.

The Risk Assessments show that triclopyr presents a high to zero risk of damage to Special Status plants through off-site drift depending upon the application method. The risk of off-site drift is high on susceptible plants when it is applied aerially at the maximum rate and moderate when applied by a low boom at the maximum rate. At the typical application rate, the risk of off-site drift drops to moderate and low for aerial and low for boom application. The Mitigation Measures and Standard Operating Procedures for aerial or low boom application of triclopyr within or near Special Status plant populations would reduce the risk of off-site drift damage to Special Status plants.

Of the 10 new herbicides in the Proposed Action, the Risk Assessments show two with a high or moderate risk to susceptible plants from surface runoff. Imazapyr has a high risk at both typical and maximum rates. Triclopyr has a moderate risk at maximum rates and a low risk at typical rates. However, following the label restrictions on these herbicides, in addition to Mitigation Measures and Standard Operating Procedures, would reduce the risk of damage from these herbicides to Special Status plants.

Revised Proposed Action

Risk Assessments indicate that aminopyralid, rimsulfuron, and fluroxypyr all present a high risk of damage to Special Status plants through direct spray scenarios. However, all have low risk from off-site drift to non-target vegetation under both typical and maximum rates, and no (0) risk from surface run-off or wind erosion scenarios. Rimsulfuron would be used in rotation with imazapic to control invasive annual grasses, especially in Categories 4, 5, and 6. Rimsulfuron is selective to annual species, so non-target annual Special Status plants could be affected if directly sprayed. However, additional Conservation Measures for aminopyralid, rimsulfuron, and fluroxypyr that include buffer distances from Special Status plants were included in the Biological Assessment for the 2016 *Biological Assessment for Vegetation Treatments Using Aminopyralid, Fluroxypyr, and Rimsulfuron* (USDI 2016e). These Conservation Measures can be found in Appendix A. Hence, these additional herbicides are unlikely to have any effect on Special Status plants.

The addition of these three herbicides would cause the use of the herbicides available under the Proposed Action to remain the same (fluridone and sulfometuron methyl) or drop (all others) when compared to the No Action Alternative and Proposed Action. Most noticeably, 2,4-D use would decrease by 65 percent when compared to the No Action, and 59 percent when compared to the Proposed Action, and picloram (high risk from drift from typical and maximum rates) would decrease by 76 and 64 percent. Clopyralid (moderate risk from drift under maximum rates) would drop by 79 percent, and chlorsulfuron (moderate risk from drift) by 34 percent.

Other effects would remain as described under the Proposed Action.

Effects of Invasive Plants on Special Status Plants

Common to All Alternatives

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

No Action Alternative

Under current management, the rate of spread is estimated at 12 percent from existing documented noxious weed sites (see *Invasive Plants* section earlier in this Chapter). This spread would continue to encroach on Special Status plant populations that have previously been unaffected by invasive plant infestations.

There are approximately 600 acres of Special Status plant sites infested with invasive plants, according to NISIMS, the majority of which are less than one acre in size. The Lime Hill area in the far northern region of the Vale District has the highest concentration of invasive plants in Special Status plant sites, with over 400 infested acres. Yellow starthistle, medusahead rye, and Scotch thistle account for the majority of the infestations. Special Status plants at Lime Hill are a mix of monocots and broadleaves, making effective treatment difficult with the four herbicides currently available. The large number of acres infested at this site makes manual or mechanical methods impractical, and biocontrols are only available for yellow starthistle.

The District modeled areas at high risk for invasion of invasive annual grasses. There are millions of acres on the Vale District at risk. Approximately 10 percent of the Special Status plant sites have been visited in the last three years. Observations show there is some level of cheatgrass present at most of the sites. The density of cheatgrass is not reported, but is likely to increase if disturbances occur within these populations. It is unknown exactly how many acres of Special Status plant populations are affected by invasive annual grasses, but it is reasonable to expect that it is a threat to at least 10 percent of all populations, if not more. Under this alternative, there is no herbicide that is selective for invasive annual grasses. The non-selective glyphosate is the only herbicide available that is effective for the control of medusahead rye. If it were to be used within Special Status plant sites to control invasive annual grasses, there is a high risk that it would harm non-target species. Cheatgrass and ventenata cannot be treated under this alternative because they are not noxious weeds and would continue to spread.

Proposed and Revised Proposed Actions

Effects of invasive plants would be similar to the No Action Alternative except that the invasive plant annual rate of spread is predicted to decrease to 7 percent, compared to 12 percent with the No Action Alternative (see *Invasive Plants* section earlier in this Chapter). This reduced spread lowers the acreage of Special Status plant habitat that would be affected each year and reduces the risk of new invasive plant introductions into previously uninfested Special Status plant populations.

The ability to treat invasive annual grasses with more selective herbicides has the potential to reduce competition with Special Status plants with less adverse effects on non-target species. The herbicides available under these alternatives would make cooperative projects with adjacent landowners consistent across land management boundaries, resulting in better protection for Special Status plant communities both on and off BLM-administered lands.

Cumulative Effects

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

The reasonably foreseeable actions included in Table 3-2, *Ongoing and Foreseeable Actions on or near the Vale District Potentially Relating to Cumulative Effects* typically require project level botanical clearances to avoid adverse effects to Special Status plants. Where conflicts are identified, projects are modified or mitigation is implemented to insure the long-term viability of Special Status plant populations. For example, grazing exclosures have been established around Special Status plant populations where declines due to livestock use were identified. For juniper removal projects, Special Status plant sites are protected from project effects by buffers in which no juniper is removed immediately surrounding the Special Status plant population. Increases in abundance of cheatgrass following juniper removal have been documented (Bates 2000) and effective control measures available under the Proposed and Revised Proposed Actions would help limit the spread of cheatgrass and other invasive plants into these treated areas.

The actions proposed in the alternatives in combination with future foreseeable actions include Standard Operating Procedures, Mitigation Measures, and Project Design Features to protect Special Status plants. Thus, the cumulative effects would be negligible to minor for Special Status plants and would not trend sensitive species toward Federal listing.

Soil Resources

Issues

- How would the alternatives affect microbiotic soil crusts?
- Are there soils / conditions where particular herbicides included in the alternatives could be transported off-site?
- What are the effects of herbicides on soils?
- How would targeted grazing of invasive annual grasses affect soils?
- What soil properties or limitations could inhibit the establishment of proposed seedings?

Affected Environment

Biological Soil Crusts

Biological soil crusts are present throughout the Vale District. The most critical physical factor for biological soil crust establishment is the presence of fine-textured surface soils such as silts, silt loams, and non-shrink / swell clays (USDI 2001). Dominant shrub type and herbaceous plant density and form also contribute to crust establishment. The District is dominated by plant communities that have a high potential for biological soil crust cover. However, sites where the vegetation structure has been modified by invasive plants would have a reduced potential for biological crusts. Other factors that determine biological soil crust presence and development include, but are not limited to, annual precipitation, fire history and fire return interval, and current ecological condition.

The actual extent of biological soil crusts on the District is not mapped as no official inventory has been conducted. Distribution is a function of seven factors that interrelate with one another: elevation, soils and topography, disturbance, timing of precipitation, vascular plant community structure, ecological condition, and microhabitats (USDI 2001).

Soils

Soils in the Vale District vary dramatically from the semiarid northern Great Basin ecoregion in the south to forested and mountain and canyon systems in the north. The NRCS General Soil Map of the State of Oregon is the broadest level of mapping and is the source for the soil order data in Table 3-13 and Map 3-2.

The inconsistency of detailed surveys and the variety of survey methods limits the ability to consistently analyze soil information for the entire District[53]. Thus, for this analysis, the NRCS General Soil Map of the State of Oregon (map scale 1:250,000) will provide broad categories of soil order groupings and properties across the District. Draft preliminary data obtained from the NRCS provides properties at a more local level across the District. These are described to provide context for proposed invasive plant treatments.

[53] Detailed NRCS Order 3 soil surveys (map scales 1:20,000 to 1:63,360) have not been completed for the entire Vale District. Surveys are complete for most of the Baker Resource Area and a current Order 3 survey is underway in the southern portion of the Malheur Resource Area. Less detailed Order 4 surveys (map scales 1:63,360 to 1:250,000) were completed for a very small, agricultural area in Malheur County by the Oregon State Water Resources Board in 1969. Draft county level data, current up to 2015, was used where available.

Table 3-13. Soil Orders

Soil Order	Average Percent Organic Matter[1]	Average Percent Clay[1]	Average T Factor[2] (Range)	Average Wind Erosion Group Rating[3](Range)	Average Water Erosion Risk Rating K Factor[4] (L<M<H)	Average pH value (*range*)	Estimated Acres on Vale BLM Lands (% of total)
Aridisols	1.67	18.2	2.7 (1-5)	5.59 (1-8)	0.31 (M)	7.47 (6.8-1.5)	2,323,600 (47%)
Mollisols	2.92	21.0	2.9 (1-5)	6.46 (1-8)	0.25 (M)	6.86 (5.4-9.0)	2,052,360 (42%)
Entisols	2.23	18.5	4.4 (2-5)	4.95 (3-8)	0.31 (M)	7.63 (5.1-9.0)	532,600 (11%)
Inceptisols	6.14	21.7	3.0 (2-5)	6.8 (4.1-8)	0.22 (M)	5.88 (4.5-8.8)	11,080 (<1 %)
Andisols	6.04	16.9	3.0 (2-5)	5.69 (2-7)	0.22 (M)	5.72 (4.4-7.3)	9,650 (<1 %)
Alfisols	3.37	15.6	3.3 (3-5)	4.85 (3-7)	0.18 (L)	6.02 (5.9-7.0)	50 (<1 %)

1. Average Organic Material and Clay contents derived from A horizon for all soils within the order, not the entire profile
2. T Factor: Tolerable amount of soil loss (tons per acre per year) prior to reduced productivity
3. Wind Erosion Groups rate the tons per acre soil loss potential for wind erosion on 70 percent-plus unvegetated soil. Ratings are: 1 = 160- 310 per tons / acre / year; 2 = 134 tons; 3 and 4= 86 tons; 5 = 56 tons, 6 = 48 tons; 7 = 38 tons; and, 8=0 tons (USDA 1999)
4. K Factor Erosion Risk Rating: Low- 0.05 to 0.2, Medium 0.21 to 0.40, High 0.41+. Erosion factor K appears in the Universal Soil Loss Equation (Wischmeier and Smith 1978) as a relative index of susceptibility of bare cultivated soil to particle detachment and transport by rainfall.
(Data derived from USDA 2009)

Three soil orders dominate the Vale District:

Aridisols are soils that have developed under low moisture regimes. Aboveground vegetation is sparse (e.g. sagebrush); thus organic matter accumulations are low (less than 2 percent), and the ability of these soils to filter, store and process herbicides is limited to the upper soil layers. Herbicide degradation by sunlight (photo degradation) would be high but biological degradation would be low unless adequate moisture for processing by organisms was present.

Mollisols are productive soils rich in organic matter from the dense root systems of perennial grasses. Their origin from windblown or weathered basalt parent materials allows some to be prone to wind erosion if not stabilized by growing vegetation. Their high organic matter content binds herbicides and provides degradation by soil organisms, helping reduce the risk of groundwater contamination.

Entisols occur in areas of recently deposited parent materials or in areas where erosion or deposition rates are faster than the rate of soil development, such as dunes, steep slopes, and flood plains. These soils are sandy in all layers, and are subject to wind erosion if vegetation is lacking.

Further information about Alfisols, Andisols, and Inceptisols can be found in the Oregon FEIS (USDI 2010a:174-188).

Organic matter

Table 3-14. Soil Composition - Organic Matter

Organic Matter in upper 6 inches	Acres
Not Rated by NRCS	2,624,846
Less than or equal to 1%	210,055
Greater than 1% but less or equal to than 2.5%	1,958,164
Greater than 2.5 % but less or equal to 4.0%	143,815
Greater than 4.0%	108,062
Total	*5,044,942*

On any soil, the amount of organic matter is key to maintaining soil structure and function, allowing water and air to infiltrate to low depths, and providing a source of energy to microbial communities. Many herbicides readily bind to organic matter. Organic matter levels greater than 2.5 to 3 percent may tie up soil-applied herbicides prior to them being delivered to the plant, decreasing the effectiveness. Some labels recommend increasing the amount of herbicide to the maximum rate in these situations. Table 3-14 below lists the acres of soil organic material composition on the District. Approximately 251,000 acres currently mapped by the NRCS have organic matter levels greater than 2.5 percent. Soils with less than 1 percent of organic matter in the top 6 inches of soil might benefit from less than recommended levels of herbicide applied and still achieve adequate results.

Soil composition

Table 3-15. Soil Composition - Clay Content

Clay Content in upper 6 inches	Acres
Not Rated by NRCS	2,627,944
Less than 25%	2,131,430
Greater than or equal to 25.0%	285,568
Total	*5,044,942*

Clayey soils have more surface area per volume and provide a greater number of binding sites for herbicides and water, supporting herbicide breakdown by microorganisms. However, as the percentage of clay in a given soil increases, the potential for compaction and runoff also increases. If the soil is nearly all clay, seasonal drying and wetting can produce wide, deep cracks in the soil. Herbicides can end up deep into the soil and not necessarily in contact with the invasive plants that they are intended to remove. If organic matter is incorporated into a soil, it provides some measure of protection from compaction. Thus, the risk of compaction is higher on Mollisols when compared to Inceptisols. Of the currently mapped NRCS acres, there are 285,568 acres (6 percent) of the Vale District where the clay content is higher than 25 percent (see Table 3-15). Overall, the Vale District soil types are silty clays and silty loams. These soils have other properties that enhance their ability to process, buffer and bind herbicides and the influence of clay content is not as overwhelming as in other areas.

Table 3-16. Soil Composition - Sand Content

Sand Content in upper 6 inches	Acres
Not Rated by NRCS	2,628,343
Less than 50%	1,878,438
Greater than or equal to 50.0%	538,161
Total	*5,044,942*

Sandy soils generally have high infiltration rates that potentially can move herbicides deep into the ground and potentially into the ground water table if it is high in the soil profile. Soils that are greater than 50 percent sand are considered sandy in texture and are most able to exhibit this trend. For the Vale District, approximately 11 percent of the soils that are currently mapped by the NRCS have 50 percent or greater sand content (Table 3-16).

pH

Table 3-17. Soil pH by Category

pH (upper 6 inches of soil)		Acres
Not Rated by NRCS		2,664,468
Strongly Acid	(5.1 - 5.5)	1,888
Moderately Acid	(5.6 - 6.0)	6,208
Slightly Acid	(6.1 - 6.5)	38,541
Neutral	(6.6 - 7.3)	997,109
Slightly Alkaline	(7.4 - 7.8)	1,205,894
Moderately to Strongly Alkaline	(7.9 - 8.8)	115,955
Very Strongly Alkaline	(9.1 - 10.1)	14,878
Total		*5,044,942*

A final important parameter that affects the fate of herbicides in soil is the pH of the soil. Some herbicides bind differently when the environment is acid or alkaline. For example, imazapic is weakly adsorbed in high pH (alkaline) soil. Adsorption increases as the pH decreases (becomes acidic) and with increasing clay and organic matter content (Tu et al. 2001). The Vale District has a large percentage of the currently mapped NRCS soils as slightly alkaline, pH 7.4-7.8 (see Table 3-17). Approximately 27 percent of the soils are slightly or very strongly alkaline and only 0.3 percent of soils are strongly alkaline. Those considered slightly or strongly acid amount to less than 1 percent of the mapped soils. Soils considered neutral amount to 20 percent of those currently mapped. With nearly 53 percent of the District unmapped, the trend would appear to be neutral to slightly alkaline.

Influences Affecting Soils

For soil properties that specifically affect the buffering and potential degradation of proposed herbicides across the District, the more specific NRCS county data are used where available. There are approximately 2.3 million mapped acres of the District. The 2.7 million acres of unmapped soils are largely in the south and middle portions of the District. Future mapping of those areas will continue and additional data will be available annually to inform treatment plans.

Invasive Plants

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

Invasive plants can cause changes in soil properties such as pH, nutrient cycling and availability, and overall composition or activity of soil microbes. A reduction in soil nutrient levels makes it difficult for native plants to compete with invasive plants, and may affect the soil biotic community. In a simulated rainfall test, soil erosion more than doubled in rangeland areas dominated by spotted knapweed when compared to natural bunchgrass / forb grasslands. This is primarily due to noticeably lower infiltration rates and higher levels of bare ground on the knapweed-dominated site in comparison to un-infested areas (Lacey et al. 1989). See the *Invasive Plants* section for more details on the expected spread of invasive plants on the District.

Erosion

Vegetation is generally the most important factor in controlling erosion because it intercepts precipitation, reduces rainfall effect, restricts overland flow, and improves infiltration. However, in desert environments, biological soil crusts and soil armoring from wind exposure are equally if not more important for controlling such processes.

Within the District, wind is a primary cause of erosion. Wind can remove soil particles under certain conditions of low vegetative cover, dry soil, high percentage of fine clays, and sufficient wind velocity. The presence of natural vegetation and soil crusts on most rangelands is generally sufficient to keep wind erosion from becoming a serious problem. Reduction of vegetation, particularly by fire, leaves large expanses of bare soil prone to wind erosion. Erosion selectively removes organic matter and the finer-sized soil particles that store nutrients for plant use, leaving behind soil with a reduced capacity to supply nutrients (Brady and Weil 1999). Herbicides bound to soil particles can be transported off-site by blowing soils, adversely affecting non-target areas.

Soils are rated by NRCS for a tolerable amount of loss before productivity is reduced. For example, Aridisols and Mollisols can lose less than 3 tons of soil per acre per year before their long-term productivity would be reduced (see T Factor, Table 3-13, *Soil Orders*). The wind erosion group rating is reflective of soils that have lower tons of soil removed if 70 percent or more of their surface cover is removed. In particular, erosion groups 1 and 2 were of concern in the Oregon FEIS as these soils have the potential to move easily across the landscape under the influence of wind. Map 3-3 and Table 3-18 show wind erosion group ratings for the District.

Table 3-18. NRCS Wind Erosion Group Ratings for Vale District Lands

Wind Erosion Group[1]	**Acres**
High (1-2)	227,749
Moderate (3-4)	1,017,587
Low (4-8)	1,080,593
Not Rated (unmapped)	2,719,013
Total	*5,044,942*

1. See Table 3-13, *Soil Orders*, for more information about wind erosion group ratings.

Macro and Microorganisms

Macro and microorganisms are extremely important to proper functioning soil processes. Fungi and bacteria convert complex organic compounds (including herbicides) into simpler ones that can be used by other plants and organisms for growth. Insects, worms, arthropods, and even burrowing animals mix the upper organic matter into the lower soil level for processing by the microorganisms found between soil particles. Soil temperature, moisture levels, and type of vegetation all affect the presence, abundance, and activity of soil organisms (USDA 2004).

Treatments Planned Related to the Issues

Under all alternatives, the majority of herbicide treatments in Categories 1, 2, and 3 are on small sites, either spot sprayed from backpacks, or spot and boom sprayed from OHVs or on-road vehicles. Many of these applications would be made from roads and other previously disturbed surfaces, but some OHVs or foot traffic may occur in new areas with intact soil crusts. Manual and mechanical treatments and targeted grazing with sheep, goats, or cattle would also occur (see Table 2-11, *Estimated Treatment Acres*).

Under the Proposed and Revised Proposed Actions, Categories 4, 5, and 6 would be treated with herbicides (primarily imazapic (under the Proposed and Revised Proposed Actions) and rimsulfuron (under the Revised Proposed Action) applied aerially), targeted grazing or prescribed fire, up to 100,000 acres annually per treatment method, or seeding on less than 20,000 acres per project. The targeted grazing, herbicide application, prescribed fire, or seeding may occur on the same acres. However, given the complexity of each operation, the combined use on all proposed 100,000 acres in a single year is unlikely, and targeted grazing, seeding, and prescribed fire are limited to 300,000 acres over the life of the plan.

Standard Operating Procedures and Mitigation Measures Relevant to Effects

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

Mechanical and Manual Methods

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

Targeted Grazing

- 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 Methods

- Minimize use of herbicides that have high soil mobility, particularly in areas where soil properties increase the potential for mobility.
- Minimize treatments in areas where herbicide runoff is likely, such as steep slopes when heavy rainfall is expected.
- Do not apply granular herbicides on slopes of more than 15 percent where there is the possibility of runoff carrying the granules into non-target areas.
- To avoid the loss of finer-sized soil particles and avoid herbicide-treated soils blown or washed off site, avoid exposing large areas with soils having high wind erosion risk when a combination of dry soil and seasonal winds are expected. Mitigation Measures could include the use of selective herbicides to retain some vegetation on site; reseeding so cover is present before the windy or rainy season; staggering treatment of strips until stubble regrows enough to provide an acceptable filter strip; rescheduling

treatments away from the windy season; or, other measures to prevent wind or water erosion on these soil groups.

Project Design Feature Adopted for this Analysis

The following Project Design Feature would further reduce effects on soil resources:

- Review and consider updated soil survey information from on-going soil surveys prior to conducting projects in areas that are currently unmapped and apply appropriate Standard Operating Procedures and Mitigation Measures.

Environmental Consequences

Effects are sometimes described using ranges of potential effects or in specific qualitative terms, if appropriate. When effects are beneficial, it is so stated. The intensities of effects are described, where possible, using the following guidance:

Negligible:	The amount of soil loss or erosion, or changes in soil characteristics would be at or below the level of detection or at a very local scale.
Minor:	The amount of soil loss or erosion, or changes in soil characteristics would be small, as would the size of the area affected. If Project Design Features were needed to offset adverse effects, it would be relatively simple to implement and would likely be successful.

Spatial Scale

Local:	6th field watershed
Watershed:	5th field watershed
Widespread:	Subbasin-4th field watershed or larger

Temporal Scale

Short-term:	Anticipated effects occur within 0 to 5 years of project implementation.
Long-term:	Anticipated effects occur for longer than 5 years.

Effects of Treatment Methods

Treatment methods (both herbicide and non-herbicide methods) may cause compaction, displacement of upper surface layers, and erosion. Traffic on the surface, be it wheeled or tracked vehicles, animals, or human feet can cause compaction, soil disturbance and a reduction in lichen/moss cover and species richness of crusts. Bare or compacted soils can be colonized by invasive plants more readily than native plants, as invasive plants tend to be more adapted to establishing on such altered sites. Compaction in lower soil horizons than the surface also can prevent roots from growing through the soil or growing with reduced capacity. This lowers plant growth and productivity. Compaction decreases soil pore space and increases soil density, decreasing productivity and reducing the ability of the soil to infiltrate water. Without the infiltration of water into the soil, soil organisms or water bound to soil particles cannot interact with the herbicides to break them down. Decreased infiltration means more water running across the surface, eroding soils (particularly those particles loosened by raindrop impact) and potentially moving herbicides off site. Resistance to disturbance generally decreases as the organisms that make up the soil crust become more morphologically complex (USDI 2001).

Non-Herbicide Treatments

Manual methods such as pulling or digging to control invasive plants have negligible adverse effects on soil resources. Manually digging and pulling invasive plants is expected to result in localized short-term ground disturbance primarily due to foot traffic and tool use. Adverse effects of manual invasive plant treatments are more likely to be realized on biological soil crust communities. Pulling and digging invasive plants can result in trampling and dislodging sensitive biological soil crusts, particularly when the crusts are dry.

Mechanical methods, including the use of weed whackers, chainsaws, and mowers, would be expected to result in negligible to minor, localized, short to long-term adverse effects to soil resources. With respect to biological soil crusts, mechanical methods involving the use of heavy equipment, such as mowers, off-highway vehicles, blading, disking and rangeland drill seeding, have the potential to cause localized, short-term adverse effects because of track or wheeled equipment needed to move the equipment, but these effects could be minimized through the application of Standard Operating Procedures and Mitigation Measures. Blading or disking may initially disturb crust presence and provide exposed areas for erosion to occur. In the long-term, removal of the invasive plants would improve local biological soil crust habitat by reducing invasive plant cover effects and their limitations on the crusts. As seeded plants become established and spread out their canopies and root masses, the potential for erosion would decrease.

Effects to soils and biological soil crusts by *targeted grazing* would vary by season of use, length of grazing period, and species and number of grazing animals. Crusts on all soil types are least vulnerable to disturbance when soils are frozen or snow covered. Biological crusts on sandy soils are less susceptible to disturbance when moist or wet; on clay soils, when crusts are dry (USDI 2001). Prolonged or concentrated grazing on wet fine-textured soils (silty clays and loams) can cause soil compaction, shearing, and post-holing. If grazing is extensive, changes in soil functions and site hydrology can occur, leading to excessive runoff and erosion. Dry-season grazing would avoid potential damage to these fine textured soils. Targeted grazing in the (drier) fall would not elevate the compaction risk but spring grazing could.

The introduction of *biological control agents* can affect soil properties, biota, and soil processes. Many biological control species will increase nitrogen inputs into the soil and interact with other soil biota. Improved soil aggregation and heightened carbon accumulation can also occur from increased organic matter levels. Generally release of biological control agents are a beneficial or negligible effect to soil resources and biological soil crusts.

Low-intensity *prescribed fires* have minimal adverse effects on soil properties due to heating in the upper most layers. Typically, broadcast burns have a slight short-term beneficial effect of increasing available nutrients to vegetation, with a slight adverse effect three to five years post burning, due to decreases in nitrogen. Johansen et al. (1993) observed that biological soil crusts structural matrix was left intact following low-intensity fire, indicating that a lightly burned crust still functions to maintain soil stability against erosive forces for both vascular plants and biological soil crusts during the recovery period. A recent study explored the effects of a controlled burn on crusts at a site in the foothills of the Onaqui Mountains in Utah. The results indicate that low-intensity fire has few long-term adverse effects. The recovery of soil crusts in a good rain year after a light fire was fairly quick (FSB 2009).

Seeding treatments: Some soil compaction and displacement may occur from the equipment used to pull a rangeland drill or other implement used to bury the seed. The greatest amount of disturbance occurs from the rangeland drill. The drill creates a shallow furrow, deposits seed and uses chains to drag soil to cover the seed. This operation will break the protective covering of the soil, most likely the armor layer created by erosion of fine materials away or from biological soil crusts growing on the soil surface. A study conducted by Von Reis (2015) discusses the effects on biological crusts in areas burned by fire, then sprayed with herbicides, and then planted with a rangeland drill. Von Reis calculated a 21 times greater chance that crusts would be absent on transects where there was exposure to a rangeland drill. Other seed distribution methods (aerial broadcast or harrowing) tend to have less disturbance, but seeding success using a rangeland drill benefits from some soil disturbance to allow the seed to establish in the soil.

Herbicide Treatments

Biological Soil Crusts

Currently, there is very little information on the effects of herbicides on biological soil crusts. One study addressed the effects of glyphosate on moss-dominated biological soil crusts and determined there were no short-term adverse effects on bryophyte cover (Youtie et al. 1999). Additionally, there is little information on repeated applications or long-term effects from glyphosate or other herbicides (Youtie et al. 1999). Various laboratory studies have been done on individual algae species present in soil crusts; however, only a handful of the studies focused on herbicides that the BLM is proposing, and of those, results were variable. Beneficial, neutral, and adverse effects were attributed to 2,4-D; neutral and adverse effects were attributed to picloram; and, beneficial effects were attributed to 2,4-D + picloram (Metting 1981). Metting cites several authors who caution against extrapolating this controlled laboratory studies information to the field. In a recent study, a measurable association was found between glyphosate and lower frequencies of biological soil crusts (0.03 compared to a control mean of 0.15). The same study found no evidence for association between picloram (0.16) or imazapic (0.11) and diminished biological soil crusts (Von Ries 2015).

Soils

Macro and Microorganisms: Herbicides affect few soil organisms directly (USDA 2004). However, there is only limited research on the toxicity of many herbicides to most soil organisms. Of the 17 herbicides proposed for use, three (chlorsulfuron, picloram, and metsulfuron methyl) have some adverse effect on soil organisms, generally reducing but not eliminating local populations for a limited period. Eight herbicides (2,4-D, clopyralid, dicamba, fluridone, glyphosate, rimsulfuron, sulfometuron methyl, and triclopyr) have no or slight adverse effect on soil organisms, with some organisms showing increases after herbicide treatments. Very little if any study of soil organisms has been conducted on six herbicides (aminopyralid, diflufenzopyr, fluroxypyr, hexazinone, imazapic, and imazapyr). Of the studies that have been conducted, effects have been demonstrated but at application rates many times higher than the typical rates proposed for use on BLM-administered lands, or the decrease in soil organisms is temporary. Populations of soil organisms have increased in some situations.

If herbicides reduce macro and microorganisms, herbicides would persist in the soil longer as other means (e.g., hydrolysis) may become the primary breakdown mechanism. If invasive plants have changed the soil chemical or moisture contents in a manner that reduces the variety or overall amount of these organisms, herbicide persistence may be extended. Finally, disturbance from mechanical treatments or animal traffic particularly on wet soils could compact the surface layer to a point that these organisms would lose their ability to degrade the applied herbicides.

Fate of Herbicides in Soils: The ability of soils to hold and break down herbicides is affected by soil biological processes (organisms and plant uptake), physical parameters (adsorption, photo degradation, volatilization, hydrolysis, and leaching), and physical parameters (climate and vegetation cover). Characteristics of the 17 herbicides that influence the effectiveness of these parameters and processes are shown on Table 3-19.

The ability of a soil to bind to an herbicide (while it breaks down) is based on its adsorption affinity. Herbicides vary in how tightly they are adsorbed to soil particles. K_{oc} measures the affinity for herbicides to “sorb” to organic carbon. The higher the K_{oc} value, the stronger the tendency for the herbicide to attach to, and potentially move with, the soil. The K_{oc} value listed in Table 3-19 below is a measure of the number of milliliters of the individual herbicide that can be bound by one gram of organic matter. Herbicide K_{oc} values greater than 1,000 ml / g indicate strong adsorption to soil whereas low K_{oc} values (less than 500) tend to allow movement with water more so than movement adsorbed to sediment. Off-site movement is also affected by the formulation of the herbicide, soil properties, rate and method of application, frequency and timing of rainfall, and depth to ground water.

Table 3-19. Fate of Herbicides in Soil

Herbicide	Soil Half-life (days)	Soil Adsorption (K_{oc})[1]	Fate in Environment (Persistence Rating[2] based on half-life)	SPISP II[3] Ratings (potential)		
				PLP[4] (Leaching)	PSRP[5] (Solution Runoff)	PARP[6] (Adsorbed Particle Runoff)
Herbicides available under all alternatives						
2,4-D	10	20 m / g (acid / salt) 100 mL / g (ester)	Rapid microbial degradation within 1-4 weeks. (Non-Persistent)	Inter mediate	Inter mediate	Inter mediate
Dicamba	14	2 mL / g	Mobile in soil but is easily degraded by microbes. (Non-Persistent)	High	Inter mediate	Low
Glyphosate	47	24,000 mL / g	Tightly adsorbed to soil and rapidly degraded by microbes, thus no soil activity. (Moderately Persistent)	Very Low	Inter mediate	Low
Picloram	20-300	16 mL / g	Very slow microbial degradation and some photo-decomposition. Picloram is persistent for a year or more. (Moderate to Persistent)	High	High	Inter mediate
Herbicides available in limited areas under the No Action Alternative and District-wide under the Proposed and Revised Proposed Actions						
Chlorsulfuron	40	40 mL / g	Relatively rapid degradation by microbial and chemical actions, trace amounts have extreme bioactivity. (Moderately Persistent)	High	High	Inter mediate
Clopyralid	40	6 mL / g, ranges to 60 mL / g	Biodegradation is rapid in soil, reducing the potential for leaching or runoff. Degraded primarily by microbial metabolism. It is resistant to degradation by sunlight, hydrolysis, or other chemical degradation. It is water-soluble, does not bind strongly with soils, and has the potential to be highly mobile in soils, especially sandy soil. It is not highly volatile. Possible release of herbicide from decaying plants with uptake by other plants. (Moderately Persistent)	High	Inter mediate	Low
Imazapic	120 to 140	137 mL / g	Most imazapic is lost through bio-degradation. Sorption to soil increases with decreasing pH and increasing organic matter and clay content. (Persistent)	Inter mediate	Inter mediate	Low
Herbicides available under the Proposed and Revised Proposed Actions						
Diflufenzopyr	2 to 14	18 to 156 mL / g (aver. 87)	Biodegradation, photo degradation, and hydrolysis are the primary mechanisms that remove diflufenzopyr from soil. (Non-Persistent)	Low	Inter mediate	Low
Fluridone	21	1,000 mL / g	Fluridone adsorption to soil increases with clay content, organic matter content, cation exchange capacity, surface area, and decreasing pH. (Non-Persistent)	Low	Inter mediate	Inter mediate

Herbicide	Soil Half-life (days)	Soil Adsorption (K_{oc})[1]	Fate in Environment (Persistence Rating[2] based on half-life)	SPISP II[3] Ratings (potential)		
				PLP[4] (Leaching)	PSRP[5] (Solution Runoff)	PARP[6] (Adsorbed Particle Runoff)
Hexazinone	90	54 mL / g	Soil organic matter content does not affect adsorption. Relatively low affinity for soil particles and dissolves in soil water. Biodegradation occurs as the plant uptakes it, and ties it up or degrades it. (Moderate to Persistent)	High	High	Inter mediate
Imazapyr	25 to 141	100 mL / g	Adsorption is affected by aluminum and iron in soil more than by clay and organic matter, subject to microbial degradation except in cool temperatures. (Moderate to Persistent)	High	High	Inter mediate
Metsulfuron methyl	30	35 mL / g	Hydrolysis and microbial degradation, with the latter being the only major pathway in alkaline soils. (Non-Persistent)	High	High	Inter mediate
Sulfometuron methyl	20	78 mL / g	Relatively rapid microbial and chemical degradation. However trace amounts can be have an impact due to extreme bioactivity. (Non-Persistent)	Inter mediate	High	Low
Triclopyr	46	20 mL / g (salt) 780 mL / g (ester)	Degradation occurs primarily through microbial metabolism, but photolysis and hydrolysis can be important. As plants die, release of triclopyr to the soil can occur and it can then be taken up by other plants. (Moderately Persistent)	High	High	Inter mediate
Herbicides available under the Revised Proposed Action						
Aminopyralid	32 to 533	1.05 to 24.3 mL/g	Broken down in the soil by microbes and sunlight, with an average half-life of 34.5 days. The main mode of degradation in the environment is expected to be microbial metabolism in soils. Microbial metabolism can be slow in some soils, especially at lower soil depths and appears to be very slow (half-lives well above a year) in aquatic systems. Persistent in plant materials and the manure of animals that have eaten plant materials treated with this herbicide. Aminopyralid is weakly sorbed to soil, and therefore is unlikely to be transported off-site in large amounts on wind-blown soil. Because of its moderate persistence, high mobility, and low soil adsorption, aminopyralid has a high potential for surface water runoff. Leaching of aminopyralid has not been documented at levels below 30 centimeters. (Non-Persistent to Persistent, depending on soil type)	Low	Inter mediate	Inter mediate
Fluroxypyr	7 to 23	50 to 136 mL/g	Mobile to very mobile in soil, but its movement is reduced by its quick initial microbial degradation. Fluroxypyr has two major metabolites: a pyridine and a methoxypyridine. Fluroxypyr degrades first to the pyridine and then to the methoxypyridine, which is persistent in soil.	Inter mediate	High	Low

Herbicide	Soil Half-life (days)	Soil Adsorption (K_{oc})[1]	Fate in Environment (Persistence Rating[2] based on half-life)	SPISP II[3] Ratings (potential)		
				PLP[4] (Leaching)	PSRP[5] (Solution Runoff)	PARP[6] (Adsorbed Particle Runoff)
			This second degradate has a high tendency to adsorb to soil, and is slowly degraded in place by microbial degradation and volatilization. In field studies submitted to the EPA, fluroxypyr was generally not found below a soil depth of 6 inches; this may vary depending on soil type (may be found deeper in coarser soils) and amount of rainfall. (Not Persistent)			
Rimsulfuron	5 to 40	19 to 74 mL/g	Breaks down rapidly in soil, with aerobic metabolism the primary route of degradation. Its mobility in soil ranges from moderate in clay and silt loams to very mobile in sandy loams. Its tendency to adsorb to soil varies by soil type, and is greatest in soils with high organic matter or clay content. Rimsulfuron has a low risk of leaching to groundwater. (Not Persistent to Moderately Persistent)	Inter mediate	Inter mediate	Low

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

Effects by Alternative

No Action Alternative

Biological Soil Crusts

This alternative would primarily treat documented invasive plant sites (Category 1) and their spread (Category 2). These treatments are often along roads or other disturbed areas, or along riparian areas that are pathways for invasive plant spread. Biological soil crusts are likely already disrupted in these areas and it is expected that if disturbance continues, crusts would stay in early-successional stages (i.e., cyanobacteria only) (USDI 2001:21). In those fire areas that are currently treated or will undergo treatment (Category 4) under this alternative in the near future, the likelihood of past disturbance is much less and those crusts would not be heavily disturbed and should not be set back to the same extent. Given that funding has generally limited treatments to approximately 3,000 acres annually, and most treatments are spot treatments, the adverse effects to biological soil crusts would be extremely low in intensity, local for spatial extent, and short-term. Therefore, the magnitude of the adverse effects would be negligible at the watershed level and negligible at the local level.

Soils

Erosion and Potential Transport of Herbicides off Site: Of the herbicides included in this alternative, only imazapic (available for use in limited areas) has the potential for application over large areas. Estimated treatment area for imazapic under the No Action Alternative is 40,896 acres over the life of the EA. Standard Operating Procedures reduce the potential for soil erosion from these treatment areas. The smaller extents common to the other herbicide applications are not likely to contribute to wind or water erosion and subsequent transport of herbicides off site. Few known sites are on highly erodible wind sites. Therefore, adverse effects from erosion or herbicide transport off-site are unlikely.

Soil Properties Effects on Herbicide Transport Off Site: Of the herbicides included in the No Action Alternative only three (glyphosate, imazapic [available for use in limited areas], and picloram) are generally tightly adsorbed to soil. Glyphosate is rapidly degraded by microbes, and imazapic adsorption is decreased by alkaline soils that are common on the Vale District. Picloram and imazapic can be persistent in the soil, which is very helpful if the objective is to treat the following years' emerging seedlings but increases the risk of movement offsite. Approximately 126,503 acres would be treated with picloram and imazapic; however, the application of imazapic is tied to emergency stabilization and rehabilitation funding that is generally only available the first two of three years after the fire. Thus, over the life of the EA there would be a higher risk that herbicides would be transported off site in the year following application. Therefore, the adverse effects for herbicide transport would be readily apparent at the local level at the beginning of application but reduce to negligible thereafter, as herbicide effectiveness declines.

Herbicide Effects on Soil Function: Of the herbicides included in the No Action Alternative, two herbicides, (chlorsulfuron [available for use in limited areas] and picloram) generally reduce but do not eliminate local populations of soil microorganisms for a few days up to three weeks (USDI 2010a: 178). The combined estimated treatment area is approximately 106,000 acres or 0.01 percent of BLM-administered lands on the District. This extent and location of coverage for the duration of the life of this EA produces a negligible effect on soil function.

Targeted Grazing on Soil Function: Targeted grazing by sheep, goats, and cattle over approximately 829 acres over the life of the plan within Category 1 is expected to contribute a negligible effect on soil function when compared to the total District acreage. The additional 600 acres per year of cattle grazing in Category 5 and 6 could potentially equal 9,000 acres over 15 years. The distribution and low number of acres compared to the District in total makes this action a negligible effect on soil functions.

Proposed Action

Biological Soil Crusts

Non-herbicide treatments could affect two percent of the District each year up to a maximum of six percent over the life of the plan in Categories 5 and 6. The expected recovery time after disturbance could be greater than 50 years for mature crusts to reestablish (USDI 2001:56-58). The magnitude of the effect to biological soil crusts would be negligible at the local and District level if one light disturbance event occurred (i.e. a prescribed fire).

Some amount of soil disturbance to biological soil crusts occurs during treatments. Combining multiple treatment methods on the same acres may cause long-term adverse effects at the local scale. Changes in biological soil crust characteristics may be apparent, and soil productivity may change. For example, this would occur where the combined treatments would remove the vegetative cover with the use of fire or grazing, and a mechanical seeding of a future cover crop would take place. However, the effects of the combined treatments would be negligible at the District level.

Dominance by annual invasive plants (such as cheatgrass) prevents the return of well-developed biological crusts (USDI 2001:66). Thus, the treatments on heavily infested areas like those in Category 6 may not affect biological crusts since the crusts have already been disturbed. Recovery of biological crusts harmed by invasive annual grasses can be facilitated by use of minimal till or no-till drills or aerial seeding methods that minimize soil surface disturbance and compressional effects.

Herbicide treatments acres are similar to the No Action Alternative; however, the individual herbicides used are different. The use of 2,4-D, glyphosate, and picloram are greatly reduced as other herbicides are available. Effects from glyphosate would be minimal as few acres are proposed for use. Thus, it is expected that only the imazapic treated areas (approximately 33 percent of the District) would be affected. A study conducted on the aerial application of imazapic at Hanford Reservation and the Hanford National Monument showed that mosses were negatively affected to a slight degree but biological crusts were not. Aerial methods drastically reduce the disturbance to biological soil crusts. If the use of ground based applications are employed then the disturbance factor is increased. It can only be assumed that applying herbicides using ground-based equipment would be a similar effect to other non-herbicide treatments. Under the Proposed Action, imazapic would be primarily applied aerially within Categories 5 and 6 in areas dominated by annual invasive grasses. Therefore, application of herbicides would not adversely affect biological crusts at either the local or District level.

<u>Soils</u>

Erosion and Potential Transport of Herbicides off Site: Of the herbicides included in this alternative, clopyralid, glyphosate, hexazinone, imazapic, imazapyr, picloram and triclopyr are rated as moderate or persistent based on half-life. The potential for application in this alternative is approximately 153,854 acres in Category 1 over 15 years. The smaller extents of disturbance common to these herbicide applications are not likely to contribute to wind or water erosion and subsequent transport of herbicides off site. The current distribution of known sites has few locations on highly erodible wind sites. The potential for adverse effects is negligible at the local scale.

The total treatment area for imazapic under the Proposed Action could be 1.5 million acres over the 15-year life of the EA. Glyphosate and picloram would be applied to 64,166 acres. These herbicides bind tightly to soil particles and potentially could be transported off site with wind or water. Glyphosate is considered moderately persistent (see Table 3-19, *Fate of Herbicides in Soil*) as it has a half-life of greater than 30 days. Picloram and imazapic can be persistent in the soil, which helps treat the following years' emerging seedlings, but increases the risk of movement offsite. Imazapic adsorption decreases in alkaline soil conditions, which are common on the Vale District. This may tend to keep imazapic from binding as well to the soil. Imazapic is applied in the fall, and wind conditions across the Vale District are such that transport of fine surface particles may occur during the winter and spring seasons on larger sized acreages. Thus, over the life of the EA, there would be a higher risk in the first year of application, but little to no risk of transport during the second winter. Therefore, the adverse effects for these three herbicides to transport would be readily apparent at the local level at the beginning of application but reduce to negligible thereafter, as degradation would ensue. Standard Operating Procedures reduce the potential for soil erosion from these treatment areas but cannot eliminate the risk due to unforeseen climatic events.

Transport of herbicides rated moderately persistent to persistent, with a high Pesticide Solution Runoff Potential would have the potential to move in surface runoff in the solution phase (Table 3-19, *Fate of Herbicides in Soil*). Most of the herbicides applied in the early spring or summer would undergo degradation (those with half-lives near 40 days) prior to the onset of continued fall rains that may produce rilling or surface erosion. Those that have longer half-lives could be subject to infrequent thunderstorms and increased runoff at a local scale. Standard Operating Procedures would prevent runoff in Categories 5 and 6 given normal precipitation patterns. Thus, the risk for adverse transport of herbicides would be negligible at the District level, but may be apparent under the right conditions (soil movement offsite would be observable as rill erosion or some deposition of soil downslope) at the local level. This could be a risk in the first year of application, but there is little to no risk of transport during the second. Therefore, the adverse effects of large applications of imazapic would be observable at the local level immediately after the application but reduce to negligible thereafter, as degradation would ensue.

Herbicide Effects on Soil Function: Three herbicides, picloram, chlorsulfuron, and metsulfuron methyl generally reduce but do not eliminate local populations of soil microorganisms for a few days, up to three weeks (USDI 2010a: 178). The combined treatment area (over the life of the plan) is less than 104,000 acres, less than 0.01 percent of BLM-administered lands on the District. This extent and location of coverage for the duration of the life of this EA, is considered a negligible effect on soil function.

Targeted Grazing on Soil Function: Targeted grazing may be an effective tool to control cheatgrass and medusahead rye. Heavy repeated grazing for two or more years will reduce plant density, size, and seed production. Grazing must be closely monitored to avoid damage to desirable perennial plant species. Control of cheatgrass can be very effective when livestock are intensively managed and grazing occurs while plants are palatable before they mature. Grazing can also be used in conjunction with mechanical methods, herbicides, and controlled burning.

Targeted grazing by sheep, goats, and cattle on 2,551 acres over the life of the plan within Category 1 would negligibly affect soil function when compared to the total District acreage. There are approximately 4 million acres of grazing allotments across the District. The additional potential for 300,000 acres of targeted grazing over 15 years in Category 5 and 6 would be equal to 8 percent of the total grazing acres on the District. Grazing would occur predominately in proposed pastures in the southern two-thirds of the District where complete soil data is currently lacking. (An Order 3 survey is underway in the southern portion of the Malheur Resource Area. Information from this survey would be factored into future targeted grazing projects as part of the Annual Treatment Plan.)

From available NRCS Draft data, soil compaction would be the greatest where soil moisture content is between 15-25 percent, depending on soil texture. Kreuger et al. (2002) found that maximum compaction occurs between 20 to 30 percent moisture (depending on soil type) and field capacity. Grazing on soils with less than 15-25 percent moisture reduces the risk of compaction during grazing. Compaction by cattle would be shallow and generally confined to the upper horizons (usually the top 2 inches of soil, but occasionally as deep as 12 inches) (Greenwood and McKenzie 2001).

The silty clay and silty loam surface soil textures distributed over the Category 5 and 6 areas are not resistant to compaction, and grazing in the wetter season would compact the upper surfaces. Where compaction is a problem, the best time to graze would be when the ground freezes. Some freezing may occur in the extended fall period, but not the spring. Shallow compaction can be alleviated with freezing and thawing over 2 to 5 years following a targeted grazing treatment.

Cattle grazing late into the season could potentially increase foraging of undesirable species (such as invasive plants) and mimic the normal pattern of native (deer and elk) herbivore use that provides grazing in the higher elevations in the fall and later winter use in the lower elevations. Such use would potentially place animals on drier soils and limit compaction and adverse effects in the months of September and October, but not November. Grazing during periods of rain (April and May) would have greater effects, as these months tend to be wet.

Through the application of the Standard Operating Procedures, Mitigation Measures and Project Design Features, soil compaction can be minimized and natural processes may reduce compaction in the upper horizons. Moving the cattle across the allotment would be necessary to prevent adverse compaction during the spring season. Rest and pasture rotation would increase the recovery of compacted surfaces and increase the success of seedings, thereby reducing the spread of invasive and noxious weeds. Targeted grazing can have a positive effect on invasive plant and seed removal. Targeted grazing would have a minor adverse effect over the long term due to its limited scope over the life of the plan.

Soil Properties or Limitations for establishing seedings: Seeding is generally successful when the alignment of the sowing time and onset of moisture are in sync. Most soils on the Vale District have surface textures that are capable of infiltration and storage of large quantities of water. These soils have gravelly or rocky surfaces with an underlying silt loam layer. Seeding treatments can be conducted aerially, broadcast, or with a rangeland drill. The lack of precipitation in the fall or reduced rainfall is a common cause of failure for broadcast seedings. The rangeland drill was developed specifically for arid conditions to enhance the soil and seed contact to increase the likelihood of germination and to reduce the waste of seed. Seeding by rangeland drill could occur in Categories 4, 5 or 6 and in rare instances on small sites (100 acres or less) of medusahead rye in Categories 1 and 2.

The NRCS provides two ratings that provide guidance for when rangeland drills could be used for seeding. Rangeland drill suitability ratings represent the relative physical limitations of slope, rock fragments, clay or sand content, the presence of ponding or high water tables in relation to effective use of a rangeland drill. The rangeland seeding suitability ratings represent the effects of soil and climatic factors upon the probability of establishing a successful seeding. Low precipitation, shallow rooting depth, excess salts reduce the probability of establishing a successful seeding. In areas having no soils data, a field inspection would occur to determine suitability of seeding prior to project implementation (see Table 3-20).

Table 3-20. Suitability Rankings Applicable to Rangeland Drill Use

NRCS Rating	Percent of Vale District Category 5 and 6 Areas			
	Not Mapped	Well-Suited	Moderately-Suited	Poorly Suited
Rangeland drill suitability rating	56%	18%	3%	29%
Rangeland seed suitability	56%	2%	14%	28%

Revised Proposed Action

<u>*Biological Soil Crusts*</u>

Under the Revised Proposed Action, effects would be similar to those described under the Proposed Action.

<u>*Soils*</u>

Erosion and Potential Transport of Herbicides off Site: In addition to the herbicides and effects described under the Proposed Action, aminopyralid and rimsulfuron are rated as moderately persistent or persistent (respectively) based on half-life in soils. The potential for application of moderately persistent to persistent herbicides in this alternative is approximately 156,600 acres in Category 1 over 15 years (slightly more than the Proposed Action). Effects would be similar to those described under the Proposed Action for Categories 1, 2, and 3. Fluroxypyr is rated as not persistent and treatment is expected to include approximately 3,900 acres. Thus, no change in effects compared to the Proposed Action is expected.

In Categories 4, 5, and 6, invasive annual grasses would be treated with imazapic or rimsulfuron (as opposed to only imazapic under the Proposed Action). Rimsulfuron is rated as not persistent to moderately persistent (half-life of 5 to 40 days) and imazapic is rated as persistent (half-life of 120-140 days). Use of rimsulfuron would reduce the use of imazapic (from a maximum of 100,000 acres down to 50,000 acres annually under Categories 5 and 6). Standard Operating Procedures would prevent runoff given normal precipitation patterns; given that rimsulfuron binds well to organic matter and clay soils, the potential for adverse effects would be negligible, when compared to the Proposed Action. Similarly, the binding of the herbicide to organic matter and clay type soils are those not generally prone to wind erosion and transport and the adverse effect is expected to be negligible.

Herbicide Effects on Soil Function: The three additional herbicides are not known to adversely affect local populations of soil microorganisms. The addition of these herbicides would cause the use of 2,4-D, dicamba, glyphosate, and picloram to drop. Most noticeably, picloram use (which does affect soil microorganisms) would decrease by 76 percent when compared to the No Action, and 64 percent when compared to the Proposed Action. The use of chlorsulfuron is 34 percent lower when compared to the Proposed Action. There would be a minor beneficial effect to soils function associated with decreased use of herbicides that reduce the presence of soil microorganisms (picloram, chlorsulfuron, and metsulfuron methyl).

Other effects, including the benefits of controlling invasive plants, would remain as described under the Proposed Action.

Effects of Invasive Plant Control

Biological Soil Crusts

Overall, beneficial effects to biological soil crusts would occur with the successful management of invasive annual grasses. These grasses occupy the same interspaces historically filled by biological soil crusts. With management of the spread of invasive annual grasses, the ecosystem functions performed by biological soil crusts would remain intact in areas protected from spread. In areas already affected by invasive annual grasses, treatments would allow biological soil crusts the opportunity over time to recover beyond the early successional stage of cyanobacteria to a mature crust containing algae, lichens, and mosses. These mature crusts provide the greatest protection of soil surfaces, increase the infiltration rate of water, and provide the most robust ecological functions.

Soils

Invasive plants can out-compete native vegetation and lead to increased soil exposure; resultant increased erosion would remove soil and nutrients (USDI 2010a: 185). Invasive plant infestations have been shown to increase soil erosion in comparison to soil occupied by native grass species (Lacey et al. 1989). By removing the invasive plants the normal soil protection processes, vegetation and soil armoring, are returned over time. This protection not only decreases erosion but also may increase soil moisture deeper in the soil. Invasive plants can directly deplete soil nutrients and water at higher rates or earlier in the growing season than native species (Olson 1999). Thus removing them from the watershed would provide the ecological balance for the native plant communities.

Cumulative Effects

Biological Soil Crusts

Several power line corridors are proposed for the northern portion of the District, with others in the Category 5 pastures. These areas are likely to remove biological crusts to provide service roads for future infrastructure management. In many locations, the new lines are an upgrade to carry more power through the existing or modified corridor, where biological soil crusts have already been removed. There will be continued restoration of burned lands that will disturb biological crusts to some degree, but improve ecological conditions over time. Fuel treatment projects reduce the potential of severe wildfires but may remove some biological crusts to provide bare earth for fuel breaks. Roadside fuel treatments have already disturbed these crusts in the past. Juniper removal has the potential to restore biological soil crusts as the soil altering plant is cut and disposed of. Other actions such as mining exploration or recreational developments are localized and can remove the crusts but are low in numbers.

Effects from invasive plant management would generally occur in areas where other activities have already created extensive ground disturbance and reduced crust cover. The cumulative effects of invasive plant treatments on biological soil crusts would generally be minor and occurrence would be either within treated areas or in associated areas such as travel ways that provide access. Mitigation Measures such as grazing areas when crusts are moist and can repair themselves if damaged, reduce the potential for adverse effects during herbicide application or grazing. Over time, treatments would reduce the spread of invasive plants to the benefit of the biological soil crust. Overall, all alternatives would help reduce adverse effects of invasive plants, provide desirable vegetation, and eventually support growth of biological soil crusts. Of the alternatives, the Revised Proposed Action is more disruptive to, but capable of increasing the extent, of biological soil crusts.

Soils

There are several ongoing projects associated with infrastructure development or fuel reduction to limit the spread or intensity of wildfire to preserve wildlife habitat that could degrade the productivity of the soil. First, as new corridors are built for power line upgrades or additions to the current electrical grid, these types of actions change the existing vegetation to one of road or managed corridor. In the case of fuel reduction projects, the soil may gain productivity especially where cut juniper is disposed of through prescribed fire. Increased water storage and the lack of allopathic residues from juniper on the surface of the soil greatly benefit the native plant community and the microorganisms within the soil. In the same way, the Proposed and Revised Proposed Actions strive to remove invasive plants and restore the native community and soil functions. Under the Proposed and Revised Proposed Actions, declines in soil productivity are directly associated with compaction of the soil surface and removal of the biological soil crusts.

Both prescribed fire and grazing can lead to the erosion of the soil and decreased productivity. The greatest potential adverse effect is erosion off bare ground after wildland fire, which is an unknown future effect. Rehabilitation efforts after a fire may introduce some short-term erosion, but the overall project goal for fire restoration is to provide desirable vegetation cover; thus reducing the adverse effects from erosion in the long-term. Restoration projects designed to reduce hazardous fuels, restore plant communities, or improve habitat may likewise cause some initial short-term erosion, but the extent of actual ground disturbance is negligible.

Standard Operating Procedures and Mitigation Measures may prevent or reduce soil productivity loss, and any degradation of soils from the herbicide applications proposed in this EA are negligible or comparable with other management activities. Soil productivity should increase over time as removal of invasive plants from the landscape and replacement of desired vegetation occurs.

Water Resources

Issues

- How would the alternatives affect surface water quality including sediment, temperature, dissolved oxygen, and chemical contamination?
- How would the alternatives affect the safety of drinking, irrigation, or stock water?
- How would the alternatives affect bioaccumulation of herbicides in hydrologic systems including groundwater and streams?
- How would the alternatives affect stream channel stability and structural complexity?

Affected Environment

Surface and Ground Water Resources

Subbasins

Hydrologic regions, subregions, basins, and subbasins are delineated based on protocol defined by the U.S. Geological Survey. This system delineates a hierarchy of geographical regions and their subparts, such as sub-region, basin, subbasin, watershed, and sub-watershed. The Vale District is comprised of 28 subbasins.

Streams and Surface Water

Stream geomorphology within the District varies widely from the small streams in the mountains of the south and the north, to the large canyons of the Owyhee and Grande Ronde, to the floodplains of the Snake and Columbia Rivers and their tributaries.

Most surface runoff within the District results from snowmelt or rainfall at higher elevations, producing peak discharges in the spring. The average annual precipitation varies substantially in relation to elevation. Year-to-year variability in rainfall and snowfall accumulation influences stream flow, both in quantity and duration of spring runoff. Many of the streams in lower-elevation, semiarid areas are intermittent; with segments of streams that flow year round due to perennial springs, or ephemeral with flow only during spring runoff and intense summer storms.

Natural flows in streams (both perennial and some intermittent) have been modified by diversions for irrigation and mining. Reservoirs have been installed for beneficial uses (see *Beneficial Use* section). Some of the major reservoirs on the District are Warm Springs, Malheur, Beulah, Bully Creek, Owyhee, Antelope, Brownlee, Lake Umatilla, Lake Wallula, Thief, Unity, and Wallowa.

There are an estimated 1,267 miles of perennial streams and 17,871 miles of intermittent or ephemeral streams on the District. Table 3-21 contains data on the miles of intermittent, perennial, and unclassified streams by subbasins located on BLM-administered lands within the Vale District.

Table 3-21. Miles of Streams on BLM-Administered Lands

Subbasin	Perennial	Intermittent	Ephemeral	Other[1]	Unknown	Total	303(d)-Listed
Alvord Lake	122.88	986.04	-	0.49	-	1,110.37	53.39
Brownlee Reservoir[3]	62.59	380.27	-	3.58	-	446.45	9.74[3]
Bully	103.29	1,184.21	5.05	12.34	0.24	1,305.12	-
Burnt	183.95	358.97	-	13.14	-	556.06	-
Crooked-Rattlesnake	10.66	2,969.55	-	9.08	0.18	2,989.48	78.98
East Little Owyhee	0.07	272.40	-	-	-	272.47	12.53
Hells Canyon	0.00	0.00	-	-	-	0.00	16.24
Imnaha	0.58	5.22	-	-	-	5.80	30.77
Jordan	37.34	758.99	-	25.88	-	822.21	-
Lower Grande Ronde	22.76	73.41	-	-	0.00	96.18	35.22
Lower John Day	-	1.09	-	-	-	1.09	65.15
Lower Malheur	79.61	1,873.48	-	2.54	-	1,955.64	55.96
Lower Owyhee	80.80	2,971.34	-	6.02	0.04	3,062.14	19.60[3]
Lower Snake-Asotin	2.20	24.97	-	-	-	27.17	21.50
Middle Columbia-Lake Wallula	2.55	6.35	-	1.14	-	10.04	71.66
Middle Owyhee	125.19	2,324.40	-	72.80	-	2,522.39	60.83

Subbasin	Perennial	Intermittent	Ephemeral	Other[1]	Unknown	Total	303(d)-Listed
Middle Snake-Payette	0.04	20.89	-	0.01	-	21.06	-
Middle Snake-Succor	15.87	464.24	-	4.85	0.07	485.02	0.55[3]
North Fork John Day	41.60	60.93	22.50	-	-	125.03	-
Powder	151.09	324.96	-	20.05	-	496.09	1.87
South Fork Owyhee	-	22.38	-	-	0.03	22.41	3.85
Umatilla	3.23	9.49	-	0.11	-	12.83	19.90
Upper Grande Ronde	7.06	11.15	-	-	-	18.20	3.52[3]
Upper Malheur	65.51	737.18	-	7.81	0.66	811.16	3.96
Upper Quinn	108.58	1,484.12	-	43.27	-	1,635.97	0.26[3]
Walla Walla	9.26	12.34	-	-	-	21.59	16.59[3]
Wallowa	4.96	24.48	-	-	-	29.45	-
Willow	25.18	508.21	-	27.54	-	560.93	77.98
Other[2]							61.85
Total	1,266.85	17,871.06	27.54	250.66	1.22	19,422.35	721.90

1. Includes, canals, ditches, and pipelines.
2. Includes Owyhee, Snake, Grande Ronde, and Malheur Rivers and other streams that cross multiple subbasins.
3. 303(d)- listed for pesticides.

Ground Water

Regional groundwater gradients and extensive aquifer systems have not been studied. Groundwater data are limited and are based on small, isolated basin studies and well logs associated with irrigated valleys and livestock water supply wells. The geology of the area is volcanic; water-bearing properties of the formations largely depend on faults, fractures, joints, etc. The rate and quantity of groundwater movement depends on the hydraulic conductivity of the geologic formation and the hydraulic gradient. Groundwater occurs as both confined and unconfined aquifer systems. Most unconfined aquifers are located in stream valleys or associated with Pleistocene lakebeds that contain recent alluvial material, although some may exist as perched aquifers. Alluvial aquifers vary greatly in size and yield from one stream / lakebed to another. These aquifers are important as transient storage systems to move groundwater to or from streams and the deeper confined aquifers, and they are typical of drainages on the District. Perched aquifers occur along ridges between stream valleys and can usually be identified by the occurrence of springs above the valley bottoms. They are often associated with alluvial aquifers where streambeds intersect permeable outcrop areas. Little is known of the areal extent or depth of deep, confined bedrock aquifer systems. The Lewiston Basin Aquifer is the only Designated Sole Source Aquifer on the District. It is located in the far northeast of the Vale District and there are 1,510.4 acres of BLM-administered lands within the boundary. Numerous volcanic flows and faults confound the concept of a uniform regional groundwater gradient. Recharge to groundwater systems occurs mainly at higher elevations where precipitation greatly exceeds evapotranspiration. Precipitation is the major recharge source in areas with an exposed permeable formation and average annual precipitation in excess of 12 inches.

Springs and seeps occur in areas where water from aquifers reaches the surface. Many springs begin in stream channels; others flow into small ponds or marshy areas that drain into channels. Some springs and seep areas form their own channels that reach flowing streams, but other springs lose their surface expression and recharge alluvial fill material or permeable stratum. Water from springs differs from that of overland runoff in that it is generally more constant in temperature and lower in dissolved oxygen, especially close to the source. Mineral content in water varies from spring to spring along stream courses depending upon the geochemistry of the substrata through which it flows.

Springs and seeps are important to aquatic habitats because of the perennial base flow they provide to a stream. In summer, the outflow from springs usually helps to maintain lower water temperatures. In winter, especially in small streams, base flow helps to maintain an aquatic habitat in an otherwise frozen environment.

Some springs are classified as warm or hot springs because of the proximity of their aquifers to a geothermal heat source. These types of springs, such as Willow Creek Hot Springs, have vegetation and microbial and algal organisms that are adapted to the hot, highly mineralized water.

Springs[54] have been disturbed by either management activities that have affected the volume of water available to the vegetation and soils where springs begin, or by activities that have affected the vegetation and soils directly. Activities such as livestock or wild horse grazing and watering, recreation use, mining, road construction, and vegetation management have affected spring systems in the past. Activities such as well drilling or blasting which can occur on public or private land can affect springs by reducing the amount of water in their aquifers or by affecting subsurface flow patterns (USDI 2002).

Potable water wells on public land are located at five campgrounds: Vassar Diggins, Spring Recreation Area, Twin Springs, Chukar Park, and Rome Launch Site. These wells are monitored to ensure compliance with the State of Oregon's requirements for public water systems (OAR 333).

Water Quality

Water quality, as defined by the *Clean Water Act*, includes all the physical, biological, and chemical characteristics that affect existing and designated beneficial uses. The States of Oregon and Washington have established beneficial uses for the surface and groundwater within the District and water quality standards, which protect these uses. The current water quality standards can be found at the Oregon DEQ web site:

> Section 303(d) of the 1972 Federal *Clean Water Act* (CWA) as amended requires states to develop a list of rivers, streams, and lakes that cannot meet water quality standards without application of additional pollution controls beyond the existing requirements on industrial sources and sewage treatment plants. Waters that need this additional help are referred to as "water quality limited." Water quality limited waterbodies must be identified by the Environmental Protection Agency (EPA) or by a delegated State agency. In Oregon, this responsibility rests with the DEQ. The DEQ updates the list of water quality limited waters every two years. The list is referred to as the 303(d) list. Section 303 of the CWA further requires that Total Maximum Daily Loads (TMDLs) be developed for all waters on the 303(d) list. A TMDL defines the amount of pollution that can be present in the waterbody without causing water quality standards to be violated. A Water Quality Management Plan is developed to describe a strategy for reducing water pollution to the level of the load allocations and waste load allocations prescribed in the TMDL, which is designed to restore the water quality and result in compliance with the water quality standards. In this way, the designated beneficial uses of the water will be protected for all citizens (ODEQ 2015).

Most of the District water is hard (high in magnesium and calcium ions) and contains moderate amounts of other dissolved minerals. District lands contain 303(d)-listed waters, including 5,195.65 miles of listed streams. Temperature is the most widespread water quality impairment on District-administered lands. Metals, bacteria (fecal coliform), and pesticides impair water quality on a few streams. A number of streams on the District are listed as "water quality limited" for parameters such as dissolved oxygen, chlorophyll a, bacteria, toxics (the pesticides DDT and dieldrin, which are not used on land administered by the BLM), and temperature (see Table 3-21, 303(d) column).

The BLM is obligated to fulfill the agency's *Clean Water Act* responsibilities and provide assurance that management activities in 303(d)-listed water bodies would contribute to the maintenance of good water quality or restoration of poor water quality. This assurance is provided by documenting and implementing sufficiently

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[54] BLM GIS shows that 1,951 springs exist on BLM-administered lands on the Vale District. However, the dataset is not complete.

stringent management measures during the planning and NEPA process and by developing and implementing water quality restoration plans. The management prescriptions in a water quality restoration plan are drawn from Federal standards, guidelines, and best management practices. They apply only to Federal lands.

A National Pollution Discharge Elimination System (NPDES) permit is required for herbicide use that may directly enter streams under the *Clean Water Act*. The permit is needed for herbicide treatments within 3 feet of streams, wetlands, and other seasonally wet areas when water is present, including conveyances with a hydrologic surface connection to a water body (e.g. near a road culvert that runs water to a creek). NPDES Pesticide General Permits are obtained prior to implementing any treatments in which herbicide could be directly introduced into surface waters. This generally includes treatment within stream banks or for target plants that emerge from or overhang water bodies.

The primary beneficial uses of surface water are domestic water supply, salmonid and other resident fish habitat, irrigation, livestock watering, wildlife and hunting, fishing, water contact recreation, and aesthetic quality. Most streams on the District support one or more of these State-designated beneficial uses. Elevated summer temperatures are the primary water quality problem identified by the State for some streams on the District. While some streams violate the State water temperature standard for the resident fish and aquatic life, it is unknown if State standards could ever be met given the anthropomorphic changes that have occurred in the watershed.

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

Public Water Supplies

Public water supplies are sources of water that are utilized for public consumption and are divided into two categories: surface and ground. There are 758,200 acres of surface water and 302,879 acres of ground water, but the majority of these sources are not associated with public lands managed by the Vale District (see Map 3-5). The BLM administers 10,967 acres or 1 percent of the Public Water Surface acreage and 6,693 acres or 2 percent of the Public Water Ground Water acreage identified.

There are three State defined source water protection areas within the District. Most of the BLM areas are near, but not adjacent to, the Columba River. The District acreage within source water protection areas, including public lands, is shown in Table 3-22.

Table 3-22. Acres of Public Lands within Source Water Protection Areas

Town	Source Water	Acres
Baker City	Goodrich Creek	3
Hermiston	Columbia River	6,268
Pendleton	Umatilla River	909
Total		7,180

Treatments Planned Related to the Issues

Any invasive plant treatment has the potential to adversely affect water resources in the short term or beneficially affect them in the long term. Wind, drift, runoff, or subsurface water flow may move unbound herbicides downslope into water or non-herbicide treatments may expose soils that can be eroded into water bodies. Treatments in Categories 1, 2 and 3 are the most likely to affect (adversely and beneficially) water resources as treatments in Categories 4, 5 and 6 are typically on upland sites. Seeding projects in Categories 1 and 2 under the

Proposed and Revised Proposed Actions would generally be less than 20 acres, and could happen on approximately 15 sites a year. Because water is a limited resource on the District, invasive plants in, near, and around water are high priority for control treatments.

Treatments would be consistent with 303(d) restoration plans. Where invasive plant control would remove plants contributing to bank stability or stream shading, particularly along 303(d)-listed stream reaches, control would be delayed or phased as necessary while aggressive restoration efforts are undertaken. BLM policy requires restoration plans to account for these effects, and prescribes mulching, seeding, and planting as needed to re-vegetate riparian and other treated areas (USDI 2008a). Speeding restoration of such management-exposed stream banks with willow planting or other measures is a common BLM practice.

Standard Operating Procedures and Mitigation Measures Relevant to Effects

Standard Operating Procedures and Mitigation Measures including limitations on the herbicides, adjuvants, carriers, handling procedures, application methods, drift minimization measures, and riparian buffers greatly reduce the likelihood that herbicides would be transported to aquatic habitats. However, some herbicides might enter streams through aerial drift, in association with eroded sediment in runoff, and dissolved in runoff, including runoff from intermittent streams and ditches.

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

- Site-specific analyses for roadside treatments should specifically consider that drainage ditches and structures lead to streams and that normal buffer distances, herbicide selection, and treatment method selection may need to be changed accordingly, particularly where those ditches are connected to streams with federally listed or other Special Status species.
- Use appropriate herbicide-free buffer zones for herbicides not labeled for aquatic use based on Risk Assessment guidance, with minimum widths from water of 100 feet for aerial, 25 feet for vehicle, and 10 feet for hand spray applications.
- 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.

Project Design Features Adopted for this Analysis

The following additional Project Design Features would further reduce effects on water resources:

- Areas with shallow groundwater and areas of groundwater-surface water interaction will be identified during the review of the Annual Treatment Plan to help inform selection of treatment method.
- Treatments that may affect 303(d)-listed streams will be noted on the Annual Treatment Plan. Where invasive plant control would remove plants contributing to bank stability or stream shading, control would be delayed or phased as necessary in order to make treatments consistent with 303(d) restoration plans.

Environmental Consequences

Invasive plant management helps improves watershed health, and therefore improved water quality. Controlling invasive plants would benefit the water resources in the uplands by improving water infiltration and the water cycle, in riparian areas by stabilizing banks and improving habitat and in the aquatic environment by reestablishing appropriate flow regimes and improved water chemistry. Restoring native vegetation would improve riparian stability where invasive plants like Canada thistle have colonized along stream channels and out-competed native species. Water resources are extremely valuable to the ecosystem and must be protected from invasion by invasive plants. Invasive plant species, such as purple loosestrife or Canada thistle, can be extremely competitive in a riparian setting. They can crowd out valuable native species, forming a solid stand of invasive plants. Studies have shown that invasive plants often do not stabilize soils as well as native plants, which can lead to soil erosion resulting in lowered water quality and loss of the stream channel function (Sheley 1994).

The indirect effects or long-term consequences of invasive plant control would depend on the long-term progression of climatic factors and the success of follow-up management actions. Reducing the number of invasive plants that have the potential to degrade water environments could have the long-term beneficial effects of promoting stream channel stability and potentially increasing dissolved oxygen levels. In addition, shade would increase, resulting in lower water temperature.

Invasive plants can create or exacerbate conditions that reduce water quality. Invasive plants are difficult to control in and around water as they thrive in the moist environment. Invasive plants can affect water quality by affecting bank stability, sediment, stream temperature, dissolved oxygen, and pH (USDA 2005a), and can increase runoff and increase peak flows (Lacey et al. 1989, cited in Dewey et al. 1995:622).

Effects of Treatment Methods

Herbicide Treatments

Following (Table 3-23) is a summary of the potential risks to water resources from each of the 17 herbicides considered in this analysis. This summary was adapted from the Oregon FEIS (USDI 2010a:194-198), the 2016 PEIS, and the Risk Assessments and risk ratings presented and described in Appendix C of this EA. Ratings are based on various plausible exposure scenarios, without the application of the Standard Operating Procedures described above and in Appendix A.

Table 3-23 Effects of Herbicides (Water Resources)

Herbicides Used for both Aquatic and Terrestrial Vegetation Control	
Herbicides available under all alternatives	
2,4-D	Some salt forms of 2,4-D are registered for use in aquatic systems. Aquatic forms of 2,4-D have been used for decades across the District to suppress species such as Canada thistle in riparian areas. Currently no submerged plants are being managed on the District with 2,4-D, therefore, no forms of 2,4-D are being applied directly to water. 2,4-D is a known groundwater contaminant although potential for leaching into groundwater is moderated by its being bound to organic matter and its short half-life. In terrestrial applications, most formulations of 2,4-D do not bind tightly with soils, and therefore have a moderate potential to leach into the soil column and to move off site in surface or subsurface water flows (Johnson et al. 1995, cited in Tu et al. 2001). In a study on groundwater in small shallow aquifers in Canadian prairies, 2,4-D was detected in 7 percent of 27 samples (Wood and Anthony 1997).
Glyphosate	Glyphosate is registered for aquatic use and would be applied to wetland vegetation. Strong adsorption to soil particles and organic matter slows microbial degradation, allowing glyphosate to persist in aquatic environments in bottom sediments (half-life of 12 days to 10 weeks) (Goldsborough and Brown 1993, Extension Toxicology Network 1996a, all cited in Tu et al. 2001). While glyphosate is very water soluble, it is unlikely to enter waters through surface runoff or subsurface

	flow because it binds strongly to soil particles, except when the soil itself is washed away by runoff. Even then, it remains bound to soil particles and generally unavailable (Rueppel et al. 1977, Malik et al. 1989, all cited in Tu et al. 2001). Studies that are more recent found solution-phase glyphosate in 36 percent of 154 stream samples, while its degradation product, aminomethylphosphonic acid, was detected in 69 percent of the samples. Glyphosate may stimulate algal growth at low concentration; Austin et al. (1991) have suggested that this could contribute to eutrophication of waterways. However, the study has more implications in streams flowing through agricultural and urban areas where glyphosate is shown to be relatively common, although additional phosphates from those same areas might mask the effect. The amount of glyphosate expected to reach streams from BLM terrestrial applications would be expected to have no noticeable contribution to eutrophication.
Herbicides available under the Proposed and Revised Proposed Actions	
Fluridone	Currently the District has no proposed fluridone application planned; however, if invasive aquatic plants were detected, fluridone could be applied to ponds, lakes, canals, and reservoirs. Fluridone has limited use in flowing water because it works through contact maintained over several weeks. Water quality is not degraded when fluridone is used at a concentration of less than 20 ppb, and there are no label restrictions against swimming, fishing, or drinking treated water (Washington Department of Ecology 2002). Whole-lake treatments using fluridone are possible because the herbicide does not cause a rapid plant kill, which would otherwise result in oxygen-depleted water and reduced water quality. Fluridone has low potential to leach to groundwater and is not known to contaminate groundwater.
Imazapyr	Imazapyr is registered for use in aquatic systems to control emergent, floating, and / or riparian and wetland plants. Imazapyr is water soluble and potentially mobile (SERA 2011b). Imazapyr is rapidly degraded by sunlight in aquatic solutions, with a half-life of approximately 2 days that decreases with increasing pH (Mallipudi et al. 1991, Mangels 1991, all cited in Tu et al. 2001). Imazapyr does not appear to degrade in anaerobic systems, such as wetland soil or lake or pond sediments (American Cyanamid 1986). In their literature review of imazapyr, Tu et al. (2001) found no reports of imazapyr contamination in water, despite its potential for mobility. It is not known to be a groundwater contaminant. Battaglin et al. (2000) stated that little is known about its occurrence, fate, or transport in surface water or groundwater. In one study, imazapyr (from terrestrial applications) was detected in 4 percent of the 133 samples taken from streams, but was not detected in reservoirs or groundwater.
Triclopyr	The two forms of triclopyr, TEA and BEE, behave very differently in water. Both forms are used to control woody riparian vegetation. However, only the TEA form of triclopyr is registered for use for selective control of floating, immersed, and submersed aquatic plants. Both forms readily degrade to the acid form, which is the active form in plants. No adverse effects on water quality were observed following triclopyr TEA applications in two studies of whole-pond applications in closed systems (no water exchange; Petty et al. 2001). Triclopyr TEA is soluble in water and photodegrades in several hours with adequate sunlight. The rate of degradation in water is generally dependent on water temperature, pH, and sediment content. (Triclopyr BEE would not be used near water.)
Herbicides Used for Terrestrial Vegetation Control	
Herbicides available under all alternatives	
Dicamba	Because dicamba is mobile in soil, terrestrial application of this herbicide can result in groundwater and surface water contamination. Biodegradation is the major mechanism for dicamba degradation in water. Dicamba is a known groundwater contaminant, and has a high potential to leach into groundwater. The EPA has set health advisory concentration levels for dicamba (e.g., 300 µg / L for 1-day exposures), but has not set maximum concentration limits for potable water. A regional study of pesticides in shallow groundwater in Delaware, Maryland, and Virginia detected dicamba in groundwater at low concentrations, generally less than 3 µg / L (ppb) (Koterba et al. 1993).
Picloram	Can move off site through surface or subsurface runoff. Picloram does not bind strongly with soil particles and is not degraded rapidly in the environment (Tu et al. 2001). Concentrations in runoff have been reported to be great enough to damage crops, and could cause damage to certain submerged aquatic plants (Forsyth et al. 1997, cited in Tu et al. 2001). Picloram may degrade through photolysis, especially in non-turbid and

	moving water. Woodburn et al. (1989, cited in Tu et al. 2001) found that the half-life of picloram in water was 2 to 3 days but the EPA reported it stable to hydrolysis and unlikely to degrade in ground water, even over several years (EPA 1995). Maximum picloram runoff generally occurs following the first large rainfall, after which runoff concentrations drop to levels that persist up to two years post-application (Scifres et al. 1971, Johnsen 1980, Mayeux et al. 1984, Michael et al. 1989, all cited in Tu et al. 2001).
Herbicides available in limited areas under the No Action Alternative and District-wide under the Proposed and Revised Proposed Actions	
Chlorsulfuron	Persistent and mobile in some soils. In aquatic environments, the environmental fate of chlorsulfuron is related to pH and temperature. Hydrolysis rates are fastest in acidic waters and slower in more alkaline systems (Sarmah and Sabadie 2002). As hydrolysis rates drop, biodegradation becomes the mechanism affecting the breakdown of chlorsulfuron. Aquatic dissipation half-lives from 24 days to more than 365 days have been reported (ENSR 2005c), with a shorter time reported for flooded soil (47 to 86 days) than anaerobic aquatic systems (109 to 263 days; SERA 2004a). Chlorsulfuron is not known to be a groundwater contaminant, but has a high potential to leach into the groundwater.
Clopyralid	Does not appear to bind tightly to soil and will leach under favorable conditions. However, leaching and subsequent contamination of groundwater appear to be minimal (SERA 2004b), which is consistent with a short-term monitoring study of clopyralid in surface water after an aerial application (Rice et al. 1997a, cited in SERA 2004b). Clopyralid is not known to be a common groundwater contaminant, and no major off-site movement has been documented. Clopyralid does not bind with suspended particles in water; biodegradation in aquatic sediments is the main pathway for dissipation. The average half-life of clopyralid in water has been measured at 9 and 22 days (Dow AgroSciences 1998).
Imazapic	In aquatic systems, imazapic rapidly photodegrades with a half-life of one to two days (Tu et al. 2001). Since aerobic biodegradation occurs in soils, aerobic biodegradation is likely important in aquatic systems. Aquatic dissipation half-lives have been reported from 30 days (water column) to 6.7 years in anaerobic sediments (SERA 2004c). Little is known about the occurrence, fate, or transport of imazapic in surface water or groundwater (Battaglin et al. 2000). However, according to the herbicide label for Plateau, in which imazapic is the active ingredient, it is believed to be a groundwater contaminant (BASF 2008).
Herbicides available under the Proposed and Revised Proposed Actions	
Diflufenzopyr	Appears to be soluble, with transportation from surface runoff following application, particularly when diflufenzopyr is applied on soils with neutral to alkaline pH. However, based upon proposed uses, fate characteristics, and model predictions, the EPA does not expect diflufenzopyr to occur in drinking water in measurable quantities (EPA 1999). Diflufenzopyr is not a known groundwater contaminant. Biodegradation, photolysis, and hydrolysis are important mechanisms in removing diflufenzopyr from aquatic systems. Its half-life is less than 1 month, with hydrolysis and photolysis rates higher in acidic environments. The aquatic dissipation half-life for diflufenzopyr is 25 to 26 days in aerobic and 20 days in anaerobic conditions. The expected half-life of diflufenzopyr in small ponds is estimated at 24 days. These factors suggest that diflufenzopyr would be removed from an aquatic environment relatively rapidly if contamination occurred (EPA 1999).
Hexazinone	Hexazinone and its degradates persist, are highly mobile, and are readily washed into surface waters. The EPA requires a groundwater advisory on all product labels stating that hexazinone must not be used on permeable soils. In areas where irrigation water is contaminated with hexazinone or where groundwater discharges to surface water, hexazinone residues in water could pose a threat to plants. In surface water, hexazinone resists photo degradation (Neary et al. 1983, cited in Tu et al. 2001). Hexazinone does not bind strongly to particulates or sediments. The main method of degradation is by microorganisms in soils. The average half-life of hexazinone in soils and water is 90 days (Tu et al. 2001). Hexazinone has been detected in streams near terrestrial application sites up to 30 days after treatment, and reported in runoff up to 6 months post-treatment in a forestry dissipation study (Neary and Michael 1996, Michael et al. 1999). Neary et al. (1984, 1993, all cited in Tu et al. 2001) concluded that hexazinone was diluted in the mainstream flow to very low concentrations in forested watersheds.
Metsulfuron methyl	Stable to hydrolysis at neutral and alkaline pH and has a half-life of three weeks in acidic systems (Extoxnet 1996b). The persistence of metsulfuron methyl (initial concentration 10 µg / L) was investigated using in situ enclosures in a woodland / boreal forest lake, and the half-life was estimated at approximately 29 days (Thompson et al. 1992). Metsulfuron methyl is not known to be a groundwater contaminant, although it has a high potential to leach into the groundwater.

Sulfometuron methyl	Degrades quickly by hydrolysis in acidic water, but is stable in neutral water. Aquatic dissipation half-lives are estimated at 1 to 3 days to 2 months in aerobic systems, and several months in anaerobic sediments (Extoxnet 1996a). Sulfometuron methyl is not known to be a groundwater contaminant. In one surface water study, sulfometuron methyl was detected in 2 percent of 133 samples taken from streams.
Herbicides available under the Revised Proposed Action	
Aminopyralid	Aminopyralid is moderately persistent and has high mobility in most soils because of its low soil adsorption values (EPA 2005c). Therefore, it is transported to surface water and groundwater. Breakdown by microbes in soil is the primary form of dissipation. Aminopyralid's mobility and high water solubility suggest that the herbicide is prone to leaching (Lindenmeyer 2012). However, in past studies, leaching of aminopyralid has not been documented at levels below 1 foot (EPA 2005b). In water, aminopyralid is stable and does not readily react with water, but is broken down by sunlight. The half-life by photolysis is very short, at 0.6 days (EPA 2005b). Therefore, it is expected that aminopyralid rapidly dissipates in clear, shallow surface water (EPA 2005c). Within fast-moving water it rapidly dissipates through mixing. The major metabolic products of photolysis in water are oxamic acid and malonamic acid, neither of which would form in large concentrations, or are of concern from a toxicity standpoint (EPA 2005b). Once aminopyralid leaches down to anaerobic soil depths, degradation is likely to slow, which could be a factor in groundwater contamination (EPA 2005c). At one study in Montana, aminopyralid was detected in groundwater in one of 23 wells (Schmidt and Mulder 2009), indicating that there is some risk of groundwater contamination. It is expected that concentrations of aminopyralid in groundwater would be greatest in areas with a high water table and when rainfall happens immediately after application (EPA 2005c). Neither aminopyralid nor its major metabolic products are included on the EPA's list of drinking water contaminants (EPA 2013). Because of its moderate persistence, high mobility, and low soil adsorption, aminopyralid has a high potential for surface water runoff. A Forest Service risk assessment for this active ingredient determined that in areas with high annual rainfall virtually all of the aminopyralid applied to a site could be transported offsite in surface runoff (SERA 2007).
Fluroxypyr	Based on soil adsorption characteristics, fluroxypyr is expected to have a high mobility in soil. However, it has a low potential for movement to groundwater because it is rapidly broken down by microbes in the soil (soil half-life is 1 to 3 weeks; California Department of Pesticide Regulation 2005; National Library of Medicine 2011). In field studies submitted to the EPA, fluroxypyr was generally not found below a soil depth of 6 inches (EPA 1998), although this may vary depending on soil type and amount of rainfall. In sandy soils, the potential to leach to groundwater is much higher, and has been identified as a concern (NYSDEC 2006). Factors that influence the rate of fluroxypyr degradation in soils include soil microbes, organic matter, temperature, and soil moisture (Tao and Yang 2011). In water, fluroxypyr does not readily break down by photolysis, but is biodegraded by microorganisms in the water and undergoes hydrolysis under certain conditions. The aquatic half-life is fairly short, at 5 to 14 days (National Library of Medicine 2011). The two major biotransformation products of fluroxypyr (a pyridine and a methoxypyridine), may be more persistent in water than fluroxypyr (Health Canada 2012). Studies of fluroxypyr in Sweden detected both fluroxypyr and pyridine in the groundwater beneath a railway treatment site (Cederlund et al. 2012). Neither fluroxypyr nor its two major biotransformation products are included on the EPA's list of drinking water contaminants (EPA 2013). Because of its quick rate of breakdown, fluroxypyr is expected to have a low risk of surface water runoff. A Forest Service risk assessment for this active ingredient determined that up to 10 percent of applied herbicide would leave a site in surface water runoff in areas with clay soils and high rates of rainfall. For most other soils, about half this amount was expected to run off, with virtually no runoff from predominantly sandy soils (SERA 2009).
Rimsulfuron	Rimsulfuron is unstable in soil, and therefore likely has a low risk of leaching to groundwater. The pH of the site conditions are likely a factor, with rimsulfuron less mobile in acidic conditions. Its metabolites may have a greater likelihood of contaminating groundwater, particularly the second metabolite, which is not readily degraded (Metzger et al. 1998). There is little available information about rimsulfuron and its metabolites in terms of groundwater and

	surface water contamination. One study in sandy soils found no rimsulfuron in groundwater following an herbicide application, but did find the first metabolite in the soil water at a depth of 3.3 feet, for as long as 3 years, in concentrations unsafe for drinking water. Concentrations of the second metabolite were much lower (Rosenbom et al. 2010). In aquatic systems, rimsulfuron is broken down via biodegradation and photodegradation. The biodegradation half-life is estimated at 10 days under aerobic conditions (NYSDEC 2009). However, neither rimsulfuron nor its two metabolites are included on the EPA's list of drinking water contaminants (EPA 2013). Given its fairly rapid dissipation rate in the soil, rimsulfuron has a low risk of surface runoff. If a rain event were to occur a week after application of rimsulfuron, only a very small portion of the active ingredient would be available for movement (NYSDEC 1997).

Non-Herbicide Treatments

Manual and mechanical treatment effects to water quality depend on soil properties, climate, distance to surface water, and the extent of the mechanical treatment. Manual and mechanical treatments are expected to cover relatively small areas within watersheds. 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. Sedimentation may adversely affect water quality by increasing turbidity. In lower intensity nonnative plant infestations, non-target vegetation left on the treatment site can reduce the potential for erosion and subsequent sediment delivery to streams or other water bodies.

The risk of adversely affecting water quality due to fine sediment production from manual treatment or use of motorized hand tools is low, and short-term, resulting in effects likely to be localized and minor. Standard Operating Procedures and Mitigation Measure (see Appendix A) are likely to prevent long-term negative effects. Depending on the scale of treatment, large riparian areas treated with motorized hand tools may affect water quality.

The risk of affecting water quality from use of wheeled or tracked machinery would vary, depending on the extent of treatment area and proximity to aquatic environments. Tracks can divert waters and disturb soils. Soil compaction within riparian areas can prevent the establishment of native vegetative cover, but equipment such as OHVs containing spray mix and other application equipment would normally be kept well away from riparian areas to minimize the risk of spills.

Power-tool use near water can potentially cause water contamination with minor amounts of chainsaw oil or minor fuel spill. Standard Operating Procedures require filling power equipment well away from the stream to minimize this risk.

Because some mechanical methods of clearing or cutting vegetation can disturb or compact soils, these methods are most likely to cause erosion-related water quality effects (in addition to the potential erosion caused by general tree removal). Some kinds of equipment, such as walking brush-cutters, minimize ground disturbance and reduce local increases in surface water runoff compared to other mechanical techniques.

Negative effects to water quality from planting or seeding are unlikely. Planting or seeding is likely to occur over small areas. Manual methods are generally used for planting and seeding, though hand carried power tools are sometimes used. Planting and seeding in riparian areas would speed establishment of vegetative ground cover, preventing fine sediment introduction to streams.

Targeted grazing is used in upland and riparian areas[55] for selected control of invasive plants. While livestock are present, they would contribute to the turbidity of the water and introduce urine and feces to the water supply. Adverse effects to the stream banks could occur depending on the structure and composition of the bank and the composition of the vegetation on the banks. However, the duration would be limited and the long-term effects of the use of livestock would have negligible adverse effects to the water supply. Improvements to the riparian vegetation would benefit the water supply in the long term by stabilizing banks and therefore reducing sedimentation.

Effects by Alternative

Common to All Alternatives

Mechanical or manual removal of invasive plants, herbicides, targeted grazing, seeding, and prescribed fire (as part of the Proposed and Revised Proposed Actions) used singularly or in combination would have short-term adverse effects to the water resources, including increased stream instability and the removal of stream shading. These short-term effects are expected to be far outweighed by the long-term beneficial effects of controlling invasive plants.

With the exception of potential increases in turbidity or temperature in the short term, none of the treatments under any alternative is expected to adversely affect the safety of drinking, irrigation, or stock water. Standard Operating Procedures require that areas with shallow groundwater and areas of groundwater-surface water interaction be identified to reduce effects to groundwater from the application of herbicides. A Project Design Feature adopted for this analysis requires identification of such areas falling within planned treatment areas in the Annual Treatment Plan. In addition, springs and wells that are known sources of potable drinking water that originate on BLM-administered lands would be avoided (see Appendix A).

Buffer distances and other Standard Operating Procedures for Water Resources (Appendix A) would minimize adverse effects to riparian vegetation and water quality. Effects would be minimized to perennial and intermittent streams because they are protected by 10-foot (ground-hand), 25-foot (ground-vehicle), and 100-foot (aerial) buffers.[56] All herbicide use would follow label constraints and requirements and mitigation measures.

No Action Alternative

The four herbicides used under this alternative include three known groundwater contaminants: picloram, dicamba, and 2,4-D (USDI 2010a:194-198). Standard Operating Procedures include evaluating the potential for groundwater contamination and avoiding areas where this could occur. Picloram is a high-risk herbicide for aquatic plants and animals and is not approved for use in aquatic environments.

Some of the invasive plants found in the Vale District are not effectively controlled by the four herbicides available. For example, the four herbicides are ineffective at treating the approximately 4,400 acres of perennial pepperweed that has been documented to be expanding in riparian areas throughout the District. The continued spread of these riparian invasive plants would have a long-term adverse effect as they can rapidly form large dense stands along entire stream corridors, riparian areas, or irrigation structures.

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[55] A Project Design Feature adopted in the *Riparian Habitats* sections states that in riparian areas, targeted grazing will only occur on armored stream banks with sheep or goats (not cattle).

[56] Intermittent stream channels (including ephemeral streams) are buffered when they have water in them, or if there is a prediction of rain within 48 hours (USDI 2010b:14).

Glyphosate is available to treat species such as knotweeds and yellow flag iris. These species can form dense stands, spread along waterways, and out-compete native species. However, no treatment method is available to treat submerged plants such as Eurasian watermilfoil and hydrilla. These species are not currently documented on the Vale District but are known to occur off of the District in the Snake River (both upstream and downstream). If infestations were to spread to the Vale District, long-term adverse effects could include changes in water temperature and oxygen levels.

Proposed Action

Ten additional herbicides would be available that have lower risk to aquatic plants and animals than the four herbicides currently available. These four herbicides would be available under the Proposed Action, but would be used on fewer acres. Therefore, no measurable short-term adverse effects to sediment, temperature, dissolved oxygen, or stream bank stability are expected from herbicide treatments in, near, and around water given the treatments planned and the limited extent of current infestations. Following Standard Operating Procedures and Mitigation Measures would result in no risk from herbicide treatments.

There is low risk to drinking, irrigation, wildlife, or stock water from aquatic treatments with imazapyr, glyphosate, triclopyr, or fluridone. These herbicides either have short half-lives, bind to soils, degrade into other forms, or are degraded by sunlight (ENSR 2005g, SERA 2011a, b, d). Targeted grazing, prescribed fire, and the herbicides imazapic, sulfometuron methyl, and hexazinone would be used in upland areas and can cause short-term adverse effects from increased erosion potential if vegetation cover were removed. However, long-term beneficial effects would occur when seeding and planting reestablishes groundcover. Chlorsulfuron and metsulfuron methyl have the potential to leach into groundwater, but a Project Design Feature adopted for this analysis would limit areas where this may occur.

None of the parameters in 303(d)-listed waterbodies on the District would be measurably adversely affected by the implementation of the Proposed Action. The Proposed Action is consistent with the *Clean Water Act* as Standard Operating Procedures, Mitigation Measures, and other measures are designed to keep non-aquatic herbicides from getting into water. The long-term benefits of controlling invasive plants before they cause adverse effects to aquatic habitat, water quality and quantity, infiltration, and runoff, outweighs the short-term risk of using herbicides labeled for aquatic use in, near, and around water.

Revised Proposed Action

Under the Revised Proposed Action, aminopyralid, fluroxypyr, and rimsulfuron could be used to treat invasive plants. None of these are approved for aquatic applications and would not be applied to water. In water, aminopyralid is broken down by sunlight so it is expected that aminopyralid would rapidly dissipate in clear, shallow surface water and within fast-moving water it would rapidly dissipate through mixing. There is some risk of groundwater contamination from aminopyralid in areas with a high water table and when rainfall happens immediately after application. Fluroxypyr and rimsulfuron would be expected to break down quickly in water (approximately a week) and are not expected to run off or leach. Risk Assessments indicate that these three herbicides all have no risk to non-target flora and fauna in any scenarios involving water runoff, consumption, or contamination.

The addition of these three herbicides would cause the use of 2,4-D, dicamba, and picloram (all known to be groundwater contaminants) to drop. Most noticeably, 2,4-D use would decrease by 65 percent when compared to the No Action, and 59 percent when compared to the Proposed Action, and picloram would decrease by 76 and 64 percent.

Other effects, including the benefits of controlling invasive plants, would remain as described under the Proposed Action.

Cumulative Effects

There would be short-term negligible adverse effects from invasive plant treatments on the District. Many factors can affect water resources, including climate change, pesticide runoff, ammonia runoff from feedlots, fish diseases, livestock and wild horse grazing, juniper expansion, mining, roads, wildfires, vegetation conversion, and invasive species (animals and plants).

As noted above, removal of riparian vegetation and resulting destabilization of stream banks causes stream degradation. Historic improper grazing is the land use most commonly associated with these problems on the Vale District. Other land uses associated with degraded streams include roads, trails, water withdrawal, reservoir storage and release, altered physical characteristics of the stream, mining, and wetlands alteration. Springs have also been disturbed by management activities, such as excessive livestock or wild horse grazing and watering, recreation use, and road construction. This affects the amount of water available.

Herbicide use also occurs on other Federal, State, and county lands, private forestry lands, rangeland, agricultural land, utility corridors, and road rights-of-way. The use of herbicides by BLM is a small amount of the total use on the District (See *Neighboring Lands Pesticide Use* section early in this Chapter).

In 2000, the Oregon Department of Forestry completed a study of aerial pesticide applications, indicating that water resources, aquatic organisms, and riparian management areas were being adequately protected under the *Oregon Forest Practices Act* (which is less restrictive than the Standard Operating Procedures associated with this EA) (Dent and Robben 2000).

Under all alternatives, no adverse cumulative effects are expected.

Riparian Habitats

Issues

- How would the alternatives affect the health and function of riparian and wetland areas?
- How would the alternatives affect riparian vegetation?

Affected Environment

Riparian Vegetation

Riparian areas are water-dependent ecosystems bordering streams, springs, and lakes. They form ecological links between the terrestrial and aquatic components of the landscape.

Riparian vegetation communities on the Vale District range from dominant woody tree / shrub species adjacent to moderate gradient streams to monotypic stands of sedge or rush associated with springs, saturated meadows, and low gradient stream reaches. Commonly observed woody riparian plant communities include cottonwood-willow, alder-willow, mixed willow, willow-chokecherry, and aspen. These communities may exhibit further diversity with additional shrub or herbaceous species associated with colonization opportunities, such as localized bank disturbance, canopy openings, and increased solar exposure. Herbaceous communities such as grasses, rushes, and sedges are often associated with finer textured soils with species composition influenced by the duration of saturation.

There are approximately 32,492 acres of riparian areas on the Vale District (see Map 3-6). There are 2,079 acres of invasive plants documented in NISIMS in those areas (see Table 3-24), and an additional 208 acres is known in Project Areas (see Appendix E), meaning that approximately 7 percent of the riparian areas on the District have invasive plants.

Table 3-24. Mapped Invasive Plants in Riparian Areas

Invasive Plants	Acres
Black henbane	2
Buffalobur	9
Bull thistle	15
Canada thistle	43
Common bugloss	< 1
Common tansy	< 1
Dalmatian toadflax	37
Diffuse knapweed	53
Field bindweed	2
Halogeton	1
Houndstongue	47
Jointed goatgrass	1
Knapweed	< 1
Leafy spurge	53
Meadow hawkweed	< 1
Mediterranean sage	23
Medusahead rye	134
Musk thistle	< 1
Myrtle spurge	< 1
Oxeye daisy	< 1
Perennial pepperweed	73
Puncturevine	12
Purple loosestrife	< 1
Rush skeletonweed	149
Russian knapweed	39
Russian olive	< 1
Scotch broom	< 1
Scotch thistle	328
Spotted knapweed	20
Squarrose knapweed	< 1
St. Johnswort	< 1
Sulphur cinquefoil	7
Tamarisk	804
Whitetop	191
Yellow flag iris	7
Yellow starthistle	29
Yellow toadflax	< 1

Proper Functioning Condition

Across the District, the majority of public land riparian areas associated with perennial streams were assessed using the Proper Functioning Condition (PFC) assessment (Prichard et al. 1998) between 1998 and 2009. PFC is an assessment of the physical function of riparian areas through consideration of hydrology, vegetation, and soil / landform attributes. This assessment utilizes existing site-specific inventory and monitoring information, and helps identify management goals and future monitoring. Definitions of the PFC ratings (Pritchard et al. 1998) used for lotic PFC assessments are identified below:

<u>Proper Functioning Condition:</u> Areas are functioning properly when adequate vegetation, landform, or large woody debris is present to:

- dissipate stream energy associated with high water flows, thereby reducing erosion and improving water quality;
- filter sediment, capture bedload, and aid in floodplain development;
- improve floodwater retention and groundwater recharge;
- develop root masses that stabilize stream banks against cutting action;
- develop diverse ponding and channel characteristics to provide the habitat and the water depth, duration, and temperature necessary for fish production, waterfowl breeding, and other uses; and,
- support greater biodiversity.

<u>Functional at Risk</u>: Areas that are in functional condition, but an existing soil, water, or vegetation attribute makes them susceptible to degradation.

<u>Nonfunctioning:</u> Areas that clearly are not providing adequate vegetation, landform, or large woody debris to dissipate stream energy associated with high flows, and thus are not reducing erosion, improving water quality, etc. (USDI 1993:10-11).

The Vale District has inventoried 1,712 miles of perennial and intermittent stream using the *Process for Assessing Proper Functioning Condition* (USDI 1993[57]). Table 3-25 summarizes the results of those inventories.

[57] Proper Functioning Condition is assessed only for perennial or intermittent streams that have riparian facultative vegetation. If the riparian area is dominated by upland species and flows water less than 30 consecutive days, monitoring is not conducted.

Table 3-25. Proper Functioning Condition Assessment Summary

Rating / Trend	Miles	Percent
Proper Functioning Condition	788	46%
Functional at Risk / Upward	265	16%
Functional at Risk / Non-Apparent	435	25%
Functional at Risk / Downward	143	8%
Non-Functioning	81	5%
Total	**1,712**	**100%**

Treatments Planned Relating to the Issues

There are approximately 32,492 acres of riparian areas on the Vale District, approximately 2,287 of which contain invasive plants. The NISIMS database shows that 26 invasive plant species occur in riparian areas within the Vale District.

Under all alternatives, herbicide treatments in riparian areas for Category 1 invasive plants on the Vale District would generally be conducted with spot spraying. Under the No Action Alternative, the aquatic formulations of glyphosate and 2,4-D, as well as dicamba would be the most used herbicides. In the Proposed Action, chlorsulfuron and clopyralid would be used most frequently (neither are registered for aquatic use but both could be used in riparian areas and seasonal wetlands), with the option of being able to use aquatic triclopyr, aquatic imazapyr, and metsulfuron methyl. Under the Revised Proposed Action, aminopyralid would be used most frequently.

Due to the small size of the riparian areas and sensitivity of these areas to concentrated early spring / fall grazing, targeted grazing in Categories 1 and 2 would only occur on armored stream banks where a protective covering, such as rocks, vegetation or engineering materials has been placed to protect the stream banks from flowing water and sheep or goats would be used, not cattle (see *Project Design Features Adopted for this Analysis*, below).

Under the Proposed and Revised Proposed Actions, as many as 15 sites within Categories 1 and 2 generally less than 20 acres each, would be seeded or planted each year. Native seed sources are more likely to be used in riparian areas because the Category 1 and 2 sites tend to be smaller and there is a greater likelihood that the seeding would be successful.

Under the Proposed and Revised Proposed Actions, Category 4, 5, and 6 treatments would generally be in larger units away from riparian and wetlands.

Standard Operating Procedures and Mitigation Measures Relevant to Effects

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

- Use a selective herbicide and a wick or backpack sprayer.
- Use appropriate herbicide-free buffer zones for herbicides not labeled for aquatic use based on Risk Assessment guidance, with minimum widths from water of 100 feet for aerial, 25 feet for vehicle, and 10 feet for hand spray applications.
- Manage animals [during targeted grazing] to prevent overgrazing and minimize damage to wetlands.

Under Fish and Other Aquatic Species in Appendix A, a Standard Operating Procedure reads:

- Limit access of domestic animals to streams and other water bodies to minimize sediments entering water and potential for damage to fish habitat.

Project Design Features Adopted for this Analysis

The following additional Project Design Feature would further reduce effects on riparian habitats:

- Do not drill seed in riparian areas.
- In riparian areas, targeted grazing will only occur on armored stream banks with sheep or goats (not cattle).

Environmental Consequences

In this analysis, the intensity of effects on vegetation is defined as follows:

Negligible:	Effects would be detectable at the stream reach scale. Specifically, slight changes in key plant frequency, ground cover, stream bank width, and / or embeddedness (the degree to which fine sediments surround coarse substrates on the surface of a streambed) may occur on one or two areas.
Minor:	Effects would be detectable at the drainage scale. Specifically, statistical changes in key plant frequency, ground cover, stream bank width, and / or embeddedness would occur within the area.

Effects of Treatment Methods

Non-Herbicide Treatments

Prescribed fire for invasive plant control would be used primarily outside of riparian areas, but burning could release ash and other nutrients that could blow or be washed to nearby riparian habitats. While these materials could potentially affect fish or water quality in large doses, ash and nutrients released from prescribed burning would not be expected to noticeably adversely affect riparian area function because the plants generally quickly utilize these materials. In a 2005 study, ash deposition from the prescribed fire appeared to have a minimal effect on stream water chemistry (Beche et al. 2005). This study citied others with similar results. In general, the direct effects of most fires (prescribed or wildfire) on streams (ash deposition and fire-induced temperature increases) are usually negligible except in the instances of severe wildfires (e.g., Minshall et al. 2001a and Minshall 2003, cited in Beche et al. 2005). For example, Townsend and Douglas (2000, cited in Beche et al. 2005) found that low- to moderate-intensity prescribed fires do not cause an increase in sediment delivery to streams (and thus, many chemical components), particularly in areas with gentle slopes.

Targeted grazing applications are designed to avoid adverse effects to riparian areas. Scientific studies have shown that livestock grazing during the time when (upland) invasive annual grasses are palatable reduces the livestock use on riparian areas. There are many examples of improvements to stream bank stability, width to depth ratio, increased woody vegetation, and reduced water temperature when targeted grazing is used to control upland invasive plants (USDI 2006a). However, these beneficial effects typically take more than 5 years to be realized; therefore, beneficial effects to riparian areas would range from no effect to negligible.

Herbicide Treatments

Herbicides used for Aquatic and Wetland Settings

Five herbicides that would be available for use under the Proposed and Revised Proposed Actions are registered for aquatic use: 2,4-D (salt forms, not esters; also available under the No Action Alternative), fluridone, glyphosate (also available under the No Action Alternative), imazapyr, and triclopyr. Cautions for each herbicide vary in the aquatic environment. Table 3-26 summarizes the effects of each herbicide. Fluridone can only be used in an aquatic environment (though currently no aquatic invasive plants exist on the District for which fluridone would be appropriate) but the other four can be used in a riparian / ephemeral wetland as well.

Herbicides used in Riparian and Ephemeral Wetland Settings (non-aquatic)

Five additional herbicides proposed for use by the Proposed and Revised Proposed Actions may be used in riparian areas and ephemeral wetlands or up to the water's edge: chlorsulfuron, clopyralid, dicamba (also available under the No Action Alternative), imazapic, and metsulfuron methyl. Table 3-26 summarizes the effects of these herbicides. The Revised Proposed Action adds aminopyralid, fluroxypyr, and rimsulfuron.

Herbicides Used for Upland Settings

Four herbicides are strictly used for upland terrestrial vegetation control but may affect riparian areas through off-site drift or accidental spill: diflufenzopyr, hexazinone, picloram, and sulfometuron methyl. Table 3-26 summarizes the effects of these herbicides. Standard Operating Procedures, Mitigation Measures, and product labels minimize the potential for actual adverse effects.

Table 3-26. Effects of Herbicides (Riparian Habitats)

Effects of Herbicides used for Aquatic and Wetland Settings	
Herbicides available under all alternatives	
2,4-D	The principle hazard is unintended spraying or drift to non-target plants; spot treatments applied according to the labeled rate do not substantially affect native aquatic vegetation or change species' diversity (USDA 2005a, Washington Department of Ecology 2002). In aerobic riparian soils that have a high content of organic material, an active microbial community, high pH values, and high temperatures, toxic effects are limited because of rapid degradation of 2,4-D. 2,4-D may inhibit shoot and / or root growth of macrophytes in aquatic systems (Roshon et al. 1999).
Glyphosate	Glyphosate is approved for emergent aquatic vegetation in wetlands and estuaries. It may move into surface water with eroded soil particles (although it is unlikely it would dislodge from the particles and become active) where it rapidly dissipates from surface water by biodegradation and adsorption. Freshwater aquatic macrophytes and algae are reported to be susceptible to low amounts (20 mg / l concentrations). For many years, glyphosate has been the most appropriate herbicide to control invasive plants in riparian areas.
Herbicides available under the Proposed and Revised Proposed Actions	
Fluridone	Fluridone is a non-selective, slow-acting herbicide used in low concentrations to control submerged and emergent vegetation in ponds or reservoirs, lakes and canals where long-term contact with the target plants can be maintained to achieve control (not flowing waters). It photo-degrades, volatilizes slowly from water, and adsorbs to suspended solids and sediments. Currently, there are no invasive aquatic plants on the District that would be treated with fluridone. If aquatic invasive plants were found, fluridone would be used where appropriate.
Imazapyr	Imazapyr is approved for wetlands and riparian areas. It is the most effective herbicide for saltcedar and Russian olive, but it may also remove non-target vegetation. Residual soil contamination with imazapyr could be prolonged in some areas, possibly resulting in substantial inhibition of plant growth (SERA 2004d). Imazapyr is not likely to degrade in anaerobic soils or sediments (American Cyanamid 1986, SERA 2004d). Aquatic applications (with approved products) can only be made within the specific restrictions outlined on the label.

Triclopyr	Triclopyr generally controls woody species in an upland environment but can be used in wetlands and riparian areas that go dry for part of the year. It can also be used for spot treatment of purple loosestrife in riparian areas, as it does not damage native grasses and sedges. Only the TEA (acid) form is approved for selective control of submersed aquatic vegetation. Triclopyr BEE (ester form) is hazardous to aquatic life forms in maximum concentrations or spill situations where runoff to open water may occur. Triclopyr BEE (ester form) should not be used where it could move into water.
Effects of Herbicides used in Riparian and Ephemeral Wetland Settings (non-aquatic)	
Herbicides available under all the alternatives	
Dicamba	Dicamba direct spray and drift scenarios pose a moderate to high risk to susceptible terrestrial plants. Susceptible aquatic algae are at high risk from an accidental spill scenario and from direct exposure at maximum rates. Tolerant (non-susceptible) algae are at low risk from accidental spill at maximum rate. In water, biodegradation is the major mechanism for dicamba degradation. Dicamba is mobile in soils and is therefore likely to reach surface water and groundwater. The rates of dicamba degradation were generally more rapid in the surface than in the subsurface soil microcosms. One study indicated that some riparian wetland soils possess limited potential to degrade dicamba (Pavel et al. 1999).
Herbicides available in limited areas under the No Action Alternative and District-wide under the Proposed and Revised Proposed Actions	
Chlorsulfuron	Chlorsulfuron is effective at low concentrations and is prone to leaching. Hydrolysis rates are the fastest in acidic waters and are slower as the pH rises (Sarmah and Sabadie 2002). When hydrolysis rates drop, biodegradation becomes the primary loss mechanism. Strek (1998a, b) studied the dissipation of chlorsulfuron in an anaerobic sediment / water system; biodegradation progressed much more slowly than in aerobic soil systems, with a half-life greater than 365 days. Chlorsulfuron would not be applied to areas with standing or moving water, but would be applied to dry areas of the wetlands.
Clopyralid	Clopyralid is relatively non-toxic to aquatic plants. Overall, effects to non-target wetland and riparian vegetation from normal application of clopyralid are likely to be limited to susceptible plant species in or very near the treatment area. Clopyralid is not likely to affect aquatic plants via off-site drift or surface runoff pathways unless spilled. It should not be applied where soils have a rapid to very rapid permeability close to aquifers.
Imazapic	Imazapic risk to aquatic plants from accidental spills is moderate to high at the maximum application rate and low to moderate at the typical application rate (there is no acute risk to aquatic plants in standing water at the typical application rate). Aquatic plants are generally not at risk from off-site drift, except when applied aerially at the maximum application rate with a buffer of 100 feet or less. Imazapic rapidly degrades through photo degradation in aquatic systems (SERA 2004c).
Herbicides available under the Proposed and Revised Proposed Actions	
Metsulfuron methyl	Metsulfuron methyl poses a low risk to aquatic macrophytes from acute exposure at upper exposure limits (SERA 2004e). Metsulfuron methyl is stable to hydrolysis at neutral and alkaline pH. Larsen and Aamand (2001) evaluated biodegradation of metsulfuron methyl (25 µg / L) under anaerobic and aerobic conditions in sandy sediments; the herbicide did not biodegrade under any of these conditions. This herbicide is injurious to plants at extremely low concentrations. Non-target plants may be adversely affected from drift and run-off.
Herbicides available under the Proposed Action	
Aminopyralid	Aminopyralid could be used in dry wetlands and riparian areas. Therefore, any herbicide that remains adsorbed to soil particles could be released into the water if these areas become flooded or saturated following the treatments. Aminopyralid does not have activity on submerged aquatic species, such as watermilfoil, and would not be applied directly to the water column to treat unwanted aquatic vegetation. However, it may be effective at controlling riparian invasive plants. Field research trials support use of aminopyralid to manage emerged shoreline invasive plant species (e.g., purple loosestrife, Japanese knotweed, and invasive thistle species; Peterson et al. 2013). Aminopyralid is effective against many invasive herbaceous broadleaf invasive plants, and may offer improvements in control of Russian olive and saltcedar. One study found that adding aminopyralid to triclopyr increased its control of these species without injuring desirable understory grass vegetation (Sluegh et al. 2011).

	Aminopyralid has a photodegradation half-life of 0.6 days in aquatic systems (EPA 2005c). In anaerobic systems, however, the active ingredient is persistent, with a half-life between 462 and 990 days (EPA 2005c). The half-life in sediment is 999 days (Yoder and Smith 2002). As described in the Risk Assessment for aminopyralid, non-target aquatic plants are not at risk for adverse effects from exposure to aminopyralid, even under direct spray and worst-case spill scenarios. However, non-aquatic plants (including riparian species and emergent wetland plants) would be at risk for adverse effects if a broadcast spray treatment were to occur near wetland and riparian habitats.
Fluroxypyr	Fluroxypyr would have minimal use in wetland and riparian habitats, except for spot treatments of certain target species. It is not approved for use in aquatic habitats or wetlands when water is present. Therefore, the amount of this active ingredient that is likely to be released to wetland and riparian areas under normal application scenarios is very small. Accidental spills or movement from adjacent upland areas could result in more of the active ingredient entering wetland or riparian habitats. Fluroxypyr is short-lived in anaerobic environments. In anaerobic soil the half-life is 14 days or less (National Library of Medicine 2011). In anaerobic aquatic habitats, the half-life is 8 days (EPA 1998). The breakdown products may persist for longer. As described in the Risk Assessment for fluroxypyr, non-target aquatic plants are not at risk for adverse effects from fluroxypyr under direct spray or surface runoff scenarios. However, they would likely be harmed by an accidental spill of fluroxypyr into a pond or stream in which they occur. The risks of such a spill occurring would be reduced by applicable Standard Operating Procedures. Algal growth may be stimulated at low fluroxypyr concentrations but depressed at higher concentrations (Zhang et al. 2011).
Rimsulfuron	Rimsulfuron is not likely to be used much in or near wetland and riparian areas, except for spot treatments of certain target species. Similar to fluroxypyr, only small amounts of this chemical are likely to enter wetland and riparian areas under normal application scenarios, although larger amounts could enter these habitats as a result of an accidental spill or movement from an adjacent treatment site. Rimsulfuron has a high rate of soil adsorption in soils with high organic content (Metzger et al. 1998). However, it is quickly degraded under anaerobic conditions. In anaerobic soil the half-life is approximately 18 days. In anaerobic aquatic habitats, the half-life is less than 2 days (NYSDEC 2009). Breakdown products may persist for longer. According to the Risk Assessment, rimsulfuron poses a risk to non-target aquatic plants under direct spray, accidental spill, spray drift, and certain surface runoff scenarios. Risks associated with surface runoff would be limited to aquatic plants in ponds, and would be greatest in areas with 50 inches of precipitation or more per year. Non-aquatic plants, such as riparian and emergent wetland species would also be at risk for adverse effects from treatments in nearby upland areas.
Effects of Herbicides used for Terrestrial Vegetation Control	
Herbicides available under all the alternatives	
Picloram	Picloram toxicity to aquatic plants varies substantially among different species. There is low risk to susceptible aquatic macrophytes from acute exposure to picloram at the maximum application rate. Because picloram does not bind strongly to soil particles and is not rapidly degraded in the environment, it has a high potential for being transported to wetland and riparian areas.
Herbicides available under the Proposed and Revised Proposed Actions	
Diflufenzopyr	Diflufenzopyr poses a low risk to riparian species and aquatic plants via off-site drift.
Hexazinone	Hexazinone exposure poses a moderate to high risk for aquatic plants from acute and chronic exposures at both the typical and maximum application rates. Aquatic algal species are also susceptible to hexazinone exposure. It is also likely that aquatic macrophytes are susceptible, based on the effects of hexazinone on algae and terrestrial plants (SERA 1997).
Sulfometuron methyl	Sulfometuron methyl poses a high risk to aquatic plants from accidental direct spray and spills, and a high risk to susceptible and aquatic plants from drift. It poses a low risk to terrestrial plants from drift. Aquatic plants in standing water are typically at low to moderate risk for adverse effects from surface runoff scenarios. Drift could cause extensive damage to vegetation at a substantial distance from the application site.

Effects of Invasive Plants on Riparian Habitats

Native wetland and riparian species are adapted to the unique relationship of inundation of plants or soil by water for various portions of the year and respond well or survive such inundations. Invasive plants displace these native species and can reduce habitat and stream bank stability. In addition, upland invasive plants spread into adjacent riparian areas where they can compete with and displace the native species. Introduction of invasive plants can delay the recovery of riparian function.

Controlling invasive plants would benefit riparian areas by stabilizing banks and improving habitat and in the aquatic environment by reestablishing appropriate flow regimes and improved water chemistry. Restoring native vegetation would improve riparian stability where invasive plants like Canada thistle have colonized along stream channels and out-competed native species. Water resources are extremely valuable to the ecosystem and must be protected from invasion by invasive plants. Invasive plant species, such as purple loosestrife or Canada thistle, can be extremely competitive in a riparian setting. They can crowd out valuable native species, forming a solid stand of invasive plants. Studies have shown that invasive plants often do not stabilize soils as well as native plants, which can lead to soil erosion resulting in lowered water quality and loss of the stream channel function (Sheley 1994).

Effects by Alternative

No Action Alternative

Control methods, including the four herbicides available District-wide under this alternative, would effectively control 21 of the 26 invasive plants known in riparian areas on the Vale District (USDI 2010a:617-622, Table A9-2). However, five species, such as whitetop, would not have an effective control.

Little targeted grazing (80 acres with sheep or goats in Category 1 over the life of the plan, or less than 5 acres per year on average) would occur in riparian areas. During the spring, there is sufficient soil moisture to allow sufficient regrowth of riparian vegetation following grazing to protect stream banks from spring runoff. Given the limited scale of targeted grazing, beneficial effects would be minor, and invasive plant cover would only vary by 2 to 5 percent.

Under the No Action Alternative, only three herbicides are labeled for application within riparian areas. Glyphosate is not selective and 2,4-D and picloram can affect neighboring broadleaf plants. This would result in adverse effects to non-target plants, albeit negligible across the District due to the limited area of treatments occurring within riparian areas. In addition, whitetop and other mustard species would continue to expand into riparian areas because there is no effective herbicide available to control this species.

Proposed Action

All 26 species of invasive plants currently found in riparian areas could be effectively controlled with the tools and herbicides that would be available under the Proposed Action.

The Proposed Action would authorize the use of selective herbicides more effective at controlling invasive plants in riparian areas, including whitetop (see Table 2-10, *Treatment Key*, for more information). Additional herbicides would more effectively control infestations at a given site, slowing invasive plant spread, and decreasing the number of herbicide applications needed at that site. Invasive plants in riparian areas could be treated with aquatic glyphosate if the herbicide might enter the water, but would be better controlled with mixes of chlorsulfuron, clopyralid, and / or 2,4-D. Chlorsulfuron could be applied away from water or in dry channels and wetlands. Risk Assessments show zero risk for fish and other life forms other than spills and direct applications to plants. Clopyralid is relatively non-toxic to aquatic plants, but accidental spill scenarios pose a low to moderate risk to aquatic invertebrates at the typical and maximum rate. Due to the increased effectiveness of the additional herbicides, beneficial effects would be greater under the Proposed Action.

To reduce effects to non-targeted plants, herbicide application within riparian areas would be limited to wick or backpack sprayer. Aerial and vehicle application would not be authorized within 100 and 25 feet of water, respectively. Adverse effects to non-target plants would be negligible and last 1 to 2 years. There would be long-term (more than 10 years) beneficial effects of treating the 2,287 acres of invasive plants within riparian / wetland areas.

Prescribed fire for invasive plant control would happen in Categories 1, 2, 5 and 6. Such treatments would primarily be outside of riparian areas, but burning could release ash and other nutrients that could blow or be washed to nearby riparian areas. While these materials could potentially affect fish or water quality in large doses (see those sections in this Chapter), ash and nutrients released from prescribed burning would not be expected to noticeably adversely affect riparian area function because these materials are generally quickly utilized by the plants.

Targeted grazing with sheep and goats would increase in riparian areas to over 210 acres over the life of the plan, which would result in a 5 to 10 percent decrease in invasive plants when compared to the No Action Alternative.

Seeding in upland vegetation communities would benefit riparian areas because it would result in reductions in sediment transfer and reduced runoff, both of which would reduce the probability of stream bank failure when compared with the No Action Alternative. Seeding and planting would occur in riparian areas, but not with a rangeland drill. Seedings and planting within the riparian area would increase competitiveness with noxious weeds and invasive plants resulting in beneficial effects. Due to the small area that would be seeded or planted, riparian seeding and planting could result in minor beneficial effects.

Revised Proposed Action

Under the Revised Proposed Action, aminopyralid, fluroxypyr, and rimsulfuron could be used in riparian areas and (dry) seasonal wetlands, but not in aquatic areas or wetlands. Aminopyralid may be effective at controlling riparian invasive plants but fluroxypyr and rimsulfuron would only be used in the occasional spot treatment of an invasive plant. Both fluroxypyr and rimsulfuron have very short half-lives (approximately 2 weeks) in riparian habitats. Aminopyralid has a half-life of between 462 and 990 days in anaerobic systems and 999 days in sediment. However, as described in the Risk Assessment for aminopyralid, non-target aquatic plants are not at risk for adverse effects from exposure to aminopyralid, even under direct spray and worst-case spill scenarios. There would be a low risk from off-site drift to terrestrial plants, and no risk from surface runoff or wind erosion.

The addition of these three herbicides would cause the use of 2,4-D, dicamba, glyphosate, and picloram to drop. Most noticeably, the less selective 2,4-D use would decrease by 65 percent when compared to the No Action, and 59 percent when compared to the Proposed Action. The additional herbicides would remove or reduce invasive plants, and would do so in a much more species-specific manner resulting in fewer adverse effects on non-target species, resulting in beneficial effects to riparian habitats.

Other effects would remain as described under the Proposed Action.

Cumulative Effects

Proper functioning condition assessments were used as an indicator of the effects of past actions on riparian vegetation resources on BLM administered lands. From this assessment it was determined that 13 percent of the 1,712 stream miles examined had a rating of "functioning at risk, downward trend" or "not functioning," and 25 percent had a rating of "functioning at risk, trend not apparent" (Table 3-25). It is not known at what level that invasive plants are contributing to these conditions.

Future projects occurring on both private and public lands have a probability of having both adverse and beneficial effects on riparian resources within the Vale District. Current and planned juniper treatments totaling 356,000 acres are expected to occur. Juniper reduction projects may increase water yield on some of the streams within the project boundaries and may result in the expansion of riparian areas and increased native plant vigor. It is difficult to determine how many streams would see increased water yield since the research on this topic shows mixed results (Brown 1987, Schmidt 1987, Deboodt et al. 2007). However, the Vale District BLM and the Baker County Soil and Water Conservation District, in 2014 and 2015, measured water flow from a spring prior to and after a juniper reduction treatment and the results indicate water flow doubled after juniper removal. The increase in water yield is likely to be localized and occur in a small fraction of the streams; therefore, the beneficial effects to riparian resources would be negligible to minor.

Livestock grazing has occurred on most of the Vale District for decades and has resulted in changes to plant communities, especially in the sagebrush steppe and riparian areas. Livestock grazing management was modified in the early 1990s, especially in the Baker Resource Area of the Vale District. In this Resource Area, approximately 80 percent of the summer grazing was changed to spring or fall, which promotes recovery in riparian areas. In addition, end of growing season riparian stubble height or utilization targets were established on 90,000 acres. These targets have been shown in peer-reviewed literature to make measurable improvement towards meeting riparian rangeland health standards (Clary and Leininger 2000). Due to the effectiveness of these riparian grazing targets and the acreage of land being treated, the BLM expects a 5 to 10 percent decrease in invasive plants within riparian areas.

Ongoing fire re-stabilization projects will improve upland vegetation conditions, which has the potential to reduce sediment transport into the riparian area and reduce spring runoff, both of which would result in minor to beneficial effects to riparian resources.

The Boardman to Hemingway 500-kv transmission line project will likely cause less than 20 acres of ground disturbance within riparian and wetland areas since towers, roads and other supporting facilities would be sited to avoid riparian areas where possible. Under the No Action Alternative, there would be no effective chemical to control whitetop, which would likely occupy the disturbed sites. Under the Proposed and Revised Proposed Actions, herbicides that are more effective would be available to restore the disturbed sites caused by the transmission line, thus resulting in negligible beneficial effects when compared to the No Action Alternative.

Taking into account the above projects, the BLM expects a 5 to 10 percent decrease in invasive plants in riparian habitats.

Fish and Other Aquatic Species

Issues

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

Affected Environment

Occupied fish habitat within the District includes mostly perennial streams and some intermittent streams, as well as channels and draws that contain flows only in response to rainfall and / or snowmelt events. Many springs and ephemeral channels (i.e., those that run only during snowmelt and rainfall events) provide water to perennial and intermittent streams that support anadromous and resident fish species.

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

Many of the stream channels that are within forested sections are quite stable; however, rain-on-snow events, landslides, avalanches, or storm events can quickly alter stream channels and riparian areas. Non-forested streams (e.g., high desert streams) can also have rain-on-snow events or storm events that reduce or eliminate riparian vegetation next to a stream. Many of the tributary streams that feed into larger rivers are on steep ground and can have high sediment yields, especially during a storm event.

The BLM has water quality and stream temperature baseline data for a majority of the streams within the District. The loss of water volume during summer low flows, mainly due to water withdrawal for irrigation purposes and hydropower dam operations, has directly affected stream temperature. Increasing air temperatures in summer months, compounded by the effects of climate change, can also affect stream temperatures, especially in areas where riparian vegetation and stream shade are currently lacking. In many areas, fish-bearing streams can be reduced to almost no flow during summer months (June to August).

The Oregon Department of Environmental Quality has identified streams on the District as being water quality limited under Section 303(d) of the *Clean Water Act*, which means in-stream water quality fails to meet established standards for certain parameters for all or a portion of the year. These standards include algae, bacteria, dissolved oxygen, flow modification, habitat modification, nutrients, pH, sedimentation, and temperature (see Table 3-21 in the *Water Resources* section for further information).

There are 2,079 acres of invasive plants documented in NISIMS in riparian and aquatic areas, and an additional 10 percent (208 acres) is estimated in Project Areas (see Appendix E). These infestations will continue to spread fastest in these areas due to water and recreation-related spread vectors, and the relative ease of plant establishment because of reliable water sources (i.e., surface and groundwater) and better soil conditions, when compared to upland areas.

Special Status Fish Species

Species designated as Special Status by the BLM include 1) those federally listed or proposed for listing as endangered or threatened under the *Endangered Species Act,* and 2) species designated by the State Director as Bureau Sensitive and requiring special management consideration to promote their conservation and reduce the likelihood and need for future listing under the *Endangered Species Act*. These are managed under provisions of the BLM's Special Status Species Program (USDI 2008b, see Table 3-27 and Map 3-7).

Table 3-27. Special Status Fish Species

Common Name	Scientific Name	Federal Status	BLM Status	Washington Status[1]	Oregon Status[2]
Chinook salmon – Snake River Spring / Summer Run ESU	*Oncorhynchus tshawytscha*	Threatened	Threatened	C	Threatened
Chinook salmon – Snake River Fall Run ESU	*Oncorhynchus tshawytscha*	Threatened	Threatened	C	Threatened
Steelhead – Snake River Basin ESU	*Oncorhynchus mykiss*	Threatened	Threatened	C	S-V
Steelhead – Mid-Columbia ESU	*Oncorhynchus mykiss*	Threatened	Threatened	C	S-V
Bull trout	*Salvelinus confluentus*	Threatened	Threatened	C	S-C
Lahontan cutthroat trout	*Oncorhynchus clarkii henshawi*	Threatened	Threatened	--	Threatened
Inland Columbia Basin redband trout	*Oncorhynchus mykiss gairdneri*	Species of Concern	Sensitive	--	S-V
Pacific lamprey	*Entosphenus tridentatus*	Species of Concern	Sensitive	M	S-V

ESU = evolutionarily significant unit
1 WA Status Definitions: C = Candidate; M = Monitored
2 OR Status Definitions: S-C = Sensitive-Critical; S-V = Sensitive-Vulnerable

Snake River Spring / Summer Chinook (threatened)

The Snake River spring / summer evolutionarily significant unit (ESU) of Chinook salmon is listed as threatened with designated critical habitat. Changes in Chinook distribution in the Lower Grande Ronde River Subbasin are somewhat subtle and difficult to map. Some areas historically used for Chinook spawning are now used primarily for seasonal rearing and migration due to human modification of the habitat, which has limited its use for spawning (J. Zakel, ODFW, 2010 personal communication).

Historically, spring / summer Chinook salmon were distributed throughout much of the Lower Grande Ronde River Subbasin. Rearing habitat for spring / summer Chinook salmon may also have occurred in other tributaries and further upstream from current habitat. Spring Chinook salmon were extirpated from the Walla Walla River basin in the early 1920s (Nielson 1950, Van Cleave and Ting 1960). The Confederated Tribes of the Umatilla Indian Reservation have been active in reintroducing spring Chinook salmon on the Walla Walla River and since 2007, the number of Chinook salmon returning to spawn has increased.

Designated critical habitat for spring / summer Chinook salmon within the Lower Grande Ronde River Subbasin includes approximately 130 miles of rearing and migration habitat. Of these 130 miles, approximately 33 miles also serve as spring / summer Chinook spawning habitat. The major spring / summer Chinook salmon-producing stream in the subbasin is the Wenaha River.

Snake River Fall Chinook (threatened)

Snake River fall Chinook ESU are listed as threatened. Natural spawning is limited to the area from the upper end of Lower Granite Reservoir to Hells Canyon Dam, the lower reaches of the Imnaha, Grande Ronde, Clearwater, and Tucannon Rivers, and small mainstem sections in the tailraces of the lower Snake River hydroelectric dams (Good et al. 2005). Fall Chinook salmon may have been indigenous to larger streams within the Lower Grande Ronde River Subbasin. However, limited information is available on areas historically used by fall Chinook.

There are 86.2 miles of designated critical habitat in the subbasin. This includes the only known spawning habitat in the subbasin, the Grande Ronde River below Rondowa (River Mile 82), and the lower 4.2 miles of Joseph Creek, where fall Chinook are believed to have historically spawned and reared. In the Lower Grande Ronde River, fall Chinook currently rear and spawn up to Wildcat Creek (River Mile 53). Identification of their spawning area is based on aerial surveys conducted annually by the U.S. Fish and Wildlife Service and the Nez Perce Tribe.

Snake River Steelhead (threatened)

Snake River Basin steelhead are listed as threatened with designated critical habitat. The Snake River Basin steelhead ESU is distributed throughout the Snake River drainage system, including tributaries in southeast Washington, eastern Oregon, and north / central Idaho (NMFS 1996). Snake River Basin steelhead migrate a substantial distance from the ocean (up to 1,500 km) and use high-elevation tributaries (typically 1,000–2,000 m above sea level) for spawning and juvenile rearing. Snake River steelhead occupy habitats that are considerably warmer and drier (on an annual basis) than other steelhead ESUs (NMFS 1996).

With the exception of the Tucannon River and some small tributaries to the mainstem Snake River, the tributary habitat used by Snake River Basin steelhead is above Lower Granite Dam. Major groupings of populations and subpopulations can be found in the Grande Ronde River system, the Imnaha River drainage, the Clearwater River drainages, the South Fork Salmon River, the smaller mainstem tributaries before the confluence of the mainstem Snake River, the Middle Fork Salmon River, the Lemhi and Pahsimeroi Rivers, and upper Salmon River tributaries (Good et al. 2005). Resident steelhead populations are present above the Hells Canyon Dam complex, but their relationship to existing steelhead populations below the dams has not been determined (Kostow 2003).

Mid-Columbia River Steelhead (threatened)

Mid-Columbia River Basin segments of summer steelhead are listed as threatened under the *Endangered Species Act* with designated critical habitat. The Mid-Columbia River population of summer steelhead within this District includes the Walla Walla River and its tributaries. Summer steelhead have been on a very steady decline over the last 40 to 50 years. Stream conditions over the years have declined, affecting the emergence and rearing of young smolts. Sediment and high stream temperatures are affecting this population and preventing population increases.

The South Fork Walla Walla River is a top producer of threatened Mid-Columbia summer steelhead and provides high-quality habitat for this species as well. The Walla Walla River population of the Mid-Columbia summer steelhead ESU is classified as an intermediate-sized population, which has a mean minimum abundance threshold of 1,000 natural spawners with a sufficient intrinsic productivity to achieve a 5 percent or less risk of extinction over a 100-year timeframe (Carmichael et al. 2006). Adult steelhead enter the Walla Walla River Subbasin from December through March, with peak numbers entering February through March. Current production of the Walla Walla River population is concentrated in the North and South Forks of the Walla Walla River, along with Course and Mill Creeks.

Low stream flow is the main limiting factor for summer steelhead. Naturally low stream flows in the summer months are severely compounded by extensive irrigation withdrawals. Normally, Oregon irrigators completely divert the mainstem Walla Walla River at the Oregon / Washington border (Mendel et al. 1999). Widespread habitat degradation resulting from irrigation, dry land farming, livestock grazing, and logging has reduced usable spawning habitat by approximately 50 percent (Mendel et al. 1999).

Bull Trout (threatened)

The coterminous United States population[58] of bull trout is listed as a threatened species under the *Endangered Species Act*, including those found in the Grande Ronde, Umatilla, Walla Walla, John Day, Snake, Imnaha, Wallowa, and Powder Rivers, as well as several tributaries within those watersheds. Critical habitat is designated throughout their U.S. range.

[58] The contiguous lower 48 states of the United States.

Within the Baker Resource Area, the BLM administers 3.5 river miles of migratory habitat within the South Fork Walla Walla River, which is a top producer of bull trout in the Walla Walla River Basin and provides high quality cold-water habitat for this species and its population is described as "low risk." By comparison, the bull trout populations in the North Fork of the Walla Walla River, the North Fork of the Umatilla River, and the North Fork of Meacham Creek are at "high risk" of extinction, while the population in Mill Creek is "of special concern" (Buchanan et al*.* 1997).

Within the Malheur Resource Area, bull trout occur only in the North Fork Malheur River, where the BLM administers 4.5 river miles of migratory habitat. North Fork Malheur bull trout are isolated from other populations in the Malheur Basin by dams at Warm Springs and Beulah reservoirs. Bull trout migrate between headwater tributaries on the Malheur National Forest, where they spawn in the fall, and Beulah Reservoir. Spawning does not occur on BLM-administered lands, and there is no indication it did historically. However, migratory and possibly rearing habitat is present in stream reaches on BLM-administered lands in the Upper and Middle North Fork Malheur watersheds.

Declines in bull trout distribution and abundance are the results of combined effects of habitat degradation and fragmentation, the blockage of migratory corridors, poor water quality, angler harvest and poaching, entrainment into diversion channels and dams, and introduced nonnative species.

Inland Columbia Basin Redband Trout (Bureau Sensitive)

Inland Columbia Basin redband trout (*Oncorhynchus mykiss gairdneri)* are spring spawners and require gravel riffles in which the female excavates a redd (Behnke 1992). Inland Columbia Basin redband trout have been designated as a Bureau Sensitive species and an ODFW and U.S. Fish and Wildlife Service species of concern. Behnke (1992) suggests that redband trout were originally native throughout the interior reaches of the Columbia River Basin, except where their migration was blocked by major falls.

The current distribution of redband trout within the District is relatively unknown due to the lack of definitive stream surveys that determine fish presence or absence and genetic analysis of specimens captured in the field. Based on their widespread historical distribution, redband trout are assumed present in all streams within the District, unless available information or data determines or states otherwise. Additionally, hybridization with rainbow trout makes it difficult to identify redband trout visually and requires verification of field identification through genetic analysis. The redband trout is currently found only in isolated sections of their historical range.

Lahontan Cutthroat Trout (threatened)

The Lahontan cutthroat trout is listed as threatened. Fish in the Upper Quinn and Alvord Lake subbasins constitute the northwestern population segment. They are only found within the Malheur Resource Area.

Lahontan cutthroat trout of the Coyote Lake area, a drainage within Alvord Lake subbasin, are currently present in Whitehorse, Little Whitehorse, Fifteenmile, Doolittle, and Cottonwood Creeks, in Willow Creek and its tributary, and in Antelope Creek. Fifteenmile Creek fish are restricted by a natural barrier to the first 700 meters above the mouth; Lahontan cutthroat trout from Whitehorse Creek were stocked above the barrier in 1971 but did not survive. Antelope Creek was stocked in 1972 with trout from Whitehorse Creek and a small population remains.

In the Upper Quinn subbasin, Lahontan cutthroat trout occur in Sage and Line Canyon creeks. Trout from Sage Creek were transplanted above a falls into Indian Creek in 1980 and 1981, and a small population persists there. In 1996, the ODFW estimated the Lahontan cutthroat trout population density for Sage and Line Canyon Creeks to be about 9,000 fish. In the Coyote Lake Basin, a 1994 inventory showed the population to be approximately 40,000 fish. However, of the 70 miles of stream, less than 20 miles supported healthy fish densities.

Major historic land uses affecting Lahontan cutthroat trout habitat within the District are grazing by domestic livestock and wild horses and activities associated with irrigated agriculture. Concentrations of livestock in riparian areas have caused loss of undercut banks and other cover, increased silt loads, and increased width-to-depth ratios, which ultimately lead to elevated summer water temperatures. Lowering of water tables caused by vegetation removal and downcutting exacerbates low flows during drought. Diversion structures and reduced flows associated with irrigated agriculture are historic and current threats to the species (USDI 2009a).

Pacific Lamprey (Bureau Sensitive)

The Pacific lamprey is designated as Bureau Sensitive in Oregon and Washington, a tribal trust species, and a species of concern by the U.S. Fish and Wildlife Service. Pacific lampreys are important because they have high cultural significance to Native American tribes and may have served as a primary food source for aquatic, mammal, and avian predators that prey on federally listed salmonids and other recreational and commercially important fish species.

A petition in 2003 (Nawa et al. 2003) to list the Pacific lamprey under the *Endangered Species Act* was determined to be not warranted by the U.S. Fish and Wildlife Service. However, in their determination, they acknowledged that Pacific lamprey have declined in the Columbia River Basin and in many parts of their range. The Pacific lamprey has and continues to face a variety of threats associated with passage and entrainment at dams and water diversion structures; altered stream flows, including dewatering of stream reaches; dredging, chemical poisoning; degraded water quality; poor ocean conditions; disease; over-utilization; introduction and establishment of nonnative fishes; predation; and stream and floodplain degradation / simplification (Silver et al. 2009).

Historically, Pacific lamprey were thought to be distributed wherever salmon and steelhead occurred. However, recent data indicates that distribution of Pacific lamprey has been reduced in many river drainages. They no longer exist above many dams and other impassable barriers in west coast streams, including many larger rivers throughout Oregon and Washington and above dams in the Snake and Columbia Rivers (USDI 2008c). Remnant populations may persist in the Grande Ronde River Subbasin, but their location and abundance are unknown, making the assessment of distribution and habitat conditions difficult. Although they are presumed to be present in the Lower Grande Ronde, Imnaha, and Lower Snake Rivers, Pacific lamprey presence has never been documented within waters managed by or adjacent to land managed by the BLM Vale District.

Amphibians and Aquatic Reptiles

Limited amphibian surveys have been conducted on the District. There are a few independent observations and several surveys for the Columbia spotted frog (Bureau Sensitive). Columbia spotted frogs prefer slower moving waters within streams or streams where water is impounded by blocked culverts or beaver dams. They breed and lay egg clusters in emergent vegetation in these slow waters. The known populations on the District are concentrated near Dry Creek and Soldier Creek, both of which drain into the Owyhee River. Category 1 invasive plants near these locations are limited. Three additional Bureau Sensitive species have been documented on the District: northern leopard frog, Rocky Mountain tailed frog, and Woodhouse's toad. Other species documented include Great Basin spadefoot, pacific tree frog, tiger salamander, long-toed salamander, western toad, and the nonnative bullfrog.

Limited reptile surveys have been conducted on the District, but many observations have occurred independently. The painted turtle is the only Bureau Sensitive reptile species documented on the District, and then only in two locations: one outside the town of Vale on private lands and one along Birch Creek near the Morrison Ranch on BLM-administered land. Not much is known about their populations on the District.

Aquatic Invertebrates

Numerous species of aquatic invertebrates inhabit the District. Many of these species are sedentary in nature and cannot move quickly if threatened. There are 11 aquatic Special Status invertebrate species documented or suspected within the District boundary: 2 bivalves and 10 gastropods (see Table 3-28). Limited surveys have been conducted on the District for these and other species that are suspected of being located or having suitable habitat on public lands. Invertebrate biodiversity and habitat relationships are poorly researched (King and Porter 2005).

Table 3-28. Special Status Aquatic Wildlife Species[1]

Class	Common Name	Scientific Name	BLM Status Oregon[2]	Oregon Occurrence[3]	BLM Sensitive in Washington[2]	Washington Occurrence[3]
Amphibian	Columbia spotted frog (Great Basin)	*Rana luteiventris*	S	Doc		
Reptile	painted turtle	*Chrysemys picta*	S	Doc		
Bivalve	California floater	*Anodonta californiensis*	S	Doc	-	Sus
Bivalve	western ridged mussel	*Gonidea angulata*	S	Doc	S	-
Gastropod	a springsnail	*Pyrgulopsis owyheensis*	S	Doc	-	-
Gastropod	blue mountainsnail	*Oreohelix strigosa delicata*	S	Doc	-	Sus
Gastropod	Columbia Gorge oregonian	*Cryptomastix hendersoni*	S	Doc	S	-
Gastropod	Crooked Creek springsnail	*Pyrgulopsis intermedia*	S	Doc	-	-
Gastropod	humped coin	*Polygyrella polygyrella*	-	Sus	S	Sus
Gastropod	Jackson Lake springsnail	*Pyrgulopsis robusta*	S	Doc	-	-
Gastropod	Owyhee hot springsnail	*Pyrgulopsis fresti*	S	Doc	-	-
Gastropod	poplar oregonian	*Cryptomastix populi*	S	Doc	S	Doc
Gastropod	salmon coil	*Helicodiscus salmonaceus*	-	-	S	Doc
Gastropod	thinlip tightcoil	*Pristiloma idahoense*	-	-	S	Sus

1. See Table 3-27 for Special Status fish species.
2. Designation - S: Sensitive
3. Oregon / Washington Occurrence - Doc: Documented; Sus: Suspected

PACFISH / INFISH

The PACFISH / INFISH strategies (USDA and USDI 1995, USDA 1995) are intended to protect and restore habitat and populations of salmon, steelhead, and cutthroat trout (anadromous fish) and bull trout on the District. These strategies define landscape-scale Riparian Management Objectives that establish measurable habitat parameters for assessing progress towards habitat health such as pool frequency, bank stability, bank angle, and large woody debris (USDA 1995). Riparian Habitat Conservation Areas are portions of watersheds that maintain the integrity of aquatic ecosystems, and management activities are subject to specific standards and guidelines. These areas are most important to the healthy functioning of watersheds and associated fish habitat that influence sediment delivery, organic matter, and woody debris, provide root strength for channel stability, shade the stream, and protect water quality. Wetlands, ponds, seasonal streams, and landslide-prone areas are protected by 100 to 150 foot Riparian Habitat Conservation Areas and fish-bearing streams are protected by 300-foot buffers. Activities that are incompatible with the protection of these functions are prohibited or modified within Riparian Habitat Conservation Areas (USDA 1995).

Essential Fish Habitat

The *Magnuson-Stevens Fishery Conservation Act* requires the identification of habitat "essential" to conserve and enhance Federal fishery resources that are commercially fished. Essential Fish Habitat (EFH) is defined as those waters and substrate necessary for spawning, breeding, feeding, or growth to maturity (50 C.F.R. 600.10). On the Vale District, there are 43.49 miles of EFH, all located on the Baker Resource Area. Conservation Measures that are applicable to EFH are located in Appendix A, *Project Design Features, Standard Operating Procedures, Mitigation Measures, Conservation Measures, Prevention Measures, and Best Management Practices*, in the *Essential Fish Habitat Conservation Measures* section[59].

Treatments Planned Related to Issues

There are approximately 32,492 acres of riparian areas on the Vale District (see Map 3-6). There are 2,079 acres of invasive plants documented in NISIMS in those areas, and an additional 10 percent (208 acres) is estimated in Project Areas (see Appendix E).

Common to All Alternatives

Herbicide treatments in riparian areas would generally be conducted with spot spraying. In addition to the use of biological control agents, invasive plants may be treated with manual and mechanical methods and targeted grazing with sheep and goats.

Problematic aquatic invasive plants that could be treated by the BLM using herbicides include yellow flag iris (21 acres) and hydrilla and Eurasian watermilfoil (not yet found on the District, only on neighboring lands). These are found in ponds, lakes, and streams. Perennial pepperweed (4,393 acres District-wide), knapweed (5,506 acres District-wide), and thistles (31,062 acres District-wide) are often found in riparian habitats.

No Action Alternative

The aquatic formulations of glyphosate, 2,4-D, and dicamba would be used in riparian areas.

Proposed Action

In addition to the herbicides used under the No Action Alternative, chlorsulfuron and clopyralid, along with aquatic triclopyr, aquatic imazapyr, and metsulfuron methyl would be used in riparian areas.

Treatments in Category 5 and 6 (including prescribed fire, targeted grazing of cattle, and aerial spray of imazapic) could be applied to as much as 100,000 acres per year for each treatment method (Targeted grazing, seeding, and prescribed fire are limited to 300,000 acres over the life of the plan). However, these treatments (and prescribed fire in Categories 1 and 2) would be in larger upland units. Category 4 (post-wildfire emergency stabilization treatments) may occasionally occur in or near riparian areas.

Seeding in Categories 1 and 2 would generally be less than 20 acres, and could happen on approximately 15 sites a year. It is likely that native seed or plants would be used to restore riparian sites since project areas would be small enough that native plants would be able to compete against invasive plants.

[59] Other Conservation Measures for fish are located in the *Aquatic Animals Conservation Measures* section of Appendix A.

Revised Proposed Action

In addition to the herbicides used under the Proposed Action, aminopyralid, fluroxypyr, and rimsulfuron could also be used in dry wetlands and riparian areas. However, fluroxypyr and rimsulfuron would not typically be used near water. Other treatment methods would remain as described under the Proposed Action.

Standard Operating Procedures and Mitigation Measures Relevant to Effects

Projects that have the potential to disturb Special Status fish or other aquatic species habitat require pre-project clearances, including review for potential habitat and / or project site surveys (USDI 2008b).[60]

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

- To protect Special Status fish and other aquatic organisms, implement all Conservation Measures for aquatic animals presented in the 2007 *Vegetation Treatments on Bureau of Land Management Lands in 17 Western States* and 2016 *Vegetation Treatments Using Aminopyralid, Fluroxypyr, and Rimsulfuron* Biological Assessments (see Appendix A).

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

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

Chemical
- Establish appropriate herbicide-specific buffer zones for water bodies, habitats, or fish or other aquatic species of interest (Tables A-3 and A-4 in Appendix A, and recommendations in individual Risk Assessments).
- Either avoid using any formulations with POEA, or seek to use the formulation with the lowest amount of POEA available, to reduce risks to aquatic organisms.
- Use appropriate application equipment / method near water bodies if the potential for off-site drift exists.
- Limit the use of terrestrial herbicides in watersheds with characteristics suitable for potential surface runoff that have fish-bearing streams during periods when fish are in life stages most sensitive to the herbicide(s) used.
- 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.
- Use of adjuvants with limited toxicity and low volumes is recommended for applications near aquatic habitats.
- Conduct mixing and loading operations in an area where an accidental spill would not contaminate an aquatic water body.

[60] Results would be entered into BLM's Oregon / Washington GeoBOB (Geographic Biotic Observations) database.

Project Design Feature Adopted for this Analysis

The following additional Project Design Features would further reduce effects on federally listed fish:

- For waterbodies that contain federally threatened or endangered species or provide critical habitat, all Project Design Criteria outlined in the Aquatic Restoration Biological Opinions II (ARBO II, USDI 2013a, NMFS 2013) from the U.S. Fish and Wildlife Service and National Marine Fisheries Service would be applied (see Appendix F). The herbicide buffer widths from that appendix are displayed in Table 3-29 for reference. If a treatment project cannot be covered by ARBO II, additional consultation with U.S. Fish and Wildlife Service or NMFS would occur before treatment.

Table 3-29. Federally Listed Fish: No-Application Buffer Widths for Herbicides[1]
No-application buffer widths in feet for herbicide application, by stream types and application methods, for federally listed fish and habitat.

Herbicide	Perennial Streams and Wetlands, and Intermittent Streams and Roadside Ditches with flowing or standing water present			Dry Intermittent Streams, Dry Intermittent Wetlands, Dry Roadside Ditches		
	Broadcast Spraying	**Spot Spraying**	**Hand Selective**	**Broadcast Spraying**	**Spot Spraying**	**Hand Selective**
Labeled for Aquatic Use						
Aquatic glyphosate	100	waterline	waterline	50	0	0
Aquatic imazapyr	100	waterline	waterline	50	0	0
Aquatic triclopyr TEA	Not allowed	15	waterline	Not allowed	0	0
Aquatic 2,4-D (amine)	100	waterline	waterline	50	0	0
Low Risk to Aquatic Organisms						
Aminopyralid	100	waterline	waterline	50	0	0
Dicamba	100	15	15	50	0	0
Dicamba + diflufenzopyr	100	15	15	50	0	0
Imazapic	100	15	bankfull elevation	50	0	0
Clopyralid	100	15	bankfull elevation	50	0	0
Metsulfuron methyl	100	15	bankfull elevation	50	0	0
Moderate Risk to Aquatic Organisms						
Imazapyr	100	50	bankfull elevation	50	15	bankfull elevation
Sulfometuron methyl	100	50	5	50	15	bankfull elevation
Chlorsulfuron	100	50	bankfull elevation	50	15	bankfull elevation
High Risk to Aquatic Organisms						
Triclopyr BEE	Not allowed	150	150	Not allowed	150	150
Picloram	100	50	50	100	50	50
2,4-D (ester)	100	50	50	100	50	50
Not Addressed in ARBO II						
Fluridone[2]	Not allowed within 300 feet of water bodies that contain federally threatened or endangered species or provide critical habitat *(Not addressed in ARBO II)*					
Fluroxypyr						
Hexazinone						
Rimsulfuron						

1. ARBO II does not address the aerial application of herbicides. If an infestation of invasive plants requires aerial application within 1,500 feet of a water body that contains federally threatened or endangered anadromous fish or provides critical habitat, additional consultation would be done with NMFS. For listed resident fish, aerial application in the same watershed (5th field Hydrologic Unit Code (HUC)) as a water body that contains federally threatened or endangered species or provides critical habitat would require additional consultation with U.S. Fish and Wildlife Service.
2. Fluridone is an aquatic herbicide that requires prolonged plant contact, so it can only be used on aquatic plants in still water. It would not be used in rivers or streams and thus would not be applied where listed fish are likely to occur.

Environmental Consequences

For the purpose of this analysis, the intensity, scale, and duration of beneficial or adverse effects on native fish species and aquatic and riparian habitat, as well as Special Status aquatic species and habitat, is defined as follows:

Intensity

Negligible	No effects to fish resources would occur, or effects to fish resources would be immeasurable and within the range of historical or natural variability, and would not retard the attainment of desirable aquatic or riparian habitat conditions.
Minor	Effects to fish resources would be measurable, but short-term in duration and within the range of historical or natural variability; effects would not retard the attainment of desirable aquatic or riparian habitat conditions.

Spatial Scale

Localized:	Drainage, valley segment, site, or stream reach scale
Watershed:	5th -field Hydrologic Unit Code (HUC)
Subbasin:	4th -field HUC

Duration

Short-term:	Anticipated effects would occur or persist within 1 to 5 years after project implementation.
Long-term:	Anticipated effects would occur or persist for more than 5 years after project implementation.

Due to their similar habitat requirements and spatial distribution, Special Status fish species are discussed with general fisheries in this section.

Effects of Treatment Methods

Herbicide Treatments

Stehr et al. (2009) studied developmental toxicity in zebrafish (*Danio rerio*), which involved conducting rapid and sensitive phenotypic screens for potential developmental defects resulting from exposure to six herbicides (picloram, clopyralid, imazapic, glyphosate, imazapyr, and triclopyr) and several technical formulations. Available evidence indicates that zebrafish embryos are reasonable and appropriate surrogates for embryos of other fish, including salmonids. The absence of detectable toxicity in zebrafish screens is unlikely to represent a false negative in terms of toxicity to early developmental stages of threatened or endangered salmonids. Their results indicate that low levels of herbicides are unlikely to be toxic to the embryos of federally listed fish. Those findings do not necessarily extend to other life stages or other physiological processes (e.g., smoltification, disease susceptibility, behavior, etc.)(USDI 2013a:249). Given their long residency period and use of freshwater, estuarine, and near shore areas, juveniles and migrating adults have a high probability of exposure to herbicides that are applied near their habitats.

Standard Operating Procedures and Mitigation Measures including limitations on the herbicides, adjuvants, carriers, handling procedures, application methods, drift minimization measures, and riparian buffers greatly reduce the likelihood that herbicide would be transported to aquatic habitats. However, some herbicides are still likely to enter streams through aerial drift, and in association with eroded and dissolved sediment in runoff including from intermittent streams and ditches. No adverse effects to tolerant fish are anticipated (see Appendix C, *Herbicide Risk Assessment Summaries*). This conclusion applies to susceptible[61] (including federally listed) fish as well.

Table 3-30. Effects of Herbicides (Fish and Other Aquatic Species)
Additional information about the risk ratings discussed below can be found in Appendix C, *Herbicide Risk Assessment Summaries*.

Herbicides available under all alternatives	
2,4-D	Drift and runoff are the most likely pathways of deposition of 2,4-D into aquatic habitats (EPA 2009b) and it is detected frequently in freshwater habitats within the four western states where federally listed Pacific salmonids are distributed. 2,4-D acid, salts, and esters are toxic to aquatic animals, with esters having greater toxicity than 2,4-D acid and salts. 2,4-D amine fits into the moderate risk group. The risk of adverse effects to fish and their habitats was evaluated in terms of hazard quotient values and no observable effect concentration levels. Over the range of 2,4-D acid / salt application rates used in U.S. Forest Service programs (0.5-4 lb. acid equivalent / acre), adverse effects on fish, amphibians, and aquatic invertebrates are likely only in the event of an accidental spill. With regard to 2,4-D esters, however, adverse effects on aquatic animals (e.g., fish, invertebrates, amphibians) are plausible in association with runoff (all application rates) and would be expected in direct spray to water and in cases of relatively large accidental spills (SERA 2006). NMFS (2011) determined that 2,4-D BEE posed a medium risk to fish. 2,4-D amine is labeled for aquatic use and 2,4-D ester is characterized as high risk to all federally listed fish due to the [narrow] proposed no-spray buffers (USDI 2013a).
Dicamba	Dicamba's soil activity is very short. Like 2,4-D, it also is available as both an amine and ester formulation. Drift from dicamba applications is common, especially from the ester formulation (DiTomaso et al. 2006). The Washington State Department of Agriculture has added dicamba to its list of Pesticides of Concern because it is being increasingly detected in most of the streams sampled in urban and agricultural watersheds in Washington (Sargeant et al. 2013). The risk characterization for aquatic animals is extremely limited by the available toxicity data. Another very substantial limitation in the risk characterization is that no information is available on the chronic toxicity of dicamba to aquatic animals and the available acute toxicity data do not permit reasonable estimates of toxicity values for chronic toxicity. Acute toxicity studies in fish indicate that dicamba is relatively non-toxic, although salmonids appear to be more susceptible than other freshwater fish to the acute toxicity of dicamba (SERA 2004c). However, the EPA concluded that dicamba compounds with currently registered uses will have "no effect" on federally listed fish and their critical habitat, and therefore consultation with the National Marine Fisheries Service is not necessary (EPA 2003). Therefore, dicamba likely fits into the "low" risk group. Aquatic invertebrates appear to be slightly more susceptible to dicamba than fish or amphibians.
Glyphosate	In general, glyphosate is immobile in soil, being readily adsorbed by soil particles and subject to microbial degradation (Norris et al. 1991). This immobility reduces the potential for glyphosate to enter water bodies during runoff. Based on bioassays, technical grade glyphosate is classified as non-toxic to practically non-toxic in freshwater fishes (EPA 1993). Some formulations are more toxic to fish than technical grade glyphosate. At the typical application rate, the less toxic formulation of glyphosate poses little risk to fish, except under accidental spill scenarios, for which there is a low to moderate risk to fish. At the typical application rate, the more toxic (non-aquatic) formulation of glyphosate poses a high risk to fish under accidental spill scenarios, and a low risk under routine acute exposure scenarios (moderate risk to susceptible fish species). At the maximum application rate, the less toxic formulation of glyphosate poses a low risk to fish under acute exposure scenarios. Accidental spills for the maximum application rate pose moderate to high risk to fish. At this same application rate, the more toxic formulation of glyphosate poses a high risk to fish under accidental spill

[61] From the Risk Assessments, susceptible fish species include cold water fish, such as trout, salmon, and federally listed species. Tolerant fish species include warm water fish, such as fathead minnows. See Risk Table C-7 in Appendix C.

	scenarios, and moderate risk to fish under acute exposure scenarios. Based on these data, the EPA classified glyphosate formulation as moderately toxic to practically non-toxic to freshwater fishes (SERA 2003a). There may be short-term adverse effects to terrestrial and aquatic amphibians where POEA formulations of glyphosate are used (see *Adjuvants, Degradates, and Inert Ingredients* section below). Effects would vary by species and by developmental stage (Relyea 2005a, Relyea et al. 2005). Larval amphibians were more susceptible in some studies (Relyea 2005b), but less so in other studies (Thompson et al. 2004). Glyphosate has not been tested on a wide range of amphibians, nor does EPA require the testing of surfactants. Proprietary labels do not always identify the surfactants used. Pre-project clearance evaluations for Special Status amphibians would help project planners choose appropriate invasive plant treatments that have lower chance of adverse effects where these amphibians are likely to occur. In any event, a Mitigation Measure specifies avoiding using glyphosate formulations containing POEA, or seeking the use of formulations with the least amount of POEA, to reduce risks to amphibians (Appendix A, *Project Design Features, Standard Operating Procedures, Mitigation Measures, Conservation Measures, Prevention Measures, and Best Management Practices*). Glyphosate hazard quotient exceedances occurred for fish and algae only at rainfall rates of 150 inches per year (over 11 times greater than the approximately 13 inches per year on average the District receives), and no hazard quotient exceedances occurred for aquatic invertebrates or aquatic macrophytes.
Picloram	The acute and chronic toxicity of picloram has been assayed in various species of fish. According to the Ecological Risk Assessments, risk to susceptible fish is moderate for accidental spill scenarios at the typical or the maximum application rate, and low for tolerant fish at the maximum rate. Under acute and chronic exposure scenarios, picloram poses no risk to fish (SERA 2011c). Based on expected concentrations of picloram in surface water, all central estimates of the hazard quotients are below the level of concern for fish, aquatic invertebrates, and aquatic plants. No risk characterization for aquatic-phase amphibians can be developed because no directly useful data are available. Upper bound hazard quotients exceed the level of concern for longer-term exposures in susceptible species of fish (hazard quotient = 3) and peak exposures in susceptible species of algae (hazard quotient = 8). It does not seem likely that either of these hazard quotients would be associated with overt or readily observable effects in either fish or algal populations. In the event of an accidental spill, substantial mortality would be likely in susceptible species of fish (SERA 2011a).
Herbicides available in limited areas under the No Action Alternative and District-wide under the Proposed and Revised Proposed Actions	
Chlorsulfuron	Chlorsulfuron's physical and chemical properties suggest that it is highly soluble in water, and is likely to remain dissolved in water and runoff from soils into water bodies. In addition, this herbicide has a long half-life in ponds, but is not likely to bioconcentrate in aquatic wildlife and will not cause any adverse effects on aquatic wildlife. No evaluated scenario, including accidental direct spray and spill of chlorsulfuron, resulted in any risk to fish in streams and ponds. No studies on amphibians were found.
Clopyralid	Application of clopyralid under the modeled scenario did not result in any hazard quotient exceedances for any of the species groups. Clopyralid applications were determined not likely to adversely affect federally listed salmonids or their habitat because hazard quotient values are less than one (USDI 2013a).
Imazapic	The average half-life for imazapic in a pond is 30 days, and this herbicide has little tendency to bioaccumulate in fish (Barker et al. 1998). According to the manufacturer's label, imazapic has a high runoff potential from soils for several months or more after application. Accidental direct spray and spill scenarios generally pose no risk to fish when imazapic is applied at either the typical or maximum application rate. Risk Assessments show fish are not at risk from off-site drift or surface runoff of imazapic.
Herbicides available under the Proposed and Revised Proposed Actions	
Dicamba + Diflufenzopyr	Found to have low residence times in water bodies and a low bioconcentration potential (National Library of Medicine 2002). Diflufenzopyr + dicamba application does not pose a risk to fish under any application scenario (also see toxicity studies under dicamba and diflufenzopyr). Aquatic invertebrates are more susceptible to dicamba than fish or amphibians.
Diflufenzopyr	The physical and chemical properties of diflufenzopyr suggest that this herbicide would be removed from an aquatic environment relatively rapidly following contamination and would not appreciably bioconcentrate in fish tissue. The Ecological Risk Assessment shows that diflufenzopyr does not pose a risk to fish under any of the Risk Assessment scenarios.

Fluridone	Fluridone has little tendency to bioaccumulate in fish (Washington Department of Health 2000). Application timing could avoid most susceptible (water-associated) stages of amphibian development, if this developmental information is available for resident reptiles or amphibians at the treatment site (ENSR 2005g). An accidental spill of fluridone poses moderate risk to fish. Direct spray of fluridone over a pond at the maximum application rate poses a low risk to fish. Accidental direct spray of fluridone over a stream (aquatic herbicides are typically applied to still water such as ponds or lakes, not flowing water) at the maximum application rate poses no or low risk to fish. Because fluridone is an aquatic herbicide, off-site drift and surface runoff scenarios were not evaluated. As fluridone is relatively non-persistent, it is not expected to affect water quality for a substantial period of time (Muir et al. 1980).
Hexazinone	According to Ecological Risk Assessments, there is a low risk to fish in ponds or streams only for accidental spill scenarios. Bioassays on the active ingredient hexazinone and commercial formulations that include hexazinone indicate that commercial formulations are substantially less toxic than the active ingredient alone, even when exposures are normalized for hexazinone levels (Wan et al. 1988). Bullfrogs were slightly more susceptible to behavioral change (diminished response to prodding) than leopard frogs over a 9-day study but amphibian studies were not adequate to determine the LD_{50}.
Imazapyr	Imazapyr is relatively non-toxic to fish (SERA 2011b). Imazapyr poses a low risk to susceptible fish only for the accidental spill scenario at the maximum application rate. Tolerant fish were not modeled. ARBO II reported that no hazard quotient exceedances occurred for imazapyr for fish or aquatic invertebrates. Hazard quotient exceedances occurred for algae and aquatic macrophytes at a rainfall rate of 150 inches per year on low permeability clay soils (USDI 2013a). Algae and macrophytes provide food for aquatic macroinvertebrates, particularly those in the scraper feeding guild (Boulton 1993). These macroinvertebrates in turn provide food for rearing juvenile salmonids. However, the small amount of imazapyr that could reach the water from applications planned for the District should not result in measureable effects.
Metsulfuron methyl	Overall, metsulfuron methyl appears to have a very low potential to cause any adverse effects in aquatic animals. According to the Ecological Risk Assessments, metsulfuron methyl poses almost no risk to fish in streams and ponds under accidental, acute, and chronic exposure scenarios involving application of typical and maximum rates (although an accidental spill at the maximum application rate poses a low risk to susceptible fish species). Values from 96-hour LC_{50} values for acute toxicity in bluegill sunfish and rainbow trout ranged from approximately 150 mg / L to 1,000 mg / L for both species (SERA 2004e). In rainbow trout, signs of sub-lethal toxicity include erratic swimming behavior, lethargy, and color change at concentrations around 100 mg / L, with a no observable effects concentration of 10 mg / L (SERA 2004e). One investigation did not observe any effects on rainbow trout hatching, larval survival, or larval growth over a 90-day exposure period, at a no observable effects concentration of up to 4.5 mg / L (Kreamer 1996, cited in SERA 2004e). The no observable effects concentration of 10 mg / L for sub-lethal effects in rainbow trout is based on an uncertainty factor of 100; it is assumed that rainbow trout are 100 times more susceptible than bluegill sunfish that has a no observable effects concentration of 1,000 mg / L. No hazard quotient exceedances occurred for metsulfuron methyl for fish, aquatic invertebrates, or algae. The hazard quotient exceedances for aquatic macrophytes occurred at the maximum application rate on clay soils at rainfall rates of 50 and 150 inches per year. These conditions do not occur on the Vale District.
Sulfometuron methyl	Sulfometuron methyl has a relatively low residence time in aquatic systems, and bioaccumulation in aquatic organisms has not been detected (Extoxnet 1996a). According to Ecological Risk Assessments, there would be no risks to fish or aquatic invertebrates associated with the use of sulfometuron methyl under any of the evaluated scenarios.
Triclopyr	Commercial formulations of triclopyr may contain the acid form (TEA) or the BEE form, although only TEA is registered for use in aquatic environments. Applications of triclopyr BEE in excess of about 1.5 to 3 lbs. acid equivalent / acre could be associated with acute effects in susceptible species of fish or invertebrates, in cases of substantial drift or off-site transport of triclopyr via runoff (SERA 2011c). Stehr et al. (2009) observed no developmental effects at nominal concentrations of 10 mg / L or less for purified triclopyr alone or for the TEA formulations Garlon 3A and Renovate. However, the developmental toxicity of other triclopyr-containing herbicides, especially formulations based on BEE (e.g., Garlon 4), were not determined. NMFS (2011a) determined that triclopyr BEE (esters) posed a medium risk to fish. However, given the uses, fate, and toxicity of triclopyr BEE, the National Marine Fisheries Service did not expect mortality to be a common occurrence. Triclopyr acid (TEA) posed a low risk only to susceptible fish under the accidental spill scenario at the maximum rate.

Herbicides available under the Revised Proposed Action	
Aminopyralid	The Risk Assessment for aminopyralid indicates that this herbicide would not pose a risk to fish or aquatic invertebrates in ponds or streams as a result of any of the modeled exposure scenarios (see Appendix C). The Risk Assessment included a direct spray scenario and a worst-case scenario involving a spill of the active ingredient into the aquatic habitat, as well as off-site drift and surface runoff scenarios. Based on toxicity data reviewed for the Risk Assessment, aminopyralid exposures to fish of as high as 100 ppm did not result in any observable mortality or sub-lethal effects. Additionally, the Risk Assessment indicates that aminopyralid is not likely to accumulate in fish tissue. Toxicity data for aquatic invertebrates was similar, with no adverse effects observed at concentrations of nearly 100 ppm.
Fluroxypyr	The Risk Assessment for fluroxypyr indicates that this herbicide would not pose a risk to fish or aquatic invertebrates in ponds or streams under any of the modeled exposure scenarios. The Risk Assessment included a direct spray scenario and a worst-case scenario involving a spill of the active ingredient into the aquatic habitat, as well as off-site drift and surface runoff scenarios. Based on toxicity data presented in the Risk Assessment, no effects to fish were observed after exposure to fluroxypyr at concentrations of approximately 7 milligrams per liter (mg/L). The Risk Assessment also indicated that based on the literature, fluroxypyr may accumulate in fish tissue. Toxicity data for aquatic invertebrates indicated that no adverse effects were observed at concentrations of 56 mg/L.
Rimsulfuron	Based on the results of the Risk Assessment, none of the modeled exposure scenarios were associated with risks to fish or aquatic invertebrates in streams or ponds, even under the worst case accidental spill scenarios. Based on toxicity data reviewed for the Risk Assessment, exposures to concentrations of rimsulfuron as high as 390 mg/L does not result in adverse effects to fish, although the potential for chronic effects is not known. Additionally, the Risk Assessments indicates that rimsulfuron is not likely to accumulate in fish tissue. Lower concentrations of the herbicide were noted to cause adverse effects to aquatic invertebrates, with test organisms affected at 50 mg/L of rimsulfuron.

Adjuvants, Degradates, and Inert Ingredients

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

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

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

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

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

Other Ingredients: Relatively little toxicity information was found on inert ingredients during preparation of the BLM Ecological Risk Assessments. A few acute studies on aquatic or terrestrial species were reported. No chronic data, no cumulative effects data, and almost no indirect effects data (food chain species) were found for the inerts in 13 herbicides examined. However, some of the inerts, particularly the EPA List 3 compounds (inert ingredients of unknown toxicity) and unlisted compounds, may potentially be moderately to highly toxic to aquatic species (based on information in Safety Data Sheets or published data) (USDI 2010a:229).

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

Non-Herbicide Treatments

Manual and Mechanical

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

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

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

Planting and Seeding

Effects from planting in riparian areas would be similar to the effects of manual methods: disturbing soil can lead to erosion, which leads to decreased fish habitat. Effects would be adverse and negligible in the short-term but beneficial and negligible in the long-term, once vegetation was established. Seeding would be minimal in riparian areas and would be conducted using hand seeders.

Targeted Grazing

Targeted grazing is not a common invasive plant treatment technique on the District in wet, riparian and / or fish bearing areas and its use, if any, is expected to be minimal (only on armored banks and with sheep or goats, not cattle). The limited extent of the treatment, coupled with the Standard Operating Procedures and Mitigation Measures (see Appendix A) would result in any effects to water, riparian and / or fish and fish habitat being at a negligible level in the short-term.

Prescribed Fire

The risk of harm to fish from prescribed fire for invasive plant control depends on fire intensity, timing, and landform, among other factors. Prescribed burning has the potential to bare large areas of soil, and thus increase both surface erosion (from wind and water) and sedimentation of streams. Heavy runoff from burned areas can increase water pH, indirectly affecting aquatic biota.

Effects of Invasive Plants

Riparian systems are being invaded by invasive plants, which are generally detrimental to native aquatic species. Invasive plants are generally less efficient at holding soil in place, and cause water-quality problems. Fish are affected by turbidity, sedimentation, loss of large organic debris, loss of shading (and associated temperature increases), and exposure to hazardous substances. Erosion increases turbidity and sedimentation that can reduce fish feeding success. Severe cases of sedimentation can keep fry (early-stage fish) from emerging, or fill in or reduce the deeper pools preferred by fish, especially trout.

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

Dense concentrations of aquatic plants can reduce light penetration and lower the concentration of dissolved oxygen in the water and can upset the balance of the fish community by providing too much cover for small fish (Payne and Copes 1986). Many invasive aquatic and riparian plants form monocultures that crowd out more desirable native plant species.

Effects by Alternative

No Action Alternative

Treatments under the No Action Alternative would not be effective against all invasive plant species, which would allow for their continued spread at about 12 percent per year in riparian areas (approximately 250 acres a year). The spread of invasive plant populations at current rates would continue to cause damage to native plant communities, including riparian communities, which directly or indirectly provide habitat for fish. Effects from invasive plant management would be adverse and minor across riparian areas within the District. It is unlikely that treatment methods themselves would harm any fish.

Proposed Action

Treatments under the Proposed Action would be more effective against all invasive plant species than the No Action Alternative (see *Invasive Plants* section earlier in this Chapter). Under this alternative, the invasive plant spread rate would be reduced over time to 7 percent per year (or about 145 acres a year). Although the Proposed Action would prevent more invasive plant infestations, their continued spread would continue to damage native plant communities, including riparian communities that directly or indirectly provide habitat for fish. This continued, albeit reduced, spread would have harmful effects on fish.

This alternative proposes to treat more acres than the No Action Alternative. Much of this increase would occur in upland areas, generally away from streams. The BLM's ability to use up to 10 additional herbicides would reduce risks to fish when compared to the No Action Alternative because having more options available would allow more site-appropriate treatments. The use of glyphosate is predicted to decrease 22 percent under this alternative (see Table 2-11, *Estimated Treatment Acres*).

Of the herbicides that can be used in aquatic or riparian areas, chlorsulfuron, clopyralid, fluridone, imazapic, metsulfuron methyl, and sulfometuron methyl were found to have no risk to fish. Imazapyr and triclopyr were found to have high risk under accidental spill scenarios. Standard Operating Procedures, including conducting mixing and loading operations away from water bodies, would limit this risk. Fluridone is an aquatic herbicide that would be available under this alternative to control submerged aquatics including Eurasian watermilfoil and hydrilla if they were to be found on the District in the future. The fluridone Ecological Risk Assessment predicts no risk to fish from direct spray in a pond (fluridone is not used in streams). However, the Ecological Risk Assessment predicts risk to fish may occur when fluridone is spilled directly into a pond. Fluridone is slow acting and is used at low concentrations on both submergent and emergent plants. As the plants die off slowly, there is not a large concentration of decaying organic matter added to the water at one time so it is less likely to deoxygenate the water and kill fish than other aquatic herbicides.

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

The goals outlined in PACFISH / INFISH align with the Purpose and Need of this EA. Goal five of the Riparian Management Goals in INFISH is to "maintain or restore diversity and productivity of native and desired nonnative plant communities in riparian zones" (USDA 1995). One of the purposes of this EA is to control invasive plants to protect native ecosystems and the flora and fauna that depend on them.

PACFISH / INFISH contains six Riparian Management Objectives for pool frequency, water temperature, large woody debris, bank stability, bank angle, and width / depth ratio. The Proposed Action would not impede the attainment of these Riparian Management Objectives. It is unlikely that the proposed spot treatments would result in a downward trend of the applicable Riparian Management Objectives. In addition, ARBO II limits treatment acreage on listed fish-bearing streams to 10 percent of a Riparian Habitat Conservation Areas within a 6th-field HUC per year (USDI 2013a, NMFS 2013). In the majority of these watersheds on Vale District, the total percentage of BLM-administered land ownership within those HUCs does not exceed 10 percent of the total acreage. This ensures future vegetative treatments along listed streams would not be extensive, and in turn, the short-term reduction of vegetative cover and soil disturbance would be limited.

Invasive plant treatment activities could result in short-term, negligible to minor, adverse effects on riparian and aquatic habitat and species. Invasive plant management activities would also result in measurable long-term beneficial effects to riparian and aquatic habitat and species by restoring and increasing the quality of upland and riparian vegetation conditions at a faster rate than the No Action Alternative.

Seeding and planting as an invasive plant control method may occur in riparian areas. These would occur rarely (on the order of a few times a year), in areas less than 20 acres, and use native plants. This would result in a beneficial localized minor effect.

Upland invasive plant treatments, including seeding, planting, and grazing, would result in long-term minor to measurable beneficial effects to riparian and aquatic habitat at the watershed scale. An increase in upland soil stability from perennial grasses would lower erosion rates and decrease the potential for sediment disturbance and delivery into waterbodies adjacent to treated areas.

Revised Proposed Action

Under the Revised Proposed Action, aminopyralid, fluroxypyr, and rimsulfuron could be used in riparian areas and (dry) seasonal wetlands, but they are not registered for use in aquatic areas or wetlands. All three herbicides have 0 risk to aquatic organisms under all Risk Assessment scenarios. However, the Risk Assessment also indicated that based on literature searches, fluroxypyr may accumulate in fish tissue and that the acid form of fluroxypyr is highly toxic to certain marine invertebrates. Fluroxypyr would never be applied to the water column and has a short half-life in anaerobic soils, so it is unlikely to be present in an aquatic environment.

The addition of these three herbicides would cause the use of 2,4-D, dicamba, glyphosate, and picloram to drop. Most noticeably, 2,4-D (low to high risk under some fish Risk Assessment scenarios) use would decrease by 65 percent when compared to the No Action, and 59 percent when compared to the Proposed Action. However, formulations of 2,4-D and glyphosate are registered for use in aquatic areas, so the addition of these three new herbicides would not greatly reduce the use of these herbicides in fish and other aquatic species' habitat and would therefore have similar effects as the use of these herbicides in other alternatives .

Other effects, including the benefits of controlling invasive plants, would remain as described under the Proposed Action.

Cumulative Effects

Fish are not restricted by land ownership: populations migrate up and downstream depending on their life history stage using aquatic habitats independent of land ownership. Water quality on BLM-administered land is often inherited from sources upstream or upslope and outside of BLM-administered lands. Herbicide use also occurs on other Federal, State, and County lands, private forestry lands, rangeland, agricultural land, utility corridors, and road rights-of-way.

Past management actions have resulted in adverse effects to riparian and aquatic habitat quality and quantity. As noted earlier, causes of stream degradation include the removal of riparian vegetation and destabilization of stream banks. The land use most commonly associated with these problems is grazing, including historic grazing practices and grazing on private lands. Other land uses associated with degraded streams include roads, trails, water withdrawal, reservoir storage and release, altered physical characteristics of the stream, mining, and wetlands alteration. Springs have also been disturbed by management activities, such as livestock or wild horse grazing and watering, recreation use, and road construction. This affects the amount of water available.

Juniper reduction projects benefit water-related resources over the mid and long-term by removing these unnaturally populous, high water-using trees. Reducing juniper increases understory vegetation and infiltration, decreases erosion within treated areas, and increases water quantity in areas where juniper is removed adjacent to seeps, springs, or streams. Other activities that could potentially affect fish and fish habitat (besides grazing) include fuels treatment projects, fence construction projects, routine road maintenance, prescribed fire, and commercial recreation permits (see Table 3-2, *Ongoing and Foreseeable Actions on or near the Vale District Potentially Relating to Cumulative Effects*).

The potential negative effects to fish from the alternatives are negligible in the context of other activities and conditions on the District, and would be positive in the long term as invasive plants are slowed. Further information about fish habitat can be found in the *Water Resources* and *Riparian Habitats Cumulative Effects* sections.

Wildlife

Issues

- How would treatment disturbances (noise, presence of humans) and the timing of that disturbance affect migratory birds and Special Status wildlife species?
- How would large-area treatments affect smaller resident species and publicly important species such as mule deer, elk, pronghorn, and bighorn sheep?
- How would the alternatives affect habitat quality (forage and cover availability, quality, and quantity)?
- How would the alternatives affect pollinators?

Issues Not Analyzed in Detail

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

Some immobile animals, such as mollusks and other invertebrates, ground-dwelling mammals, or pre-fledgling birds could be restricted to the treatment area. It is acknowledged that these organisms could be adversely affected by broad scale treatments using herbicides with moderate to high toxicity (USDI 2010a:246). However, the risk tables (see Appendix C, *Herbicide Risk Assessment Summaries*) indicate that the risk from direct spray is low or zero for almost all scenarios involving typical application rates, and is moderate for five herbicides applied at maximum rates (USDI 2010a:96-98, and discussion at 247-250). Exposure is reduced because relatively intact habitats would be spot treated. Broadcast or aerial treatments would only occur where invasive plants are wide spread. This issue is not analyzed in detail; there is not enough difference between the alternatives relative to the issue for an analysis to aid the decision-maker and required Standard Operating Procedures and Mitigation Measures make it unlikely that detailed analysis would reveal a potentially significant effect.

- How would the alternatives affect Canada lynx, gray wolves, and yellow-billed cuckoo on the District?

Although Canada lynx have been known to pass through the District, they are assumed an occasional visitor to the area. Not much is known about their populations (USDA et al. 2010). Resident wolf populations and denning areas do not occur on BLM-administered land and treatments are unlikely to affect wolves moving across the District (ODFW 2010). The last recorded observations of the yellow-billed cuckoo on the Vale District were in the 1940s (USDI 2013b). Invasive plant control treatments are not expected to disturb or affect these species other than to protect or restore native vegetation contributing to their habitat.

Affected Environment

Numerous species of wildlife occur within the Vale District. The species and species groups discussed here specifically relate to the issues identified above. Species protected under the *Endangered Species Act* or as a BLM Special Status species are provided in Table 3-33.

Birds

Eagles
The BLM manages the bald eagle as a sensitive species, and it is protected by the *Migratory Bird Treaty Act* of 1918, the *Lacey Act* of 1900, and the *Bald and Golden Eagle Protection Act* of 1940. Inventories of nesting bald eagles on the District have been conducted periodically over many years. There is only one documented nest on BLM-administered land, recorded in 2009. Other nests are documented on private and National Forest land inholdings within the District. In addition, one sighting of an immature bald eagle was recorded in July of 1996. Bald eagles are frequently seen foraging in the winter on BLM-administered lands throughout much of the District especially from January through March.

The golden eagle is a species of high public interest and is given consideration when planning resource activities. The golden eagle is not federally listed under the *Endangered Species Act*; however, it is protected under the *Migratory Bird Treaty Act* and the *Bald and Golden Eagle Protection Act* and is provided some of the same protections as a BLM Special Status species.

No systematic inventories have been completed for golden eagles on the District, but known nesting sites have been monitored at higher frequencies within the last 5 years. There are 86 observations recorded on the Vale District, but most are not nesting observations. The BLM does not know all the golden eagle nest sites on the District, but the majority of suitable habitats have been surveyed for nest sites.

Peregrine Falcon
The BLM manages the peregrine falcon as a Special Status species, and it is protected by the *Migratory Bird Treaty Act* of 1918 and the *Lacey Act* of 1900. The peregrine falcon was federally listed under the *Endangered Species Act* as endangered throughout its range and as a State endangered species under the *Oregon Endangered Species Act*. It was federally delisted in 1999 after reaching the recovery goals set forth in the *1982 Pacific Coast Recovery Plan for the American Peregrine Falcon*.

Peregrine falcon habitat exists on the District, especially along the Owyhee River where one nest was documented as active in 2010 (but has not been re-surveyed). No direct effect to peregrines could occur since they nest on bare rock on high cliffs and do not use vegetation for nesting materials. Indirect effects associated with consumption of prey species obtained near treatment areas would be negligible. For these reasons, peregrines will not be discussed further in the environmental consequences section.

Other Raptors

There are many other raptors on the District. These include, but are not limited to, osprey, northern harrier, sharp-shinned hawk, Cooper's hawk, northern goshawk, Swainson's hawk, red-tailed hawk, ferruginous hawk, rough-legged hawk, American kestrel, merlin, prairie falcon, barn owl, great horned owl, burrowing owl, long-eared owl, short-eared owl, and turkey vulture. The great gray owl and the gyrfalcon, which are Bureau Sensitive species in the Washington part of the District, are suspected to occur there but have not been documented.

Neotropical Migratory Bird Species

Numerous neotropical migratory bird species are found on the District, although no systematic nesting inventories have been conducted. Birds of Conservation Concern (USDI 2008d) that have been documented on the District include the bald eagle, golden eagle, ferruginous hawk, Swainson's hawk, long-billed curlew, Cassin's finch, white-headed woodpecker, Lewis' woodpecker, loggerhead shrike, Brewer's sparrow, sage sparrow, and the sage thrasher. Neotropical migrant bird species are protected and managed under the *Migratory Bird Treaty Act* and the *Neotropical Migratory Bird Conservation Act* of 2000.

Greater Sage-Grouse

On March 5, 2010, the U.S. Fish and Wildlife Service concluded that the Greater Sage-Grouse warranted protection under the *Endangered Species Act*, but that proposing the species for protection was precluded by the need to take action on other species facing more immediate threats (USDI 2010c). On September 22, 2015, the U.S. Fish and Wildlife Service announced that the bird would not be federally listed as endangered, as areas where the sage-grouse breeds were being restored.

The Oregon BLM completed a Proposed Resource Management Plan Amendment in June of 2015 that incorporates sage-grouse conservation measures into its existing Resource Management Plans in eastern Oregon (USDI 2015a). The Record of Decision for the *Approved Resource Management Plan Amendments for the Great Basin Region Including the Greater Sage-Grouse Sub-Regions* was signed September 21, 2015 (USDI 2015b). BLM has designated Priority Habitat Management Areas (PHMA) and General Habitat Management Areas (GHMA). PHMA include areas that have the highest conservation value to maintain or increase sage-grouse populations. GHMA are occupied or suitable habitat outside of PHMA. Currently there are approximately 2,275,000 acres of PHMA on the Vale District of which 2,640 acres (0.12 percent) are recorded in NISIMS as Category 1 noxious weeds. There are approximately 2,038,000 acres of GHMA on the Vale District of which 2,969 acres (0.15 percent) are Category 1 noxious weeds (see Map 3-8). However, approximately 54 percent of Greater Sage-Grouse habitat has some level of infestation by invasive annual grasses (see Table 3-31). Since invasive annual grasses are spreading 10 to 20 percent per year or more (Duncan et al. 2004), this number could increase rapidly.

Table 3-31. Invasive Annual Grasses in Greater Sage-Grouse Habitat

	PHMA Acres *(percent infested)*		GHMA Acres *(percent infested)*		PHMA and GHMA *(percent infested)*	
Greater Sage-Grouse habitat	2,275,168		2,038,374		4,313,541	
Moderately[1] infested (6 to 10 percent)	266,146	*(12%)*	288,688	*(14%)*	554,834	*(13%)*
Heavily[2] infested (11 to 25 percent)	465,346	*(20%)*	813,810	*(40%)*	1,279,158	*(30%)*
Severely[3] infested (greater than 25 percent)	100,841	*(4%)*	390,668	*(19%)*	491,509	*(11%)*
Total Acres Infested (at any level)	832,333	*(37%)*	1,493,166	*(73%)*	2,325,502	*(54%)*

The greatest threat to sage-grouse has been the destruction or modification of their habitat, especially by wildfire and the spread of invasive plants. In the last 30 years, most sagebrush habitat loss has been due to wildfires, which have grown in size in the last 15 years. In the last 8 years (2006-2014), roughly 1.7 million acres burned, 4.5 times the amount of acres burned during any other 8-year period dating back to 1980. Approximately 665,000 acres of this was PHMA and 487,500 acres was GHMA, totaling over 1.15 million acres of sage-grouse habitat. The increase in invasive annual grasses has contributed to increased frequency and intensity of wildfire by carrying the fire from shrub to shrub. Invasive annual grasses also threaten sage-grouse by outcompeting the native forbs and grasses needed to provide food and shelter for the species. The *Oregon Greater Sage-Grouse Proposed Resource Management Plan Amendment and Final Environmental Impact Statement* recommends reducing invasive annual grasses within 4 miles of leks with a conservation status of occupied or pending[62] to less than 5 percent cover (USDI 2015a:2-15). Currently, invasive annual grasses have invaded known leks (breeding areas), nesting and brood-rearing habitat throughout the District.

Mammals

Bats

There are four species of bats on the Oregon / Washington BLM Special Status species list known to occur on the District. They include Townsend's big-eared bat, pallid bat, spotted bat, and fringed myotis. Numerous bat surveys have been conducted across the District. There are thirteen records of fringed myotis throughout the District, of which eight are call recordings. There are twenty-two records of pallid bat, of which six are call recordings. There are eight records of Townsend's big-eared bats, all of which are visual or capture observations. Only four records of spotted bats exist within the District, all of which are call recordings. Identification by call recording has a lower accuracy than visual or capture observations.

Other Small Mammals

Pygmy rabbits, a Bureau Sensitive species, usually occur in dense stands of big sagebrush in deep loose soils. Surveys are conducted in suitable habitat when projects are proposed.

Limited small mammal inventories conducted by the ODFW and BLM have documented various small mammals within the District. These include kit fox, white-tailed and black-tailed jackrabbits, cottontail rabbits, sagebrush voles, yellow-bellied marmots, and Douglas' squirrel. In addition, four species of ground squirrel have been documented: Columbian ground squirrel, Merriam's ground squirrel, white-tailed antelope squirrel, and Washington ground squirrel. Additional species that most likely occur on BLM-administered lands but have not been recorded include kangaroo mice, grasshopper mice, and least chipmunks.

Ungulates

Several ungulate species within the District are important to the public for hunting and wildlife viewing. These include Rocky Mountain elk, mule deer, California bighorn sheep, and pronghorn. BLM-administered land within the District is especially important as winter range for elk and deer. (Adjacent National Forest lands are used primarily in summer and transitional periods.)

Based on ODFW estimates, the present population of Rocky Mountain elk on the District and adjacent lands administered by the U.S. Forest Service are expanding toward the management objectives or goals of Oregon's Elk Management Plan (ODFW 2003b). Approximately 1,095,000 acres of elk winter range have been identified on the Vale District. Of these acres, about 2,909 acres are documented in NISIMS as being infested with Category 1 invasive plants, which is less than 0.27 percent of District elk winter range. As with sage-grouse habitat, elk winter range is also being affected by invasive annual grasses. Approximately 42 percent of elk winter range is moderately or heavily infested with invasive annual grasses (Category 5) and 12 percent is severely infested (Category 6). In areas severely infested, it can be assumed that the habitat is barely, if at all, suitable for elk (see Table 3-32).

[62] "Pending occupied" leks and "pending unoccupied" leks are collectively referred to as "pending" in the *Resource Management Plan Amendment*. "Pending" refers to leks that have not been surveyed regularly in the last seven years to confirm activity.

Approximately 1,796,365 acres of mule deer winter range exists on the District. Of these acres, about 7,734 acres are recorded in NISIMS as being infested with the Category 1 invasive plants, which is less than 0.5 percent of deer winter range. Like elk and sage-grouse habitat, mule deer winter range and spring range are affected by invasive annual grasses across the District (see Table 3-32). Approximately 44.5 percent of deer winter range is moderately and heavily infested with invasive annual grasses (Category 5) and 21.5 percent is severely infested (Category 6). Deer winter range is primarily juniper woodland and sagebrush communities with interspersed grasses. Browse is the major component of the winter diet, primarily antelope bitterbrush, big sagebrush, curl-leaf mountain mahogany, and western juniper. Habitat conditions on winter ranges on the District vary considerably and are site-specific. It is extremely difficult to precisely measure habitat condition and productivity and even more difficult to relate these measures to herd parameters; survival of deer during the winter is based on condition of the animals as they enter winter and the accumulation of snow, which increases use of stored fat faster than during milder winters.

California bighorn sheep occupy approximately 973,000 acres of sagebrush-grassland habitat year-round on the District. Approximately 736 acres are recorded in NISIMS as infested with Category 1 invasive plants, which is about 0.076 percent of bighorn sheep range. However, 626,990 acres have at least a moderate level of infestation with invasive annual grasses; about 64 percent of the total bighorn sheep habitat (see Table 3-32). Escape areas, lambing areas, thermal protection, rutting areas, and foraging areas are provided by the rugged mountains, canyons, and escarpments. Most water sources for bighorn sheep in this area consist of big game guzzlers and some natural seeps, springs, and waterholes. There are approximately 600 to 800 bighorn sheep currently on the District. California bighorn sheep numbers are managed in accordance with the *Bighorn Sheep and Rocky Mountain Goat Management Plan* (ODFW 2003a).

Table 3-32. Invasive Annual Grass Infestations in Ungulate Habitat

Ungulate	Total Habitat Acres	Acres Moderately[1] Infested *(percent)*		Acres Heavily [2] Infested *(percent)*		Acres Severely[3] Infested *(percent)*		Total Acres Infested *(percent)*	
Deer	1,796,365	199,190	*11%*	601,095	*33.5%*	385,347	*21.5%*	1,185,632	*66%*
Elk	1,095,000	156,989	*14%*	311,433	*28%*	126,100	*12%*	594,522	*54%*
Bighorn	973,000	121,372	*12%*	375,984	*39%*	129,635	*13%*	626,991	*64%*

1. 6 to 10 percent
2. 11 to 25 percent
3. Greater than 25 percent

Pronghorn are a very common big game species throughout the Vale District. Occupied pronghorn winter range has not been delineated for the District so the acres of current invasive plant infestations and the corresponding percent of winter range affected are not available. Their diet consists primarily of forbs and grasses during the spring and early summer. The rest of the year, pronghorn are primarily dependent upon low sagebrush and antelope bitterbrush. Seasonal movements are controlled primarily by snow depth, with deep snows hindering movement and covering the short brush. Pronghorn can be found at the highest elevations on the District during summer.

Reptiles

Limited reptile surveys have been conducted on the District, but many observations have occurred independently. Common garter snake, wandering garter snake, desert horned lizard, sagebrush lizard, long-nosed leopard lizard, western whiptail, Mojave black-collared lizard, western fence lizard, western rattlesnake, racer, and gopher snake are common in appropriate habitat types. Western skink, side-blotched lizard, desert collared lizard, rubber boa, night snake, ground snake, and striped whipsnake are known to occur on the District, but limited data is available on distribution and abundance of these species. The painted turtle is the only Bureau Sensitive reptile species documented on the District (see the *Fish and Other Aquatic Species* section).

Invertebrates

Numerous species of terrestrial invertebrates inhabit the District. Many of these species are sedentary in nature and cannot move quickly if threatened. There are six terrestrial Special Status invertebrate species documented or suspected within the District boundary: four butterflies, one dragonfly, and a bumblebee (See Table 3-33). The western bumblebee (*Bombus occidentalis*) is the only one of these invertebrates to be recently documented on BLM-administered lands, though the others are suspected. Limited surveys have been conducted on the District for these and other species that are suspected of being located or having suitable habitat on public lands. Invertebrate biodiversity and habitat relationships are poorly researched (King and Porter 2005).

Pollinators
Pollinators can include hummingbirds and bats, but insects make up the vast majority of pollinators. Ground nesting bees (both solitary bees and bumblebees) are likely to be the most important pollinators in grasslands, but flies, beetles and butterflies are also prevalent. Pollinators are essential for rangeland food production, help with nutrient cycling, and are prey for many birds. Diversity of plant habitat is essential for supporting a variety of pollinators since many pollinators are specialists in terms of the plants they visit. Pollinators are not entirely averse to nonnative plants, especially certain flowering species such as saltcedar or thistles. However, most invasive annual grasses and forbs (such as cheatgrass and whitetop) do not seem to attract many native pollinators (Cane 2011).

Special Status Species

Including some of the species described above, the Final Oregon / Washington State Director Special Status Species List, dated July 29, 2015, lists 28 documented and 13 suspected Special Status wildlife species located on the Vale District. Two of these species are also listed as threatened federally under the *Endangered Species Act*. The status of some of these species differs by state (Table 3-33).

Table 3-33. Special Status Wildlife Species

Class	Common Name	Scientific Name	BLM Status Oregon[1]	Oregon Occurrence[2]	BLM Sensitive in Washington[1]	Washington Occurrence[2]
Bird	yellow-billed cuckoo	*Coccyzus americanus*	T	Doc	T	-
Mammal	Canada lynx	*Lynx canadensis*	T	Sus	T	Sus
Bird	American peregrine falcon	*Falco peregrinus anatum*	S	Doc	S	Doc
Bird	American white pelican	*Pelecanus erythrorhynchos*	S	Doc	S	-
Bird	bald eagle	*Haliaeetus leucocephalus*	S	Doc	S	Doc
Bird	bobolink	*Dolichonyx oryzivorus*	S	Doc	S	Sus
Bird	Columbian sharp-tailed grouse	*Tympanuchus phasianellus columbianus*	S	Sus	-	-
Bird	Franklin's gull	*Larus pipixcan*	S	Doc	-	-
Bird	grasshopper sparrow	*Ammodramus savannarum*	S	Doc	-	-
Bird	great gray owl	*Strix nebulosa*	-	-	S	Sus
Bird	Greater Sage-Grouse	*Centrocercus urophasianus*	S	Doc	S	-
Bird	gyrfalcon	*Falco rusticolus*	-	-	S	Sus
Bird	horned grebe	*Podiceps auritus*	S	Doc	S	-
Bird	Lewis' woodpecker	*Melanerpes lewis*	S	Doc	S	-
Bird	purple martin	*Progne subis*	S	Doc	-	-
Bird	Wallowa rosy finch	*Leucosticte tephrocotis wallowa*	S	Sus	-	-
Bird	white-headed woodpecker	*Picoides albolarvatus*	S	Doc	S	-

Class	Common Name	Scientific Name	BLM Status Oregon[1]	Oregon Occurrence[2]	BLM Sensitive in Washington[1]	Washington Occurrence[2]
Insect	Columbia clubtail	*Gomphus lynnae*	S	Sus	S	Doc
Insect	intermountain sulphur	*Colias occidentalis pseudochristina*	S	Sus	-	Sus
Insect	meadow fritillary	*Boloria bellona*	-	Sus	S	-
Insect	silver-bordered fritillary	*Boloria selene*	S	Sus	-	-
Insect	western bumblebee	*Bombus occidentalis*	S	Doc	S	-
Insect	Yuma skipper	*Ochlodes yuma*	S	Doc	-	-
Mammal	black-tailed jackrabbit	*Lepus californicus*	-	-	S	Sus
Mammal	fringed myotis	*Myotis thysanodes*	S	Doc	-	-
Mammal	gray wolf (Northern Rocky Mtn.)	*Canis lupus*	S	Doc	S	-
Mammal	kit fox	*Vulpes macrotis*	S	Doc	-	-
Mammal	pallid bat	*Antrozous pallidus*	S	Doc	-	-
Mammal	Preble's shrew	*Sorex preblei*	-	-	S	Doc
Mammal	pygmy rabbit (Outside Columbia Basin)	*Brachylagus idahoensis*	S	Doc	-	-
Mammal	spotted bat	*Euderma maculatum*	S	Doc	-	-
Mammal	Townsend's big-eared bat	*Corynorhinus townsendii*	S	Doc	S	Doc
Mammal	Washington ground squirrel	*Urocitellus washingtoni*	S	Sus	S	-
Mammal	white-tailed jackrabbit	*Lepus townsendii*	-	-	S	Doc
Mammal	wolverine	*Gulo gulo*	S	Sus	S	-

1. Designation - T: Threatened; C: Candidate; S: Sensitive
2. Oregon / Washington Occurrence - Doc: Documented; Sus: Suspected

Treatments Planned Related to the Issues

Common to All Alternatives

Manual methods to control invasive plant infestations would be used very little in all alternatives (Tables 2-10 and 2-11). Targeted grazing with cattle would primarily be used for annual grass control. Targeted grazing with domestic sheep and goats would occasionally be used for Category 1 invasive plants where current interagency guidelines for separation from bighorn sheep can be met.

Documented infestations of invasive plants (Category 1) occupy 5,609 acres of Greater Sage-Grouse habitat within the Vale District. Additionally, control treatments would be conducted on documented invasive plants in mule deer winter range (7,734 acres) and elk winter range (2,909 acres), bighorn sheep habitats (736 acres), pronghorn and pygmy rabbit habitats over the next 10 to 15 years. The above acres overlap, so treatments within sage-grouse habitat could also occur in deer and elk winter range.

No Action Alternative

Only the four chemicals 2,4-D, dicamba, glyphosate, and picloram would be used on noxious weeds District-wide. Emergency stabilization and rehabilitation treatments (Category 4) would continue in areas where authorized by existing post-fire planning documents, and include the use of imazapic, chlorsulfuron, and clopyralid.

Proposed Action

Fourteen herbicides would be available District-wide, including those that are selective for invasive annual grasses that occupy 533,000 acres (12.5 percent) of sage-grouse habitat available on the Vale District. In Categories 5 and 6, individual treatment projects with targeted grazing with cattle, prescribed fire, or seeding or planting would be around 20,000 acres per project. Targeted grazing, prescribed fire, and seeding or planting would not exceed 100,000 acres a year, per treatment type, or 300,000 acres over the life of the plan, per treatment type (see Table 2-6). Imazapic may be applied on up to 100,000 acres annually, both in conjunction with other treatment methods or as the only method of treatment in Categories 5 and 6. Category 1 and 2 invasive plant treatments would continue based on available funding; however, treatment of more acreage is possible due to the ability to use herbicides that are more effective.

Revised Proposed Action

In addition to the herbicides used under the Proposed Action, aminopyralid, fluroxypyr, and rimsulfuron could also be used. Rimsulfuron would be used primarily to treat invasive annual grasses in rotation with imazapic in Categories 5 and 6 on 50,000 acres annually, as well as 17,452 acres over the life of the plan in Category 1. Aminopyralid and fluroxypyr could be used on 77,612 and 3,925 acres respectively in Category 1 over the life of the plan. The addition of these herbicides would cause substantial decreases in the acres where 2,4-D (59 percent), picloram (64 percent), imazapic (43 percent), clopyralid (79 percent) would be used, compared to the Proposed Action (see Table 2-12). Other treatment methods would remain as described under the Proposed Action.

Standard Operating Procedures and Mitigation Measures Relevant to Effects

Projects that have the potential to disturb Special Status wildlife habitat require pre-project clearances, including review for potential habitat and / or project site surveys (USDI 2008b).[63]

The Oregon Greater Sage-Grouse Approved Resource Management Plan Amendment (USDI 2015a) adopted the following Required Design Feature applicable to all activities on the District:

- Limit noise at the perimeter of occupied or pending leks from two hours before to two hours after sunrise and sunset during the breeding season to less than 10 decibels above ambient sound levels.

The potential for adverse herbicide-related wildlife health effects is minimized for all alternatives by existing Standard Operating Procedures and Mitigation Measures (see Appendix A, *Project Design Features, Standard Operating Procedures, Mitigation Measures, Conservation Measures, Prevention Measures, and Best Management Practices*). These include, but are not limited to:

- Minimize treatments during nesting and other important periods for birds and other wildlife.
- Use herbicides of low toxicity to wildlife, where feasible.
- Use spot applications or low-boom broadcast operations where possible to limit the probability of contaminating non-target food and water sources, especially non-target vegetation over areas larger than the treatment area.
- Use timing restrictions (e.g., do not treat during critical wildlife breeding or staging periods) to minimize impacts to wildlife where feasible.

[63] Results would be entered into BLM's Oregon / Washington GeoBOB (Geographic Biotic Observations) database.

- 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 diflufenzopyr + dicamba 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.
- Impacts to wildlife from herbicide applications can be reduced by treating habitat during times when the animals are not present or are not breeding, migrating or confined to localized areas (such as crucial winter range).
- When treating nonnative plants in areas where herbivores are likely to congregate, choose herbicides with lower risks due to ingestion. This Mitigation Measure is applicable if large areas of the herbivores' feeding range would be treated, either because the treatment areas are large or the feeding area for an individual animal is small.
- 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.
- Avoid treating vegetation during time-sensitive periods (e.g., nesting and migration, sensitive life stages) for Special Status species in area to be treated.
- Maintain herbicide free buffer zones around patches of important pollinator nectar and pollen sources.
- When conducting herbicide treatments in or near habitats used by special status and listed terrestrial arthropods, design treatments to avoid the use of fluroxypyr, where feasible. If pre-treatment surveys determine the presence of listed terrestrial arthropods, do not use fluroxypyr to treat vegetation.

Project Design Feature Adopted for this Analysis

The following additional Project Design Features would further reduce effects on wildlife:

- Where domestic sheep or goat grazing is proposed, follow *Recommendations for Domestic Sheep and Goat Management in Wild Sheep Habitat* (Wild Sheep Working Group 2012) for determining appropriate separation. Standards call for site-specific evaluations when domestic sheep and goat use is proposed within 20 miles of wild sheep.

Environmental Consequences

The analysis of potential effects to wildlife resources is based on the expertise of BLM resource specialists and on the review of existing literature and information provided by non-planning team experts in the BLM, U.S. Fish and Wildlife Service, ODFW, and other agencies.

Quantifying effects to wildlife is difficult due to the lack of monitoring data for most species. In absence of quantitative data, particularly regarding effects of disturbance and habitat manipulation, best professional judgment was used. Effects are sometimes described using ranges of potential effects or in qualitative terms, if appropriate. The intensities of effects are also described, where possible, using the following guidance:

Negligible: The effect to wildlife would be at or below the level of detection, and changes would be so slight that there would not be any measurable or perceptible consequence to individuals or the population as a whole.

Minor: The effects on wildlife would be detectable but localized, small, and of little consequence to the population of any species. Mitigation Measures, if needed to offset adverse effects, would be simple and successful.

Temporal Scale

Short-term: Anticipated effects occur within 0 to 5 years of project implementation.
Long-term: Anticipated effects occur for at least 5 years.

Effects of Treatment Methods

Non-herbicide Treatments

Manual and mechanical control methods would likely not result in any noticeable modifications to wildlife habitats. This is primarily because selective removal of individual plants would change the habitats very little from a structural standpoint. Small mammals and some birds would be affected by these treatments if their habitat were exposed by the removal of cover species. Manual and mechanical control methods would remove less than 10,000 acres of vegetation across the District over the life of the plan. This is a very small amount resulting in overall minor effect to these species.

The main effect to wildlife from non-herbicide treatments is disturbance and / or displacement from human presence or operating machinery. More mobile animals (including ungulates and birds) would leave the area during treatment and return after treatment. Minor effects would occur. Localized effects would occur if birds were nesting in the area during treatment or if treatments occurred during critical birthing periods; however this would be eliminated using Standard Operating Procedures and Mitigation Measures. Small mammals may be affected by disturbance if their range is restricted to certain microhabitats. However, many small mammals live in burrows that they can retreat to during disturbance.

Biological control agents, since they are host specific, would have negligible effect on wildlife or Special Status species. Disturbances associated with the release of agents into habitat would be negligible. Adverse effects from modification of habitats by biological control agents are unlikely because the agents target invasive plants. There are rare examples of native species developing a dependence on invasive plants, but none are known on the Vale District.

Prescribed fire would generally be used in areas predominantly covered with invasive plants where little or no wildlife habitat values are present. An example of this would be areas dominated by invasive annual grasses with no overstory shrubs present. In these cases, fire could be used as a tool to reduce the invasive plant seed bank and thatch on these sites.

Targeted grazing for early season invasive annual grasses could conflict with critical nesting periods. Targeted grazing around active sage-grouse leks or in areas where Special Status ground-nesting birds are known to occur would be avoided according to Standard Operating Procedures. Targeted grazing could possibly disturb birthing grounds for ungulate species. However, this is a negligible risk. These areas are so heavily infested with invasive annual grasses that they are unfavorable to ungulates, and therefore are not likely to be preferred or utilized for birthing grounds. Goat or sheep grazing near big horn sheep populations would be examined on a case-by-case basis according to the Project Design Feature. Targeted grazing of invasive annual grasses would reduce the seed bank of these invasive plants and reduce competition with native plants.

Herbicide Treatments

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

Following (Table 3-34) is a summary of the potential risks to wildlife from each of the 17 herbicides considered in this analysis. This summary was adapted from the Oregon FEIS and the Risk Assessments and risk ratings presented and described in Appendix C of this EA. Ratings are based on various plausible scenarios. Standard Operating Procedures and Mitigation Measures including limitation on the herbicide types and doses, handling procedures, application methods, drift minimization, and timing of application are designed to greatly reduce the likelihood that the modeled exposure scenarios would actually occur, and thus reduce the described adverse effects to wildlife species, including Special Status species.

Table 3-34. Effects of Herbicides (Wildlife)

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

Herbicides available under all alternatives	
2,4-D	2,4-D is a possible endocrine disrupter and is one of the more toxic herbicides for wildlife of the foliar-use herbicides considered in this EA. The ester form is more toxic to wildlife than the salt form. Ingestion of treated vegetation is a concern for mammals, particularly since 2,4-D can increase palatability of treated plants (USDA 2006a) for up to a month following treatment (Farm Service Genetics 2008). Mammals are more susceptible to toxic effects from 2,4-D, and the sub-lethal effects to pregnant mammals were noted at acute rates below LD_{50}. Birds are less susceptible to 2,4-D than mammals, and the greatest risk is ingestion of contaminated insects or plants. There is little information on reptile toxicity, although one study noted no sexual development abnormalities. Honey bees would not be adversely affected by 2,4-D use, even at the highest application rate (SERA 2006). Studies that quantify exposure for other terrestrial invertebrates suggest that adverse effects occur at application rates of 4 lbs. / acre but this rate is greater than that used by the BLM (SERA 2006).
Dicamba	No adverse effects on mammals are plausible for either acute or chronic exposures of dicamba. At the highest tested rate, there are adverse reproductive effects possible for acute scenarios consuming contaminated vegetation. Dicamba has no adverse effects on birds for acute or chronic exposures, although highest tested application rates had possible adverse reproductive concerns for acute scenarios involving birds consuming contaminated vegetation or contaminated insects (SERA 2004g). Dicamba is practically non-toxic to honeybees.
Glyphosate	The glyphosate risk assessment (SERA 2011a) found that toxicity to most wildlife groups is very low, so much so that No Observed Adverse Effects Level levels are used because the LD_{50} were not found. Observed effects had to do with reduced feeding efficiency and reduced weight gain. Glyphosate adheres to soil, is degraded by soil bacteria, and does not bioaccumulate. Formulas vary in toxicity: 1) technical grade (pure) glyphosate is much less toxic than some of the commercial formulations; 2) commercial glyphosate formulations with the surfactant POEA are similar in toxicity to the surfactant POEA alone; 3) glyphosate herbicide formulations, such as Rodeo®, that are formulated without a surfactant are much less toxic than formulations with the surfactant POEA; and, 4) glyphosate herbicides with alternative surfactants would be much less toxic to frogs than Roundup Original / Vision® (Mann and Bidwell 1999, Perkins et al. 2000, Edginton et al. 2004a, Howe et al. 2004, all cited in Govindarajulu 2008, Relyea 2006). These studies support the conclusion that the toxic effect of POEA-containing glyphosate herbicides is due to POEA rather than to the active glyphosate ingredient. Glyphosate is low risk to honeybees, but little information is available for other terrestrial invertebrates. Most field studies suggest that effects on terrestrial invertebrates will be minimal (SERA 2011a). A recent study found that chronic exposure to low doses of glyphosate resulted in kidney and liver damage to laboratory animals (Mesnage et al. 2015).
Picloram	Studies on birds, bees, and snails generally support picloram as relatively nontoxic to terrestrial animals. The few field studies indicated no change to mammalian or avian diversity following picloram treatment. Variations in different exposure assessments have little effect on risk through ingestion, grooming or direct contact. Maximum rates have higher risk to mammals due to contaminated grass or insects. No information was found in the literature about picloram's effect on reptiles (SERA 2011c). No conclusive studies on invertebrates were found. No sublethal effects were noted on honeybees in terms of activity patterns.
Herbicides available in limited areas under the No Action Alternative and District-wide under the Proposed and Revised Proposed Actions	
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 concerns for wildlife groups under tested scenarios, even under spill or off-site drift scenarios. There is very little information on the effects of chlorsulfuron on terrestrial invertebrates, amphibians, or reptiles (SERA 2004a). The literature includes two toxicity studies involving leaf beetles exposed to chlorsulfuron that reported there were no substantial

	effects on survival or growth for insects from host plants treated with chlorsulfuron. Toxicity studies in honeybees were not identified for chlorsulfuron.
Clopyralid	Clopyralid is unlikely to pose risk to terrestrial mammals. All of the estimated mammalian acute exposures are no or low risk; mammalian chronic exposures are below the no observed adverse effects level at the typical rate. At the maximum rate, all but one risk scenario has no risk. Large and small birds have some risk of ingestion of contaminated food but hazard quotients are below the level of concern for all exposure scenarios under the typical rate. There is no risk to honeybees from direct spray at typical application rates. No studies on reptiles or invertebrates were found (SERA 2004b).
Imazapic	Imazapic is an ALS-inhibitor that rapidly metabolizes and does not bioaccumulate. Imazapic is not highly toxic to most terrestrial animals. Mammals are more susceptible during pregnancy and larger mammals are more susceptible than small mammals. No adverse short-term exposure risks to birds were noted for imazapic, but some chronic growth reduction was noted. None of the risk ratings for susceptible or non-susceptible mammals or birds shows any ratings that exceed the level of concern. Imazapic is one of the lowest toxic risks to wildlife of herbicides evaluated in this EA along with other ALS-Inhibitors (SERA 2004c). No studies on invertebrates were found. 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).
Herbicides available under the Proposed and Revised Proposed Actions	
Dicamba + Diflufenzopyr	Diflufenzopyr has slightly more toxic effects to wildlife than dicamba based on evaluations in the Ecological Risk Assessment. The mixture has a moderate residual effect that could affect insects and mammals through ingestion but insect lethal effects are unlikely. Risk quotients for terrestrial wildlife were all below the most conservative level of concern of 0.1 (acute endangered species), indicating that accidental direct spray effects are not likely to pose a risk to terrestrial animals. The mixture is practically non-toxic to birds, but there are some concerns for ingestion of contaminated thistle or knapweed manifesting in reproductive effects at the maximum application rates. There are chronic and acute ingestion concerns for mammals as well (see Appendix C, *Herbicide Risk Assessment Summaries*). Dicamba is practically non-toxic to honeybees.
Fluridone	Fluridone exhibits low toxicity to most terrestrial mammals and small mammals may be more susceptible than large. Acute oral exposure of fluridone is practically non-toxic to birds. Fluridone is one of the aquatic herbicides with the highest risk factors to aquatic species (fish and aquatic invertebrates); however, it has very low risk to other wildlife forms (see Appendix C, *Herbicide Risk Assessment Summaries*). No studies on terrestrial invertebrates were found since fluridone is only used in aquatic applications.
Hexazinone	The commercial formulas are less toxic than hexazinone by itself and the liquid form is more toxic than granular. For granular formulations, none of the hazard quotients for mammals exceeds a level of concern even at the highest application rate. For liquid formulations of hexazinone, hazard quotients exceed the level of concern at all application rates and all of the scenarios involving residue rates for contaminated vegetation or insects (Fletcher et al. 1994). Hexazinone poses zero to moderate risk to mammals for ingestion under both acute and chronic scenarios (see Appendix C, *Herbicide Risk Assessment Summaries*). Birds are more tolerant than mammals (SERA 2005c). No studies on invertebrates were found.
Imazapyr	There is a lack of information on dose levels that demonstrate harm to mammals, amphibians, or birds. Effects of field studies (Brooks et al. 1995) suggest observed changes to birds and mammals following treatment are habitat related, and not due to toxic effects. Imazapyr is one of the least toxic aquatic herbicides evaluated. Imazapyr is only slightly more toxic than the other ALS-inhibitors, all of which are the least toxic of any of the herbicides evaluated (SERA 2011b). No studies on invertebrates were found.
Metsulfuron methyl	Metsulfuron methyl is an ALS-inhibitor that does not appear to bioaccumulate. Metsulfuron methyl can be effective for invasive plants that are unsusceptible to other herbicides. None of the acute or chronic exposure scenarios exceeded the level of concern at the typical rate, and few exceeded the level of concern at maximum rate. Metsulfuron methyl has very low toxicity to birds for direct spray and consumption and no mortality of acute spray on honeybees. One study on Rove beetle indicated reduced egg hatching. Like other ALS-inhibitors, it is one of the least toxic of herbicides evaluated (SERA 2004e).
Sulfometuron methyl	Sulfometuron methyl is an ALS-inhibitor. Sulfometuron methyl could be used to control invasive plants in riparian areas when no water exposure is likely. It is highly toxic to aquatic plants. Sulfometuron methyl has the lowest risk to all groups of wildlife of the herbicides evaluated (with other ALS-inhibitors).
Triclopyr	Triclopyr, as triethylamine (TEA) salt and butoxyethyl ester (BEE), is covered in the Ecological Risk Assessments. Some formulations of the TEA salt of triclopyr have been labeled for aquatic invasive plant control. Triclopyr TEA is less toxic to wildlife than triclopyr BEE. The major metabolite of triclopyr, 3,5,6-trichloro-2-pyridinol (TCP) is more toxic than triclopyr to mammals. At the upper range of exposures, hazard quotients for triclopyr exceed the level of concern for mammals, but average hazard quotients do not exceed

	the level of concern for any exposure scenario. Triclopyr is practically non-toxic to slightly toxic to birds at the typical rate. Consumption of treated vegetation (and insects) is the greatest concern for birds or mammals. Using less toxic formulas reduces risk (SERA 2011d). No studies on invertebrates were found.
Herbicides available under the Revised Proposed Action	
Aminopyralid	The risk assessment for aminopyralid predicted that exposure to this active ingredient would not pose a risk to terrestrial wildlife (including pollinators) under any of the modeled exposure scenarios. Risk quotients were all below the level of concern of 0.5 (acute high risk). Therefore, exposure of wildlife to this active ingredient by direct spray, contact with sprayed vegetation, or ingestion of plant materials or prey items that have been exposed to this active ingredient is not a concern from a toxicological perspective.
Fluroxypyr	The risk assessment for fluroxypyr predicted that exposure to fluroxypyr would not pose a risk to most terrestrial wildlife (including pollinators) under any of the modeled exposure scenarios; the Risk Assessments indicate that there is a low risk under typical and maximum rates to special status species pollinators under the 100 percent absorption scenario (direct spray). All other risk quotients were all below the level of concern of 0.5 (acute high risk); Therefore, exposure of wildlife to this active ingredient by direct spray, contact with sprayed vegetation, or ingestion of plant materials or prey items that have been exposed to this active ingredient is not a concern from a toxicological perspective.
Rimsulfuron	The risk assessment for rimsulfuron predicted that none of these exposure scenarios would pose a risk to any type of terrestrial wildlife (including pollinators). Risk quotients were all below the level of concern of 0.5 (acute high risk). Therefore, use of rimsulfuron on public lands does not present a toxicological concern for wildlife.

Effects by Alternative

Common to All Alternatives

Disturbance from treatments would occur under all alternatives. Because of Standard Operating Procedures and Mitigation Measures, this would be minimized and would not occur during critical periods, as mentioned in *Effects of Treatment Methods* above. Smaller resident species, including small mammals, reptiles and invertebrates, would be affected by disturbance the most. Under all alternatives, treatments of invasive plants in Categories 1 and 2 would affect less than one percent of sage-grouse, elk, and deer winter range, and bighorn sheep habitat. Therefore, effects to these species would be negligible.

Many species of wildlife tend to avoid large areas infested with invasive plants. This is primarily due to the vegetation structural changes caused by invasive plants competing with natural vegetation as well as low palatability due to noxious weed defenses such as toxins, spines, and / or distasteful compounds (DiTomaso et al. 2006).

Some wildlife species such as elk and occasionally pronghorn consume large quantities of grass and are therefore potentially at risk where broad-scale applications of selective herbicides have been made on invasive plants where native grasses exist. Thus, 100 percent grass grazing scenarios were specifically modeled in the Ecological Risk Assessments. However, reaching Ecological Risk Assessment-identified risk levels would be unlikely unless the animals foraged exclusively within the treatment area for an entire day (USDI 2010a:269[64]). Other than invasive annual grasses, the vast majority of invasive plant treatment sites are less than 0.5 acre. Large treatment sites where ungulates and other browsing or grazing animals could be exposed to herbicides would be invasive annual grass infestations treated with imazapic (available in limited areas under the No Action Alternative and District-wide under the other alternatives) or rimsulfuron (see *Revised Proposed Action*, below). None of the risk ratings for susceptible or non-susceptible mammals or birds for imazapic shows any ratings that exceed the level of concern.

[64] Risks to non-target species associated with herbicide use are often approximated via the use of surrogate species in the Risk Assessments (USDI 2010a:605). Risks to large mammals, including horses, elk, and pronghorn, where generally approximated with a 70 kg. mule deer.

Imazapic is one of the lowest toxic risks to wildlife of herbicides evaluated in this EA along with other ALS-Inhibitors (SERA 2004c).

Biological control agents (primarily insects) could provide more food sources for migratory birds and sage-grouse if they are in the area of the release sites. This should have a negligible effect on the control agents and could provide a short-term source of protein for some wildlife species.

Effects to pollinators from spraying herbicides[65] would generally be related to habitat loss; however, BLM uses treatments that target specific invasive plants (such as spot treatments and selective herbicides), so that effects to non-target species are kept to a minimum. Only minimal amounts of adjacent desirable vegetation that pollinators might seek out would be affected. Standard Operating Procedures require the maintenance of buffer zones around important pollinator habitat and would reduce the risk of exposure to pollinators. A reduction in invasive plants such as perennial pepperweed, whitetop, and Canada thistle, which replace native forbs, would benefit pollinators as well as sage-grouse and other ground-dwelling birds. Native forbs and the insects they support are important food items for these birds, especially the chicks and hens during summer and fall.

The Fish and Wildlife's 2010 *12-Month Findings for Petitions to List the Greater Sage-Grouse (*Centrocercus urophasianus*) as Threatened or Endangered; Proposed Rule* indicates that herbicide use has resulted in declines of sage-grouse breeding populations through the loss of live sagebrush cover. However, the BLM does not propose to treat sagebrush (a native plant) in this analysis. The 12-Month Finding also found that, "A comparison of applied levels of herbicides with toxicity studies of grouse, chickens, and other gamebirds (Carr 1968, as cited in Call and Maser 1985) concluded that herbicides applied at recommended rates (as BLM does) should not result in sage-grouse poisonings" (USDI 2010c).

No Action Alternative

The use of 2,4-D and glyphosate present low to moderate risks to mammals under scenarios of direct spray and consumption of contaminated grass at the typical and maximum application rates. Inadvertent spraying of grass and other forage near treated invasive plants, as well as drift and other avenues, could result in exposure. In addition, treating medusahead with glyphosate when it is young and palatable could result in exposure.

Similarly, dicamba and picloram present low to moderate risks under some exposure scenarios. The primary targets for these two herbicides are broadleaf and woody species, so it can be used to target species infesting desirable grass areas without affecting the grass. Grazing of these sprayed grasses by wildlife could result in exposure (USDI 2010a:270).

In areas where the use of chlorsulfuron, clopyralid, and imazapic are authorized, these herbicides pose very low risk to wildlife. However, these herbicides are only available in limited areas, not District-wide, and thus would not contain the spread of invasive plants and annual grasses in the long term, leading to increased degradation of wildlife habitat.

Specific Standard Operating Procedures and Mitigation Measures help prevent the moderate risks described above. These include minimizing treatments during nesting seasons, timing of treatments when wildlife species are absent or less vulnerable, and minimizing treatments around Special Status species (USDI 2010a:93). For the

[65] Several large bee kills received attention recently in Oregon when pesticide applicators sprayed insecticides containing neonicotinoids to control aphids and / or other problematic insects. The State subsequently banned the use of several insecticides until more research could be conducted on their safe use. Herbicides do not contain neonicotinoids and BLM is not proposing to use any insecticides in this EA.

reasons described above, the likelihood of an exposure leading to illness or death of wildlife other than the least mobile species is low to none.

Without the use of more effective herbicides, invasive plants would persist and continue to spread. The use of pre-emergent herbicides would not be permissible on most of the District. Thus, Category 5 and 6 invasive annual grasses would be treated less often, treated manually or mechanically, or treated with less effective herbicides. If not treated, these large areas of invasive annual grasses would continue to spread and degrade habitat quality across the District, reducing the quantity of good quality habitat. This would not be favorable to Greater Sage-Grouse populations and thus would not aid in preventing the listing of this species. This would also reduce the quantity of good quality habitat for small resident species as well as ungulates, thus limiting population growth of these publicly important species. The inability to treat other non-noxious invasive plants with herbicides increases the likelihood additional plants would become well established before they are declared noxious weeds. Without the additional herbicides, treatments of many invasive plants would have to be done using manual or mechanical means. Control of invasive plants using only these methods would lead to removal of the species on a very local level. The effect of this would not be measurable on a landscape level and therefore would not be beneficial to wildlife as a whole.

Proposed Action

Under this alternative, the use of the four herbicides available under the No Action Alternative would decrease, and herbicides generally less toxic to wildlife would be used (see Appendix C, *Herbicide Risk Assessment Summaries*). Glyphosate use would be reduced by 22 percent. Information on herbicides (see Table 3-34) available in this alternative show low risk / low toxicity to pollinators and pose little threat of adverse effects to overall population numbers from herbicide applications. Potentially half or more of the projected herbicide use under this alternative would be with imazapic, an herbicide with very low measured risk to wildlife including pollinators, under any of the exposure scenarios. Other herbicides including chlorsulfuron, fluridone, clopyralid, and sulfometuron methyl had risk quotients that were all below the most conservative Levels of Concern, indicating that direct spray would not likely pose a risk. Sulfometuron methyl is not registered for rangelands. The herbicides imazapyr and metsulfuron methyl under typical application rates had no risk to wildlife predicted under any scenario.

Treatments of Categories 4, 5, and 6 would mostly be with imazapic, which poses a low measured risk (risk rating of 0) to wildlife under any exposure scenarios. However, these treatment areas are on the order of tens of thousands of acres. Treatment of these large areas poses a greater, but still minimal, risk to less mobile species, including smaller species and nesting birds. Standard Operating Procedures and Mitigation Measures would reduce the already minimal risk to nesting birds and small mammals from imazapic. Herbicide and even targeted grazing treatments in the invasive annual grasses under the Proposed Action could cover several thousand contiguous acres, but such treatments would be in already compromised habitat and the treatment would be designed to restore these areas, improving sage-grouse habitat and big game winter range. The net effect for most species would be beneficial, particularly since imazapic shows no measureable toxicity to the full range of wildlife species.

For the other five herbicides added by this alternative, hexazinone presents a low to moderate risk for some scenarios. However it is typically utilized for treatment of woody species and is semi-selective with spot application, so encountering scenarios used in the Ecological Risk Assessment is unlikely. Triclopyr presents low risk through consumption of contaminated vegetation at the typical rate and moderate risk at the maximum rate. It is utilized in rangelands due to selectivity for woody species, and has low residual activity (USDI 2010a:271). As with the No Action Alternative, specific Standard Operating Procedures and Mitigation Measures would help prevent the risks described above (USDI 2010a:93). Effects from 2,4-D, glyphosate, picloram and dicamba are discussed in the *No Action Alternative* section.

Under the Proposed Action, the noxious weed spread rate is projected to be reduced to 7 percent per year over the course of 15 years from the 12 percent projected under the No Action Alternative. Thus, the Proposed Action would allow for a better chance at controlling new and expanding invasive plant populations. Having more herbicides available for control of invasive plants (particularly invasive annual grasses) would allow for more targeted treatment of infestations and allow for restoration of infested sites for wildlife and Special Status species habitat. Restoration of invasive annual grass sites could reduce the frequency and size of wildfires.

Restoration of functionality through increased deep-rooted perennial grasses and forbs with shrub cover after competitive seeding would create more usable and productive habitats for wildlife. Many nonnatives, such as crested wheatgrass, can provide some forage for herbivores such as ungulates or seed-collecting rodents, even though they are less favorable than native plants. However, given the choice between nonnative annual grasses and nonnative perennial grasses, perennials are much more favorable. Perennial grasses can also provide some marginal cover habitat for small mammals, reptiles, and ground-nesting birds, whereas nonnative annuals do not provide any. Additionally, some studies have shown that with intense spring livestock grazing of crested wheatgrass, sagebrush seedlings have a greater chance of establishment (Pellant and Lysne 2005:84). No research has shown the same for cheatgrass.

Prescribed fires are timed to maximize control of target plants while retaining desirable species, and would facilitate the long-term restoration of some areas that would have long-term benefits for wildlife and Special Status species. The size of the area treated would be negligible when compared to wildfires that are currently removing habitat for wildlife and Special Status species.

Overall, the effects at the population scale would be positive, as the benefits of controlling invasive plants would result in proportionately fewer degraded sites and better retention of native forage. This would lead to improvement of habitat quality, including habitat for Special Status species such as Greater Sage-Grouse, for pollinators, and for other publicly important species.

The Oregon Greater Sage-Grouse Approved Resource Management Plan Amendment (USDI 2015a) adopted a Required Design Feature that limits noise at the perimeter of occupied or pending leks during the breeding season. Treatments of invasive annual grasses (the primary treatments occurring near leks) would not happen during sage-grouse breeding season; imazapic is applied in fall and early spring.

Revised Proposed Action

Risk Assessments indicate that fluroxypyr presents a low risk to Special Status pollinators (such as the western bumblebee), under both typical and maximum rates in the direct spray scenario. Fluroxypyr would be used most often in the treatment of invasive biennial thistles, chenopods, and trees and shrubs. A Mitigation Measure adopted with the 2016 PEIS states that treatments near Special Status terrestrial arthropods should be designed to avoid the use of fluroxypyr. Fluroxypyr has no (0) risk to wildlife under all other scenarios. Fluroxypyr would be used on 3,925 acres over the life of the plan, primarily on chenopods (kochia and halogeton), biennial thistles, and trees and shrubs.

In Categories 4, 5, and 6, rimsulfuron would be used in rotation with imazapic for invasive annual grass treatments (on 50,000 acres annually in Categories 5 and 6). Like imazapic, rimsulfuron has no risk under any Risk Assessment scenarios, so effects would remain as described for imazapic treatment under the Proposed Action. Similar to imazapic, rimsulfuron is applied in fall and early spring, and treatments of invasive annual grasses would not disturb sage-grouse during breeding season.

Aminopyralid would be used extensively under the Revised Proposed Action to treat biennial thistles (known on 30,343 acres) and rush skeletonweed (known on 73,597 acres). It would also be used on other species such as perennial mustards, knapweed, and starthistle, and it has no risk to wildlife under any Risk Assessment scenario.

Aminopyralid can pass through the urine or droppings of native ungulates such as elk, deer, and pronghorn. However, wildlife tend to avoid invasive plants and wildlife tend to disperse across great distances; therefore, any indirect effects to desirable broadleaf plants following ingestion by wildlife would be diluted widely across the landscape and effects would be negligible. The addition of aminopyralid would cause the use of 2,4-D, dicamba, glyphosate, and picloram to drop. Most noticeably, 2,4-D (low to moderate risk under some mammal risk assessment scenarios) use would decrease by 65 percent when compared to the No Action, and 59 percent when compared to the Proposed Action, and picloram (low to moderate risk under some wildlife risk assessment scenarios) would decrease by 76 and 64 percent.

Other effects, including the benefits of controlling invasive plants, would remain as described under the Proposed Action.

Cumulative Effects

Loss of native vegetation and declining ecosystem health on public lands due to global climate change, development including rights-of-way, increasing public use including the use of motorized equipment such as ATVs, and invasive plants, all contribute to reductions in the ability of public lands to support healthy wildlife populations. The herbicide risk, and the disturbance and potential short-term localized loss of some forage or cover, can contribute to these pressures on wildlife, but the net effect of all alternatives is beneficial as they attempt to control invasive plants and restore native habitats. Other ongoing restoration and habitat improvement projects such as the removal of unnatural levels of western juniper also reduce the ongoing decline of native shrubs and grasses, thereby allowing more native grass and shrub habitats for a variety of wildlife species.

Over 1.15 million acres of sage-grouse habitat in the Vale District has burned in the last eight years. Given recent low precipitation and higher than normal temperatures, it is likely that wildfire will continue to threaten sagebrush ecosystems in the near future. Anticipated fuels reduction projects such as the Tri-state Fuels Project may help curtail larger fires, but would have the short-term effect of reducing sagebrush habitat. Since invasive annual grasses and wildfire have been identified as the two greatest threats to sage-grouse habitat (and also degrade habitat for ungulates, and other small mammals), it is reasonable to expect that additional funding may be earmarked for habitat restoration. The Selected Alternative in the Oregon Sub-Region Greater Sage-Grouse Proposed Resource Management Plan Amendment and Final Environmental Impact Statement recommends reducing invasive annual grasses in PHMA to less than five percent cover (USDI 2015a:2-15)

Projects implemented by neighboring landowners would contribute to overall healthy landscapes. This includes invasive plant treatments by the Wallowa-Whitman National Forest, Malheur National Forest, and the Umatilla National Forest, as well as by landholders through either private funds or Natural Resource Conservation Service funding. These treatments often align with projects being completed on public lands. For example, the Northwest Malheur Fuels Treatment will remove juniper on lands adjacent to private lands with similar projects. Overall, the health of the landscape would improve with the removal of undesirable vegetation (both invasive plants and rapidly expanding juniper). This would provide better quality native habitat for all wildlife.

Livestock Grazing[66]

Issues

- How would herbicide restrictions affect livestock grazing on BLM allotments?
- How would the alternatives affect livestock and their forage?
- How would targeted grazing of invasive annual species affect existing grazing permits?

Affected Environment

The BLM conducts grazing management practices in accordance with the Federal regulations for grazing administration (43 CFR Part 4100). Management of livestock grazing is authorized and enforced through permits or leases. The grazing permit/lease establishes the allotment(s) to be used, the total amount of use (in animal unit months[67]), the number and kind of livestock, and the season of use. Grazing permits/leases may also contain terms and conditions as appropriate to achieve management and resource condition objectives. Allotment management plans further outline how livestock grazing is to be managed to meet multiple-use, sustained yield, and other needs and objectives, as identified in resource management plans. Livestock grazing is administered on 524 allotments on the Vale District. All of the allotments in the Malheur Resource Area were established under Section 3 (grazing *permits* on public lands *within* grazing districts) of the *Taylor Grazing Act* of 1934. There are 74 allotments established under Section 15 (grazing *leases* on public lands *outside* grazing districts) in the Baker Resource Area. Resource Management Plans for the Malheur and Baker Field Offices identify a total of 323,620 Animal Unit Months (AUMs) (See Table 3-35). The primary kind of livestock authorized on these allotments is cattle. Further information about the allotments is located in the Southeastern Oregon Resource Management Plan Record of Decision (USDI 2002) and Baker Field Office Draft Resource Management Plan (USDI 2011a).

Table 3-35. Allotments

Resource Area	Active Allotments (Acres)	Allotments	Grazing Permits	Grazing Leases	Animal Unit Months
Malheur	4,541,135	171	207	0	276,267
Baker	395,769	353	282	74	47,353
Total	*4,936,904*	*524*	*489*	*74*	*323,620*

Approximately 58,900 acres identified in the Southeastern Oregon Resource Management Plan were discontinued for livestock grazing and are outside any livestock grazing allotment. Approximately 18,000 acres within livestock grazing allotments are excluded from grazing by past decisions or agreements.

The BLM, through the development of grazing regulations in 1995, was directed to develop state or regional standards and guidelines for rangeland health. The objectives of these regulations are to promote healthy, sustainable rangeland ecosystems; to accelerate restoration and improvement of public rangelands to properly functioning conditions; and to provide for the sustainability of the western livestock industry and communities that are dependent upon productive, healthy rangelands. With public participation and assistance from the Resource Advisory Councils, the BLM developed the Standards for Rangeland Health and Guidelines for Grazing Management for Oregon and Washington (USDI 1997). The five standards are:

[66] This section addresses livestock grazing authorized through permits and leases. The use of livestock for invasive plant management (targeted grazing) is described in the *Invasive Plants* section. (The effects of targeted grazing to permitted grazing are described in this section.)
[67] While definitions of an Animal Unit Month (AUM) can vary, BLM defines an AUM as the amount of forage necessary for the sustenance of one cow and its calf or its equivalent for a period of 1 month (43 CFR 4100.0-5)

1. watersheds are in or making significant progress towards properly functioning physical condition in uplands areas;
2. watersheds are in or making significant progress towards properly functioning physical condition in wetland-riparian areas;
3. ecological processes including the hydrologic cycle, nutrient cycle, and energy flow are maintained;
4. water quality complies with State water quality standards; and,
5. significant progress is being made toward restoring or maintaining habitats for all Special Status species.

Livestock consume annual and perennial native and introduced grass species, and seasonally utilize forbs and some shrubs. Healthy plant communities support higher levels of livestock grazing than degraded plant communities. Non-palatable invasive plants reduce forage abundance and quality for livestock, degrade plant community health, and result in reduced capacity to sustain grazing levels. A combination of invasive plants and shorter fire return intervals can further limit forage use from year-round, to seasonal, or to none at all (USDI 2010a). About three-fourths of District pastures are at risk to loss of ecological function due to the presence of invasive annual grasses (Category 5) and 400,000 acres on the District (8 percent) are dominated with invasive annual grasses (Category 6).

Grazing animals tend to avoid many invasive plants because of low palatability due to defenses such as toxins, spines, and / or distasteful compounds (DiTomaso et al. 2006). In addition, some invasive plants (e.g., poison hemlock and St. Johnswort) are poisonous to cattle. Nevertheless, some invasive plants (such as invasive annual grasses) are grazed by cattle early in the spring or fall when they are green and palatable.

Treatments Planned Relating to the Issues

Common to All Alternatives

In Categories 1 and 2, invasive plant treatments would occur on approximately 3,000 acres annually using a variety of herbicide and non-herbicide treatment methods

No Action Alternative

Four herbicides are available District-wide under Categories 1, 2, and 3 to treat noxious weeds, in addition to non-herbicide control methods, including targeted grazing. In Categories 1 and 2 over the life of the plan, targeted grazing would occur on 80 acres with sheep or goats (on species groups such as annual broadleaves, thistles, and spurges) and 468 acres with cattle (on annual grasses in Categories 1 and 2). Control treatments would rarely occur in Categories 5 and 6. No herbicide is available under the alternative that is selective for the invasive annual grasses in Categories 5 and 6, however, limited targeted grazing may occur (600 acres per year).

Proposed Action

Ten additional herbicides would be available District-wide to treat invasive plants, in addition to non-herbicide control methods. In Categories 5 and 6, imazapic may be applied on up to 100,000 acres annually, both in conjunction with other treatment methods or as the only method of treatment. Individual treatment projects with targeted grazing, prescribed fire, or seeding or planting would be approximately 20,000 acres per project, not to exceed 100,000 acres a year or 300,000 acres over the life of the plan.

The use of prescribed fire and targeted grazing with sheep, goats, and cattle would increase compared to the No Action Alternative because these treatments would be used in conjunction with herbicide treatments; for example, targeted grazing with cattle may be used to remove the thatch from areas with invasive annual grasses before herbicide is applied. In Categories 1 and 2, grazing by sheep and goats would occur on 210 acres over the life of the plan and cattle would be used on 2,341 acres. Projects involving targeted grazing using cattle would occur in selected pastures within grazing allotments and may occur outside the authorized pasture use dates identified in existing grazing permits for Category 5 and 6. In Category 4, targeted grazing would not occur since all potential forage would be removed by wildfire.

Revised Proposed Action

Treatment methods and acreage would be similar to those described under the Proposed Action, except that 17 herbicides would be available District-wide to treat invasive plants. Herbicide treatments done on invasive annual grasses in Categories 5 and 6 would primarily be done with imazapic and rimsulfuron.

Standard Operating Procedures and Mitigation Measures Relevant to Effects

The potential for adverse herbicide-related livestock health effects is minimized for all alternatives by existing Standard Operating Procedures and Mitigation Measures (see Appendix A, *Project Design Features, Standard Operating Procedures, Mitigation Measures, Conservation Measures, Prevention Measures, and Best Management Practices, Livestock*). These include, but are not limited to:

- Whenever possible and whenever needed, schedule [herbicide] treatments when livestock are not present in the treatment area. Design treatments to take advantage of normal livestock grazing rest periods, when possible.
- As directed by the herbicide product label, remove livestock from treatment sites prior to herbicide application, where applicable.
- Take into account the different types of application equipment and methods, where possible, to reduce the probability of contamination of non-target forage and water sources.
- Notify permittees of the herbicide treatment project to improve coordination and avoid potential conflicts and safety concerns during implementation of the treatment.
- Provide alternative forage sites for livestock, if possible.
- Do not apply 2,4-D, dicamba, Overdrive® [dicamba + diflufenzopyr], picloram, or triclopyr across large application areas, where feasible, to limit impacts to livestock, particularly through contamination of food items.
- Where feasible, limit glyphosate and hexazinone to spot applications in rangeland.

Project Design Features Adopted for this Analysis

The following additional Project Design Features would further reduce effects.

- In monocultures of invasive annual grasses (generally Category 6), livestock grazing would not resume at permitted levels in the treatment area until desired seeded grass species were mature enough to be grazed without suffering damage (generally three growing seasons post treatment, but potentially longer).
- A label restriction states that 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 (Dow AgroSciences 2014). Pastures would be confirmed as not having desirable broadleaf plants through vegetation mapping, monitoring data, and on the ground surveys. In addition, utilizing pastures during time periods when desirable broadleaf plants are dormant would also be emphasized.

Environmental Consequences

This analysis defines levels of effects on livestock grazing as follows:

Negligible: Grazing operations would not be appreciably affected by increased or decreased costs or changes to forage quality and quantity.
Minor: Effects would be small but detectable and only slightly increase or decrease the cost of livestock grazing.

Temporal Scale
Short-term: Anticipated effects occur within 5 years of implementation.
Long-term: Effects generally occur after the first 5 years following treatment and persist for as many as 15 years.

There are adverse and beneficial effects to permittees, livestock, and livestock forage from the alternatives. In the short term, treatment activities could disturb livestock or they could eat treated forage. In addition, permittees might need to find access to alternative forage if grazing is excluded for a period of time following treatment. However, in the long term, invasive plant treatments would improve rangeland health and the security of grazing permits may be greater.

Effects of Treatment Methods

Potential effects of herbicides to livestock would be influenced by the amount of untreated forage available in the grazing area. Livestock prefer grasses rather than invasive forbs and some grasses for forage, and within small treatment sites, untreated plants are readily available. Avoidance would be more difficult with large aerial treatments, but effects would be minimized by several factors. Imazapic, the herbicide most likely to be used on large areas of invasive annual grasses, is not toxic to livestock at any rate of application, and carries no livestock use restrictions (Rimsulfuron is also likely to be aerially applied to large areas of invasive annual grasses and is similarly not toxic to livestock at any rate. However, label restrictions indicate that livestock grazing should not occur on treated sites for 1 year following application to allow newly emerged grasses sufficient time to establish). Large aerial treatments are coordinated with the permittees, so they could take appropriate avoidance or management steps. Cattle are also startled by low flying airplanes or helicopters and are likely to move away from the treated area while treatments are occurring.

As shown in Table 3-36 under all planned treatment scenarios, the 17 herbicides available under the Revised Proposed Action are relatively benign to large mammals. The mammal used in the Ecological Risk Assessments was a 154 pound deer; cattle are larger and in general, the potential adverse effects would be fewer due to their larger mass. See Appendix C, *Herbicide Risk Assessment Summaries,* for further information about the Ecological Risk Assessments including the risk quotients, levels of concern, and other Ecological Risk Assessment terms used below. The label restrictions on use around livestock for 2,4-D, aminopyralid, picloram, and clopyralid are at least partially due to these herbicides passing through the digestive tract intact. As a result, urination or defecation on susceptible plants can kill that plant. 2,4-D and picloram are among the four currently authorized herbicides, and their use would decrease under the Proposed and Revised Proposed Actions.

Herbicide risks and examples of label restrictions are described in Table 3-36. Stated risks are for the exposure scenarios described in the Risk Assessments (see Appendix C, *Herbicide Risk Assessment Summaries*). As discussed under the *Effects by Alternative* section below, such exposures are limited by the Standard Operating Procedures and Mitigation Measures.

Table 3-36. Effects of Herbicides (Livestock)

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

Herbicides available under all alternatives	
2,4-D	2,4-D presents a low acute risk to livestock under the direct spray, ingestion, and spill scenarios, and a low chronic risk for large mammals for consumption of on-site contaminated vegetation under both typical and maximum rate, for both acid and ester formulations (SERA 2006). The Risk Assessment suggests that because large livestock eating large quantities of grass and other vegetation are at risk from routine exposure to 2,4-D and because 2,4-D is considered for use in rangeland, it should not be applied over large application areas where livestock would only consume contaminated food. According to label directions for one formulation, dairy animals should be kept out of areas treated with 2,4-D for seven days. Grass for hay should not be harvested for 30 days after treatment. Meat animals should be removed from treated areas three days prior to slaughter. Similar restrictions may be in place for other formulations.
Dicamba	The ingestion of food items contaminated by direct spray of dicamba at the typical and maximum application rate would pose a low and moderate acute risk to large mammalian herbivores respectively, and no chronic risk (SERA 2004g). Because dicamba is proposed for use in rangelands and forestlands and has moderate residual activity, livestock may be at risk, particularly if it is sprayed throughout the range area. Based on label directions, there are no restrictions on livestock use of treated areas, other than for lactating animals.
Glyphosate	Glyphosate with POEA presents a low acute risk to livestock under the direct spray scenario at the maximum rate, and under the ingestion scenario at the typical and maximum rate (SERA 2011a). Glyphosate without POEA (e.g. aquatic formulations) presents a low risk at maximum rate for consumption of contaminated grass (SERA 2011a). Ingestion of treated grasses could represent a risk, but glyphosate is non-selective and kills grass, suggesting that spot applications in rangeland would be the most appropriate use of this herbicide (although risk could occur if invasive grasses were treated when they were young and palatable). Spot applications would reduce risks associated with consumption of contaminated vegetation, as fewer non-target areas would be affected by direct spray or spray drift. Based on label directions, there are no restrictions on livestock use of treated areas.
Picloram	Picloram poses a low to moderate risk for applications at the typical and maximum application rates for consumption of contaminated vegetation by a small animal, and low risk for consumption of contaminated vegetation by a large mammal at the maximum rate (SERA 2011c). Picloram is registered for use in rangeland, and can be applied over large areas heavily infested with invasive plants, as its primary targets are broadleaf and woody species. Therefore, it might be used to manage certain broadleaved plants without affecting desirable grasses, but with the potential to expose livestock. Picloram has a number of restrictions on use in areas grazed by livestock. In general, livestock should not be grazed on treated areas for 2 weeks after treatment.
Herbicides available in limited areas under the No Action Alternative and District-wide under the Proposed and Revised Proposed Actions	
Chlorsulfuron	Chlorsulfuron risk quotients for mammals for all modeled scenarios were below the conservative level of concern of 0.1, indicating that direct spray and ingestion of sprayed vegetation is not likely to pose a risk to livestock (Appendix C; ENSR 2005c). Based on label directions, there are no restrictions on livestock use of treated areas.
Clopyralid	Large mammals face low acute risks from direct spray and from consumption of contaminated grass at the typical and maximum application rates. The maximum application rate also poses a low chronic risk to large mammals consuming on-site contaminated vegetation (SERA 2004b). All risks identified fall within the lowest risk rating; adverse effects to livestock are unlikely with expected exposure scenarios. According to label directions, there are no restrictions on grazing following application at labeled rates, but livestock should not be transferred from treated grazing areas to susceptible broadleaf crop areas without first allowing for seven days of grazing on untreated pasture.
Imazapic	Risk quotients for terrestrial animals were all below the most conservative levels of concern of 0.1, indicating that direct spray or drift of imazapic would be unlikely to pose a risk to livestock (Appendix C; ENSR 2005h). Based on label directions, there are no restrictions on livestock use of treated areas.
Herbicides available under the Proposed and Revised Proposed Actions	
Dicamba + Diflufenzopyr	Dicamba + diflufenzopyr poses a low chronic risk to large mammalian herbivores that consume plants contaminated by direct spray at the typical application rate and a moderate risk for ingestion scenarios involving direct spray at the maximum application rate (Appendix C; ENSR 2005i). Because it is proposed for use in rangelands and has moderate residual activity, livestock may be at risk from the application of this herbicide, particularly if it is sprayed throughout the range area. Based on label directions, there are no

	restrictions on livestock use of treated areas.
Fluridone	Risk quotients for large terrestrial animals were below the most conservative levels of concern of 0.1 for all scenarios (Appendix C; ENSR 2005g). These results indicate that accidental direct spray or drift of this aquatic herbicide would be unlikely to pose a risk to livestock.
Hexazinone	Applications of hexazinone at the typical and maximum application rates would pose a low acute risk to livestock under the direct spray, accidental spill, and ingestions of treated vegetation scenarios, and a low to moderate chronic risk to large mammals under the on-site consumption of contaminated vegetation scenario at typical and maximum rates respectively (SERA 1997). According to label directions, livestock should not be grazed on treated areas for 60 days after application.
Imazapyr	Applications at the typical and maximum rate should not pose a risk to livestock (SERA 2011b). Imazapyr is not registered for use in rangelands; therefore, it is unlikely that effects via direct spray or consumption of contaminated vegetation would occur. Based on label directions, there are no restrictions on livestock use of treated areas.
Metsulfuron methyl	Metsulfuron methyl applications at the typical application rate should not pose a risk to livestock (SERA 2004e). Applications at the maximum application rate pose a low acute risk to small animals under scenarios involving 100 percent absorption of direct spray and to large mammals under scenarios involving consumption of contaminated vegetation. However, a supplemental label restricts the application on rangelands to 0.0625 pounds of active ingredient per acre. Metsulfuron methyl is registered for use in rangeland, but effects to livestock are unlikely if the typical application rate is used.
Sulfometuron methyl	This herbicide is relatively non-selective. It would be used on rights-of-way, but it is not registered for sites that are grazed. Risk quotients for terrestrial animals were all below the most conservative levels of concern of 0.1, indicating that direct spray or drift of sulfometuron methyl would be unlikely to pose a risk to livestock (Appendix C; ENSR 2005j).
Triclopyr	Triclopyr presents low risk to livestock under the direct spray scenario at the maximum rate, and a moderate to high acute and chronic risk for consumption of contaminated vegetation at the typical and maximum rate respectively (SERA 2011d). Triclopyr can be used in rangelands to selectively manage woody species without effecting desirable grasses, so broadcast treatments could create exposure scenarios if livestock are not removed or the treatment area is not limited in scope. There are few grazing restrictions for triclopyr, except for lactating dairy cattle. Although cattle can graze at any time, they would be removed from treated areas at least three days prior to slaughter.
Herbicides available under the Revised Proposed Action	
Aminopyralid	The Risk Assessment for aminopyralid predicted that none of the possible scenarios of aminopyralid exposure (direct spray, contact with foliage after direct spray, ingestion of food items contaminated by direct spray) would pose a risk of adverse effects to livestock. Even scenarios that assume 100 percent of the diet comes from treated vegetation indicated no risk to livestock. While aminopyralid is unlikely to adversely affect survival, growth, or reproduction of livestock, aminopyralid is persistent in vegetation and does not break down in plants (Dow AgroSciences 2005), and therefore may be present in the urine or manure of livestock that have grazed in aminopyralid-treated rangelands. Therefore, 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.
Fluroxypyr	According to the risk assessment, fluroxypyr does not have a risk of causing adverse health effects to livestock as a result of dermal exposure or ingestion scenarios. Fluroxypyr does not have any grazing restrictions for livestock, including lactating and non-lactating dairy animals. However, livestock must not eat treated forage for at least 2 days before slaughter for meat.
Rimsulfuron	According to the Risk Assessment, rimsulfuron does not pose a risk to mammals under any of the modeled exposure scenarios. These include scenarios involving direct spray, indirect contact with foliage after direct spray, and ingestion of food that has been treated with the active ingredient. The label for rimsulfuron products includes a grazing restriction for range and pasture areas. No livestock grazing should occur on treated sites for 1 year following application to allow newly emerged grasses sufficient time to establish.

Herbicide treatment methods include ground-based and aerial methods. When herbicide labels prohibit grazing, or risks are otherwise anticipated, exposure is typically reduced by the removal of livestock during vegetation treatments, scheduling treatments when livestock are not present, temporarily fencing the treated area, herding the livestock away from the treatment area and shutting off water, or using other techniques to keep them away.

Manual (pulling and grubbing plants) and mechanical (use of mowers and weed whackers) treatment methods would be used to control some invasive plants, particularly if the population is relatively small. Due to the small size of treatment efforts with this method, effects to livestock grazing on BLM allotments would be negligible.

Biocontrol methods that weaken or destroy vegetation are only available for invasive plants that are generally not palatable to livestock. Therefore, the effects to livestock grazing on BLM allotments would be negligible.

Prescribed fire and targeted grazing would be used, generally in conjunction with imazapic and rimsulfuron (rimsulfuron under the Revised Proposed Action only) use under Categories 5 and 6 to remove (fire) or break up (targeted grazing) annual grass thatch from the treatment area. Targeted grazing would generally happen during phenological periods when native perennials would not be negatively affected (early spring or fall/winter) when cheatgrass is growing but the native plants are still dormant. Effects would vary under each alternative, and are discussed below.

Seeding and planting would be used in areas where desirable vegetation is not sufficient to produce a seedbed adequate to reestablish the site. Most of the reseeding would be in Category 6 and the monoculture portion of Category 5 however, there could be occasional small (generally less than 20 acres) seeding projects per year in Categories 1, 2, and 3. Seeding and plantings would require resting the treatment site from livestock grazing until the seeding was mature enough to be grazed without suffering damage (generally two growing seasons after seeding takes place).

Effects by Alternative

Common to All Alternatives

Herbicide use on invasive plants in Categories 1, 2 and 3 may mean that the grazing permit / lease-holder would be adversely affected in the short term where the treatment area would be temporarily unavailable for grazing purposes. In the short term, there could be delays to the sale and consumption of livestock because of mandatory restrictions (quarantine) associated with the use of herbicides. During the interim period, the permit holder may incur additional costs for replacement forage and / or a loss of income.

The actual carrying capacity of the rangelands varies widely from 2 to 30 acres per AUM depending on factors such as site potential, ecological condition, annual precipitation, distance to water, steepness of slope, and palatability. For illustrative purposes, this analysis assumes 10 acres / AUM, an average of the capacity of the resource areas within the District.

Targeted grazing using sheep and goats would be used in limited areas (210 acres over the life of the plan under the Proposed and Revised Proposed Actions and 80 acres under the No Action Alternative). Due to the confined and small nature of the treatments, effects to permitted livestock use is not expected to occur.

No Action Alternative

Under the No Action Alternative, 3,000 acres of noxious weeds, primarily broadleaf, are treated annually. This is generally done when the livestock are not in the treatment area. Due to the small acreage, treatments would have negligible effect to livestock.

Invasive annual grasses are generally not treated; cheatgrass and ventenata are not listed as noxious, and none of the four herbicides available are selective for medusahead rye. Not treating invasive annual grasses has had adverse effects to livestock grazing since forage production is lower and varies dramatically from year to year, when compared to desirable grasses. Livestock readily graze most annual grasses in the spring before annual grasses set seeds. Seed set coincides with decreased forage nutritive value and lower digestibility of annual grass forage. Grazing dormant cheatgrass or other annual grasses in late fall or winter reduces mulch accumulations and enhances seedling establishment of perennials (ASI 2006). Native or desirable perennial grasses are palatable in the spring, summer, and fall. The longer time period native and perennial nonnative grasses are palatable allows greater flexibility to the timing and length of time livestock can stay in a pasture, which is beneficial to the livestock permittee.

Each year, about 50 acres are treated mechanically and manually by pulling and grubbing invasive plants and there have been more than 400 biocontrol releases in the past 10 years (insects, nematodes, mites, etc. See Table 2-7, *Annual Treatment Summary*). The direct adverse effect to livestock and their forage from these methods is negligible and offers some control of noxious weed species that allows desirable species to persist. The control of these noxious weeds reduces the risk of expansion into un-infested areas, which preserves the existing livestock forage base.

Indirectly, the adverse effects to livestock grazing would expand over time as invasive plants spread. Existing noxious weed infestations are expanding at approximately 12 percent per year. Invasive annual grasses are also spreading rapidly, particularly after wildfires. This expansion reduces the forage base for livestock, thereby increasing grazing use on available un-infested acres. Increased grazing pressure on some acres and noxious weed expansion on other acres can reduce the rangeland health of the landscape.

The No Action Alternative lacks sufficient range of effective treatment methods for all invasive plant species found on the District. The treatment methods in use provide effective control on some (not all) invasive plant species, which provides a negligible to minor beneficial effect to livestock grazing. However, the existing suite of control measures in this alternative provides little to no control for other invasive plant species, including invasive annual grasses. Invasive plants by their nature invade range sites in all manner of ecological condition and alter the ecological function in varying degrees. Many of the invasive plants are not palatable to livestock and do not provide forage for livestock. It is expected that for infested parts of the District, this alternative would result in a slow decrease in livestock carrying capacity as native plant communities are lost.

Proposed Action

Expansion of the number of herbicides available for use under the Proposed Action would allow a larger number of invasive plants to be controlled and the use of the four herbicides available under the No Action Alternative would decrease.

In Categories 1, 2 and 3, over 80 percent of the herbicides used are selective to broadleaf plants, which are only consumed incidentally by cattle. Therefore, adverse effects from herbicide treatments would be negligible. Over time, broadleaf invasive plants would be replaced by native species more palatable to cattle, which would result in negligible, beneficial effects. Broadleaf plants are palatable to sheep. However, less than five percent of the AUMs within the Vale District are authorized for sheep grazing and invasive plant treatments within these allotments would be spot treatments of low-density invasive plants. This would have minor effects to non-target plants and negligible adverse effects because of the limited amount of sheep grazing. Over time, treatments in sheep allotments would increase the availability of more palatable native broadleaf plants resulting in minor beneficial effects to sheep grazing.

Imazapic application in Category 5 would typically occur when livestock were not in the treatment area. Livestock could return once the application is completed if sufficient desirable grass species exist to revegetate the treatment area. However, even if imazapic treatment occurs when cattle are in the allotment there would be a negligible adverse effect, according to Ecological Risk Assessments and the label. Livestock grazing rest may need to occur in Category 5 stands if native plant production is below the NRCS ecological site description for the predominate soil series in the treatment area. However, if production is lower than the NRCS ecological site description and the treatment site is at least 1.8 miles from water and / or on steep slopes (over 60 percent) it is possible that a rest from livestock use would not be needed since these areas receive incidental livestock use as cattle do not prefer grazing steep slopes or areas far from water (Holechek 1988, Valentine 1947). Up to 100,000 acres could be treated per year in Category 5 and the BLM estimates that half the acres may require livestock rest resulting in a temporary loss of 5,000 AUMs, which is 1.5 percent of the District's permitted use; however, the effect to the individual permittee may be greater. If 50,000 acres were rested in the first year and unavailable for two growing seasons, it would not be available until the middle of the second year. In the second year, another 50,000 acres may be rested and unavailable for two growing seasons; hence, there would be a loss of 3 percent of permitted use for the first half of the second year resulting in minor adverse effects. If combined with reseeding, desirable forage production would increase in the treated area over the long term, resulting in beneficial effects to livestock grazing.

Livestock would be removed from Category 6 treatment sites prior to imazapic application and livestock would not be authorized to graze the site until desired grasses were mature enough to be grazed without suffering damage (generally three growing seasons, but potentially longer. This includes one year following herbicide treatments followed by two additional years after planting and seeding). Since Category 6 has very few remnant native plants to reestablish the site, seeding of desirable plants species would occur generally one year after herbicide application. Under the Proposed Action, there would be an average of 20,000 acres seeded or planted per year. Assuming that there are 10 acres per AUM, there could be as many as 3,000 AUMs of forage that are not available for livestock during the treatment period. There are 323,267 AUMs of permitted grazing on the Vale District. A temporary loss of 3,000 AUMs would be a temporary loss of less than 1 percent of the District's permitted use as a whole; however, the effect to the individual permittee may be greater if, in the first year, 20,000 acres were treated and unavailable for three growing seasons, it would not be available until the middle of the third year. In the subsequent two years, another 20,000 acres each year may be treated and unavailable for three growing seasons; hence, there would be a loss of 3 percent of the District's permitted use for the first half of the second year resulting in minor adverse effects. However, once the treated sites become dominated by the seeded vegetation, as much as 300,000 acres would benefit from an improved, native perennial plant community and increased forage production and quality[68].

Allotments and pastures that included Categories 5 and 6 are depicted in Map 2-4 and Table 5-E of Appendix E. In Categories 5 and 6, prescribed fire and /or targeted grazing using cattle would generally occur as a pretreatment followed by herbicide application and seeding, if needed. There would be no change in preference permits / leases and associated AUMs as a result of targeted grazing. Although invasive plant species in Categories 5 and 6 hold a forage value, these species are not considered in determining carrying capacities associated with preference permits within the Vale District. Treatment prescriptions would be designed to avoid conflicts with a preference permit/lease. Treatments would occur when permitted livestock associated with a preference permit are not scheduled to be in the affected pasture or by adjusting the scheduled seasons of use to meet treatment objectives as described in the District's Annual Treatment Plan. Therefore, no adverse effects to livestock grazing, including animal husbandry, are expected with the implementation of prescribed burning or targeted grazing. Livestock grazing on public lands may benefit in the long-term from a reduction of invasive annual grass infestation density and improved forage quality.

Revised Proposed Action

Rimsulfuron application in Category 5 would typically occur when livestock were not in the treatment area. There is a one-year post application grazing restriction on rimsulfuron, to allow newly emerged grasses sufficient time to become established.

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[68] Any future changes in permitted use as a result of increased forage production would be analyzed under a separate NEPA document.

Livestock would be removed from Category 6 treatment sites prior to rimsulfuron application and livestock would not be authorized to graze the site until desired grasses were mature enough to be grazed without suffering damage (generally three growing seasons, but potentially longer).

Other effects, including the benefits of controlling invasive plants, would remain as described under the Proposed Action.

Cumulative Effects

Common to All Alternatives

Reductions in livestock grazing capacity can result from wildfires, competition with wild horses, climate change, changed management emphasis, and invasive plants. Other ground disturbing projects (see Table 3-2, *Ongoing and Foreseeable Actions on or near the Vale District Potentially Relating to Cumulative Effects*) can also reduce forage. The increase of invasive plants, particularly invasive annual grasses and the reduced fire return interval associated with them, are cumulative to these other pressures. Loss of desirable vegetation and declining ecosystem health on public lands due to invasive plants has contributed to reductions in the ability of public lands to support livestock sustainably.

Foreseeable actions on the District that improve rangeland health include juniper treatments, mowing of vegetation for fuel breaks, grazing withdrawals, and grazing permit renewals (see Table 3-2). Grazing permit renewals change livestock management in areas not meeting rangeland health standards due to current livestock grazing as a causal factor. In these cases, reductions in livestock AUMs could occur. Some of these projects may result in a project area being rested from grazing for two growing seasons or longer, which would result in a short-term negligible to minor adverse effect on livestock grazing, but would benefit the native plant community and thus, grazing in the long term.

There would be no long-term adverse effects on livestock grazing from invasive plant treatments associated with any alternative. Therefore, there are no anticipated cumulative effects to livestock grazing.

Wild Horses

Issues not analyzed in detail

- How would consumption of herbicide-treated vegetation affect wild horses?
- How would herbicide treatment activities affect wild horses?

These issues were not analyzed in detail because effects would be too small to measure, as previously described in the analysis for the Oregon FEIS (USDI 2010a:268-273). The Revised Proposed Action includes an additional three herbicides; Risk Assessments indicate that these additional herbicides have no (0) risk to large mammalian herbivores (see Appendix C, *Risk Assessment Summaries*). The Proposed and Revised Proposed Actions would be expected to improve (or at least slow the decline of) the amount and quality of forage available, potentially increasing the carrying capacity of the Herd Management Areas and reducing other resource concerns (USDI 2010a:268). The effects to habitat conditions under all alternatives are analyzed in the *Native Vegetation* section of this EA and would apply to wild horse habitat conditions. A number of Standard Operating Procedures and Mitigation Measures (see Appendix A) are in place to minimize potential risks, if they arise, to wild horses from specific chemicals or application rates. The analysis of effects of consumption of treated vegetation was based upon the BLM and U.S. Forest Service Herbicide Risk Assessments (see Appendix C). Based on these risk assessments, the Oregon FEIS concluded that reaching Ecological Risk Assessment-identified risk levels would be unlikely unless the animal forages exclusively within the treatment area for an entire day (USDI 2010a:269). The likelihood of a wild horse eating herbicide treated vegetation, other than invasive annual grasses, for an entire day is unlikely. Under the Proposed and Revised Proposed Actions, large-scale treatments would be implemented on Vale District to reduce the dominance of invasive annual grasses. The herbicide treatment work in these areas involves broadcast spraying (ground or aerially) with imazapic or rimsulfuron. As analyzed in the Oregon FEIS and the 2016 PEIS, imazapic and rimsulfuron present no identified risk to wild horses (USDI 2010a:273).

Herbicide treatment activities would be short term (one day to one week) within Herd Management Area boundaries. Horses often leave the area where activity is taking place then return to the area once activity subsides, even with aerial herbicide application. To further minimize effects to wild horses during treatment activities, additional Project Design Features have been included in the Proposed and Revised Proposed Actions.

Projects Design Features Adopted for this Analysis

The following additional Project Design Features would further reduce effects on wild horses:

- Minimize activities to limit unintentional movements of wild horses, especially repeated movement of horse herds within the same day.
- Avoid or minimize treatment techniques during peak foaling season (March 1 - June 31). [This is the site-specific application / clarification of the Standard Operating Procedure reading “Avoid critical periods and minimize impacts to habitat that could adversely affect wild horse and burro populations” permitted by the Oregon FEIS.]
- Minimize potential adverse effects to wild horse habitat when using targeted 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.
- Minimize effects to horse-preferred habitat that could adversely affect wild horse populations.

Wildland Fire and Fuels Management

Issues

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

Affected Environment

The potential effects of invasive plants on fire regimes and fire behavior is largely dependent on the structure and species-specific characteristics (flammability) of the plants themselves, and their indirect effect of altering the abundance and arrangement of native plant fuels. Invasive plants may reduce fuels in ways that suppress the spread of fire in ecosystems where fire is desirable; or may increase hazardous fuels in ways that increase fire intensity or frequency in ecosystems where it is not (Brooks et al. 2004).

Native sagebrush plant communities in the Sagebrush Steppe Biome were historically made up of sagebrush, separated by native forbs and bunchgrasses that retained moisture long into the dry summer season and existed in discontinuous bunches, often separated by areas of biological soil crust. Natural fire return intervals in this type were 32 to 70 years (Quigley and Arbelbide 1997:797). In the past 130 years, invasive annual grasses (particularly cheatgrass) have become established in many sagebrush communities. When wildfires occur, these grasses increase exponentially since they reestablish more quickly and outcompete native plants. Large areas of sagebrush communities have experienced a total vegetation conversion to fire-prone invasive annual grasses (Menakis et al. 2003). Due to the invasion of the noxious weed medusahead rye and invasive cheatgrass, roughly 3.5 million acres of lands administered by the Vale District have been or are on the verge of conversion to invasive annual grasslands.

These grasses can increase horizontal fuel continuity and create a fuel bed more conducive to ignition and spread, and have been shown to increase fire frequency and size as well as expand the seasonal window of burning (Zouhar et al. 2008). These grasses have increased fuel continuity across large areas of contiguous landscape, supporting more frequent and more intense fast-moving fires that are initially difficult to contain and result in large landscape fires. Since 1980, roughly 3.7 million acres on the Vale District have been burned by wildfire. As shown in Table 2-3, almost 2 million acres have burned since 2010 alone, on average 4.6 times the amount of acres during any other 10-year period dating back to 1980. This increase in wildfire has allowed invasive annual grasses a competitive advantage that results in an unnatural fire regime; a more natural fire regime would be associated with a native plant community.

With the exception of cheatgrass, medusahead rye, and other invasive annual grasses (primarily in the Sagebrush Steppe Biome), the effects of invasive plants on fire frequency and intensity are mixed and generally subdued.

Treatments Planned Related to the Issues

No Action Alternative

Few treatments would occur in Category 5 and 6 because no herbicide is available District-wide under the alternative that is selective for the invasive annual grasses. Glyphosate is sometimes used in high-priority invasive grass monocultures where there are few desirable native species to suffer collateral damage; such treatments may be used to partition large expanses of invasive annual grass monocultures. Treatments would otherwise be limited to manual and mechanical methods. The District would also use imazapic for invasive annual grass treatments in limited areas listed on Table 2-8 and Map 2-5.

Proposed and Revised Proposed Actions

Treatments would focus on restoration of invasive annual grass-infested areas, which would reduce severe fire behavior and reduce fuels. Herbicides could be used on up to 100,000 acres per year depending upon management emphasis, to control invasive annual grasses where native ecological function is at risk (Category 5) or to restore communities that are dominated by invasive annual grasses (Category 6). The size of treatments to protect post-fire emergency stabilization areas from becoming infested with invasive annual grasses (Category 4) would depend on the size, location and intensity of the wildfire. Priority treatment would be given to areas where desirable species are present in sufficient quantities that controlling the invasive annual grasses can benefit intermixed perennials.

Larger upland areas of Categories 1 and 2, on the order of a few hundred acres, may be seeded and / or planted where species such as whitetop, rush skeletonweed, invasive annual grasses, Scotch thistle, or leafy spurge have taken over the site. Native species would be used unless a nonnative species (often crested wheatgrass) had previously been used for site rehabilitation, where site conditions warrant (highly erosive soils, steep slopes, etc.) or if appropriate species and quantities of native seed are unavailable. Seeding in Categories 5 and 6 may happen on up to 300,000 acres over the life of the plan. This would generally happen on individual projects that were less than 20,000 acres. Most of these would happen in the monocultures of Category 6, and seeding there would likely be a mix of native and nonnative species. In Category 5, native species are more likely, and projects are likely smaller due to the potential risk of conversion within these areas.

Targeted grazing with livestock could occur on up to 100,000 acres per year (up to 300,000 acres over the life of the plan) within the Vale District. Targeted grazing would occur during the growth stage when native grass species are resilient to grazing and when livestock preference is shifted towards consumption of the targeted species, which occur in the early spring and fall (Stroud et al. 1985, Ganskopp 1988, Vallentine and Stevens 1994, Brewer at al. 2007, Diamond et al. 2009).

Prescribed fire can be used as an herbicide pre-treatment to remove a seed source where the target invasive plant has gone to seed or to help reduce a heavy layer of thatch. Heavy thatch inhibits herbicide from reaching the target species. Pile burn spots, jackpot and broadcast burn areas are prone to colonization by invasive plants, and imazapic or rimsulfuron would be applied following a burn to prevent their establishment. Competitive seeding could also be used following prescribed fire to prevent re-infestation by invasive plants.

Standard Operating Procedures and Mitigation Measures Relevant to Effects

The potential for adverse effects to fire and fuels management is minimized for all alternatives by existing Standard Operating Procedures and Mitigation Measures (see Appendix A). These include, but are not limited to:

- Time treatments to encourage rapid recovery of desirable vegetation.
- When appropriate, reseed following burning to re-introduce species, or to convert a site to a less flammable plant association, rather than to specifically minimize erosion.
- Limit area cleared for firebreaks and clearings to reduce potential for weed [invasive plant] infestations.

Environmental Consequences

The analysis of potential effects to fire and fuels management is based on the expertise of BLM resource specialists, guidance from national and state fire policies, and scientific literature. This analysis defines levels of effects as follows:

Minor: The effect would be detectable. Threats to people, property or sensitive resources from wildfire would be minimal. Few changes in ability to implement a management response to wildfires and implementation of fuels management treatments would occur. Changes to fuel loads, fire regime condition class, and risk of undesirable wildfire would be measurable or perceptible, but localized in relatively small areas.

Temporal Scale
Short-term: A change in a resource or its condition would generally last less than 3 years.
Long-term: A change in a resource or its condition would last longer than 3 years.

Adverse/Beneficial
Adverse: Promotes or facilitates a continued accumulation of fuel loading to uncharacteristic levels for the plant community and historical fire regime; increases risk of uncharacteristic or unwanted fire behavior or fire effects relative to resource objectives, the plant community, or the historical fire regime; increased risk of post-fire invasion or dominance by invasive plants; increased risk of continued conifer encroachment into plant communities where not desired; and / or an increased threat to private property or resources from fires that originate on BLM-administered land.
Beneficial: Promotes or facilitates a reduction of fuel loading toward characteristic levels for the plant community and historical fire regime; decreased risk of uncharacteristic or unwanted fire behavior or fire effects relative to resource objectives, the plant community, or the historical fire

regime; decreased risk of post-fire invasion or dominance by invasive plants; decreased risk of conifer encroachment into plant communities; and / or a decreased threat to private property or resources from fires that originate on BLM-administered land.

Effects by Alternative

Common to All Alternatives

It is difficult to quantify the amount or rate of spread of invasive annual grasses in terms of acres or percentage of the landscape affected, as the factors of spread are highly variable. The acres of pre-existing sites, site precipitation, prescribed burn severity, track disturbance, slope, aspect and seed viability all have contributing influences from location to location. Continued increases in invasive annual grasses combined with global climate change would likely usher in larger, more intense wildfires in the foreseeable future, and the rehabilitation treatments would likely only slow this increase. The trend of large wildfires and large emergency stabilization and rehabilitation projects is likely to continue.

Given their relatively small size, treatments on Category 1, 2 and 3 invasive plants would have little to no effect in restoring fire frequency and intensity to natural ranges of variation across the landscape. The effects of herbicides as either a standalone treatment or in combination with prescribed fire, manual or mechanical treatments, to reduce fire behavior characteristics of invasive annual grasses, are generally localized to the areas treated.

No Action Alternative

Due to the need for repeat treatments and the higher cost per acre, manual and mechanical treatment areas would be small in scale, providing protection to limited areas, and would not reduce the risk of fire.

Prescribed burning can be used to suppress invasive annual grasses in the short term. However, sagebrush steppe is very susceptible to reestablishment by invasive annual grasses which tend to increase in abundance after prescribed burning unless the site initially had a sufficient component of native perennials to naturally reestablish (Zouhar et al. 2008). If a wildfire initially promoted invasive plants, then using prescribed fire without subsequent seeding or herbicide treatment to reduce the invasion is not likely to be effective. The use of prescribed fire would be limited and dependent on current condition of the fire regime prior to treatment (Zouhar et al. 2008) and would be addressed through separate NEPA analysis as projects are identified.

Actual fuel hazard reduction benefits (even in the short term) are limited[69]. The reduction in the severity of fire behavior characteristics (rate of spread, fire line intensities) under the No Action Alternative would be relatively labor-intensive, and benefits would be localized to the area treated.

Table 3-2, *Ongoing and Foreseeable Actions on or near the Vale District Potentially Relating to Cumulative Effects,* outlines the current treatments performed by the fuels program on the Vale District. Over the last 10 years there has been an average of 5,600 acres of mechanical juniper treatments and 1,517 acres of burning, either broadcast or pile burning. Along with the mechanical juniper treatments, 249 miles of grading / blading, mowing, and plowing (brownstripping) is conducted yearly on identified, established road systems classified as Wildland Urban Interface (WUI). These brownstrips are created in areas where wildfires have occurred repeatedly. The areas have been altered from their historical conditions and are at risk of losing key ecosystem components. Repeated wildfire has threatened private structures and property and reduced and fragmented critical shrub habitat on public lands.

[69] Currently, the only treatments are mow lines and disk lines, on top of conifer treatments, addressed and analyzed under their own NEPA.

These treatments break up the continuity of flammable fuels within the project area to reduce the size and frequency of wildfire.

The herbicides available District-wide under the No Action Alternative are not the most effective or efficient herbicides to use on invasive annual grasses. Under the No Action Alternative, threats to people, property, or sensitive resources from wildfire would be noticeable, as the spread of invasive annual grasses would promote the accumulation of fine fuels across the landscape. During times where fire conditions are high to extreme, the abundance of fine fuels would likely contribute to fire behavior resulting in an increase of rates of spread and intensity, affecting firefighters' abilities to suppress wildfires safely and efficiently, thereby increasing the potential of large landscape fires and the risk of fire to local communities. There would also be greater potential of large wildfires during times when historically the District did not receive them, causing fire season to occur earlier and extend longer.

Proposed and Revised Proposed Actions

If invasive annual grasses were treated at 100,000 acres a year for the next 15 years, 23 percent of the Vale District would be treated through projected fuels treatments. In the context of managing vegetation conditions to reduce wildfires, such treatments are more likely to have an ecosystem rehabilitation benefit than a fire reduction one. However, using herbicides in conjunction with natural or assisted re-vegetation would provide an opportunity to return fire frequency and intensity within natural, historic ranges of variation within treatment areas, which would be beneficial and improve the ability to respond to wildfires in the long-term.

Herbicides that would become available under these alternatives include pre-emergents (e.g. imazapic) that would selectively control invasive annual grasses including cheatgrass and medusahead rye, making some combination of herbicide / seeding treatments effective at removing these grasses and restoring native vegetation. This treatment would help to reduce the risk of faster moving fires by breaking up the fuels continuity, modifying rates of spread and fire intensity which would allow for safer fire suppression actions, and providing multiple fire suppression strategies.

Herbicides would also increase the effectiveness of fuel breaks created by green-stripping, a proactive technique to reduce the magnitude of the cheatgrass-wildfire cycle by growing fire-resistant vegetation at strategic locations in order to slow or stop the spread of wildfires (Quigley and Arbelbide 1997:801). Using herbicides to control invasive annual grasses would reduce the cost of maintaining these areas and increase their effectiveness at reducing fires. The availability of a wider range of herbicides would help with the coordination and collaboration with private or adjacent lands not managed by the BLM to reduce invasive plants and establish fuel breaks[70]. The use of these herbicides would also assist the current emergency stabilization and rehabilitation program by providing additional treatment options to ensure the success of future emergency stabilization and rehabilitation projects, increasing fire return intervals when compared to untreated areas under the No Action Alternative, which would be a beneficial long-term minor effect.

Seedings in Category 1, while having a site-level beneficial effect, would be negligible to minor beyond the treated area. However, integrated treatments and subsequent seedings at the landscape level in Categories 4, 5, and 6 would have a beneficial long-term effect within and adjacent to the treatment area.

Seed mixes in competitive seeding treatments would emphasize the use of native plant species where possible. Certain native plant species (Sandberg bluegrass, squirreltail) have been shown to have a beneficial effect because they reduce the rate of spread of fire by reducing fuel loading, and by providing a competitive advantage relative to invasive annual grasses (Goergen et al. 2011). Competitive seedings following herbicide treatments in

[70] Construction and improvement of fuel breaks is covered under other NEPA, not related to this EA.

Categories 4, 5 and 6 would be perceptible over a moderately sized area in and adjacent to treated areas due to the decrease in fine fuel loads resulting in longer fire return intervals and decreased rates of spread and intensity.

Using targeted grazing with cattle to control invasive annual grasses would result in a minor beneficial effect due to the reduction in fine fuels, decreasing fire intensity and rates of spread within and adjacent to treated areas.

Cumulative Effects

Treating invasive annual grasses in combination with hazardous fuels reduction (such as constructing or maintaining fuelbreaks and altering fuel bed characteristics to reduce potential fire behavior and spread direction) would reduce the risk undesirable environmental effects from wildfires. These types of treatments in combination should reduce potential flammability, slow potential rates-of-spread under all but extreme burning conditions, and increase the probability of reducing potential fire size, thereby reducing risks of adverse effects to a wide variety of environmental and social / economic factors, reducing potential risk to firefighters and public, and in the long term, reducing the overall cost of fire suppression.

In addition, these treatments in combination should increase resistance to climate change by reducing the potential frequency, intensity, and severity of wildfires. Many studies have documented that the most rapid environmental changes arising from changing climate occur following a stand-replacing disturbance, such as wildfire, since established vegetation typically can tolerate greater climate variability than seedlings can tolerate.

Without the ability to treat invasive annual grasses, the potential for large landscape altering wildfires will persist or intensify with the spread of invasive annuals. Following a wildfire, ecosystems are prone to conversion to annual grasslands, loss of key ecosystem functions, and reduced habitat for wildlife.

Air Quality

Issues

- How would the alternatives affect air quality?

Affected Environment

The Vale District lies within the Eastern Oregon Intrastate Air Quality Control Region (40 CFR 81.220). In general, the air quality within the District is good, but with persistent problem areas where strong inversions tend to trap either carbon monoxide or particulate matter at certain times of the year. No designations of non-attainment currently exist within the action area. One Air Quality Maintenance Area exists in the city of La Grande in Union County. La Grande has complied with National Ambient Air Quality Standards for PM_{10}[71] since 1991 and, a maintenance plan for La Grande was adopted by the Environmental Quality Commission on August 11, 2005 (ODEQ 2005). Several PM_{10} monitoring sites have been established in and around the northern part of the District. Sites are operational from April 1 to approximately October 1 in Asotin, Enterprise, Baker City, and John Day, and throughout the year in La Grande and Pendleton. The monitoring network, in operation since 1995, provides real-time monitoring to those conducting prescribed burning, as well as providing for long-term monitoring of trends and conditions.

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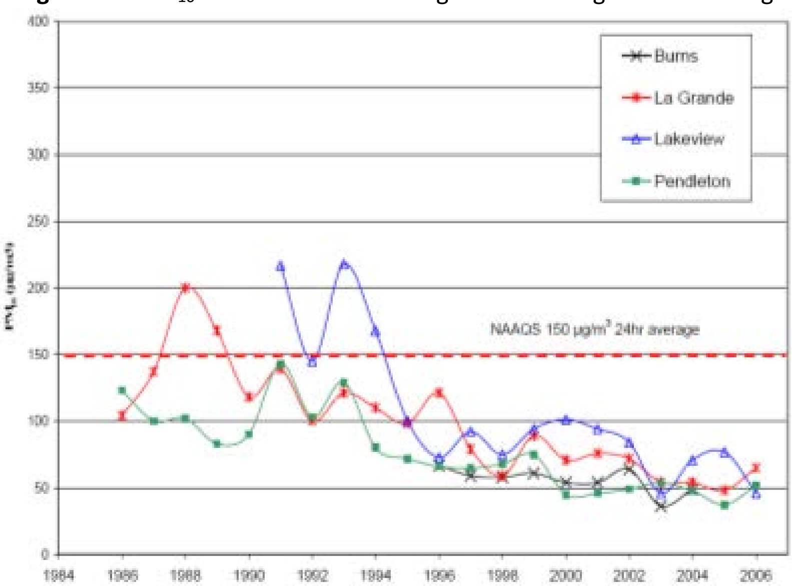
[71] PM_{10} includes all particulate matter with an aerodynamic diameter of 10 microns or less and is referred to as inhalable PM.

No monitoring stations exist in the Malheur Resource Area; therefore, air quality data from regional sources or the nearest appropriate monitoring stations were reviewed. The Oregon Department of Environmental Quality (DEQ) operates fine particulate matter $PM_{2.5}$[72] monitoring sites in the cities of Lakeview and Burns, which are west of the District (ODEQ 2010). The Idaho DEQ operates monitoring sites in Boise, Idaho and in the Treasure Valley, which is east of the District. Due to topography and weather patterns, the Treasure Valley, which extends from Vale, Oregon on the west to Boise, Idaho on the east, is subject to some of the most severe wintertime inversions in the intermountain West. During these events, air pollution monitors in the Treasure Valley have recorded levels above the national health-based standard for both fine particulate matter $PM_{2.5}$ and coarse particulate matter (PM_{10}). The valley experiences air pollution problems in the summer months as well. Monitoring has shown increased levels of ozone in the valley, sometimes to unhealthful levels, during the past several summers. Air quality improvement plans have been implemented to address carbon monoxide and PM_{10} pollution. According to the Idaho DEQ, pollutants of concern today in the Treasure Valley are $PM_{2.5}$ in the winter and ozone in the summer (IDEQ 2015).

Overall, air quality on the District is good with particulate matter well below the national standards. The Vale District complies with the Oregon Smoke Management Plan, with the goal of minimizing emissions from prescription burning consistent with air quality objectives of State and Federal clean air laws. The occurrence of wildfires and the use of prescribed fire have been increasing over the last decade, yet the air quality in eastern Oregon has improved, as indicated in Figure 3-5.

Figure 3-5. PM_{10} Trend for Eastern Oregon Cities using the Second Highest 24 hour Average



Visibility Protection in Mandatory Federal Class I Areas

Visibility protection in mandatory Class I areas is an important aspect of the human welfare standards of the *Clean Air Act*. The EPA promulgated the Regional Haze Rule in 1999 to further improve visibility in mandatory Federal Class I national parks and Wilderness Areas. Mandatory Class I areas include national parks over 6,000 acres in size and Wilderness Areas over 5,000 acres in size that were in existence on August 7, 1977 plus any subsequent additions to those areas or any Wilderness Areas designated as Class I in their enabling legislation. Any national park or Wilderness that has not been designated Class I is designated as a Class II area. The nearest monitoring stations of visibility conditions are located in the Strawberry Mountain Wilderness Area, Oxbow Dam on the Snake River, and near the Starkey Experimental Forest headquarters. There are two mandatory Class I airsheds within the District: the Eagle Cap Wilderness and the Hells Canyon Wilderness. The Strawberry Mountain Wilderness, also a Class I area, lies just west of the Vale District.

In all mandatory Class I areas, improvement in visibility must be made every 10 years for the 20 percent most impaired (haziest) days, regardless of current condition, and there must be no degradation for the 20 percent best (clearest) days, until the national visibility goal is reached in 2064. State and Tribal Implementation Plans outline

[72] $PM_{2.5}$ includes all particulate matter with an aerodynamic diameter of 2.5 microns or less, called fine PM, and is by definition a subset of PM_{10}

how reasonable progress towards this goal will be achieved and demonstrated. Section 308 of the Regional Haze Rule provides nationally applicable provisions of the rule in the development of State and Tribal Implementation Plans.

No “restricted areas” (i.e., areas for which permits to burn on forestland are required year round), “designated areas” (i.e., principal population centers), or “special protection zones” (i.e., buffer zones around non-attainment areas) currently exist in or near the District. In 2009, Oregon Department of Forestry burning rules were changed. Within the Vale District, Baker City, La Grande and Pendleton are now designated as Smoke Sensitive Receptor Areas.

Treatments Planned Relating to the Issues

Common to All Alternatives

Manual, mechanical, and herbicide treatments would occur in Categories 1, 2, and 3. Crews would be transported to control sites in vehicles, often on unpaved roads.

No Action Alternative

Few if any herbicide treatments would occur in Categories 5 or 6 because no herbicide is available under the alternative that is selective for the invasive annual grasses, so no pre-burning is expected.

Proposed and Revised Proposed Actions

Herbicides could be used on up to 100,000 acres per year (depending upon funding and management emphasis) to control invasive annual grasses in areas at risk of converting to invasive annual grass monocultures (Category 5) or to restore areas otherwise completely infested with invasive annual grasses (Category 6). Similar treatments could occur in post-fire emergency stabilization (Category 4) as well.

The availability of imazapic and rimsulfuron to treat invasive plants may increase the use of prescribed fire. Prescribed fire could be used as a preparation treatment on 20,000 acres per project, not to exceed 100,000 acres a year or 300,000 acres over the life of the plan in Categories 5 or 6 where plant communities are at risk of converting to invasive annual grass monocultures, or dominated by invasive grasses. Prescribed burning would likely take place in late summer or early fall so that follow-up seeding could have the advantage of winter precipitation to enhance germination and establishment.

Standard Operating Procedures and Mitigation Measures Relevant to Effects

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

Fire Use

- Have clear smoke management objectives.
- Evaluate weather conditions, including wind speed and atmospheric stability, to predict effects of burn and impacts from smoke.

- Burn when weather conditions favor rapid combustion and dispersion.
- Manage smoke to prevent air quality violations and minimize impacts to smoke-sensitive areas.
- Coordinate with air pollution and fire control officials, and obtain all applicable smoke management permits, to ensure that burn plans comply with Federal, State, and local regulations.

Chemical

- Apply herbicides in favorable weather conditions to minimize drift. For example, do not treat when winds exceed 10 mph (6 mph for aerial applications) or rainfall is imminent.
- Use drift reduction agents, as appropriate, to reduce the drift hazard.
- Select proper application equipment (e.g., spray equipment that produces 200- to 800-micron diameter droplets [spray droplets of 100 microns and less are most prone to drift]).
- Select proper application methods (e.g., set maximum spray heights, use appropriate buffer distances between spray sites and non-target resources).

Environmental Consequences

Effects are sometimes described using either a range of potential effects or in specifically qualitative terms, if appropriate. The intensities of effects are also described, where possible, using the following guidance:

Negligible: No changes to air quality would occur, or changes in air quality would be below or at the level of detection. If detected, the effects would be considered slight.

Temporal Scale
Short-term: Anticipated effects occur during implementation of the management action and would last from a few hours to a few weeks.

Effects of Treatment Methods on Air Quality

Fugitive dust from driving on unpaved roads, associated with all treatment methods, is not expected to measurably alter air quality in mandatory Class I areas or in air quality non-attainment or maintenance areas. The number of trips and vehicles used would not be a substantial increase compared to typical ongoing land management and recreation activities on the District. The highest emissions from manual treatments are carbon monoxide, which largely comes from vehicle exhaust, although manual emissions are minor relative to prescribed burning and mechanical treatments. Direct effects to air quality from burning invasive annual grasses are of very short duration due to the lack of smoldering. Emissions are quickly dispersed and diluted, and therefore are not expected to impair visibility in any mandatory Class I areas or air quality non-attainment or maintenance areas. Herbicide use would be localized and constrained by Standard Operating Procedures for herbicide application to control drift of chemicals into the airstream. As a result, the adverse effects to air quality would be negligible. BLM policy requires that all prescribed fire burn plans address smoke management, regardless of location. All prescribed burning on the Vale District complies with the Oregon Smoke Management Plan, with the goal of minimizing emissions from prescription burning consistent with air quality objectives of State and Federal clean air laws.

Effects by Alternative

No Action Alternative

Since there is no herbicide available under the No Action Alternative that is selective for invasive annual grasses, no burning for pretreatment would happen. Manual treatments and herbicide application result in few emissions of the pollutants analyzed, mostly related to travel exhaust and dust, or, incidental mechanical treatments exhaust (almost none planned). The adverse effects to air quality under the No Action Alternative would be negligible. Air quality would be affected by wildfire occurrence, severity, and intensity, all of which are expected to be greater under the No Action Alternative than under the other alternatives (see *Wildland Fire and Fuels Management* section).

Proposed and Revised Proposed Actions

Short-term adverse air quality effects could result from fugitive dust and smoke that both directly and indirectly relate to these alternatives. Vehicle and equipment use on unpaved roads is the main source of fugitive dust. Wildland and prescribed fires are the main sources of smoke. Prescribed burning would create smoke, exposed soils would contribute dust, and driving (to access treatment areas) and implementation activities would create dust and exhaust. Due to the use of prescribed fire on up to 100,000 acres per year (not to exceed 300,000 acres over the life of the plan), emissions of particulate matter, carbon monoxide, and carbon dioxide would be higher than the No Action Alternative. The increase of emissions from prescribed fires is not expected to adversely affect the town of La Grande's Air Quality Maintenance Area, any Class 1 airsheds or create any non-attainment status areas. Standard Operating Procedures and Mitigation Measures prevent the risk of intrusion by smoke or herbicide into Air Quality Maintenance Areas or Class I airsheds if burning is used as a pre-treatment tool. Adverse effects to air quality under the Proposed and Revised Proposed Actions would be short term and localized. It is anticipated that the treatment of Category 5 and 6 areas with prescribed fire and herbicide applications would result in a general decrease in emissions. This is due to a reduction in smoke from both future prescribed burning in previously treated project areas and in future wildfire occurrence, severity, and intensity.

Cumulative Effects

Common to All Alternatives

Adverse effects to air quality on the Vale District come primarily from sources outside the District, such as regional haze. Neighboring BLM districts, the U.S. Forest Service, and private landowners do prescribed burning at the same time as the District with no adverse air quality effects. This is due to coordination of burning and compliance with the Oregon Smoke Management Plan. Smoke from invasive annual grass restoration projects on adjacent BLM districts would not noticeably contribute to adverse air quality in the action area. Air quality in La Grande, an Air Quality Maintenance Area, is primarily affected by unpaved road dust, residential wood heating combustion, and agriculture activities, which are the dominant sources of PM_{10} and the topographic and weather conditions of the town (ODEQ 2005).

On the Vale District, the main sources of fugitive dust include vehicle and equipment use on unpaved roads, road construction and maintenance activities, and mineral operations. Main sources of smoke arise from wildland and prescribed fires. Particulate levels within the Vale District due to smoke are generally well below the national standards. Burning as an invasive plant control method, if used, would increase emissions. The amount of fugitive dust and motor exhaust from travel to the control sites, exhaust from OHVs used during treatments, and exhaust from occasional motorized equipment such as chainsaws, would provide a negligible (immeasurable) adverse effect to air quality within the Vale District. Unpaved road dust, residential wood heating combustion, and agriculture activities are the primary cause of air quality concern in identified maintenance areas, with occasional short-term contributions from wildfire. Other management activities on the District provide negligible effects to air quality. The Vale District burns less than 1,000 acres of cut juniper and prescribed fire per year on average, but can schedule this when atmospheric conditions promote dispersal and protection of Class 1 airsheds.

Treatment activities in any alternative in combination with other foreseeable actions listed in Table 3-2, *Ongoing and Foreseeable Actions on or near the Vale District Potentially Relating to Cumulative Effects,* would be minimal and are not expected to impair air quality within the Vale District, Class 1 airsheds, or create issues for maintenance and non-attainment areas.

Cultural Resources and Resources Important to Native American Tribes

Issues

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

Affected Environment

The BLM is required to consider the effects of agency actions on cultural resources that are determined eligible or potentially eligible for the National Register of Historic Places. The Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation are also an important element of management of cultural resources on public lands. Further laws that address various aspects of heritage resource management on BLM-administered land include but are not limited to the *National Environmental Policy Act* (NEPA), *National Historic Preservation Act*, the *Antiquities Act*, the *Historic Sites Act*, and the *Archaeological Resource Protection Act*.

Tribal Interests

Identified prehistoric sites within the Vale District consist of hunting-related lithic scatters, multitask occupation sites, toolstone quarries, rock shelters, rock art, and rock structures such as cairns or blinds. These reflect Native American use from at least 10,000 years ago to the recent past. The density of scientifically important prehistoric sites is high along major streams and rivers, along the margins of pluvial lakebeds, in some dunal areas, and near springs. Low site density is expected in large areas of the treeless, undifferentiated volcanic uplands and in the bottoms of former pluvial lake basins, where surface water and various life-sustaining resources are less prevalent.

The Vale District maintains government-to-government relations with numerous Native American tribes who have treaty reserved or Executive order rights on the District. Tribal members use BLM-administered lands to collect native plant species for a variety of cultural uses, such as food, medicine, dress, basketry, or ceremonial purposes.

Native American tribes federally acknowledged with reserved rights[73] on the Vale BLM District include:

- Confederated Tribes of the Umatilla Indian Reservation
- Confederated Tribes of Warm Springs

[73] In the Treaty of 1855, tribal ancestors reserved rights to maintain and exercise traditions and customs for gaming, fishing, hunting, and traditional food and medicine gathering throughout the ceded lands.

- Fort McDermitt Paiute-Shoshone Tribes
- Nez Perce Tribe
- Shoshone-Paiute Tribe of the Duck Valley Reservation
- Burns Paiute
- Shoshone Bannock Tribe of Fort Hall

The listed tribes are considered to be from two cultural and environmental locations, the Northern Great Basin tribes and the Southern Plateau tribes. Characteristics of the natural environment that are important to Native American human settlement are topography, flora, and fauna. The three elements are closely related, with variations in topography-elevation, degree of slope, direction of exposure, and drainage pattern-having important effects on the distribution and abundance of plants and animals in any given locality. In general, areas that are topographically diverse, including both lowland and highland terrain, are also biotically diverse, and offer greater possibilities for human exploitation than do relatively more uniform landscapes (Aikens 1986).

The Northern Great Basin

The Northern Great Basin area consists of a series of smaller basins formed by displaced fault blocks. To the north, the Great Basin meets the Southern Columbia Plateau. The alternating highlands and valley basins supported flora and fauna ranging from Upper Sonoran to Arctic-Alpine types providing a series of ecosystems centered on the lake basins. During postglacial climatic fluctuation, many species gradually shifted upward from their Pleistocene levels to reach a maximum elevation in the Altithermal (5000 to 2500 B.C.) and then to move somewhat lower again in the Medithermal (3000-1000 B.C.)(Cressman et al. 1942, Cressman 1956, Bedwell 1970).

Northern Great Basin tribes knew their territory, available foods, and the environmental dynamics. The basic roots gathered for winter storage include camas bulb (kehmmes), bitterroot (thlee-tahn), khouse or cous (qawas), wild carrot (tsa-weetkh), wild potato (keh-keet), and other root crops. Fruit collected includes serviceberries, gooseberries, hawthorn berries, thorn berries, huckleberries, currants, elderberries, chokecherries, blackberries, raspberries, and wild strawberries. Other food gathered includes pine nuts, sunflower seeds, and black moss.

The Southern Plateau

The Southern Plateau group had a generally riverine focus, with a semi-sedentary winter pit house village settlement pattern and subsistence relying primarily on salmon, ungulates, and wild root crops. The ethnographic boundary crossed the Snake River above Weiser, Idaho, at the southern end of Hells Canyon and followed the rugged mountains that form the southern rim of the Salmon River Drainage east to the Bitterroot Range. Plateau people utilized approximately 135 species of plants as sources of foods, flavorings, or beverages. They included root vegetables, green vegetables, fruits and nuts, inner bark of trees, mushrooms, one lichen species, and a variety of casual foods, sweeteners, flavorings, and beverage plants (Hunn et al. 1998).

Until the early 1900s, the culture of the Cayuse, Umatilla, and Walla Walla tribes were based on a yearly cycle of travel from hunting camps, to fishing spots, to celebration and trading camps. The three tribes spent most of their time in northeastern Oregon and southeastern Washington. The most plentiful foods were salmon, roots, berries, deer, and elk. The tribes moved from place to place seasonally to the food source to prepare it for consumption and winter storage. They followed the same course from year to year in a large circle from the lowlands along the Columbia River to the highlands in the Blue Mountains.

While the tribes no longer rely upon the traditional collection and processing of plants for food, fiber, and medicine for their existence, they still consider the preservation of these plants, their use in ceremonies, and the knowledge that they exist to be important to the maintenance of their cultural heritage. Plants are mostly used today in cultural ceremonies, special occasions, for medication, and for the perpetuation of cultural traditions within families. Great concern is expressed for the preservation of important plant areas and plant types. Due to confidentiality concerns, the BLM does not know how often plants are collected or where, strong indications are given that this is done on a regular basis by all tribes within the Vale District. Invasive plants, exclusion of fire, effects from resource extraction, road building, and other factors have contributed to declines and dislocations in many of the plant species important to tribes within the region.

Treatments Planned Related to the Issues

Common to All Alternatives

While many areas of the District have been surveyed for cultural resources, it would not be feasible to survey the entire 5 million acre district. As such, when a vegetation treatment project is proposed, the 2015 BLM / SHPO Protocol would be researched for applicability. If the proposed treatment is not identified in the protocol, cultural survey needs would be determined and survey would be completed prior to vegetation treatments. The survey would assess the proposed treatments in conjunction with the effects on cultural resources prior to any ground disturbing activities.

Proposed vegetation treatments were divided into two groups for cultural resource management purposes; these include ground disturbing and non-ground disturbing actions (see Table 3-37).

Table 3-37. Ground Disturbing / Non-Ground Disturbing Actions

Ground Disturbing Actions[1]	Non-Ground Disturbing Actions
• Manual (pulling and grubbing) • Competitive seeding and planting (Proposed and Revised Proposed Actions) • Biological (targeted grazing) • Prescribed fire (Proposed and Revised Proposed Actions)	• Mechanical (chainsaws, mowing and weed eating) • Biological Control Agents (insects) • Herbicide Application (spraying, aircraft, and booms)

1. Cultural survey needs would be determined for all ground-disturbing actions.

The Non-Ground Disturbing Actions are considered "exempt" from field survey and further review as identified in the 2015 State Protocol between the Oregon-Washington BLM and the Oregon State Historic Preservation Officer (SHPO). Appendix E of the State Protocol identifies specific projects or activities that are exempt from field survey and consultation with SHPO. The items pertaining to vegetation management are located in Range Management Program, which state:

Item 1. Vegetation treatment by spraying, permit issuance, and aerial seeding of grasses. However, the effects of vegetation treatment by spraying upon traditional food resources will be considered through other analyses (NEPA and / or Land Use Plans)[74]."

Item 4. Herbicide application where it would be unlikely to affect rock art images or traditional Native American plant gathering areas as determined in consultation with affected tribes."

No Action Alternative

District-wide, treatments would be primarily limited to noxious weeds in Categories 1, 2 and 3. Infestations in these Categories tend to be small, involving spot treatments and other selective methods of treatment. Treatments on invasive annual grasses (Category 5 and 6) would not occur; invasive annual grasses are the greatest threat to edible root species because they prefer similar soil sediment types.

[74] This environmental assessment meets the requirements of analysis referenced in the Protocol.

Three additional herbicides would be used in limited areas, primarily for emergency stabilization and rehabilitation following fires (see Table 2-8, *Summary of Existing NEPA Authorizing Invasive Plant Treatments*).

Proposed and Revised Proposed Actions

The Proposed and Revised Proposed Actions are similar to the No Action Alternative except they are expanded to allow herbicide use on all invasive plants (not just noxious weeds), and are expanded to include the use of 14 or 17 herbicides District-wide rather than 4. The ability to treat all invasive plants and the inclusion of herbicides selective to invasive annual grasses greatly increases the number of acres treated under these alternatives.

Standard Operating Procedures and Mitigation Measures Relevant to Effects

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

- Follow guidance under Human Health and Safety Standard Operating Procedures and Mitigation Measures in areas that may be visited by Native peoples after treatments.
- Do not exceed the typical application rate when applying 2,4-D, fluridone, hexazinone, and triclopyr in known traditional use areas.
- Consideration should be given to herbicides other than 2,4-D; use of 2,4-D should be limited to situations where other herbicides are ineffective or in situations in which the risks posed by 2,4-D can be mitigated.
- 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.
- Follow standard procedures for compliance with Section 106 of the *National Historic Preservation Act* as implemented through the National Programmatic Agreement and State protocols or 36 CFR Part 800, including necessary consultations with the State Historic Preservation Officers and interested tribes.

Project Design Features Adopted for this Analysis

The following additional Project Design Features would further reduce effects on resources important to Native American tribes:

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

Environmental Consequences

Effects of Treatment Methods

This analysis estimates effects over the next 10 to 15 years and focuses on the cultural resource values where experience on similar lands indicates a potential for change by the proposed activities. Magnitudes as they relate to this analysis are defined as:

Negligible: Effects to Native American tribes and cultural resources would be slight and barely measurable.
Minor: Effects to Native American tribes and cultural resources would be small, measurable, and detectible.

The No Action Alternative has a higher potential for introduction and spread of invasive nonnative species because of the limited amount of herbicides allowed. The Proposed and Revised Proposed Actions have a lower potential for introduction and spread of invasive nonnative species populations because of the additional herbicides that are available for use.

Benefits from an aggressive invasive plant management program include:

- A decrease in the spread of invasive plants degrading the existing native plant gathering areas.
- A decrease in the spread of invasive plants from the BLM to Tribal trust lands and adjacent private property.
- In the long-term, without aggressive vegetation management methods, invasive plants populations may threaten to take over traditional gathering areas. No adverse human health effects are anticipated.

Non-Herbicide Treatments

Non-herbicide treatments may affect culturally significant plants. Prescribed burning associated with rehabilitation treatments could temporarily remove desirable plants if present, but such fires would be conducted only once or twice a decade and are either on sites so dominated with invasive plants that there are few desirable native plants on the site, or they are conducted at times of the year and under conditions when edible root plants are dormant. Such fires are conducted at lower heat intensity than wildfires, and are part of a rehabilitation strategy that would provide long-term benefits to culturally significant plants.

Herbicide Treatments

An herbicide-by-herbicide discussion of their potential to harm non-target plants is included in the *Native Vegetation* section in this Chapter. Herbicides are designed to kill plants, so culturally significant plants could be damaged or killed if sprayed with any of the herbicides to which they are susceptible. Selective herbicides such as imazapic would reduce this risk on perennial broadleaf plants and perennial grasses but not on most annuals (grasses and broadleaves). Further, chlorsulfuron, metsulfuron methyl, sulfometuron methyl, imazapic, and imazapyr are effective at very low rates (half ounce to a few ounces per acre). Because of their high potency and longevity, these herbicides can pose a particular risk to non-target plants. Off-site movement of even small concentrations of these herbicides can result in damage to surrounding plants, and damage to non-target plants may result at concentrations lower than those reportedly required to kill target invasive plants (Fletcher et al. 1996, USDI 2010a:145). 2,4-D is a selective herbicide that kills broadleaf plants but not grasses, and is used in many tank mixes. Direct spray and nearby drift can kill non-target plants. Triclopyr is selective to broadleaf and woody plants, and susceptible species could be affected by drift as far as 1,000 feet away at the maximum rate. Imazapic treatments could contaminate pre- and post-emergent fungi, but there is no potential human health effect from such contamination identified in the Human Health Risk Assessments (see Appendix C).

Human Health Risks from Herbicide Treatments

Human health risks are addressed in the *Human Health and Safety* section in this Chapter, which itself tiers to over 6,000 pages of Risk Assessments closely examining the potential for adverse human health and environmental effects. Within those assessments, a variety of possible human exposures are examined, including contact with sprayed vegetation, consumption of sprayed fruit and berries, consumption of contaminated water, and consumption of contaminated fish by subsistence populations. The possible herbicide exposure under each scenario was compared with levels of each herbicide known to cause adverse effects in humans. In many cases, the adverse effect was eye or other irritation, typically reversible. Where modeled scenarios resulted in herbicide exposures less than one-tenth of the lowest level to cause an adverse effect, the Risk Assessments (and this EA) consider the herbicide to have "zero" or "no" risk. Where modeled scenarios resulted in exposures between one-tenth and the lowest level to cause an adverse effect, risks were rated as "low." It is important to note the modeled exposure scenarios were generally conservative, and various uncertainty factors were used wherever data were missing. Risk ratings for all of the modeled exposures, for all 17 of the herbicides, are included in Appendix C, and discussed individually in the *Human Health and Safety* section in this Chapter.

All of the human health scenarios for the public or subsistence populations, including accidental spill scenarios, have zero or no risk except the four herbicides discussed in Table 3-38.

Table 3-38. Effects of Herbicides (Native American)
Additional information about the risk ratings discussed below can be found in Appendix C, *Herbicide Risk Assessment Summaries*.

Herbicides available under all alternatives	
2,4-D	2,4-D has a low risk for direct spray, to a child, at the maximum rate. A Mitigation Measure precludes use of the maximum rate where feasible.
Glyphosate	Glyphosate has a low risk for consumption of contaminated water, to a child, at the maximum rate. No maximum rate treatments are anticipated.
Herbicides available under the Proposed and Revised Proposed Actions	
Fluridone	Fluridone has a low risk for accidental spill scenario for a berry picker, child and for residential – contaminated water, to a child or adult. Use would be extremely limited, and well posted for this aquatic herbicide.
Triclopyr	Triclopyr has a low risk for consumption of contaminated water, to a child, at the maximum rate, and triclopyr BEE has a low risk at the maximum rate for scenarios of consumption of contaminated fruit; dermal – contaminated vegetation, to a woman; and, direct spray, to a woman, on the lower legs. A Mitigation Measure precludes use of the maximum rate where feasible.

Effects by Alternative

Common to All Alternatives

Direct short-term (0-3 years) effects may occur from the ground disturbing activities identified in Table 3-37; these activities include manual (pulling and grubbing), competitive seeding and planting, targeted grazing and prescribed fire. Risk to Native American cultural plant gathering areas and other BLM product gathering sites from these activities would be minor over the short-term. Some of the non-herbicide treatments would consist of hand pulling of individual plants, especially in areas where culturally significant plants are identified in consultation with the tribes. Efforts would be made to disturb as little of the site as possible because ground disturbance encourages reinfestation or the germination of on-site seeds. Broad-scale herbicide and targeted grazing treatments in medusahead rye and cheatgrass could affect large areas; a project design feature in this EA is to notify the tribes of such proposals and coordinate with them to avoid conflicts where possible.

Most treatments in Categories 1, 2, and 3, particularly those associated with small, new populations, would be treated in late April through July. Most edible plant gathering occurs in May through mid-June so conflicts may occur for a brief period. Effects to non-target plants could occur, but would be limited because sprays are directed at the target plants; nearby native species would repopulate the site and resist reinfestation. Survey areas, and treatments planned on established sites (Categories 1 and 2), would be identified on the Annual Treatment Plan, and coordination with the tribes would decide if conflicting treatments can be rescheduled or treatment areas need to be posted so people can avoid them.

No Action Alternative

The No Action Alternative would not directly adversely affect the existing condition of cultural resources within the District. However, indirectly, without the use of the additional herbicides, fewer invasive plant infestations would be effectively controlled. The root structures of nonnative vegetation are less suitable to hold soils in place (Lacey et al. 1989), thus increasing surface erosion processes in comparison with the stabilizing root masses of native vegetation. Erosion affects buried cultural material by increasing artifact exposure, facilitating illegal collection and theft. Native American gathering areas are at greater risk of spread from invasive plants under the No Action Alternative than the Proposed or Revised Proposed Actions because of the limited approved herbicides available.

Proposed and Revised Proposed Actions

The decrease of existing nonnative vegetation areas and the increase in native vegetation root masses would have negligible effects. The higher rate of effective invasive plant management containment, control, and / or eradication of invasive plants anticipated with the Revised Proposed Action supports the protection of culturally significant plant areas by reducing the encroachment of invasive plants. The Proposed and Revised Proposed Actions would include Standard Operating Procedures, Mitigation Measures, and Project Design Features that are designed to avoid effects to cultural resources.

Effects from manual treatments, competitive seeding and planting, targeted grazing, and prescribed fire would be the same as under the No Action Alternative.

Targeted grazing in pastures identified in Table E-6 (Appendix E) may have a minor, direct effect over the short term. Osborn et al. (1987) summarized that grazing influenced breakage and / or edge damage to cultural resources, visibility, and the degree of artifact displacement. All three factors identified have historically occurred. Areas proposed for targeted grazing would be surveyed for cultural resources prior to project implementation.

The adverse effects of competitive seeding and planting would be short term. The ground disturbance associated with preparing the seed bed or digging holes for plants could cause a minor adverse effect. If cultural resources were encountered, appropriate regulations would be followed. The Oregon SHPO has determined that drill seeding is an undertaking that would require cultural surveys and associated reports be completed and submitted to the Oregon and Washington SHPOs as appropriate prior to project implementation. All eligible and potentially eligible cultural sites would be avoided and thus there would be no effect to cultural resources.

Indirect effects resulting from the listed ground disturbing activities in Table 3-37 would increase acreage of native vegetative ground cover in the long term, improving the associated soil stability and erosion potential while reducing artifact exposure and theft.

Cumulative Effects

Ongoing and foreseeable future actions (such as energy developments and mining operations) would not have effects on cultural resources because of consultation and survey requirements, which would identify and protect the location of any sensitive resources prior to project implementation. Effects from wildfires would accelerate soil erosion disturbance levels and negatively affect cultural resources in the short term. However, emergency stabilization and rehabilitation projects would include revegetation activities that benefit cultural resource management by establishing an adequate vegetative cover that decreases encroachment by invasive plants, artifact exposure, illegal collection, and theft. Ongoing grazing, roads, recreation and other BLM activities in combination with the Proposed or Revised Proposed Actions would, over the short-term (0-3 years), result in a decrease of overland erosion until the establishment of a vegetative soil cover and intact root masses on cultural resource sites. Over the long-term (3+ years), a decrease in invasive plant establishment and encroachment areas would reduce soil erosion disturbance levels, benefitting cultural resources.

Recreation / Interpretive Sites

Issues

- How would the alternatives affect the recreating public? (see also *Human Health and Safety*)
- How would the alternatives affect access to recreation sites?
- How would the alternatives affect pets?

Affected Environment

The majority of BLM-administered lands on the District are managed to accommodate and provide for a multitude of developed, semi-developed, and dispersed recreation uses. These include ATV motorized activities, driving for pleasure, power and float boating, horseback riding, hiking, nature viewing, rock hounding, fishing, interpretive displays, hunting, and others. Recreation settings range from lowlands and valley floors to high deserts and mountainous terrain. Access to these lands is provided where legally allowed and possible, by motorized, non-motorized, mechanized methods or by foot travel. A key component of BLM's integrated vegetation management strategy is raising public awareness of the threats of spreading invasive plants, and including prevention techniques on maps, brochures, informational kiosks, and interpretive signage at trailheads. In addition, using recreational livestock requires the use of pelletized or certified weed-free hay throughout the District. Visitors generally have the freedom of recreational pursuits with minimal constraints in dispersed settings. Peak use seasons are dependent upon a variety of factors that are specifically associated with the resources being sought. Peak use patterns vary by season as well as by elevation, weather patterns, regulations (i.e. hunting / fishing seasons), water levels, and even fuel prices.

Table 3-39. Recreation Use

Resource Area	Type	Visitors Per Year
Malheur	Dispersed	142,112
Baker	Dispersed	111,273
		Total: 253,385
National Oregon Trail Interpretive Center	Developed	33,436
Malheur	Developed	272,941
Baker	Developed	174,565
		Total: 480,942
		Grand Total: 734,327

Source: RMIS (2014)

Though many developed or semi-developed recreation areas are available for specific recreational opportunities, many visitors to the District still seek their own areas or activities in remote or non-developed / dispersed settings. Primary use settings include the District's Wild and Scenic Rivers, special attraction sites such as Leslie Gulch or Birch Creek, the vast expanses of Wilderness Study Areas, the National Historic Oregon Trail Interpretive Center, as well as the reservoirs created by the Hells Canyon Complex. Visitation on the Vale District is approximately 253,385 dispersed visitors per year (RMIS 2014) with an additional 480,942 per year (RMIS 2014) who seek use of the more developed sites (Table 3-39).

Although the numbers would indicate that developed uses exceed dispersed activities, dispersed area use numbers are not as easily accounted for due to their random nature, remote locations, and lack of a system to count specific uses. Therefore, the dispersed recreation use shown in Table 3-39 likely represents only a portion of the total dispersed uses of the District. Most users of the Vale District are local or regional residents.

Recreational activities occurring on the Vale District range from primitive forms, such as dispersed camping, hunting, and hiking, to fully developed campgrounds that service motorized travelers. There are two fee camping areas within the Vale District: Chukar Park and Spring Recreation Site. Other developed camping locations include Antelope Reservoir, Birch Creek Historic Ranch, Cow Lakes, Rome Launch Site, Slocum Creek / Leslie Gulch, Three Forks, Twin Springs, Willow Creek Hot Springs, Hells Canyon Reservoir Recreation Area (9 campgrounds), and Bassar Diggins with additional nearby developed sites existing under other agency management. Idaho Power, Oregon State Parks, U.S. Forest Service, as well as some counties, all have fully developed campsites that currently meet the needs and demands of the public who seek these forms of recreational experiences. Developed recreation sites on the Vale District include fully developed campgrounds, trails, interpretive centers, Off Highway Vehicle (OHV) areas, Watchable Wildlife areas, Backcountry Byways, developed boat launches, day use areas, and cultural viewing / interpretive sites. These sites vary distinctly based on the recreational emphasis of the area, visitation numbers, location, and physical limitations of the landscape. Management objectives for these areas focus on protecting visitors from hazards, and protecting the resources that attract the recreational uses. Developed recreation sites are one of the features most at risk for invasive plant infestation on the Vale District. Recreation sites bring together the routes of invasive plant spread, people and recreation equipment, and usually water. Invasive plants can be easily transported into the site and away from the site to other areas on the District and beyond, by the public on their equipment, clothing, pets, and animals.

Treatments Planned Relating to the Issues

Common to All Alternatives

Invasive plant treatments under all alternatives could be conducted using (individually or in combination) hand tools, motorized or mechanized equipment, biological control agents, seeding with native and / or nonnative species (under the Proposed and Revised Proposed Actions), prescribed fire (under the Proposed and Revised Proposed Actions), and targeted grazing. Additionally, herbicide applications would also be utilized to control invasive plants in both dispersed and developed recreation sites and / or interpretive sites. Invasive plants in developed recreation and interpretive sites are a high priority for treatment. The acres associated with these sites are between 1 and 10 acres in size. Actual infestations within the sites are often less than an acre, so grubbing, mowing, and other manual or mechanical methods may be practical. Manual and mechanical methods may also be used to control growth and prevent seeding during the recreation season, delaying the need to use herbicides until recreation site use levels have declined for the season. When herbicides are needed, campground hosts would provide outreach to recreationists, and place signage throughout the campground in advance of and following treatments. The herbicide mix contains a colored dye, so observers can tell what areas have been sprayed. Campgrounds would not typically not be closed when localized treatments are planned unless label specific guidelines, recommendation of the weed management specialist, the size of the application area, or the use of treatment methods that could be hazardous to the public (e.g. low-flying aircraft or motorized spray equipment operation) require such a closure. In the event of such a closure, recreation sites or concentrated use areas could be unavailable for use for as little as a few hours to a few days depending on infestation size and method of control. Such treatment activities would be advertised well in advance to minimize effects to recreation activities at specific sites, but there is no way to reach all users. Overlooks would usually not need to be closed, though signage would be used. Annual treatments of infestations occurring within developed recreation or interpretive areas by all methods are estimated to be between 75 and 150 acres.

Treatments in dispersed recreation areas would be much like the rest of the District. Spot treatments could occur anytime, would not necessarily be signed (although colored dyes are always used), and recreationists and their pets could be potentially exposed to small quantities if treatment areas are entered. Aerial application of herbicides would also occur on larger areas of invasive plants.

No Action Alternative

Under this alternative, the District would continue to use four herbicides currently allowed for treatments of noxious weeds in both developed and dispersed recreation sites in the appropriate manner and for the necessary treatment timeframes required. Species not readily controlled by the four herbicides may require follow up treatments with multiple entries over several years.

Proposed and Revised Proposed Actions

Under the Proposed and Revised Proposed Actions, the District would have access to a larger variety of herbicides from which to implement treatments. The 10 or 13 additional herbicides are expected to increase overall effectiveness, so fewer entries would be required.

Standard Operating Procedures and Mitigation Measures Relevant to Effects

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

- Schedule treatments to avoid peak recreational use seasons, while taking into account the optimum management period for the targeted species.
- Notify the public of treatment methods, hazards, times, duration and nearby alternative recreation areas when closure or modification of public use patterns will be affected.
- Adhere to entry restrictions identified on the herbicide product label for public, animal and worker access.
- Post signs noting exclusion areas and the duration of exclusions, if necessary.

Environmental Consequences

The intensities of effects to recreation are described, where possible, using the following guidance:

Negligible: The effect is at the lowest level of detection; there would be no measurable change to recreation activities or recreational opportunities.
Minor: The effect is slight but detectable; but the change would be small and, if measurable, would be localized or mitigated to reduce the effect on recreation activities or recreational opportunities.

Common to All Alternatives

Invasive plants are projected to continue to spread on the District under all alternatives. Effective treatments of invasive plants would enhance the recreational experience and opportunities of the public land visitors.

The implementation of all control methods identified (manual, motorized or mechanized equipment, seeding with native and / or nonnative species (under the Proposed and Revised Proposed Actions), biological control agents, prescribed fire (under the Proposed and Revised Proposed Actions), targeted grazing, and herbicide application by backpack, OHV, or aircraft) for the treatment of invasive plants can directly and indirectly affect a variety of recreation activities within or around recreation / interpretive sites as well as dispersed recreational activities on the District. For example, the noise associated with mechanical methods of treatment (i.e. mowing, disking, drill seeding) may adversely affect the recreational experience of a visitor or the odor or dye associated with herbicide methods may make an area temporarily less attractive for use. Additionally, mowing and other mechanical treatments leave obvious treatment scars and debris that decrease the aesthetic appeal of an area, as would dead and browned vegetation from herbicide treatments. All methods have the potential to temporarily adversely affect or displace recreational activities until the effects from treatments have lessened.

Herbicide treatments could potentially pose some exposure risks to recreational users and / or their pets, although exposure potentials are limited by Standard Operating Procedures and appropriate safety measures. Adverse effects because of exposure are very unlikely. (The potential for adverse health effects of exposures is discussed in the *Human Health and Safety* section later in this Chapter.) Although some users might be displaced because of treatment activities, this displacement would be temporary and would not affect the overall recreational use of an area. Adverse effects would be short-term, negligible, and localized.

Treatments in dispersed areas where recreational activities are present but at lower densities would occur across the District as treatment seasons allow. Aerial applications would occur in large invasive plant infestations or areas inaccessible by other means. Such areas are generally unattractive to most users. Imazapic, the herbicide more likely to be aerially applied, shows zero human health risk at all exposure scenarios. Spot treatments of herbicide could occur anytime and in a variety of locations where invasive plants are present. Spot treatment sites in these dispersed areas are unlikely to be signed because of these small-scale and dispersed locations. Users and their pets could be potentially exposed to small quantities if those applications occur during a season (i.e. hunting, fishing seasons) when visitation is likely to occur. Although animals and pets (i.e. horses, dogs, llamas, etc.) that accompany recreationists, could potentially be exposed if they pass through very recently treated vegetation, most treatment areas are small with visual cues such as dyes or signs to alert owners and keep exposure potential low. With the application of Standard Operation Procedures and Mitigation Measures, the adverse effects would be negligible and short term.

Effects of Invasive Plant Control

Infestations from all species of invasive plants have the potential to decrease the recreational attractiveness of an area and its uses. This occurs as the species expand thereby limiting the available usable area of sites, displacing or reducing specific recreational activities, affecting resources that attract recreation uses, or by providing potential for physical injury from spines or needles. Affected areas can be small (less than 1 acre) to large (larger than 5 acres). With specific recreation or interpretive sites being relatively limited in size (between 1 to 20 acres), even a small infestation can result in a noticeable effect on recreational uses.

Invasive plants adversely affect all recreation activities regardless of its type or frequency. Adverse effects range from changes in visual quality, to displacement of native flora and fauna, to actual human injury from plant defenses such as spines, needles, and toxins. Infestations by invasive plants directly and indirectly decreases the recreational experience of an area (i.e. fishing, hunting, hiking, wildlife viewing, etc.). Removal, control, eradication, or replacement of undesirable vegetation through the variety of treatment methods available to protect visitors, maintain the appearance and function of a site and to prevent the degradation of BLM resources and infrastructure (i.e. buildings, parking lots, and camping pads) of developed sites is always an objective of the recreation program. Invasive plants adversely affect dispersed users directly by reducing native habitats, and indirectly as they increase the likelihood of large wildfires that threaten human safety and restrict recreation activities. Prevention and removal of invasive plants would maintain or enhance recreation visits and opportunities on public lands by creating a more “natural” or “desirable” vegetative condition which recreationists find more appealing than they do the lands infested by invasive plants.

No Action Alternative

Under this alternative, in addition to the treatment methods identified above, the District would continue to use four herbicides for noxious weed control in both developed and dispersed recreation areas. Where treatment methods are not effective, multiple treatments can increase the risk of exposures and disruption. Additionally, those species that are not effectively controlled by the four allowable chemicals would continue to advance in population size and density with an ever-increasing detrimental effect on the recreation opportunities on the District. However, with the application of Standard Operation Procedures and Mitigation Measures, adverse effects from the No Action Alternative would be expected to be negligible to minor in the short term with the potential for small, localized effects over time as invasive plants not adequately controlled by the current herbicides continue to expand.

Proposed and Revised Proposed Actions

Because the additional herbicides would provide choices for using products that are more effective, more target-specific, and less potentially toxic to humans and pets, the potential for public exposure would decrease, and treatments would be less likely to displace recreational activities.

Under the Proposed and Revised Proposed Actions, the rate of invasive plant spread would decrease from 12 percent per year to an estimated 7 percent per year directly resulting in fewer acres becoming infested and more acres remaining attractive for recreational pursuits. Although all alternatives offer beneficial effects, the Revised Proposed Action provides for a wider variety of treatment options with the highest likelihood of success for vegetation enhancement and the least amount of exposure to recreators (see also the *Human Health and Safety* section), their animals, and pets from herbicide treatments. Under the Revised Proposed Action, the use of herbicides that have moderate or high risk to small and large mammals is reduced when compared to the other alternatives; use of 2,4-D and picloram reduces by 65 percent and 76 percent, respectively, when compared to the No Action Alternative; and triclopyr reduces 11 percent compared to the Proposed Action). Beneficial effects of invasive plant control would be result in small, localized but permanent improvements to recreational opportunities in the long term.

Cumulative Effects

The projected visitor use increase on the District over the next 20 years would continue to increase demand for primitive, developed, and dispersed recreation opportunities. Current technological improvements in the form of personal land and water based motorized and non-motorized equipment facilitates changes to demand for recreation on the District. Ever-advancing technology creates equipment that can easily traverse the topography and both natural and man-made physical barriers in order to access lands or waters in search of solitude or exploration. Given this increase in access, it is likely that invasive plants would be introduced to new areas and / or spread to new areas from existing sites. The steep terrain and dry high desert conditions of the District are prone to longer-term effects from simple activities such as motorized uses, mechanized uses, and pedestrian trailing that creates soil disturbances. In some cases, these repetitive activities can cause long-term adverse effects in steeper terrain or in drier environments that take longer to restore naturally. Adverse cumulative effects can be expected to occur, in many cases not dissimilar to the adverse effects of invasive plants. However, the Standard Operating Procedures and Mitigation Measures as well as the information and education of users to invasive plants over time would mitigate these effects. Cumulative effects would be minor in the long term across the District.

Visual Resources

Issues

- How would treatments affect visual resource objectives?

Affected Environment

BLM policy requires that the visual values be determined for all BLM-administered lands during the resource management planning process. Scenic quality, sensitivity, and distance from observers are used to assign one of four visual resource inventory classes, ranging from I to IV. The Resource Management Plans finalize and set management objectives for these classes (see Table 3-40 and Map 3-9). After Visual Resource Management (VRM) classes have been established, BLM policy requires all management activities be designed to meet the assigned classes. Class IV allows for the most visual change to the existing landscape, while Class I allows the least. It is important to note that while lands classified as Class IV are managed to allow for "major modifications to the landscape," "every effort should be made to … minimize disturbances and design projects to conform to the characteristic landscape" (USDI 1986:290). VRM Class I is usually associated with Special Designations such as Wild and Scenic Rivers, Wilderness Areas, and Wilderness Study Areas. Usually the stringent standards of those designations themselves, as well as any site specific management plans associated with their management (i.e. Wild and Scenic River Management plans, *Wilderness Act*, etc.), result in projects meeting visual quality objectives (see *Special Management Areas* section for more details).

Table 3-40. Visual Resource Management Classes: Objectives and Change Permitted by Management Activities

VRM Class	Visual Resource Objective	Change Allowed (Relative Level)	Relationship to the Casual Observer
Class I	Preserve the existing character of the landscape. Manage for natural ecological changes.	Very Low	Activities should not be visible and must not attract attention
Class II	Retain the existing character of the landscape.	Low	Activities may be visible, but should not attract attention
Class III	Partially retain the existing character of the landscape.	Moderate	Activities may attract attention but should not dominate the view
Class IV	Provide for management activities that require major modification.	High	Activities may attract attention and may dominate the view

The public lands administered by the Vale District contain many outstanding scenic landscapes. Visual resources in these landscapes consist of land, water, vegetation, and other natural or man-made features visible on public lands. Vast areas of grassland, shrublands, canyon land, and mountain ranges on public land provide scenic views to recreationists, visitors, adjacent landowners, and those just passing through. On the Vale District, based on the visual resource inventories and decisions made in the Southeastern Oregon Resource Management Plan and the Proposed Action in the Draft Baker Resource Management Plan, the BLM-administered lands of the Vale District are classified as follows:

Table 3-41. Visual Resource Management Classes and Category 1 Invasive Plant Infestations

VRM Class	Acres	Percentage of District Land Base	Category 1 Infested Acres (NISIMS)
Class I	1,329,088	26%	512
Class II	362,983	7%	2,219
Class III	696,634	14%	2,759
Class IV	2,681,004	53%	6,109

Treatments Planned Relating to the Issues

Invasive plant treatments under all alternatives would happen within every classification of Visual Resource Management across the District. However, to help maintain the management objectives of a VRM class, the BLM's visual contrast rating system, outlined in Handbook H-8431-1, is used for proposed projects and activities to help analyze and mitigate visual effects (USDI 1986). This systematic process uses the basic design elements of form, line, color, and texture to compare the proposed project or activity with the major features of the existing landscape. Contrast ratings are required for all major projects proposed on public lands that fall within VRM class I, II, and III, which have high sensitivity levels (USDI 1984b). Additionally, the visual contrast rating system can be used to identify reasonable mitigation requirements to prevent unnecessary or undue degradation of the visual resources in areas designated as VRM IV objectives. In specific circumstances, such as in areas classified as VRM I, some treatments may not be appropriate.

Standard Operating Procedures and Mitigation Measures Relevant to Effects

Handbooks H-8410-1 (Visual Resource Inventory) and H-8431-1 (Visual Resource Contract Rating; USDI 1986) and Manual 8400 (Visual Resource Management; USDI 1984b) provide policy and guidance to manage public lands in a manner which will protect the quality of the scenic (visual) values of these lands. In addition to these handbooks and manual, the potential for adverse effects is minimized for all alternatives by existing Standard Operating Procedures and Mitigation Measures (see Appendix A). These include but are not limited to:

- Minimize loss of desirable vegetation near high public use 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.
- Treatments will include reseeding where there is little likelihood of natural re-establishment and will be based on site-specific conditions and emphasize the use of native species.
- 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).

Environmental Consequences

The intensities of effects are also described, where possible, using the following guidance based on their effects to the VRI classifications:

Negligible:	The effect is at the lowest level of detection. There would be no measurable change to visual character within the identified VRI classification area.
Minor:	The effect is slight but detectable, but the change would be small and, if measurable, would be localized and not affect visual character of the VRI classification area.

Common to All Alternatives

The effects of implementing manual, fire, mechanical, biological control agents, and targeted grazing treatments on visual resources within the Vale District could potentially have both short and long-term adverse effects. Manual (hand-pulling and grubbing) treatments would generally be limited to small infestations and would cause very little discernable ground disturbance or vegetative debris noticeable to the casual observer. Effects would be short-term and negligible. Biological control agents would kill or reduce the target species slowly over a period of time and would generally not result in a noticeable effect that would alter visual characteristics of an area. Targeted grazing treatments using increased numbers of cattle or a change in season would likely result in increased areas of disturbance associated with trampling or vegetation cropping as well as concentrated disturbances around water developments and fences but would quickly dissipate through seasonal vegetative growth. Visual resources would be affected in specific areas and not on the landscape as a whole. In specific circumstances, such as in areas classified as VRM I, targeted grazing treatments may not be appropriate in order to meet the VRM objectives for those areas. Fire and soil-disturbing mechanical methods (e.g. disking or drilling) could produce both short and long-term adverse effects to visual resources depending on the terrain, size of treatment area, and other vegetation that may show adverse effects to the casual observer for longer periods.

No Action Alternative

Use of the four existing herbicides would cause some short-term negligible to minor adverse visual effects associated with treatment areas. These adverse effects would vary in magnitude, depending on the size of the area treated and whether or not motorized equipment or aerial applications were used. The use of the less selective herbicides would be expected to create a more consistent or uniform color change as all vegetation, not just the target species, succumbs to the herbicides used. Treatments utilizing these four herbicides could result in more clearly identifiable and unnaturally appearing edges along the treatment area boundaries and undesirable effects to non-target native vegetation that may be visible for longer periods to the casual observer. However, non-selective herbicides are generally used only in invasive plant monocultures where even total dieback might be viewed as a seasonal or plant-specific mortality, and not necessarily as an unnatural change in the landscape.

Herbicide treatments are typically noticeable, at least in the foreground, from application dye, brown or discolored vegetation, physical changes (wilting), noticeable linear features along treatment boundaries as vegetation color changes, or tracks created if motorized vehicles (OHV, full sized vehicle) are utilized during application. These effects are noticeable and adverse, but are typically short-term, not exceeding one year. However, due to the less effective herbicides available under this alternative, re-treatments could be necessary over many years and would likely increase the visibility of such treatments for a greater length of time. Aerial applications are used in both large-scale treatment projects and for small areas that are not easily accessed by any other means. Effects from large-scale treatments are more noticeable to the casual observer simply because of their size. Regardless, the adverse effects from invasive plant treatments on the visual resources of an area are short-term in nature and would be negligible to minor.

A number of noxious weeds are not likely to be adequately controlled under this alternative, as the four herbicides are not particularly effective on these species. These species would likely remain unchecked under this alternative and would change the visual characteristics of the landscape over time as native species are replaced by invasive plants.

Proposed and Revised Proposed Actions

Although the Proposed and Revised Proposed Actions would treat more acres, the effects of conducting herbicide treatments on visual resources would be similar to the No Action Alternative except that under these alternatives, additional herbicides would be available for use that are more effective and / or selective then the four currently utilized. The additional herbicides would remove or reduce invasive plants, and would do so in a much more species-specific manner resulting in fewer adverse effects on non-target species, and therefore reducing adverse effects to the visual characteristics of an area. Although physical changes to vegetation would still be noticed in the form of color variations and wilting, the survival of non-target species would reduce the overall effects of these changes. Seeding of either native or nonnative species, which is associated with hand seeding, disking and drilling activities, would result in color and texture variations to the landscape because of the species introduced. Though mechanical actions associated with seeding would be noticed in the short term, the vegetative species introduced and their effect on the visual setting of landscapes would be negligible. Adverse effects from the implementation of treatments are primarily short-term and minor in nature at the local levels. However, since the use of these control or rehabilitation methods are designed and implemented with the identified Standard Operating Procedures and Mitigation Measures to improve the vegetative condition of an area, these activities and their effects on the visual characteristics of the landscape would be expected to be negligible to minor and only in the short term.

The Revised Proposed Action, with the availability of 17 herbicides, would offer the best opportunity to use the most effective and selective herbicide, and therefore would have the least effect on visual resources. Risk Assessments indicate that aminopyralid, rimsulfuron, and fluroxypyr have low risk from off-site drift to non-target vegetation under both typical and maximum rates, and no (0) risk from surface run-off or wind erosion scenarios. Over the long-term, both alternatives, under the limitations of the Standard Operating Procedures and Mitigation Measures, would protect native ecosystems and lead to the reestablishment of desirable vegetation at treated sites, and would by design meet VRM Class objectives of those treatment areas. Additionally, this improvement of vegetation to more desirable species would slowly improve the visual characteristics of an area when compared to the No Action Alternative. In general, the effects of expanding the integrated weed management program, which includes the use of the additional herbicides and the appropriate project design features, would be beneficial to visual resources.

Cumulative Effects

Currently, with technological and economical advances, more and more pressure is being placed on public lands. Some of these pressures, such as facility developments, energy developments, and motorized equipment capabilities, are causing increased effects on the visual integrity of the public lands. Although VRM designations do not affect developments on private or other public lands, the identification of sensitive areas or viewsheds would prevent actions that affect scenic views from occurring on BLM-administered lands, especially when BLM-administered lands are prominent in the immediate foreground. Cumulative effects to visual resources from developments and projects adjacent to BLM-administered lands could indirectly lower the overall quality and quantity of scenic landscapes over time. However, invasive plant management activities and their short-term effects would not contribute to a cumulative increase of these visual effects. Therefore, based on this analysis, no cumulative effects to the visual resources of the Vale District are anticipated because of implementation of any alternative.

Special Management Areas

Issues

- How would the alternatives affect special management areas like Wilderness Areas, Wilderness Study Areas, Areas of Critical Environmental Concerns, Research Natural Areas, and those areas determined to be administratively suitable for national Wild and Scenic River designations?

Affected Environment

Special designations include Wilderness Areas, Wilderness Study Areas (WSAs), Wild and Scenic Rivers, Areas of Critical Environmental Concerns (ACECs), and Research Natural Areas. These are addressed independently below (see Map 3-10 at the end of the EA).

Wilderness Areas

The McGraw Wilderness is 968 acres and is the only Wilderness Area on the Vale District. It is co-managed with the U.S. Forest Service and is located within the Hells Canyon Wilderness. Both the U.S. Forest Service and the BLM treat invasive plants in the Wilderness Area. According to NISIMS, there are currently four Category 1 species occupying 7 acres on four separate sites within the McGraw Wilderness of the Vale District. The dominant invasive plant species in the Wilderness Area is rush skeletonweed, covering 4.14 acres. The other individual sites fall between 0.01 and 4 acres in size.

BLM Manual 6340 – *Management of Designated Wilderness* (USDI 2012c) provides guidance for Wilderness management including:

General principles. Generally, Wilderness Areas must, at a minimum, be managed to maintain the baseline degree of wilderness character that existed when the area was designated by Congress. When possible, management activities should emphasize enhancement of wilderness character over time. Natural processes should always be favored to restore disturbed vegetation in order to maintain the Untrammeled, Natural, and Undeveloped qualities of wilderness character, as well as outstanding opportunities for Solitude or Primitive and Unconfined Recreation. However, in some cases, restoration management activities may be needed to restore vegetation and to preserve or enhance the area's wilderness character, despite the effects of such activities on the untrammeled quality of wilderness character. The need for active restoration and the alternatives available for conducting restoration activities are analyzed using the Minimum Requirements Decisions Guide.

Vegetation. Whenever possible, the BLM would rely on natural processes to maintain native vegetation and to influence natural fluctuations in populations within Wilderness. Natural disturbance processes, including fire, insect outbreaks, and droughts, are important shapers of the ecosystem. In some cases, vegetation in a Wilderness has been altered by past human activities. Fire suppression, livestock grazing, and introduction of invasive plants are examples of activities that may have changed the vegetative composition within the Wilderness.

Manipulation of vegetation through prescribed fire, herbicide application, mechanical treatment, or introduced biological agents, is normally not permitted. Exceptions may include emergencies, actions taken to recover a federally listed threatened or endangered species, control of nonnative species, and restoration actions where natural processes alone cannot recover the area from past human intervention. All management activities must be designed to strive towards natural vegetative composition and processes that reflect what would likely have developed with minimal human influence.

Management actions may be taken to restore vegetation to characteristic conditions of the ecological zone in which the area is situated, to the extent that they would not cause unacceptable effects to other components and processes of the ecosystem or to wilderness character as a whole and where:

I. natural successional processes have been disrupted by past human activity and to the extent that intervention is necessary in order to return the ecosystem to a condition where natural process can function; or
II. restoration through natural processes would require lengthy periods of time during which the affected area would suffer other degradation of wilderness character without intervention

Wilderness Study Areas

Wilderness Study Areas (WSAs) are areas that the BLM has identified as having wilderness characteristics. The initial task of identifying areas suitable for Wilderness preservation was completed as mandated in FLPMA Section 603, and is documented in BLM's Oregon Final Wilderness EIS and Wilderness Study Report for Oregon (USDI 1991b), which includes recommendations for areas to be designated as Wilderness. While the President subsequently passed his recommendations on to the Congress in 1991, Congress has yet to act on the majority of these recommendations. In the interim, WSAs are managed in accordance with the BLM Manual 6330 – *Management of Wilderness Study Areas* (USDI 2012b) to preserve their wilderness character, pending action by Congress.

WSAs are managed slightly different from Wilderness; the FLPMA mandates that the BLM "not impair the suitability" for future designation as Wilderness. Temporary non-wilderness conforming uses such as using motorized vegetation control equipment could be permitted without the concern for effects to solitude that must be considered in Wilderness. Actions that clearly benefit a WSA by protecting or enhancing these characteristics are allowable even if they are impairing, though they must still be carried out in the manner that is least disturbing to the site.

There are 35 WSAs within the Vale District including three areas that are shared with the Burns District (Alvord Desert, Sheepshead Mountains, and Wildcat Canyon). According to NISIMS, there are currently 11 Category 1 species documented in NISIMS occupying 314.9 acres on 25 separate sites within 11 WSAs on the Vale District (Table 3-42). Over 210 of these acres are infested by Scotch thistle and saltcedar.

Table 3-42. Wilderness Study Areas

Wilderness Study Area	Acres[1]	Documented Infestation Acres
Alvord Desert	138,613.4[2]	210.0
Beaver Dam Creek	19,079.7	0
Blue Canyon	12,620.5	0
Bowden Hills	59,030.7	0
Camp Creek	19,880.5	1.0
Castle Rock	6,151.2	0
Cedar Mountain	33,433.3	0
Clarks Butte	31,291.3	0
Cottonwood Creek	8,109.6	0
Disaster Peak	14,213.7	0
Dry Creek Buttes	51,285.2	0
Dry Creek	23,352.8	0
Fifteenmile Creek	50,352.3	0
Gold Creek	13,591.3	0
Homestead	14,590.6	0
Honeycombs	38,771.3	27.4
Jordan Craters	27,760.7	0.1
Lookout Butte	66,194.0	0
Lower Owyhee Canyon	75,088.5	23.3
McGraw Creek	504.8	0
Oregon Canyon	42,070.8	0
Owyhee Breaks	13,108.5	21.0
Owyhee River Canyon	187,344.2	0.2
Palomino Hills	54,255.7	0
Saddle Butte	85,765.8	0
Sheep Mountain	7,247.2	22.0
Sheepshead Mountains	31,070.8	0
Slocum Creek	7,528.1	3.4
Sperry Creek	5,296.5	0
Twelvemile Creek	28,110.8	1.0
Upper Leslie Gulch	2,910.8	5.5
Upper West Little Owyhee	61,488.8	0
Wild Horse Basin	12,967.3	0
Wildcat Canyon	26,192.7	0
Willow Creek	29,856.9	0
Total	1,299,130.3	314.9

1. Current WSA acreage total differs from historic totals by 19,442 acres due to more accurate GIS acreage calculations currently utilized.
2. Wilderness Study Area shared with the Burns District; acreage only includes Vale District.

All management activities in Wilderness or WSAs, including the control of invasive plants, must be conducted in a manner that is consistent with the Wilderness or WSA management policy and must either preserve wilderness characteristics (wilderness) or meet the non-impairment criteria (WSAs). Policy allows restoration activities that include treatment of "nonnative vegetation that interferes, or has the potential to interfere with ecosystem processes or function… and allows control using the method or combination of methods known to be effective, while causing the least damage to non-target species" (USDI 2012b:1-33 to 1-34). Reseeding or planting of native species may also be done following invasive plant treatment and fire or other large scale disturbances, as needed where natural regeneration is not likely, as well as to prevent nonnative vegetation from becoming dominant (USDI 2012b:1-34).

Wild and Scenic Rivers

In 1968, Congress passed the *Wild and Scenic Rivers Act* establishing a nationwide system of outstandingly free flowing rivers. The primary purpose of the *Wild and Scenic Rivers Act* is to balance river development with river protection and conservation. Rivers are classified by Congress as Recreational, Scenic, or Wild usually depending on the extent of development and access along each river at time of designation. Wild rivers are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and water unpolluted. Scenic rivers are free of impoundments with shorelines or watersheds largely undeveloped, but accessible in places by roads. Recreational rivers are readily accessible by road or railroad, may have some development along their shoreline, and / or may have undergone some impoundment or diversion in the past.

The designated river segments on the Vale District cover every classification allowed under the Act. Scenic and Recreational river segments have roads, diversion dams, bridges, recreation facilities, railroad rights-of-way, and historic structures that existed at the time of designation. These facilities and structures continue to be maintained and would be replaced as necessary to provide for public health and safety and resource protection. However, the large majority of river segments are primitive in character.

The intent of the *Wild and Scenic Rivers Act* is to maintain the free-flowing character of designated rivers and to protect or enhance their specific Outstandingly Remarkable Values (ORVs). ORVs are rare, unique, or exemplary from a regional or national perspective, and are classified as Scenery, Geological, Recreational, Fish, Wildlife, Vegetation, Botanic, Cultural, and Historic. Within the Vale District-BLM, there are six designated Wild and Scenic Rivers totaling 254.8 miles (Table 3-43), with five additional rivers totaling 49.2 miles determined to be "Suitable" for inclusion into the National Wild and Scenic Rivers system (Table 3-44). These "Suitable" river segments are protected at the recommended classification level (i.e. Recreation, Scenic, and Wild) pending a decision regarding formal designation.

Table 3-43. Designated Wild and Scenic Rivers

River	Classification	Outstandingly Remarkable Values	BLM Acres	Miles[1]
Grande Ronde	Recreation	Fish, Prehistoric, Recreational, Scenery, Wildlife	1,267.8	17.4
	Wild	Fish, Prehistoric, Recreational, Scenery, Wildlife	2,146.4	26.4
Main Owyhee	Wild	Geological, Historic, Prehistoric, Recreational, Scenery, Wildlife	36,513.6	120.0
North Fork Owyhee	Wild	Recreational, Scenery, Wildlife	1,893.0	9.7
Powder River	Scenic	Fish, Prehistoric, Recreational, Scenery, Wildlife	2,508.8	11.8
Wallowa River	Recreation	Fish, Prehistoric, Recreational, Scenery, Wildlife	1,319.0	10.1
West Little Owyhee	Wild	Recreational, Scenery, Wildlife	12,771.3	59.5
		TOTAL	59,415.8	254.8

Table 3-44. Wild and Scenic Rivers - "Suitable"

River Segment	Classification	Outstandingly Remarkable Values	Miles[1]
Dry Creek	Wild	Geological, Fish, Wildlife, Other	17.6
Owyhee River – M16	Recreation	Geological, Recreational, Scenery, Fish, Wildlife, Other	14.8
Antelope Creek	Wild	Prehistoric, Recreational, Scenery	8.5
North Fork Malheur River	Wild	Recreational, Scenery, Wildlife, Fish	5.7
Joseph Creek – Segment 5.7	Wild	Geological, Scenery	2.6
		TOTAL	49.2

1. River miles may vary due to current GIS accuracy and improvements in mapping data.

There are currently 17 Category 1 species documented in NISIMS occupying 84.58 acres on 25 separate sites within the Wild and Scenic River corridors of the Vale District. The main infestations are from whitetop and perennial pepperweed.

Areas of Critical Environmental Concern

Areas of Critical Environmental Concern (ACECs) are areas within public lands where special management attention is required to protect and prevent irreparable damage to important historic, cultural, or scenic values, fish and wildlife resources, or other natural systems or processes, or to protect life and safety from natural hazards. Some ACECs can be Research Natural Areas (RNAs) or Outstanding Natural Areas (ONAs). Research Natural Areas are designated where natural processes predominate and they are managed for research and education. Designation of a Research Natural Area does not automatically prohibit or restrict other uses in the area. By policy, any authorized action should maintain or improve the values for which the Research Natural Area was designated (USDI 1988). Outstanding Natural Areas are areas of outstanding scenic quality, natural wonder, or scientific importance that merit special attention and care in management to insure preservation in their natural condition. For the remainder of this section, ACECs, Research Natural Areas, and Outstanding Natural Areas will be referred to collectively as ACECs unless there is something specific to Research Natural Areas or Outstanding Natural Areas. On the Vale District there are 39 ACECs totaling 255,000 acres. Seventeen are also designated as Research Natural Areas and one an Outstanding Natural Area. Table 3-45 shows the ACEC name, type, acres, designation values, and acres of documented Category 1 invasive plants within the ACEC.

According to NISIMS, there are 25 species of Category 1 invasive plants in NISIMS totaling 668 acres located within ACECs. Three species comprise the majority of the acres: rush skeletonweed, Scotch thistle, and yellow starthistle, totaling 570 acres.

Table 3-45. Areas of Critical Environmental Concern

ACEC Name	ACEC Type	Values	Acres	Category 1 Acres in NISIMS
Black Canyon	RNA	Natural Systems, Botanical	2,644	0
Castle Rock	ACEC	Cultural, Scenic, Historic, Wildlife	22,799	0
Coal Mine Basin	RNA	Botanical, Ash Communities, Paleontological	755	0
Dry Creek Bench	RNA	Natural Systems	1,616	0.1
Dry Creek Gorge	ACEC	Scenic, Geological, Fish, Amphibian	16,082	0.7
Grande Ronde	ACEC	Natural, Scenic, Geologic, Ecologic, Cultural, Wildlife, Recreation, Visual	16,960	181
Hammond Hill Sand Hills	RNA	Natural Systems	3,712	0.2
Homestead	ACEC	Scenic, Wildlife, Bald Eagle, Botanical	8,750	67
Honeycombs	RNA	Scenic, Geological, Wildlife, Botanical, Natural Systems	15,847	7
Hunt Mountain	ACEC	Mountain Goats, Big Game, Botanical	1,231	0

ACEC Name	ACEC Type	Values	Acres	Category 1 Acres in NISIMS
Jordan Craters	ACEC	Historic, Cultural, Scenic, Wildlife, Botanical, Geological	31,370	0.1
Joseph Creek	ACEC	Riparian, Wildlife, Geologic, Recreation, Education	3,497	0
Keating Riparian	ACEC	Riparian, Wildlife	2,143	64
Keating Riparian RNA	RNA	Natural Systems	80	0
Lake Ridge	RNA	Natural Systems, Wildlife	3,825	0.8
Leslie Gulch	ACEC	Botanical, Scenic, Wildlife, Geological	11,673	37
Little Whitehorse Creek	RNA	Natural Systems, Federally Listed Fish		0
Mahogany Ridge	RNA	Botanical, Wildlife, Natural Systems	682	0
Mendi Gore Playa	RNA	Natural Systems	148	0
North Fork Malheur River	ACEC	Scenic, Fish, Amphibians	1,810	0
North Ridge Bully Creek	RNA	Natural Systems, Wildlife	1,569	0.5
Oregon Trail	ACEC	Historic, Visuals	1,901	11
Oregon Trail, Birch Creek	ACEC	Historic, Scenic	119	0
Oregon Trail, Keeney Pass	ACEC	Historic, Scenic, Botanical	3,154	84
Oregon Trail, Tub Mountain	ACEC	Historic, Scenic, Cultural	5,902	25
Owyhee Below Dam	ACEC	Scenic, Botanical, Wildlife, Natural Systems	11,239	20
Owyhee Views	ACEC	Scenic, Wildlife, Botanical	52,506	1
Palomino Playa	RNA	Botanical, Natural Systems	642	0
Powder River	ACEC	Raptor, Wildlife, Cultural, Scenic	5,906	19
Saddle Butte	ACEC	Wildlife, Geological, Cave System	7,056	0
Sheep Mountain	ACEC	Scenic, Wildlife, Bald Eagle	5,289	19
South Alkali Sand Hills	ACEC	Botanical	3,520	130
South Bull Canyon	RNA	Natural Systems	792	0
South Fork Walla Walla River	ACEC	Fisheries, Riparian, Wildlife, Bighorn Sheep, Botanical, Cultural	2,040	0.6
South Ridge Bully Creek	RNA	Natural Systems, Wildlife	620	0
Spring Mountain	RNA	Natural Systems	1,002	0
Stockade Mountain	RNA	Natural Systems	1,767	0
Toppin Creek Butte	RNA	Botanical, Wildlife	3,996	0
Unity Reservoir Bald Eagle Nest Habitat	ACEC	Habitat for Bald Eagles	356	0
		Total	*255,000*	*668*

Standard Operating Procedures and Mitigation Measures Relevant to Effects Analysis

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

Mechanical, Manual, and Biological

- Use the least intrusive methods possible to achieve objectives, and use non-motorized equipment in Wilderness and off existing routes in Wilderness Study Areas, and where possible in other areas.
- If mechanized equipment is required (for mechanical treatments), use the minimum amount of equipment needed.
- If aircraft are used, plan flight paths to minimize impacts on visitors and wildlife. Re-vegetate disturbed sites with native species if there is no reasonable expectation of natural regeneration.

- Design activities to repeat the form, line, color, and texture of the natural landscape character conditions to meet established Visual Resource Management (VRM) objectives. [Visual Resources Standard Operating Procedure]

Chemical
- Use the "minimum tool" to treat noxious weeds and other invasive plants, relying primarily on the use of ground based tools, including backpack pumps, hand sprayers, and pumps mounted on pack and saddle stock.
- Use herbicides only when they are the minimum treatment method necessary to control weeds that are spreading within the Wilderness or threaten lands outside the Wilderness.
- Implement herbicide treatments during periods of low human use, where feasible.

BLM policy allows the use of nonnative species for competitive seeding or planting in ACECs, but not in RNAs. Nonnative seeding is not allowed in any other special management area.

Treatments within Special Management Areas are subject to the direction provided in Special Management Area plans and Resource Management Plans.

Treatments Planned Relating to the Issues

Treatments in special management areas would be included on the Annual Treatment Plan and be subject to interdisciplinary review.

Wilderness and WSA

Consistent with Wilderness and WSA management policy, treatment methods are limited by special area restrictions as well as the remote and rugged terrain of these areas. Treatments would be designed to have transient short-term adverse effects. In Wilderness Study Areas, non-herbicide treatments would be conducted using one or more of the following: hand tools, motorized or mechanized equipment, biological control agents, prescribed fire (under the Proposed and Revised Proposed Actions), seeding actions (under the Proposed and Revised Proposed Actions, native species only) and in some cases targeted grazing. In Wilderness Areas, manual treatments would be the only non-herbicide method used. Additionally, herbicide applications would also be utilized in the control of invasive plants as in the past utilizing the four herbicides authorized under the No Action Alternative, or for the control of invasive plants utilizing 10 or 13 additional herbicides under the Proposed or Revised Proposed Actions. Additional treatments could occur in previously untreated special management areas or in newly designated areas if inventories discover new infestation sites or species (Categories 2 and 3).

Wild and Scenic Rivers

Treatments of invasive plants within designated river segments having final river management plans would follow management objectives established for the treatment or control of invasive plants identified in those plans. Those river segments identified as "suitable" would be managed to protect the identified Outstanding Remarkable Values and the interim classification pending a designation decision by Congress. Treatments would be similar to those in WSAs and could be conducted using the same methods.

Areas of Critical Environmental Concern

ACECs receive priority treatment if they become infested. As with other special management areas, treatments within ACECs are subject to the direction provided in ACEC plans and the Resource Management Plan. For example, following management decisions from the Oregon Greater Sage-Grouse Resource Plan Amendments (USDI 2015a), all or portions of key Research Natural Areas will be unavailable to all grazing, which would preclude the use of targeted grazing for the purposes of invasive plant management. Treatments would be designed to protect the resources for which the area was designated. Additional buffers, for example, may be needed in those areas designated for listed, Special Status species, or otherwise outstanding botanical features.

Environmental Consequences

Wilderness and WSAs

The intensities of effects to Wilderness and WSAs are described, where possible, using the following guidance:

Negligible: The effect is at the lower level of detection; there would be no measurable change to Wilderness character.
Minor: The effect is slight but detectable; the change would be small and, if measurable, would be localized and not affect wilderness character.

Temporal Scale
Short-term: Effects are noticeable from 1-5 years.
Long-term: Effects are noticeable for more than 5 years.

Common to All Alternatives

Manual, fire, mechanical, biological control agents, and targeted grazing treatments within Wilderness and WSAs would have primarily short-term adverse effects to wilderness values. Manual treatments would cause some short-term ground disturbance that would vary in magnitude depending on the size of the area treated. Manual (hand-pulling, digging, and grubbing) methods would generally be limited to small infestations and would cause some discernible yet negligible ground disturbance. Biological control agents would kill or reduce the vigor of target species, but would generally not result in ground disturbance or noticeable effects. Fire and mechanical methods would be used rarely if ever. Such treatments could potentially produce slightly longer lasting adverse effects to wilderness values, primarily naturalness, through the visual effects of burned areas or the residual footprints of motorized or mechanical equipment. However, these adverse effects would be considered short-term and only in localized areas, as they would have to meet all management direction for implementation in these areas. Outstanding recreation and solitude opportunities could be affected to greater or lesser degrees depending on the method of treatment and size of the treatment area. However, this effect would be localized during the period when treatments are being implemented and only in the short term. Overall, wilderness values would not be impaired and any adverse effects would be short-term, negligible to minor, and localized.

Treatments would have no long-term effects to designated Wilderness or WSAs because they would be designed to be consistent with management policy and to be the minimum necessary to administer the area. This means that any actions that the BLM would take to control invasive plants would be designed to comply with the policies that have been put in place to protect the qualities for which the area was designated. BLM Manual 6340 - *Management of Designated Wilderness Areas* (USDI 2012c) and Manual 6330 *Management of Wilderness Study Areas* (USDI 2012b) describe how control of nonnative vegetation should use the least disruptive techniques and favor incremental treatments instead of aggressive long-term changes all at once. For use of chemical treatments, preference is for those that have the least impact on non-target species.

No Action Alternative

The adverse effects of using the four existing herbicides within Wilderness and WSAs would be associated with the physical characteristics of treated vegetation (i.e. wilting, color change, removal), of both targeted and non-targeted species, which would vary in magnitude depending on the size of the area treated. In addition, there are a number of noxious weed species that are not likely to be adequately controlled under this alternative, as the four herbicides are not effective on some species, such as perennial pepperweed and whitetop. In these circumstances, species go untreated and infestations expand. Other species require more than one treatment, leading to additional treatment entries and disturbances from application crews. In cases where motorized use is found to be the minimum tool and non-impairment standards or exceptions with Standard Operating Procedures and Mitigation Measures are met and properly implemented, motorized equipment may be utilized leaving additional visual effects because of their presence and use. However, these effects would be negligible and localized. Furthermore, outstanding recreation and solitude opportunities in Wilderness could be adversely affected during the short period of time when treatments are being implemented. However, overall Wilderness values would not be impaired by application of the four existing herbicides and adverse effects would be short-term and negligible.

Proposed and Revised Proposed Actions

The adverse effects from the Proposed and Revised Proposed Actions would be similar to the No Action Alternative except that under these alternatives, additional herbicides would be used that are more effective and / or selective than the four currently available for use under the No Action Alternative. Increased use of targeted grazing in Categories 5 and 6 would likely result in increased areas of disturbance (trampling, cropped vegetation, and concentrated use areas) and may not be appropriate in certain areas. The additional herbicides would better remove or reduce invasive plants, and would do so in a much more targeted manner having fewer adverse disturbances or observable effects compared to the No Action Alternative. Although adverse visual effects would still occur in the form of physical changes to targeted species (i.e. wilting, color change, removal), these disturbances would be less than in the No Action Alternative due to the survival of non-target species occurring in the area, which would help to break up linear patterns along the edges of treatment boundaries. Outstanding opportunities for recreation and solitude could be adversely affected during the short period of time when treatments are being implemented. Overall, adverse effects would be negligible, localized and short-term.

Effects of Invasive Plant Control

In Wilderness and WSAs, although likely unnoticed by the casual observer, native vegetation would re-establish at treatment sites over the long term and result in neutral or slightly enhanced effects on natural character. Generally, any efforts to control the spread of invasive plants in Wilderness and WSAs would create the beneficial effects of preserving the naturalness of these areas. Due to lower treatment costs and / or increased control efficiency, more acres could potentially be treated under the Proposed and Revised Proposed Actions in a given year. This would tend to improve ecological conditions within these areas at a faster rate than under the No Action Alternative. Better control of invasive plants would provide benefits to most resources within Wilderness and WSAs. *Naturalness* would be better protected by the Proposed and Revised Proposed Actions as invasive plants are more effectively controlled and therefore prevented from displacing native plants and the ecosystems they support.

Outstanding opportunities for *Solitude* or an unconfined type of *Recreation* would benefit slightly from the Proposed and Revised Proposed Actions when compared to the No Action Alternative. More efficient vegetation control would reduce the number of entries into these areas resulting in fewer intrusions by treatment crews or equipment. Over the long-term, Wilderness and WSAs would not be impaired, native vegetation would re-establish at treatment sites and would result in neutral or slightly beneficial effects on natural character. Even so, over the long-term these effects would likely go unnoticed by the casual observer.

Wild and Scenic Rivers

Effects on Wild and Scenic River outstandingly remarkable and free flowing values would come from management actions that either diminish or enhance those values that make the river eligible / suitable. The duration of effects would be considered to be short-term if their occurrence lasts between 1-5 years, and long-term if effects exceed 10 years.

Negligible:	A change enhancing, protecting, or diminishing outstandingly remarkable or free flowing values could occur, but the change would be so small that it would not be of any measurable or perceptible consequence.
Minor:	A change enhancing, protecting, or diminishing outstandingly remarkable or free flowing values would occur, but the change would be small and, if measurable, would be localized and not affect eligibility or suitability determinations.

Common to All Alternatives

In Wild and Scenic Rivers, only treatments that protect and enhance the Outstandingly Remarkable Values identified in the legislation establishing each river would be allowed and therefore, long-term adverse effects from treatment methods would be expected to be negligible. In general, the methods of vegetation treatments identified within the alternatives would be primarily short-term with negligible adverse effects on Wild and Scenic Rivers and those rivers determined to be “suitable” for inclusion. In rare cases, some longer-term effects could result from the mechanical treatments such as disking / drilling and seeding in specific areas; however, these effects would be negligible to minor as vegetation restores itself and diminishes the noticeable effects from these methods of treatment. Additional adverse effects could occur to recreational uses of these rivers from the implementation of restoration activities as this use is displaced for hours or days depending on treatment method, re-entry restrictions or where required to give vegetation the necessary recovery time. Overall, adverse effects would be negligible to minor, localized and short-term.

No Action Alternative

The adverse effects of conducting treatments using the four existing herbicides within Wild and Scenic Rivers or those river segments determined to be “suitable” for inclusion would be associated with the physical characteristics of treated vegetation which would vary in magnitude depending on the size of the area treated. There are a number of noxious weeds that are not likely to be adequately controlled under this alternative, as the four herbicides are not effective on some species, such as perennial pepperweed and whitetop. This results in species that go untreated due to inefficient herbicide control measures, which allows for population expansion, and requires additional entries by application crews. In cases where OHV use is allowed, adverse visual effects could occur as a result of a visible “footprint” left by their use. These less selective herbicides and their effects on non-target species can add to the amount of vegetation that is noticeably treated and intensify and sharpen the edges of treatment areas making them appear unnatural. However, these effects would be negligible and localized. Overall, the Outstandingly Remarkable Values associated with these rivers would not be impaired by application of the four existing herbicides and adverse effects would be short-term and negligible.

Proposed and Revised Proposed Actions

The effects of the Proposed and Revised Proposed Actions would be similar to those of the No Action Alternative except that under these alternatives, additional herbicides would be available for use that are more species-specific and more effective at invasive plant control than those herbicides identified in the No Action Alternative. Adverse effects would be noticed primarily through the visual appearance of treatment areas such as discoloration, wilting, or removal of vegetation. However, with herbicides that more precisely target and affect only those species to be treated, these effects would be less noticeable as boundaries and borders of treatment areas are less likely to have sharply defined features such as lines or solid areas of discoloration. Standard Operating Procedures and Mitigation Measures help reduce or eliminate potential adverse effects to the Outstandingly Remarkable Values. Adverse effects would be negligible, localized, and short-term.

Effects of Invasive Plant Control

In Wild and Scenic Rivers or those rivers determined to be "Suitable" for inclusion, and within the confines that only treatments that protect and enhance outstanding and remarkable values are permitted, the long-term effects of the Proposed and Revised Proposed Actions would be beneficial. The beneficial effect of treatments that reduce, eliminate, or replace invasive plants would create an overall improvement in the characteristic values of the river environment, as more desirable vegetation is re-established. Over the long-term, native vegetation would generally be reestablished at treated sites and result in neutral or slightly enhanced effects on the natural character of the river environments. Regardless of the treatment method, the overall effect would be long-term and beneficial.

Areas of Critical Environmental Concern

ACECs are one of the treatment priority-setting criteria listed in Chapter 2. The special resources for which the ACECs are designated are, by definition, worthy of extra effort to protect against the adverse effects of invasive plants. For that protection, the Proposed and Revised Proposed Actions would be expected to provide for more effective invasive plant control than under the No Action Alternative. Moreover, the additional herbicides available under the Proposed and Revised Proposed Actions make it more likely that an invasive plant control tool could be found that would simultaneously control the target plants while protecting adjacent ACEC resources.

A more detailed discussion of the potential effects to vegetation, wildlife habitat, cultural resources, scenic resources, and Special Status plants can be found in the resource sections in this Chapter, particularly those identified in Table 3-45, *Areas of Critical Environmental Concern*, under *Values*.

Cumulative Effects

Wilderness / Wilderness Study Areas

Current technological improvements in the form of personal motorized equipment, large-scale fire events, and the displacement of native vegetation by invasive plants continue to be the greatest threat to the Wilderness and WSA resources of the District. The BLM-administered public lands that fall within these designations account for 1,279,688 historic acres (1,299,130 acres currently) of the Vale District in 35 separate WSA units with one 968 acre Wilderness Area. Additionally, other Federal designations of Wilderness do exist within the District on National Forest lands, which provide 584,956 acres of Wilderness in six units, adding to the opportunities for wilderness experiences provided to the public.

Foreseeable future effects would continue to result from the projected population increases within and surrounding the Vale District, along with fire events and the advancement of current or new invasive plant infestations. The projected population growth over the next 20 years is expected to continue to increase demand for primitive, unconfined recreation areas in and around the Wilderness and WSA units. Use of these areas would be expected to intensify as population increases over time. With increased use comes the increased potential to introduce invasive plants and / or spread existing invasive plants to new areas. Invasive plant encroachment along with fire events go hand in hand as invasive plants often increase the rate of spread and size of fires. Both have the ability to change the characteristics of these areas and reduce the qualities of the special designations especially naturalness. Fire management and invasive plant management actions to preserve Wilderness and WSAs would need to intensify to compensate for both the protection of the resources as well as to ensure the quality and quantity of public experiences remains intact. Although there could be localized adverse effects from invasive plant treatments in the short term, overall cumulative effects are expected to be negligible in the long term as naturalness is maintained or restored.

Wild and Scenic Rivers

Six rivers on the Vale District are part of the National Wild and Scenic River System and the BLM manages them for the protection of their individual Outstandingly Remarkable Values associated with individual segment classifications in cooperation with other private, State, and Federal agencies where appropriate to ensure that management actions for these rivers are consistent as much as possible across ownership boundaries. Additionally, five other rivers on the Vale District have been determined to be "suitable" for inclusion into the Wild and Scenic Rivers System and are being protected under their interim classification (i.e. Wild, Scenic or Recreational) pending a final designation decision by Congress. Actions and activities that affect both the designated and the suitable rivers include increased use because of population growth and popularity of some river segments, as well as the activities that occur on adjacent private land which can directly and indirectly affect the overall appearance and characteristics of river sections.

Developments adjacent to or within river boundaries will continue to occur and in some cases increase on private and State lands, which will continue to adversely affect the overall characteristics of some segments of rivers. Additionally, allowable changes within Recreational or Scenic river classifications on both public and private lands would develop over time because of human or societal needs such as power line rights-of-way, mineral exploration and extraction as well as possible transportation network increases. It would be expected that the continued encroachment of invasive plants species would occur throughout the river environment in the foreseeable future, as would the possibility of large-scale fire events. Large fire events coupled with the displacement of native vegetation by invasive plants can by themselves or in tandem have the potential to change the ORV characteristics of the river such as scenery, recreation, and wildlife. Fire management and invasive plant management actions to preserve these areas would need to intensify to protect the resources and ensure the quality and quantity of public experiences. Although there could be localized adverse effects from invasive plant treatments in the short term, long-term cumulative effects are expected to be negligible as native plant communities are maintained, improved, or restored.

Areas of Critical Environmental Concern

The reasonably foreseeable actions included in Table 3-2, *Ongoing and Foreseeable Actions on or near the Vale District Potentially Relating to Cumulative Effects* include actions that would occur within ACECs: Boardman to Hemingway 500-kv Transmission Line; Fire Year 2012 Emergency Stabilization and Rehabilitation; 2014 Buzzard Complex Fire Emergency Stabilization and Rehabilitation; Tri-State Fuels Projects; and NW Malheur Fuels Project. These projects have been designed to either maintain or improve the relevant and important values of the ACECs through avoidance of the ACEC or designing the treatment to maintain or improve the relevant and important values. The actions identified in this EA plus the effects of the No Action, Proposed Action Alternatives, or Revised Proposed Action would not increase the cumulative effects on the relevant and important values of the ACECs.

Lands with Wilderness Characteristics

Issues

- How would the alternatives affect areas possessing wilderness characteristics?

Affected Environment

Although the BLM's authority to designate Wilderness Study Areas or recommend new Wilderness Areas has expired, Section 201 of FLPMA requires the BLM to maintain on a continuing basis an inventory of all public lands, their resources, and other values, which includes wilderness characteristics. Such lands must possess sufficient size, naturalness, and outstanding opportunities for either solitude or primitive and unconfined recreation. In addition, it may also possess supplemental values. The BLM may manage, through the Resource Management Plan process, areas newly found to have wilderness characteristics to protect or affect wilderness characteristics. Land use planning tools include, but are not limited to, VRM class designation, ATV and mechanized vehicle designation, land tenure designations and mineral development restrictions, and conditions of use to be attached to permits, leases or other authorizations.

To date, these areas found to possess wilderness characteristics have not been addressed in a Resource Management Plan. As such, they would normally be subject to individual analyses and management decisions as on-the-ground projects are proposed. But for lands within the Vale District that are within the Southeastern Oregon Resource Management Plan planning area, a court-approved settlement agreement also sets out certain actions BLM must follow until completing a Resource Management Plan amendment (Settlement Agreement Between the Oregon Natural Desert Association, Committee for the High Desert, Western Watersheds Project, and the BLM (June 7, 2010)). In particular, the settlement agreement precludes BLM from approving any surface-disturbing activity on lands that BLM has identified as having wilderness characteristics if BLM finds that the project would either diminish the size of the inventory unit or cause the entire inventory unit to no longer meet the criteria for wilderness characteristics. The potential effects of a proposed action on wilderness characteristics and compliance with BLM Resource Management Plans for the areas must be considered when making project-level decisions.

From 2007-2012, the Vale District conducted wilderness inventory updates for public lands outside of designated Wilderness and WSAs. Interdisciplinary teams reviewed the existing wilderness inventory information contained in the BLM's wilderness inventory files, previously published inventory findings (USDI 1980a, 1980b), and citizen-provided wilderness information. The Vale District has completed inventory updates for wilderness characteristics and is in the process of amending Resource Management Plans (in both Southeastern Oregon and in the Baker Resource Area) to address those areas found to possess wilderness characteristics. Of the 1,804 areas assessed for wilderness characteristics, the Vale District determined that 70 inventory units totaling 1,225,133 acres have wilderness characteristics. A number of these inventory units (31) are composed of more than one non-contiguous area, but are adjacent to existing areas managed for wilderness values, such as Wilderness Study Areas.

According to NISIMS, there are 24 Category 1 species found in areas determined to have wilderness characteristics. These species occur on 223 sites with the primary infestations being rush skeletonweed, whitetop, Scotch thistle and saltcedar.

These species could expand from their current populations or establish new colonies in other portions of these areas in the future that would require treatment. However, inventories for these species are ongoing and exact locations of all invasive plants are unknown.

Treatments Planned Relating to the Issues

Treatments in areas possessing wilderness characteristics would be included on the Annual Treatment Plan and be subject to its interdisciplinary review. Treatments that would not diminish the size of the inventory unit or cause the entire inventory unit to no longer meet the criteria for wilderness character could be conducted. Treatments would be similar to those in WSAs and could be conducted using the same methods.

Management Direction, Standard Operating Procedures and Mitigation Measures Relevant to Effects

No management direction, Standard Operating Procedures, or Mitigation Measures were identified in the PEIS, Oregon FEIS, *Southeastern Oregon Resource Management Plan and Record of Decision*, *Baker Resource Management Plan and Record of Decision* or the 1989 *Integrated Weed Control Plan and Environmental Assessment* for lands with wilderness characteristics.

BLM has not yet completed a comprehensive plan amendment to determine how to best manage lands that it recently found to contain wilderness characteristics. As a matter of policy, these lands cannot be designated as WSAs or managed under the Wilderness Study Area Management manual (USDI 2011a, 2012c). However, the following terms (paragraphs 18-20) from a 2010 Settlement Agreement[75] between the BLM and the Oregon Natural Desert Association do apply:

> "18. Subject to valid existing rights, until it completes the RMP [Resource Management Plan] amendments, the BLM shall not implement any projects in the respective RMP planning areas (Lakeview and Southeast Oregon) that fall within either a) an inventory unit determined by BLM to possess wilderness character, where such action would be deemed by BLM to diminish the size or cause the entire BLM inventory unit to no longer meet the criteria for wilderness character, or b) a unit identified in ONDA's (Lakeview) April 1, 2005 or (Southeast Oregon) February 6, 2004 citizen inventory reports as having wilderness character, but where BLM has not yet completed its inventory update, where the action would be deemed by BLM to diminish the size or cause the entire ONDA inventory unit to no longer meet the criteria for wilderness character.
>
> "19. Until the BLM has completed an RMP amendment, if a project is proposed or scheduled for implementation in either of the respective planning areas and would be in an area that BLM has found to possess wilderness character, the BLM will analyze the impacts on wilderness character through each project's NEPA process. Such analysis shall include an alternative that analyzes both mitigation and protection of any BLM-identified wilderness character that exists within the project area. Consistent with paragraph 18, until the BLM has completed an RMP amendment, the BLM shall not implement any project if its analysis determines that the effects of the project would cause an area with BLM-identified wilderness character to no longer meet the minimum wilderness character criteria.
>
> "20. Until the BLM has completed an RMP amendment, where the BLM has not completed its inventory update, the BLM shall update the inventory for units in areas affected by proposed new activity plans, leases, or other projects that may cause surface disturbance or result in a permanent development" (USDI et al. 2010).

The analysis contained in this EA addresses the potential effects of implementing an integrated invasive plant management program on those areas where BLM has identified the presence of wilderness characteristics and, thus fulfills the requirements of paragraphs 18 and 19 from the 2010 Settlement Agreement described above.

[75] June 7, 2010 agreement related to litigation involving the Lakeview and Southeastern Oregon Resource Management Plans.

Project Design Feature Adopted for This Analysis

The following Project Design Feature would further reduce effects on lands with wilderness characteristics:

- In any lands on the Malheur Resource Area found to contain wilderness characteristics, treatments would be designed so that there would be no effects on those values that would diminish the size of, or otherwise cause the inventory unit to not meet the wilderness criteria. This direction applies until BLM has completed a Resource Management Plan Amendment that addresses how to manage lands with wilderness characteristics.

Environmental Consequences

The intensities of effects to lands with wilderness characteristics are described, where possible, using the following guidance:

Negligible:	The beneficial or adverse effect is at the lowest level of detection and there would be no measurable change to the unit's wilderness characteristics.
Minor:	The beneficial or adverse effect is slight but detectable, but the change would be small and, if measurable, would be localized. Adverse effects would not affect the unit's ability to meet minimum requirements for identification as lands with wilderness characteristics.

Temporal Scale

Short-term:	Effects are noticeable from 0-5 years.
Long-term:	Effects exist and are noticeable beyond 5 years.

Effects Common to All Alternatives

The effects of implementing manual, fire, mechanical, biological control agents, seeding (native and / or nonnative) and targeted treatments within lands determined to contain wilderness characteristics would primarily consist of short-term adverse effects to characteristic values with some possible but limited long-term adverse effects. Authorized manual treatments would cause some short-term ground-disturbance effects that would vary in magnitude depending on the size of the area treated. These manual methods (hand pulling, digging, and grubbing) would generally be limited to small infestations and would cause some visually discernable yet negligible ground disturbance. Biological control agents would kill or reduce the vigor of target species but would generally not result in ground disturbance or be noticeable effects. Disturbance associated with fire, mechanical methods and seeding (native and / or nonnative) could potentially produce longer-term adverse effects to wilderness characteristic values, primarily naturalness. However, the adverse effects from fire, seeding and mechanical prescriptions would be limited by the requirement not to diminish the size of the inventory unit or cause the entire inventory unit to no longer meet the criteria for wilderness characteristics. The implementation of the Project Design Feature would be expected to keep adverse effects at a negligible level.

Outstanding Primitive Recreation and Solitude opportunities of those areas determined to have wilderness characteristics could be affected to greater or lesser degrees depending on the type of treatment and size of treatment area and whether or not aerial applications were being utilized. However, this adverse effect would be localized during the period when the various forms of treatments are being implemented and only in the short term. Overall, wilderness characteristics would not be impaired and any adverse effects would be short-term and negligible to minor. Treatments conducted under all alternatives would have no effect that would result in diminishing the size of those wilderness inventory units where BLM identified wilderness characteristics to be present, nor would they eliminate characteristic values that could cause the entire inventory unit to no longer meet the criteria.

Effects of the No Action Alternative

Treatments using the four existing herbicides within lands with wilderness characteristics would cause some short-term, adverse effects associated with vegetation modification or removal, which would vary in magnitude, depending on the size of the area treated and the method used for application. Herbicide applications could result in hard, angular, unnaturally appearing edges along the treatment area boundary along with undesirable effects to non-target vegetation. There could also be some short-term visual effects such as tracks and minor soil disturbances if machines (i.e. OHVs) are used for applications. In addition, there a number of noxious weeds that are not likely to be adequately controlled under this alternative, as the four herbicides are not particularly effective on these species. This would result in additional treatment entries by crews in attempts to control these species, or those species would see less control efforts due to the inefficiency of the herbicides being used and would therefore continue to expand in population size or density. Additionally, the increased number of entries to try to control invasive plants would have adverse effects on Solitude experiences of recreationists visiting these areas during treatment periods. However, these effects would be minor and only in the short term.

Effects of the Proposed and Revised Proposed Actions

The effects of conducting herbicide treatments on lands with wilderness characteristics under the Proposed and Revised Proposed Actions would be similar to those of the No Action Alternative except that additional herbicides would be available for use that are more effective and / or selective than the four currently available for use under the No Action Alternative. Increased use of targeted grazing in Categories 5 and 6 would likely result in increased areas of disturbance (trampling, cropped vegetation, and concentrated use areas) and may not be appropriate in certain areas. The additional herbicides would remove or reduce invasive plants with less effect on non-target vegetation species. However, applications by aircraft could increase because of the additional herbicides that are more effective on the control of invasive plants that encompass the greatest acreages. This form of herbicide application would create the largest adverse effects to Solitude during implementation; however, the adverse effects would be short-term, negligible to minor in magnitude and localized.

Effects of Invasive Plant Control

Generally, any efforts to control the spread of invasive plants in lands with wilderness characteristics would create beneficial effects preserving the naturalness of these areas. However, the treatment opportunities under the Revised Proposed Action would be more effective in controlling undesirable species and would have slightly fewer adverse effects on non-target species. In addition, due to lower treatment costs and / or increased control efficiency, more acres could potentially be treated under these alternatives in a given year. This would tend to improve ecological conditions within lands with wilderness characteristics at a faster rate than the No Action Alternative. Over the long-term, native vegetation would re-establish at a given treatment site and result in neutral or slightly beneficial effects on natural character.

Cumulative Effects

Recent inventories identified approximately 70 units as possessing wilderness characteristics. These lands were found to not possess these characteristics in the late 1970s to early 1980s when the BLM completed its original wilderness inventory for Oregon under Section 603 of FLPMA. Since then, the BLM has carried out management prescriptions in these areas that have directly and / or indirectly restored and improved the public lands to the point that wilderness characteristics are now present. Such management, ranging from restricting potentially impairing activities to restoring fire events in adjoining WSAs, has created lands that now appear to be in a predominantly natural condition. Overlapping and adjoining ACECs, Outstanding Natural Areas, Research Natural Areas, and Wild and Scenic River designations in some areas have further restricted activities and facilitated restoration of more primitive conditions. These designations and the presence of adjoining WSAs and National Forest Potential Wilderness Areas have cumulatively aided in the gradual reduction of human imprints, such as road development and maintenance, timber harvest, rights-of-way, and unrestricted motorized uses that previously disqualified these areas from further Wilderness consideration.

Present actions that affect lands with wilderness characteristics consist of the level of human use, the methods of access utilized within these areas, large fire events, right-of-way developments, energy developments, and the increase and spread of invasive plants species. Historic recreational usage and current population increases affect the demands on lands with wilderness characteristics, which are typically used for low-impact forms of recreation such as camping, hunting, and hiking. Current trends in population growth continue to add pressure to these areas, especially due to their proximity to existing Wilderness, WSAs, or potential wilderness areas, which serve as the basic attraction for more individuals seeking primitive settings. With increasing use, wilderness characteristics can be adversely affected and primitive recreation experiences in these areas could diminish in quality. Additionally, mineral exploration and extraction in association with existing mineral rights, timber harvest, travel and transportation developments or improvements, and other economic pursuits would cumulatively affect the qualities of the lands with wilderness characteristics both directly and indirectly. Management actions to preserve or protect overlapping special area values, such as restrictions on the type of recreational use allowed (e.g., motorized or mechanized use) and limitations on the type of fire suppression and vegetation management efforts, help to prevent or eliminate adverse effects on areas identified as having wilderness characteristics.

The final Southeastern Oregon and Baker Resource Management Plans will address wilderness characteristics management in the Vale District and will direct management to either protecting or not protecting those values. In some cases, management direction identified in the Resource Management Plans will influence which future actions may be authorized. Depending on management plan objectives, those areas identified for protection could direct or restrict projects that have the potential to change the size of character units by creating boundary features such as rights-of-way associated with transmission lines, road developments, or renewable energy developments. Additionally, future fire events along with the potential expansion of invasive plants can affect "Naturalness." These future effects along with the increase in human population and uses of these areas continue to add to the primary threats to lands with wilderness characteristics. However, management actions designed to offset these effects would generally improve conditions of these lands as well as reduce the risk of adversely affecting wilderness characteristics from landscape altering events. The cumulative effects of implementing the Revised Proposed Action including the use of additional herbicides would generally remove or reduce ecologically undesirable species and would have fewer adverse effects than the No Action Alternative. This would allow native vegetation to re-establish and would maintain or enhance wilderness characteristics, particularly natural character, over the long-term.

The cumulative effects of implementing the Revised Proposed Action would generally be beneficial but negligible-to-minor in magnitude to lands with wilderness characteristics. While the Proposed and Revised Proposed Actions would have more benefits than the No Action Alternative, none of the alternatives would result in substantially noticeable beneficial or adverse cumulative effects in the long-term.

Lands and Realty

Issues

- How would invasive plant treatments affect rights-of-way and administrative site grants and leases?

Affected Environment

The Vale District encompasses slightly more than 5 million acres and includes the Baker and Malheur Resource Areas. The Baker Resource Area consists of blocks of public land interspersed with private lands varying greatly in size while the Malheur Resource Area consists of large areas of public lands intermingled with large private land holdings, rural home sites, and large areas of State lands.

Lands actions are generally considered reactive. BLM's decision is driven by the action requested, with requirements including best management practices written into the stipulation portions of the land agreements. These can vary widely in such a diverse and large area of land, and cover invasive plant prevention and control. A majority of the rights-of-way across the District are issued to local and regional utilities including Harney Electric Cooperative, Oregon-Idaho Utilities, Idaho Power Company, and Bonneville Power Administration. Counties in the District and the Oregon Department of Transportation also hold several rights-of-way for State highways, mineral pits, and county roads.

Authorized rights-of-way on the District also include communication site leases at 11 sites: Rhinehart Butte, Blue Mountain, Cottonwood Mountain, Coyne Point, Mahogany Mountain, Lime Hill, Gold Hill, Big Lookout Mountain, Halfway / Richland Hill, Sheep Mountain, and Hermiston Butte.

Treatments Planned Relating to the Issues

Though not a requirement, Vale District attempts to partner closely with the larger right-of-way holders in an attempt to effectively combat the invasive plant issues that adversely affect both BLM and non-BLM resources.

The BLM monitors invasive plants, even where they are a grant holder's responsibility (see Table 2-1, *Summary of Known Invasive Plant Sites*). BLM recommends treatment methods when infestations are detected, and in some cases, may cooperate with the right-of-way holder to conduct treatments. Newer right-of-way holders are required to notify the Authorized Office of their intent to use herbicides in order to receive direction regarding acceptable treatments, although leaseholders are not required to inform BLM of treatments. Under the No Action Alternative, herbicide use on BLM-administered lands is restricted to four herbicides and the constraints (including Standard Operating Procedures and Mitigation Measures) adopted with the 2010 Record of Decision (USDI 2010b:12). Under the Proposed and Revised Proposed Actions, rights-of-way requirements would remain the same but 10 or 13 additional herbicides, respectively, would become available.

Emergency stabilization (Category 4), seeding and planting, and invasive annual grass treatments (Categories 5 and 6) would be expected to remain the responsibility of the BLM unless otherwise described in NEPA documents and resulting rights-of-way grants and / or leases for major rights-of-way such as major transmission lines.

Grants and leases currently require control only of noxious weeds.

Standard Operating Procedures and Mitigation Measures Relevant to Effects

The potential for adverse effects to lands and realty is minimized for all alternatives by existing Standard Operating Procedures and Mitigation Measures (see Appendix A). These include, but are not limited to:

- Coordinate vegetation treatment activities where joint or multiple use of a right-of-way exists.

New and recently renewed grants and leases require the following:

- All earth-moving equipment used in connection with this right-of-way shall be thoroughly washed down and cleaned of all mud, dirt, and vegetative debris at a location acceptable to the Authorized Officer. Cleaning of equipment shall be accomplished immediately prior to initial mobilization and anytime the equipment is removed and returned to the road area.
- The holder shall be responsible for invasive plant prevention and control within the limits of the right-of-way when new surface disturbing activities on the right-of-way are proposed. Prior to undertaking any invasive plant prevention or control measures the Holder shall consult with the BLM Authorized Officer regarding acceptable invasive plant control methods, monitoring, reporting, and education of personnel on invasive plant identification. Application of chemicals for control of noxious weeds or any other purpose shall be in accordance with applicable Federal and State law and shall be approved by BLM prior to application.
- According to BLM Policy, all pesticides would be applied by a certified applicator or under the direct supervision of a certified applicator (USDI 1992a).

Environmental Consequences

No Action Alternative

Grant and leaseholder's responsibilities would continue, but their ability to meet those responsibilities would continue to be restricted by having access to just four herbicides District-wide and three additional herbicides in limited areas (see Table 2-8, *Summary of Existing NEPA Authorizing Invasive Plant Treatments*).

Grants and leaseholder employees and others using the rights-of-ways (e.g. ATV operators, horseback riders, hikers) may be exposed to herbicides used along the rights-of-way (see *Human Health and Safety* section).

Proposed and Revised Proposed Actions

Grant and leaseholder responsibility for control of noxious weeds would continue, but additional herbicides could be used. Holders of long, linear rights-of-way crossing multiple jurisdictions would benefit by being able to use the same herbicides over long expanses rather than changing each time they enter BLM-administered lands. In cases where grants or leases specify or limit the herbicides to be used, there may be some delay in approving additional herbicides until grants or leases are renewed.

The addition of invasive plants to the species that can be controlled would enable right-of-way holders the opportunity to more effectively manage the right-of-way and conduct maintenance.

Grant and leaseholder employees and others potentially exposed to herbicides used along the rights-of-way would potentially be less at risk, because the additional herbicides as a group have lower human toxicity that than the four currently being used (see *Human Health and Safety* section).

The use of additional herbicides to treat invasive plants under the Proposed and Revised Proposed Actions have no adverse effects to rights-of-way and administrative site grants and leases. Beneficial effects include reduced invasive plant spread.

Cumulative Effects

There would be no adverse effects to rights-of-way and administrative site grants and leases; therefore there are no anticipated cumulative effects to lands and realty.

Minerals

Issue

- How would invasive plant treatments affect mineral development, operations, and reclamation for saleable, leasable, and locatable minerals?

Affected Environment

There are approximately 2,700 mining claims, 34 active mining notices, and 9 mining plans of operations on the Vale District conducted under the locatable mineral regulations (43 CFR 3809). These operations range from lode and placer gold operations, industrial minerals (limestone, diatomaceous earth, and bentonite clays), and gem stone production. Operations conducted under the regulations must not create undue and unnecessary degradation of public lands, which would include the spread of invasive plants. Under 43 CFR 3809.420, operations on public lands must have plans for revegetation, which would include:

- Seeding location
- Species type
- Seeding or planting rates
- Treatment methods such as fertilization or inoculation
- Stabilization of the reclamation area during vegetation establishment
- Proposed criteria for what constitutes successful revegetation
- Measures, such as temporary fencing or noxious weed control, which would be used during operations and for reclamation.

Mining operations conducted under the regulations must have reclamation bonds posted for post-mining reclamation including stabilization and revegetation of disturbed areas. The BLM monitors revegetation for two years after seeding and retains 40 percent of the reclamation bond until the revegetation standards have been met. The operator is responsible for invasive plant control during operations and reclamation. Operations conducted for leasable (oil and gas, geothermal) and saleable (mineral materials such as sand and gravel) must also control invasive plants.

Although there are no active leasable mining operations on the Vale District, there is considerable interest in leasable mineral development primarily in the vicinity of Vale, Oregon. There are currently 103 authorized oil and gas leases in the area that could possibly be developed in the future. Current leasable mineral activity is limited to geophysical exploration and seismic activity for geothermal resources on private lands in close proximity to public lands within the Malheur Resource Area.

There are currently 97 saleable (sand and gravel, building stone, etc.) mineral authorizations on the Vale District, comprised of community pit or common use areas, free use permits to governmental agencies, and mineral material sale sites. BLM is responsible for invasive plant control on community pits. The permit holder of free use permits or other mineral material sites is required to control invasive plants and establish desirable vegetation in reclaimed areas as part of their permit.

Casual use activity is defined under the regulations as locatable mineral operations not utilizing mechanized earth moving equipment and does not require a permit or authorization from the BLM. Casual use mining activities on the Vale District include gold panning and rock hounding.

Treatments Planned Relating to the Issues

Under mining laws, the exploration and development of locatable mineral resources are non-discretionary activities, meaning that the BLM cannot prohibit reasonably necessary activities required for the exploration, prospecting, or development of valuable mineral deposits. However, the BLM has the authority and the obligation to regulate locatable mineral operations in order to prevent undue and unnecessary degradation of public lands. This is the purpose of 43 CFR 3809. Leasable and most saleable applications are discretionary actions and would continue to be considered pursuant to existing policies and practices, areas identified as closed to mining, and valid existing rights. Best Management Practices for locatable mining Plans of Operations and Stipulations and Conditions of Approval for Saleable and Leasable mineral operations require that all vehicles and equipment be cleaned prior to operating on BLM-administered lands. Under 43 CFR 3809.1, operations conducted under casual use or a notice are not subject to stipulations, but do require that operations not create undue and unnecessary disturbance of public lands, which would include spread of invasive plants.

The BLM monitors invasive plants, even where noxious weeds are a mine operator's responsibility. BLM recommends treatment methods when infestations are detected, and in some cases, may cooperate with the mineral permit holder to conduct treatments. Mineral permit holders are required to notify the Authorized Officer of their intent to use herbicides to be given direction as to acceptable treatments and practices, including using licensed herbicide applicators. Under the No Action Alternative, herbicide use on BLM-administered lands is restricted to four herbicides and the constraints adopted with the 2010 Record of Decision (USDI 2010b:12). Under the Proposed and Revised Proposed Actions, mineral requirements would remain the same but 10 or 13 additional herbicides would become available.

Standard Operating Procedures and Mitigation Measures Relevant to Effects

- Have licensed or certified applicators or State-licensed "trainees" apply herbicides, or they can be applied by BLM employees under the direct supervision of a BLM-certified applicator.

Environmental Consequences

Common to All Alternatives

Under all alternatives, there would be no change to the current management of mining operations. Mine operators would continue to have the responsibility for control and prevention of noxious weeds, although the BLM often recommends treatment methods when infestations are detected. In some cases, the BLM may cooperate with the mine operator to conduct treatments. Mine operators are monitored and required to use licensed applicators and best management practices. Mineral permit holders, through the use of licensed applicators, are accustomed to using the prescribed herbicides to manage invasive plants within mining areas. Noxious weed control would continue to be mitigated on a case-by-case basis using the BLM required treatment. Invasive plant control could represent additional unanticipated costs to mine operators both during operations and reclamation. The cost for invasive plant control is generally not addressed within reclamation cost estimates provided by the operator, but the operator would be required to treat invasive plants resulting from their operations in order to remain in compliance with the mining regulations and to meet vegetative guidelines for reclamation. Because of travel time to the mining site and amount of disturbance, the main cost of invasive plant control for mining operations is primarily in the application method, not the cost of the herbicide. Invasive plant control on older historic mining sites (mining disturbance with no responsible party or reclamation bond) would be a BLM responsibility.

No Action Alternative

Mine operators' responsibilities for noxious weeds would continue, but their ability to meet those responsibilities would continue to be limited by having access to just four herbicides. Because of this, mine operators would not be able to effectively treat invasive plants such as whitetop, which would adversely affect their ability to complete reclamation of sites, especially the establishment of desirable vegetation necessary for reclamation bond release. This could increase reclamation costs by extending the monitoring period. Mine rehabilitation requires the use of native plants for site restoration, which means that reclamation costs can be higher because native plants may have difficulty establishing or outcompeting invasive plants. Erosion or site stability issues may occur in reclaimed areas that require additional heavy equipment work to correct. This could represent a perceptible effect to mine operators. Without the ability to control certain invasive plants effectively, areas with considerable past (including historic pre-regulation mining activity) and current mining activity would be susceptible to invasive plant spread. In the long-term, this could affect potential mining activity within these areas and would represent a measurable adverse effect for future mining activity through the increase in reclamation costs and invasive plant treatments.

Proposed and Revised Proposed Actions

The Proposed and the Revised Proposed Action would provide more options to the miner for invasive plant management, especially in areas with multiple infestations by several invasive plants species or by invasive plants not currently treatable (such as whitetop). Mine operators' responsibilities would continue, but they would be better able to meet the objectives of their reclamation plans and comply with BLM regulations. The increased ability to use nonnative seed for invasive plant control in treated areas where invasive grasses such as cheatgrass and other invasive annual grasses have become established would be beneficial both during short-term interim reclamation or long-term final reclamation. Mine operators would be more likely to meet the vegetation requirement for reclamation bond release, reducing the possibility of multiple seedings and additional invasive plant treatments, and controlling erosion or site stability issues. Miners, employees, contractors, and BLM inspectors would have less exposure risk, because the additional herbicides have lower human toxicity than the four chemicals currently being used (see *Human Health and Safety* section). More effective invasive plant control by the BLM or mining operations on adjacent public lands could also reduce the long-term spread of invasive plants on to and off of the mine site in areas with mining potential such as the Burnt River, Mormon Basin, or Virtue Flat. Since the per acre cost of the majority of the additional herbicides available under the Proposed and the Revised Proposed Action is comparable to the four currently being utilized, the cost of purchasing herbicides would not change. The total cost of invasive plant control for mining operations would be lower as more effective herbicides are used (see *Implementation Costs* section), reducing the need for retreatment and the time involved with reclaiming the mining site. Overall, this represents both a short-term and long-term benefit for mine operators, especially when compared to the No Action Alternative.

A possible indirect effect of the Proposed and Revised Proposed Actions is that treated areas, because of increased desirable vegetative growth and removal of invasive plants, would be released for reclamation completion much faster than areas requiring additional invasive plant treatments and seedings if vegetative success criteria is not met. Areas not meeting the vegetative criteria for reclamation could require additional measures such as fencing to protect from livestock and wildlife. The Proposed and Revised Proposed Actions could have an additional minor beneficial effect to mine operators by meeting reclamation criteria faster and not requiring additional measures such as fencing or reseeding over an extended period to meet vegetative criteria.

Cumulative Effects

The demand for locatable and saleable minerals is expected to remain constant in the future. The interest in leasable minerals, specifically geothermal and oil and gas is expected to increase within the analysis area. There are currently 109 oil and gas leases primarily in the Vale area. Limited geophysical exploration has occurred in this area, but it is anticipated that exploratory drilling and eventually production, primarily for natural gas, could occur. These lease areas also correspond with areas identified as infested with invasive plants, specifically invasive annual grasses.

Mineral development of split-estate lands (where the BLM retains subsurface mineral interest) can be expected to occur, especially for leasable minerals. Operations for locatable, leasable, or saleable mineral activity on these lands could include invasive plant control measures, especially if conducted as part of a project that includes other Federal lands. For leasable operations on split estate lands, the BLM would offer the surface owner the same level of protection against adverse effects from the mining activities that the BLM provides on Federal surface. These activities would be permitted and analyzed under separate NEPA analysis and are not part of the alternatives described in this document.

Socioeconomics

Issues

- How would the alternatives affect adjacent landowners?
- How would the alternatives affect permitted land uses?

Affected Environment[76]

The Vale District is located predominantly in Malheur and Baker Counties, with much smaller areas managed in Wallowa, Union, Umatilla, Morrow, Grant, and Harney Counties in Oregon and Asotin County in Washington State. The socioeconomic study area is defined as Malheur, Baker, Wallowa, Union, Umatilla, and Morrow Counties. Table 3-46 shows that Malheur is the only county in which a majority of the Federal land (73 percent) is managed by the BLM. About 18 percent of Baker County Federal land is managed by the BLM, while the percentage in the other counties is 1 percent or less. A majority of both Baker and Wallowa Counties is Federal land, but in both cases, the vast majority is managed by the U.S. Forest Service.

Table 3-46. District Socioeconomic Statistics

	Malheur	Baker	Wallowa	Union	Umatilla	Morrow	Oregon
Population 2013	30,479	16,018	6,814	25,662	76,720	11,336	3,970,239
Population 2000	31,615	16,714	7,220	24,537	70,728	10,995	3,421,399
Federal land within the County	73%	51%	59%	46%	21%	17%	54%
Federal land managed by BLM	73%	18%	1%	1%	1%	1%	25%
Service sector jobs	56%	61%	50%	55%	57%	34%	70%
Non-service jobs	20%	26%	30%	25%	25%	56%	18%
Farming jobs	12%	10%	13%	7%	8%	19%	3%
Government sector jobs	20%	14%	14%	16%	18%	12%	12%
Proprietor jobs	21%	35%	45%	28%	20%	20%	22%
Unemployment rate	9%	9%	10%	8%	8%	8%	7%
Percent living below poverty level	26%	19%	17%	19%	17%	15%	17%
Percent minority population[1]	37%	7%	5%	9%	31%	35%	23%
Per capita income	$16,352	$23,234	$23,131	$22,684	$20,836	$20,663	$26,809
Personal income due to non-labor[2]	50%	55%	55%	46%	40%	27%	39%

[76] Information in this section comes from OSU (2012), US Census Bureau (2015), and EPS-HDT (2015).

1. Individuals who report being Hispanic / Latino, and / or a race other than white, and / or more than one race.
2. Income from investments and age-related or hardship payments such as Social Security, Medicare or welfare.

County populations range from 6,814 in Wallowa to 76,720 in Umatilla. Since 2000, half of the counties have increased in population and half have decreased. All of the counties have a low population density, with only Umatilla having a density over 20 persons per square mile, compared to 40 per square mile in Oregon. The county with the second-lowest density, Malheur, also has the greatest proportion of public and BLM-administered land.

Like many places in the U.S., much of the recent growth in jobs is due to increases in the services sector, which includes not only retail trade and accommodations / dining establishments but also services such as finance and insurance, real estate, professional and technical services, and health care and social assistance. The majority of jobs in the six counties are in the services sector except for Morrow County, which remains dominated by agriculture and related sectors such as food processing. The percentage of jobs in farming, a sector especially concerned about invasive plants, varies from 7 percent in Union County to 19 percent in Morrow. The percentage of jobs in farming in all six counties is considerably higher than that of Oregon statewide (3 percent). Jobs that are proprietors—people who own their own business or are otherwise self-employed instead of working a wage job—can be farm or non-farm related.

Malheur County has been experiencing drought conditions, which have an especially strong effect on agriculture and livestock operations. The Governor declared a drought in Baker, Malheur, Morrow, Umatilla, and Union Counties for 2016. In 2015, the U.S. Department of Agriculture designated Harney, Lake, and Malheur Counties natural disaster areas due to drought-related damages and losses; farmers and ranchers in these counties qualify for natural disaster assistance.

Treatments Planned Relating to the Issues

County residents can obtain a “No Spray” permit issued by the State or County if they do not wish to have herbicides sprayed next to their property. These permits are not binding on the BLM; they are most commonly used to prevent State or County road maintenance spraying noxious weeds immediately adjacent to private properties, and these crews know where these permits have been issued. Other people put up such signs without the permit. BLM spray crews would generally respect signs they see; some are intended to protect high-value crops or other things not always apparent at the site. Standard Operating Procedures preclude ground spraying within 100 feet of a residence, and ¼ mile for aerial, without written permission from the owner.

Standard Operating Procedures and Mitigation Measures Relevant to Effects

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

- Consider the potential for treatments to affect communities from herbicide-contaminated resources originating from the BLM, such as subsistence resources or water used downstream for human or agricultural uses.
- Coordinate with and / or notify neighboring landowners who may want to treat, or are already treating, adjacent lands.
- Areas with potential for groundwater for domestic or municipal use shall be evaluated through the appropriate, validated model(s) to estimate vulnerability to potential groundwater contamination, and appropriate Mitigation Measures shall be developed if such an area requires the application of herbicides and cannot otherwise be treated with non-herbicide methods.

- To protect domestic water sources, no herbicide treatments should occur within 100 feet of a well or 200 feet of a spring or known diversion used as a domestic water source unless a written waiver is granted by the user or owner.
- Proposals to boom or aerially spray herbicides within 200 feet of streams that are within 1,000 feet upstream from a public water supply intake, or spot apply herbicides within 100 feet of streams that are within 500 feet upstream from a public water supply intake, will include coordination with the Oregon Department of Environmental Quality and the municipality to whom the intake belongs.
- Consider surrounding land use before selecting aerial spraying as a treatment method, and avoid aerial spraying near agricultural or densely populated areas.
- Establish a buffer between treatment areas and human residences based on guidance given in the Human Health Risk Assessment, with a minimum buffer of ¼ mile for aerial applications and 100 feet for ground applications, unless a written waiver is granted.

Environmental Consequences

Two of the issues identified were socioeconomic: the effects of the alternatives on adjacent private lands; and, the effects to permitted land uses. These issues overlap closely with those identified for invasive plants, livestock grazing, and lands and realty. As a result, conclusions in those sections regarding environmental consequences are relevant to this section.

The effects of the alternatives (including the use of herbicides) on adjacent private, county, State, and other Federal lands is a multipronged issue. On one hand, there is a clear benefit to adjacent landowners, county, State, and other Federal lands resulting from the BLM having a broader range of herbicides available for consideration. Many scoping comments on the Oregon FEIS favored the BLM's ability to utilize a wider range of herbicides than the four currently available because it would better match those currently used on private, county, State, and other Federal lands. Having more herbicides available would also enhance the BLM's ability to prevent the spread of invasive plants from Federal lands to private, county, State, and other Federal lands, a major concern in Malheur County, where Federal lands predominate and private lands support grazing. Even in counties with relatively little BLM-administered land, adjacent landowners are affected by invasive plants present on Federal lands. To many ranchers and other residents, it makes sense for the BLM to have more tools in the invasive plant-fighting toolbox to be able to choose the best site-specific treatment. The Oregon FEIS and other sections of this EA describe some of the benefits to resources of concern. A recent report described the negative economic effects associated with invasive plants, the additional costs associated if invasive plants expand to new areas, and the positive return on investment associated with control (The Research Group 2014).

On the other hand, there is a potential for drift onto adjacent lands with the potential to damage crops and other desirable vegetation, and to contaminate domestic water sources (see *Water Resources* section in this Chapter). Standard Operating Procedures and Mitigation Measures call for buffers to domestic water sources and notification of residents of planned nearby herbicide use. Buffers applicable to different application methods, drift reducing adjuvants, and notifications all work to keep BLM herbicides on BLM-administered lands.

No Action Alternative

As described in other sections of this EA, the existing availability of four herbicides District-wide and restriction to treatment of only noxious weeds limits the BLM's ability to target specific infestations with the most cost-effective, least-risk treatment, when compared to the Proposed or Revised Proposed Actions. Under this alternative, noxious weeds are expected to continue spreading at about 12 percent per year (USDI 2010a:133). In an area where farming is a dominant land use and contributor to the local economy, as well as a strong aspect of the local culture and lifestyle, both the use of various pesticides and the control of noxious weeds that adversely affect crops are priorities. Neighboring landowners (including BLM's permittees) expect the BLM to control its invasive plants and prevent their spread to private lands. Therefore, the No Action Alternative has the potential to adversely affect adjacent private lands by denying some treatments on BLM that would be more effective in limiting the spread of damaging noxious weeds.

Adjacent landowner resources, and the landowners themselves, have the potential to be affected by the herbicides used in this alternative. The Risk Assessments indicate some risk to non-target plants and crops, livestock, and human health under some exposure scenarios. While Standard Operating Procedures and Mitigation Measures are designed to reduce that risk to negligible levels, continuing to limit use to four herbicides would result in a higher risk than would occur under the Proposed or Revised Proposed Actions (see Appendix C. *Herbicide Risk Assessment Summaries)*.

Proposed and Revised Proposed Actions

As described in other sections of this EA, the addition of 10 or 13 herbicides and the ability to treat both noxious weeds and other invasive plants would improve the BLM's ability to select the most cost-effective and lowest-risk treatment from within the integrated invasive plant management system. In many cases, the additional herbicides provide less environmental and human health risk than the four existing herbicides, decreasing the risk to adjacent private landowners and their resources. For example, applications of 2,4-D are predicted to decrease 30 percent on the District (see Table 2-11, *Estimated Treatment Acres*) from the No Action Alternative to the Proposed Action. During scoping on the Oregon FEIS, county governments and others expressed frustration with the BLM's inability to use herbicides that would allow the BLM to more effectively participate in "geographically logical" invasive plant control efforts.

The BLM's ability to more closely match existing private land treatments on adjacent areas would be more effective than the No Action Alternative at meeting the EA Purpose of *Cooperatively control invasive plants so they do not infest or re-infest adjacent non-BLM-administered lands*. Under these alternatives, noxious weed spread would be reduced to an estimated seven percent and infest fewer acres in 15 years than under the No Action Alternative (see *Invasive Plant* section earlier in this Chapter). The counties currently have Cooperative Weed Management Areas that work with landowners to identify and treat noxious weeds on both private and public lands. The Proposed and Revised Proposed Actions would allow the BLM to be a more effective partner with the CWMAs and all their permittees.

Environmental Justice

Issue Not Analyzed in Detail

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

This issue was not analyzed in detail because effects were previously described in the analysis for the Oregon FEIS (USDI 2010a) and there are no new circumstances or information that would change the effects anticipated for this EA. All of the counties on the District are considered environmental justice populations due to their low-income status, minority status, or both. Malheur County stands out as the one most vulnerable to effects because it has by far the greatest proportion of BLM-administered land (73 percent of the county), the lowest per capita income, the highest proportion of individuals living below the poverty level, and the highest proportion of minorities (see Table 3-46). The presence of minority and low-income populations is of special interest due to BLM environmental justice policy, which calls for the fair and equitable treatment and involvement of all people, and avoidance of disproportionate, negative effects on low-income and minority populations. Based on BLM definitions of environmental justice populations, all of the counties except Morrow qualify as low-income populations, and Malheur, Umatilla, and Morrow Counties are environmental justice populations due to their high proportions of minorities. Thus every county in the socioeconomic study area is considered to be an environmental justice community.

The Oregon FEIS analysis found a potential for contract and other crews to include a small disproportionate number or minority and / or poor (defined as below Federal poverty standards), and that "American Indian and visitors from other racial, ethnic, or low-income backgrounds participating in subsistence or cultural uses could be adversely affected by herbicide exposure, or by inadvertent effects to non-target culturally important plants, or to wildlife species of value to these groups" (USDI 2010a:333). However, that analysis noted such effects would be partially mitigated by treatment designs that attempt to minimize exposure of non-target food and water sources, and Standard Operating Procedures requiring consultation with tribes to locate any areas of vegetation that are significant to the tribes and that might be affected by herbicide treatments. The *Human Health and Safety* section in Chapter 3 addresses the potential for worker and public exposure to herbicide and non-herbicide treatments and finds, that while there is a measurable risk to workers under some scenarios, that risk is lower under the Proposed and Revised Proposed Actions than under the No Action Alternative.

The Oregon FEIS analysis also noted that the natural resources used for cultural or subsistence purposes would be adversely affected by the spread of invasive plants, which would be greater under the No Action Alternative (USDI 2010a:333).

Implementation Costs

Issues

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

This section examines the direct costs of the alternatives. Total direct costs and direct costs per effectively treated acre are examined for each alternative. Costs are arguably not a potential effect on the human environment and thus the section is not necessarily required by NEPA. However, in this case, it furthers NEPA objectives to display the factors that would be used by the decision-maker to select from among the alternatives, and cost-effectiveness is thus identified as a *Purpose* in Chapter 1. BLM planning policy specifies that management actions having a high likelihood of improving resource conditions for relatively small expenditures of time and money should receive relatively higher priority (USDI 2005a:34). This section helps further these decision-making objectives.

Treated Acres and Effectively Treated Acres, by Alternative

Treated Acres

An estimate of the total acres of invasive plants that would be treated with each herbicide and each non-herbicide treatment method for all alternatives is presented in Table 2-11, *Estimated Treatment Acres*.

The costs presented in this section are in 2015 dollars. If funding were available, it would be desirable to treat all invasive plant sites analyzed in this EA, and to do so as quickly as possible. Annual treatment levels would vary based on changes in program emphasis or priorities, fluctuations in budgets, opportunities for cost savings with partnerships, and the availability of external funding. Since project related actions might be implemented through cooperative agreements, multiple partners may bear these costs. State and local governments, adjacent land owners, Cooperative Weed Management Areas, interest groups, and permit holders would contribute to or fully fund some invasive plant treatments, especially where those parties own, or have interests in, a potentially affected area or development.

Effectively Treated Acres

Invasive plant control treatments are not 100 percent effective at controlling invasive plant populations on the first try. Under all alternatives, some level of retreatment would be necessary to achieve complete control. A five-acre treatment, for example, would be monitored to detect additional or remaining plants, and some portion of those acres would likely require retreatment. The amount of retreatment necessary is a function of how effective the prior treatment is.

"Effective" treatments for each alternative are the portion of the treatments that successfully control the invasive plants on the treated site and thus prevent future invasive plant spread. The percentage of treatments meeting this definition varies by alternative and is estimated to be 60 and 80 percent of the Category 1 invasive plant treatments for the No Action Alternative (60 percent) and the Proposed and Revised Proposed Actions (80 percent); see Table 3-47)(USDI 2010a:136). It is most appropriate to look at cost per effectively treated acres, because the overarching objective is to control invasive plants and prevent their spread.

Table 3-47. Estimated Acres of Invasive Plant Treatments, Category 1, by Alternative

Method	No Action Alternative	Proposed and Revised Proposed Action
Total Acres	140,230	197,781
Total Treated Effectively with 1st Treatment[1]	84,138 (60%)	158,225 (80%)
Total Treated Effectively with 2nd Treatment	117,793 (85%)	189,870 (96%)
Total Treated Effectively with 3rd Treatment	131,255 (94%)	196,199 (99%)

1. See USDI 2010a: 136-137.

Costs by Treatment Method

Costs displayed here include equipment, materials (including herbicides), wages, and contract costs; they do not include program planning (e.g., NEPA) or overhead. The acreage-weighted averages of these estimates are shown in Table 3-48. Herbicide application costs were averaged. Even though the cost of the herbicides themselves varies, the differences in cost are generally minor[77]. The price of herbicides per acre can be found in Table 3-49.

Table 3-48. Average Direct Cost of Treatment, by Treatment Method, per Acre

Treatment Method	Estimated Cost per Acre[1]
Herbicide	
Spot treatment backpack / wiper	$704
Spot treatment - OHV mounted w / handgun	$443
Spot treatment - truck mounted w / handgun	$340
Broadcast treatment - backpack	$704
Broadcast treatment - OHV boom	$267
Broadcast treatment - truck mounted	$218
Broadcast treatment - aerial	$40 - $60
Manual	
Hand pulling / grubbing / digging	$1,500
Mechanical	
Chainsaw and leave trees in place	$36 - $100
Chainsaw, pile trees, and burn	$130 - $160

[77] Fluridone, hexazinone, and rimsulfuron are substantially more expensive per acre than the other herbicides. However, very little (if any) of fluridone and hexazinone would be used overall. Acres treated with rimsulfuron in the short-term could cost $30 more per acre. However, the price is expected to drop once its patent expires.

Treatment Method	Estimated Cost per Acre[1]
Weed whacker (around buildings / fences)	$50 - $250
Mowing (walk behind push mower)	$80- $150
Fire	
Prescribed fire broadcast burning (depends on size)	$25 - $300
Biological	
Insect, pathogen, and nematode	$150 - $1,000
Targeted grazing[3]	$320
Seeding and Planting	
Native	$275
Nonnative	$165

1. Estimated costs for fiscal year 2016. Includes a $25 / acre cost for herbicides, and does not include time for BLM specialists, Contracting Officer Representative or cost of government vehicle expenses.
2. Reported in cost per mile. For purposes of analysis, it is assumed that 1 mile = 1 acre.
3. Estimate taken from an Idaho Fish and Game leafy spurge project. Actual costs are unknown on the Vale District.

Table 3-49. Cost of Herbicide Active Ingredients

Active Ingredient[1]	Price / Lb.	Typical Rate		Maximum Rate	
		Lbs. / Acre	Price / Acre	Lbs. / Acre	Price / Acre
Herbicides available under all alternatives					
2,4-D	$2.07	1	$2.07	1.9	$3.93
Dicamba	$23.38	0.3	$7.01	2	$46.76
Glyphosate	$5.00	2	$10.00	7	$35.00
Picloram	$39.37	0.35	$13.78	1	$39.37
Herbicides available in limited areas under the No Action Alternative and District-wide under the Proposed and Revised Proposed Actions					
Chlorsulfuron	$519.23	0.047	$24.40	0.141	$73.21
Clopyralid	$26.24	0.35	$9.18	0.5	$13.12
Imazapic	$78.75	0.0313	$2.46	0.1875	$14.78
Herbicides available under the Proposed and Revised Proposed Actions					
Dicamba + diflufenzopyr	$65.00	0.2625	$17.06	0.4375	$28.44
Fluridone	$485.00	0.15	$72.75	1.3	$630.5
Hexazinone	$40.49	2	$80.97	4	$161.94
Imazapyr	$49.08	0.45	$22.09	1.25	$61.35
Metsulfuron methyl	$363.12	0.03	$10.89	0.15	$54.47
Sulfometuron methyl	$52.38	0.14	$7.33	0.38	$19.90
Triclopyr	$23.17	1	$23.17	10	$231.70
Herbicides available under the Revised Proposed Action					
Aminopyralid	$207.98	0.078	$16.22	0.11	$22.88
Fluroxypyr	$92.85	0.26	$24.14	0.5	$46.43
Rimsulfuron	$1183.80	0.0469	$55.52	0.0625	$73.99

Total Cost and Cost per Effectively Treated Acre by Alternative

The number of acres treated is predicted to increase under the Proposed and Revised Proposed Actions. Reasons for this increase include:

- the additional herbicides provide tools to control invasive plants not presently treated or at least not treated effectively;
- the additional herbicides make control treatments more effective and therefore more treatments can be done within existing funding;
- additional cooperator and permit-holder funding sources become available as it becomes practical to effectively treat more species; and,

- approving herbicides currently used on adjacent non-BLM-administered lands would encourage cooperative weed management across ownerships.

Total costs increase as more acres are treated. However, the cost per effectively treated acre decreases as effectiveness increases (see Table 3-50). This decrease is wholly related to the increased efficiency of having more control tools available. It is assumed that treatments would be 60 percent effective under the No Action Alternative and 80 percent effective under the Proposed and Revised Proposed Actions (see Table 3-47, *Estimated Acres of Invasive Plant Treatments, Category 1, by Alternative*)(USDI 2010a:136).

Table 3-50. Cost of Invasive Plant Treatments, Category 1, by Alternative[1]

Method	No Action Alternative	Proposed and Revised Proposed Actions
Non-Herbicide ($750 / acre)	$10,485,750	$12,021,000
Herbicide ($390 / acre)	$50,048,700	$70,925,790
Seeding / Planting ($275 / acre)	NA	$1,237,500
Total cost	$60,534,450	$84,184,290
Cost per acre	$425.37	$425.41
Cost per acre effectively treated[2]	$708.94	$531.76

1. These figures reflect the cost to treat every infested acre on the District in one year. Actual annual expenditures would be limited by budget and priorities.
2. It is assumed that treatments would be 60 percent effective under the No Action Alternative and 80 percent effective under the Proposed and Revised Proposed Actions (see Table 3-47)(USDI 2010a:136).

Effects by Alternative

No Action Alternative

Category 1 (Existing Known Sites): The cost of implementing treatments for Category 1 would be $60,534,450 in 2015 dollars, or $425.37 an acre. Treatments are estimated to be 60 percent effective, so treatment cost per effectively treated acre is $708.94 (see Table 3-50).

Category 2 (Future Spread from Existing Sites): Under the No Action Alternative, invasive plants are estimated to spread 12 percent annually or 17,077 acres in the first year. Assuming that treatment methods and herbicides would be similar to sites in Category 1, the cost of implementing treatments for Category 2 would be $7,264,043 for the first year of spread. Treatment cost per effectively treated acre would continue to be $708.94, as under Category 1.

Category 3 (New Invaders): The cost of implementing treatments for Category 3 is unknown, but is likely to be minimal as new invaders are found only a few times a year, and often cover less than one acre when discovered.

Categories 4, 5, 6, and 7 (Post Fire Emergency Stabilization, Invasive Annual Grasses and Low Priority Invasive Plants): These Categories are unlikely to be treated under the No Action Alternative. There is no effective herbicide available to treat invasive annual grasses, nor are many invasive annual grass species listed as noxious. No low priority species are listed as noxious.

Proposed and Revised Proposed Actions

Category 1 (Existing Documented Sites): The total cost of implementing treatments is more than the No Action Alternative: $84,184,290 in 2016 dollars, and is slightly more per acre at $425.41. Additional acres treated under the Proposed and Revised Proposed Actions include invasive plants not listed as noxious weeds by the State or County. Increased effectiveness of treatment makes the treatment cost per effectively treated acre for both alternatives lower than the No Action Alternative at $531.76 (see Table 3-50, *Cost of Invasive Plant Treatments, Category 1, by Alternative*).

Category 2 (Future Spread from Existing Sites): Under the Proposed and Revised Proposed Actions, the annual spread rate would, after 15 years, slow to 7 percent annually (see *Invasive Plants* section earlier in this Chapter). The first full year of treatments would have an annual spread rate of 9.8 percent, or 19,532 acres. Assuming that treatment methods and herbicides would be similar to sites in Category 1, the cost of implementing treatments for Category 2 would be $8,186,883 for the first year of spread. Treatments are estimated to be 80 percent effective under both the Proposed and Revised Proposed Actions (and treatment cost per effective acre would continue to be $523.95).

Category 3 (New Invaders): The cost of implementing treatments for Category 3 is unknown, but is likely to be minimal, as new invaders are found only a few times a year, and often cover less than one acre when discovered. Fluridone, which costs more than the average price of other herbicides available under the Proposed or Revised Proposed Actions (see Table 3-49, *Cost of Herbicide Active Ingredients*), may be used if an aquatic invasive plant is found on the District.

Category 4 (Post-fire Emergency Stabilization and Rehabilitation): The cost of implementing treatments for Category 4 is unknown. Fires on the District burn an average of 110,809 acres annually. These treatments would be funded with post fire emergency stabilization budgets. Under the Revised Proposed Action, acres treated with rimsulfuron in the short-term could cost $30 more per acre than the estimates in Table 3-48. However, the price is expected to drop once its patent expires.

Categories 5 and 6 (Invasive Annual Grasses): Treatments would be aerial broadcast herbicide treatments, targeted grazing, and / or prescribed fire. These treatments could be followed up with seeding or planting with native or nonnative vegetation. Seeding and planting would cost on average $225 / acre and would occur on 300,000 acres over the life of the plan. The annual average would be $4,500,000. Under the Revised Proposed Action, acres treated with rimsulfuron in the short-term could cost $30 more per acre than the estimates in Table 3-48. However, the price is expected to drop once its patent expires.

Category 7 (Low Priority Invasive Plants): The cost of implementing treatments for Category 7 would be unknown since the District generally does not inventory these plants. They are a low priority for treatment, based on their apparent lower level of threat to natural resources. Plants in this Category would not normally be treated except in conjunction with treatment of other plant species on the same site, or if they begin to threaten native ecosystems.

Non-Quantified Effects

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

Human Health and Safety

Issues

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

Issue Not Analyzed in Detail

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

This issue was not analyzed in detail because an analysis of the risk from volatilization of herbicide residues was done as part of the 1991 *Vegetation Treatment on BLM Lands in Thirteen Western States FEIS*. Based on this assessment, neither workers nor the public would be expected to be at risk from herbicide residues volatilized in a brown-and-burn operation (USDI 1991a). Wild or prescribed fire-volatilized herbicides are not identified as a risk in the Risk Assessments. More recent research was not found.

Affected Environment

Background Health Risks

People living within the Vale District in eastern Oregon are exposed to a variety of risks common to the U.S. as a whole. Risks to workers may differ from those facing the public, depending on the nature of a person's work. Some of these risks may be quantified, but a lack of data allows for only a qualitative description of certain risks.

Approximately 10 to 15 percent of the U.S. population suffers from allergy symptoms from invasive plant species. Allergies to invasive plants such as knapweed may complicate or trigger asthma (USDA 2008).

Risks from Injury and Diseases

Disease Incidence

Despite the difficulties in establishing correlations between work conditions and disease, only certain illnesses have been linked to occupational hazards in National and State-level studies. Occupational exposures to some metals, dusts, and trace elements, vegetation fire smoke, carbon monoxide, carbon disulfide, halogenated hydrocarbons, nitroglycerin, and nitrates can result in increased incidence of cardiovascular disease. Neurotoxic disorders can arise from exposure to a wide range of chemicals, including some pesticides.[78] Dermatological conditions like contact dermatitis, infection, trauma, cancer, vitiligo, urticaria, and chloracne have a high occurrence in the agricultural, forestry, and fishing industries.

Injury and Disease Mortality

Occupational injury, illness, and fatality rates in Oregon (rates are not calculated by County) show the agriculture, forestry, hunting, and fishing industry to have some of highest injury rates (USBLS 2012a, b). Reportable injuries

[78] Pesticides include insecticides, rodenticides, fungicides, herbicides, and other "pest" control materials.

occurred at a rate of 3.45 per 100,000 hours worked, and fatalities occurred at a rate of 0.0063 per 100,000 hours worked (seven times the occupational rate overall).

Treatments Planned Relating to the Issues

Common to All Alternatives

The full range of treatments envisioned under both of the alternatives bear on the issues identified for this section. The use of manual, mechanical, and both ground and aerial herbicide treatments all have the potential for injury to workers. In addition, the public may be exposed to herbicides because, in spite of posting known public concentration areas or tribal gathering areas, the public ultimately has access to all treated lands. The spread of invasive plants is primarily facilitated by public activities, so treatment areas necessarily correlate with public use areas including campgrounds, trailheads, roads, and stream corridors. However, where required by labels or where the BLM determines there would be a real or perceived risk to the public from an herbicide treatment, treatment areas are signed or closed to public access, and / or treatments are scheduled to avoid normal public use periods. Where the Human Health Risk Assessments (see Appendix C) for the 13 herbicides indicate a moderate or high risk to the public under modeled exposure scenarios, Mitigation Measures to reduce the risk have been adopted and made a part of the Alternatives (see Appendix A, *Project Design Features, Standard Operating Procedures, Mitigation Measures, Conservation Measures, Prevention Measures, and Best Management Practices*).

Proposed and Revised Proposed Actions

Under the Proposed and Revised Proposed Actions, there are a wider range of herbicides from which exposure is possible. In addition, there could be additional acres of invasive annual grasses treated with herbicides (imazapic (under the Proposed and Revised Proposed Actions) and rimsulfuron (under the Revised Proposed Action), up to 100,000 acres annually), prescribed fire (up to 100,000 acres annually, or 300,000 acres over the life of the plan), and targeted grazing (up to 100,000 acres annually, or 300,000 acres over the life of the plan) when compared with the No Action Alternative (see Table 2-11, *Estimated Treatment Acres*).

Standard Operating Procedures and Mitigation Measures Relevant to Effects

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

- Post treated areas with appropriate signs at common public access areas.
- Observe restricted entry intervals specified by the herbicide product label.
- Provide public notification in newspapers or other media where the potential exists for public exposure.
- Consult with Native American tribes to locate any areas of vegetation that are of significance to the tribes and Native groups and that might be affected by herbicide treatments[79].
- Use the typical application rate, where feasible, when applying 2,4-D, fluridone, hexazinone, and triclopyr to reduce risk to workers and the public.

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

- Consideration should be given to herbicides other than 2,4-D; use of 2,4-D should be limited to situations where other herbicides are ineffective or in situations in which the risks posed by 2,4-D can be mitigated.
- Use protective equipment as directed by the herbicide product label.

Work practices are also dictated by Federal and State Occupational Safety and Health Administration rules, by Oregon Department of Agriculture rules, and by product labels. These work requirements include:

> When conducting treatments, workers would always wear appropriate safety equipment and clothing and use equipment that is properly maintained. For prescribed fire, workers would notify nearby residents who could be affected by smoke. Those involved in fire use treatments would maintain adequate safety buffers between the treatment area and residences / structures. For cutting vegetation, all brush and tree stumps would be cut flat, where possible, to eliminate sharp points that could injure a worker or the public. Spark arrestors would be required on all equipment to reduce the risk of accidental fire.
>
> Workers applying herbicides would minimize application areas where possible, establish appropriate (herbicide-specific) buffer zones, post treated areas with appropriate signs at common public access areas, and notify the public of the potential for exposure. The results from the Human Health Risk Assessments (see Appendix C, *Herbicide Risk Assessment Summaries*) help inform District personnel on the proper application of herbicides to ensure that effects to humans are minimized.

Additionally, the BLM requires that Risk Management Worksheets be completed for specific, potentially hazardous work activities. These worksheets address the hazard of specific work activities, identify the steps to be taken (such as the use of safety equipment, cleaning equipment, and so forth) to reduce the hazard where indicated, and identify responsibilities and monitoring to ensure those steps are taken.

Environmental Consequences

Effects of Treatment Methods

Non-Herbicide Treatments

Manual, mechanical, and chemical treatments can present health hazards to workers. Hazards could include workers suffering hearing damage, falling objects (especially when cutting trees), tripping or slipping on hazards on the ground, protruding objects such as branches and twigs, poisonous plants and insects, and dangerous wildlife.

Adverse weather and terrain commonly create unfavorable working conditions and increased hazards. Hazards associated with adverse weather conditions include extreme heat and cold, which can be exacerbated by very dry and very wet conditions. 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.

Tools and equipment present inherent hazards, such as sharp edges, and the hazardous nature of petroleum used in mechanized equipment. Equipment operators could be injured from improperly operating the equipment or losing control of equipment on steep or slippery terrain. Manual and mechanical methods present a potential for being struck by flying debris and ergonomic hazards related to lifting and carrying equipment and when pulling vegetation. Members of the public are usually not at risk from manual and mechanical methods unless they are close to machinery that is producing flying debris during treatment.

Prescribed fire presents hazards from inhaling particulates. Studies have shown that fine particles are linked (alone or with other pollutants) to increased mortality and aggravation of preexisting respiratory and cardiovascular disease. Particulate matter can also affect immune systems (Ammann et al. 2001). Fatalities have occurred during prescribed fire operations (NIOSH 2009a).

Use of all-terrain vehicles (ATVs) for herbicide application and prescribed fire has also caused injuries and fatalities. In response to this, BLM has conducted research to evaluate the type of vehicle, load size, slope, and to establish policy and training to make ATV application safer (Morin 2008). This research has been used by Occupational Safety and Health Administration, the Consumer Product Safety Commission, and by the EPA to promulgate regulations for ATV use.

The potential for hazard exposure (risk of injuries) is exacerbated if workers are fatigued, poorly trained, poorly supervised, or do not follow established safety practices. Appropriate training, together with monitoring and intervention to correct unsafe practices, minimizes risk of worker injury and illness. Compliance with Occupational Safety and Health Administration standards, along with the Agency's Risk Assessments, industry, and manufacturers' recommendations reduces the potential exposure and risk of injury to workers.

Herbicide Treatments

Appendix C (*Herbicide Risk Assessment Summaries*) presents summaries of the level of risk that workers and the public would face during the application of a given herbicide for modeled plausible exposure scenarios at both the maximum and typical application rates[80]. For 6 of the 17 herbicides addressed in this EA, the risk tables show a measureable level of risk, either low, moderate, or high. Eleven of the 17 herbicides have no (0) measurable risk. These designations are for comparison purposes, and do not imply actual risks to people because Standard Operating Procedures, Mitigation Measures, and actual application and exposure scenarios would lessen exposures from Risk Assessment levels (see *Relationship of Effects to the Standard Operating Procedures and Mitigation Measures* near the beginning of this Chapter). Risk ratings and other information about the six herbicides with a measurable level of risk are discussed in Table 3-51, and the ratings are summarized in Table 3-52.

Table 3-51. Effects of Herbicides[1] (Human Health)
Additional information about the risk ratings discussed below can be found in Appendix C, *Herbicide Risk Assessment Summaries*.

Herbicides available under all alternatives	
2,4-D	Mitigation Measures (Appendix A) limit the use of 2,4-D to typical application rates, where feasible, and an Oregon Mitigation Measure says consideration should be given to herbicides other than 2,4-D; use of 2,4-D should be limited to situations where other herbicides are ineffective or in situations in which the risks posed by 2,4-D can be mitigated. At the typical and maximum (1.9 lb.) application rates, workers involved in backpack spray, boom spray, and aerial application face low risk from 2,4-D exposure. Workers also face moderate risk from wearing contaminated gloves for 1 hour and no risk from exposure to a spill on lower legs for one hour or from exposure to spill on the hands for one hour. Based on upper bound hazard quotients that exceed one, adverse health outcomes are possible for workers exposed repeatedly over a longer period. The public faces zero risk from all modeled scenarios except direct spray to a child over their entire body at maximum application rate poses a low risk. Other exposure scenarios to the public have no risk. Based on recent studies reviewed by SERA, 2,4-D is toxic to the immune system and developing immune system, especially when used in combination with other herbicides (tank mixes). The mechanism of action of 2,4-D toxicity is disruption of cell membranes and cellular metabolic processes. 2,4-D toxicity affects human lymphocytes and nerve tissue. Therefore, interactions are likely to occur when 2,4-D is mixed with other chemicals that affect cell membranes and cell metabolism (SERA 2006).

[80] For aminopyralid, diflufenzopyr, fluridone, fluroxypyr, imazapic, rimsulfuron, and sulfometuron methyl (Risk Assessments for BLM-evaluated herbicides), an accidental spill scenario was also modeled.

	SERA (2006) suggests that 2,4-D may cause endocrine disruption in male workers applying large amounts of this herbicide; however, the study was inconclusive. Based on currently available toxicity information that demonstrate effects on the thyroid and gonads following exposure to 2,4-D, there are some data supporting its endocrine disruption potential and EPA is studying this further (EPA 2005a). In the Human Health Risk Assessment conducted to support the reregistration of 2,4-D (EPA 2004), the EPA concluded that there is not sufficient evidence that 2,4-D is an endocrine disrupting chemical.
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. In 2015, the International Agency for Research on Cancer concluded that glyphosate should be included in their Group 2A, probable carcinogens (IARC 2015). However, in May 2016, the Joint FAO/WHO Meeting on Pesticide Residues determined that glyphosate is unlikely to pose a carcinogenic *risk* to humans from exposure through the diet and that it was not necessary to establish an acute reference dose for glyphosate or its metabolites in view of its low acute toxicity (JMPR 2016)[81].
Herbicides available under the Proposed and Revised Proposed Actions	
Fluridone	Mitigation Measures (Appendix A) limit the use of fluridone to typical application rates, where feasible. Fluridone does not pose a risk to workers or the public when applied at the typical application rate. When fluridone is applied at the maximum application rate, there is low risk to mixer / loaders. For accidental scenarios, fluridone poses a low to high risk to all workers at typical and maximum rates respectively, and a low risk to children and resident publics at the maximum rate. Fluridone causes reversible eye irritation.
Hexazinone	Mitigation Measures (Appendix A) limit the use of hexazinone to typical application rates, where feasible, in addition to not allowing the application of hexazinone with an over-the-shoulder broadcast applicator. At maximum application rates, the three general exposure scenarios for workers, backpack, boom, and aerial would pose a low risk (SERA 1997). Risk was zero for all modeled public exposure scenarios.
Triclopyr	Mitigation Measures (Appendix A) limit the use of triclopyr to typical application rates, where feasible. Workers face low risk from directed and broadcast ground spray and aerial applications at the upper ranges of exposures for both evaluated forms of triclopyr (triclopyr acid and triclopyr BEE) at the maximum application rate (SERA 2011d). At the maximum application rate for triclopyr BEE, workers face low risk from accidental exposure to contaminated gloves (1-hour duration). Thus, for workers who may apply triclopyr repeatedly over a period of several weeks or longer, it is important to ensure that work practices involve reasonably protective procedures to avoid the upper extremes of potential exposure. At higher application rates, measures that limit exposure should be developed on a case-by-case basis depending on the application rate and method. There is low risk to the public from triclopyr BEE applications at the maximum rate under four acute or accidental scenarios: 1) direct spray to the lower legs; 2) dermal contact with contaminated vegetation; 4) acute consumption of contaminated fruit; and 4) acute consumption by a child of pond water contaminated by a spill. There is low risk to the public from triclopyr acid applications at the maximum rate for acute consumption by a child of pond water contaminated by a spill, and for chronic consumption of contaminated fruit.
Herbicides available under the Revised Proposed Action	
Rimsulfuron	Rimsulfuron has low acute toxicity orally, by dermal exposure, and by inhalation, but is a moderate eye irritant. It is not a dermal sensitizer. Based on sub-chronic and chronic toxicity studies, long-term exposures can cause a variety of adverse health effects targeting multiple organs. Because there are currently no registered residential uses for rimsulfuron and chronic exposures due to residential use are not expected, chronic risk is solely due to dietary risk from food and water (EPA 2011). Rimsulfuron chronic dietary (food or water) exposure estimates are well below level of concern for the U.S. population and each of the population subgroups (EPA 2011:24). No developmental toxicity has been observed at high doses, and there is no evidence that rimsulfuron is an endocrine disruptor. Rimsulfuron is classified as “Not Likely a Human Carcinogen” (EPA 2011).

1. Table does not include herbicides with no measurable risk.

[81] The IARC defines a cancer “hazard” as an agent that is capable of causing cancer under some circumstances, while a cancer “risk” is an estimate of the carcinogenic effects expected from exposure to that substance.

Herbicide Risk Summary

At the typical rate, only two of the herbicides pose a measured risk to workers. Fluridone poses a low risk under one scenario, and 2,4-D poses a low risk under three worker scenarios (backpack spray, boom spray, and aerial application) and a moderate risk under one scenario (wearing contaminated gloves for an hour). None of the herbicides pose a risk to the public under any of the modeled scenarios including accidental spill at the typical rate (see Table 3-52).

At the maximum rate, four of the herbicides pose a risk to workers. These include fluridone (high risk for accidental spill, low risk for aerial mixer / loader), 2,4-D (low under three scenarios and high for contaminated gloves), hexazinone (low for three exposure scenarios), and triclopyr acid and BEE (low under three and four scenarios respectively). Four herbicides also pose a risk to the public at maximum rates. These are fluridone (two exposure scenarios), 2,4-D (one scenario, direct spray of a child, entire body), triclopyr acid and BEE (two and four scenarios respectively), and glyphosate (one scenario, consumption of pond water after an accidental spill) (see Table 3-52). A Mitigation Measure limits application of all of these herbicides except glyphosate to typical rate where feasible.

Table 3-52. Human Health Herbicide Risk Summary
(Includes low and moderate risk scenarios for each herbicide)

Herbicide	Worker		Public		Category 1 Acres to be Treated over the life of the plan[1]		
	Typical rate	Maximum rate	Typical rate	Maximum rate	No Action Alternative	Proposed Action	Revised Proposed Action
Fluridone	L	H, L[2]	-	L, L[2]	-	0	0
2,4-D	L, L, L, M	L, L, L, M[2]	-	L[2]	98,517	84,245	34,747
Hexazinone	-	L, L, L[2]	-	-	-	672	536
Triclopyr acid	-	L, L, L[2]	-	L, L[2]	-	1,895	1,690
Triclopyr BEE	-	L, L, L, L[2]	-	L, L, L, L[2]			
Glyphosate	-	-	-	L	8,198	6,382	5,645

1. See Table 2-11, *Estimated Treatment Acres*
2. Limited by Mitigation Measure to typical rate where feasible.

Under accidental spill scenarios, rimsulfuron poses a low to moderate risk and fluridone poses a low to high risk. The spill scenario evaluated assumes that 0.5 L of the formulation is spilled on a worker receptor. It is assumed that 80 percent of the spill lands on clothing and 20 percent lands on bare skin, and that use of proper personal protective equipment would not prevent dermal exposure. The penetration rate through clothing is assumed to be 30 percent. Accidental scenarios were analyzed for Forest Service-evaluated chemicals, but did not include accidental spill scenarios.

Effects by Alternative

Common to All Alternatives

Physical injuries related to treating sites in Categories 1, 2, and 3, including vehicle travel, walking (tripping, falling), carrying backpacks or tools, OHV use, and applying herbicides, would be similar for all alternatives, since the level of treatments by all methods is expected to be similar under all alternatives. Manual pulling and cutting treatments, estimated for less than two percent of the Category 1 acres (and likely a much higher percentage of new infestations under Categories 2 and 3), can be expected to add strains and cuts. All injury rates would be within agricultural industry norms.

Aerial applications of herbicides, particularly imazapic in Categories 4, 5, and 6 poses additional risks for aerial application contractors, and these risks would be proportional to the acres treated. Aerial applicator injuries are included in the rates cited above for agricultural workers.

Herbicide risks are summarized by alternative below, but Standard Operating Procedures, application rates, personal safety equipment and practices, and other measures seek to prevent Risk Assessment-modeled exposure scenarios from occurring to the public or workers. No injuries to herbicide applicators from herbicide exposure have been recorded for at least the past 20 years on BLM-administered lands in Oregon (Erin McConnell, Oregon BLM State Weed Coordinator, 2016 personal communication).

Access to recreation and other concentrated public use sites may be restricted for a few hours or days, depending on the requirements of the herbicide label. During site closures, BLM posts signs noting the exclusion area and the duration of the exclusion. Standard Operating Procedures also require providing public notification in newspapers or other media where the potential exists for public exposure, and consulting with Native American tribes to locate any areas of vegetation that are of significance to the tribes that might be affected by herbicide treatments.

No Action Alternative

There are no public exposure risk scenarios for any of the four herbicides at the typical rate. Because some invasive plants are treated with two herbicides at the same time (tank mix), an acres-by-herbicide summary of the herbicide portion of treatments on the 197,781 acres in Category 1 totals 315,419 acres (See Table 2-11, *Estimated Treatment Acres*). About 115,155 of these acres would include 2,4-D either alone or in conjunction with one or more other herbicides in a tank mix. Almost of all of these treatments are planned for the typical rate (see Table 2-10, *Treatment Key*). There is no measured risk for any of the public exposure scenarios at this rate.[82] However, there are four worker exposure scenarios with low or moderate risk. When Standard Operating Procedures, Mitigation Measures, and handling policies and direction are followed, this herbicide poses little risk to workers. The acres planned for glyphosate treatments (over 10-15 years) are almost entirely below or near typical rate. Glyphosate poses a low risk under one public exposure scenario at the maximum rate

Exposure scenarios for 2,4-D at the maximum rate (see Table 3-52, *Human Health Herbicide Risk Summary*) are unlikely because a Mitigation Measure prohibits this rate where feasible. In addition, access to recreation and other concentrated public use sites may be restricted for a few hours or days, depending on the requirements of the herbicide label. During site closures, BLM posts signs noting the exclusion area and the duration of the exclusion. Standard Operating Procedures also require providing public notification in newspapers or other media where the potential exists for public exposure, and consulting with Native American tribes to locate any areas of vegetation that are of significance to the tribes that might be affected by herbicide treatments.

Proposed Action

As with the No Action Alternative, there are no public exposure risk scenarios for any of the 14 herbicides at the typical rate. Fluridone poses a low risk under one worker exposure scenario but no use is envisioned unless a new aquatic species is discovered on the District. Worker 2,4-D exposure risks of low to moderate under four worker exposure scenarios remain under this alternative, but estimated treatment acres decrease 14 percent when compared to the No Action Alternative (see Table 3-52, *Human Health Herbicide Risk Summary*).

[82] In the case of tank mixes, risk ratings for both materials are considered, and mitigation for both are applied. Risks are not averaged.

Up to 100,000 acres of invasive annual grasses could be treated with herbicides annually in Category 5 and 6, most of which would be imazapic and aerially applied. However, imazapic poses no public or worker risk under any of the exposure scenarios studied.

Exposure scenarios for fluridone, 2,4-D, hexazinone, and triclopyr acid and BEE (see Table 3-52, *Human Health Herbicide Risk Summary*) at the maximum rate are unlikely because Mitigation Measures prohibit this rate "where feasible."

Revised Proposed Action

Worker 2,4-D exposure risks of low to moderate under four worker exposure scenarios remain under this alternative, but estimated treatment acres decrease 59 percent when compared to the Proposed Action, and 65 percent when compared to the No Action Alternative. (Glyphosate, hexazinone, and triclopyr also decrease, by 12 percent, 20 percent, and 11 percent, respectively when compared to the Proposed Action.) Rimsulfuron would be used extensively to treat invasive annual grasses on up to 60,000 acres annually (assuming 50,000 acres in Categories 5 and 6 and additional acreage in other Categories), and Risk Assessments show a low to moderate risk in worker accidental spill scenarios. Following Standard Operating Procedures and the herbicide label guidance make the tested Risk Assessment scenarios unlikely. Other effects would remain as described under the Proposed Action.

Cumulative Effects

The pounds of herbicide anticipated to be used by the Vale District under all three alternatives represent about 1 / 10th of one percent of the total pounds of herbicide estimated to be used in Malheur and Baker Counties (see *Neighboring Lands Pesticide Use* early in this Chapter). However, none of the 17 herbicides proposed for use are likely to persist, be blown, transported in water, or moved in soils in ways that would combine them with similar materials to increase human health risk. The Proposed Action would decrease the pounds of herbicide used by 7 percent and the Revised Proposed Action would decrease the pounds of herbicide used by 52 percent when compared with the No Action Alternative in spite of adding up to 100,000 acres per year of imazapic (Proposed Action) or imazapic and rimsulfuron (Revised Proposed Action).[83] In addition, the acres to be treated with herbicides showing measurable risks under one or more exposure scenarios decreases 24 percent under the Proposed Action when compared to the No Action Alternative. The newer herbicides themselves pose less risk to the public and workers, and the increased number of herbicides available would facilitate the selection of a treatment most appropriate for the site and surrounding conditions.

The risk from herbicides is only partly cumulative to the risks from other management activities. If BLM personnel are applying herbicides, they are not cutting juniper, mowing invasive plants, or working with cattle. Traveling to and from the worksite has a higher (and cumulative) risk. The analysis indicates risks to the public are negligible, but such risks would be cumulative to the risks incurred from traveling to BLM-administered lands to recreate, and interacting with wildland resources, both of which carry a higher risk of injury or death.

[83] This reduction is primarily because the Proposed and Revised Proposed Actions would add herbicides designed to be applied in much lower rates. This reduction, by itself, does not necessarily mean less risk.

Glossary

Abiotic: Not involving living organisms.

Acetolactate synthase (ALS): A plant enzyme that facilitates the development of amino acids needed for plant growth.

Acetolactate synthase (ALS)-inhibitor: An herbicide that starves plants by reducing ALS. In this EIS, the ALS-inhibitors include three sulfonylureas (chlorsulfuron, metsulfuron methyl, and sulfometuron methyl) and two imidazolinones (imazapic and imazapyr).

Acid Equivalent (a.e.): that portion of a formulation that theoretically could be converted back to the corresponding or parent acid. Or: the theoretical yield of parent acid from an active ingredient that has been formulated as a derivative (esters, salts, and amines are examples of derivatives).

Active ingredient (a.i.): The ingredient in an herbicide that prevents, destroys, repels, desiccates, or otherwise controls the target plant.

Acute effect: An adverse effect on any living organism in which symptoms develop rapidly and often subside after the exposure stops.

Acute toxicity: The quality or potential of a substance to cause injury or illness shortly after exposure through a single or short-term exposure.

Adjuvant: A chemical that is added to the pesticide formulation to enhance the toxicity of the active ingredient or to make the active ingredient easier to handle.

Administrative site: A reservation of public land for use as a site for a public building or other administrative facility. On BLM-administered lands in Oregon, this may include seasonal fire stations, wild horse corrals, rock quarries, bilk material and equipment storage areas, seed orchards, BLM-administered airstrips and helipads, BLM range improvements and water source developments, sanitary systems, BLM communication sites, remote automated weather stations, etc.

Adsorption: 1) The adhesion of substances to the surface of solids or liquids. 2) The attraction of ions of compounds to the surface of solids or liquids.

Affected environment: Existing biological, physical, social, and economic conditions of an area subject to change, both directly and indirectly, as the result of a proposed human action.

Air quality: The composition of air with respect to quantities of pollution therein. Used most frequently in connection with “standards” of maximum acceptable pollutant concentrations.

Allelopathic: Suppression of growth of a plant by a toxin released from a nearby plant of the same or another species.

Allotment (grazing): Area designated for the use of a certain number and kind of livestock for a prescribed period of time. An allotment may contain one or more separate pastures.

Alluvial: Made up of or found in the materials that are left by the water of rivers, floods, etc.

Ambient air: Any unconfined portion of the atmosphere; open air, surrounding air, or "outdoor air."

Anadromous fish: Fish that mature in the sea and swim up freshwater rivers and streams to spawn. Examples include salmon, steelhead, and sea-run cutthroat trout.

Anaerobic: Life or processes, such as the breakdown of organic contaminants by microorganisms, which take place without oxygen.

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

Area of critical environmental concern (ACEC): Type of special land use designation specified within the *Federal Land Policy and Management Act*. Used to protect areas with important resource values in need of special management.

Best management practices: Manual-directed Standard Operating Procedures and other standing direction, particularly when they apply to water.

Bioaccumulation: The process of a plant or animal selectively taking in or storing a persistent substance. Over time, a higher concentration of the substance is found in the organism than in the organism's environment.

Biological Assessment (BA): Information prepared by a Federal agency to determine whether a proposed action is likely to: (1) adversely affect listed species or designated critical habitat; (2) jeopardize the continued existence of species that are proposed for listing; or (3) adversely modify proposed critical habitat. Biological assessments must be prepared for "major construction activities" (50 CFR §402.02). A BA may also be recommended for other activities to ensure the agency's early involvement and increase the chances for resolution during informal consultation.

Biological control: The use of nonnative agents including invertebrate parasites and predators (usually insects, mites, and nematodes), and plant pathogens to reduce populations of invasive plants.

Biological crust: Thin crust of living organisms on or just below the soil surface; composed of lichens, mosses, algae, fungi, cyanobacteria, and bacteria. Biological crusts are typically found in arid areas.

Boom (herbicide spray): A tubular metal device that conducts an herbicide mixture from a tank to a series of spray nozzles. Usually mounted to a truck, or behind a tractor or all-terrain vehicle.

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

Buffer: A solution or liquid whose chemical makeup is such that it minimizes changes in pH when acids or bases are added to it; a space or distance left between the application and a non-target area; a strip of vegetation that is left or managed to reduce the effect that a treatment or action on one area might have on another area.

Candidate species: Plants and animals for which the U.S. Fish and Wildlife Service or National Marine Fisheries Service has sufficient information on their biological status and threats to propose them as endangered or threatened under the *Endangered Species Act*, but for which development of a proposed listing regulation is precluded by other higher priority listing activities.

Chronic exposure: Exposures that extend over a long period. Chronic exposure studies are used to evaluate the carcinogenic potential of chemicals and other long-term health effects.

Chronic toxicity: The ability of a substance or mixture of substances to cause harmful effects over an extended period, usually upon repeated or continuous exposure sometimes lasting for the entire life of the exposed organism.

Clay: In soil, particles smaller than 0.002 mm in diameter.

Conservation Measures: Measures adopted with the *2007 Vegetation Treatments using Herbicides on BLM Lands in 17 Western States Biological Assessment* to prevent or reduce herbicide effects to federally listed species. A Mitigation Measure adopted at the Oregon FEIS level also applies these measures to any species in the Special Status Species Program. These measures include (but are not limited to) herbicide-by-herbicide buffer distances from special status species, dependent on taxa and application method.

Consultation: Exchange of information and interactive discussion; usually refers to consultation mandated by statute or regulation that has prescribed parties, procedures, and timelines (e.g. Consultation under *National Environmental Policy Act* or Section 7 of the *Endangered Species Act*, or consultation with tribes under Section 106 of the *National Historic Preservation Act*).

Control: Eradicating, suppressing, or reducing vegetation; a population that is not exposed to the potentially toxic agent in toxicology or epidemiology studies.

Critical habitat: 1) Specific areas within a species' habitat that are critically important to its life functions; an area designated by the US Fish and Wildlife Service under rule-making as being critical to the needs of a federally listed species, and which then carries special protection and consultation requirements.

Cultural resources: Nonrenewable evidence of human occupation or activity as seen in any area, site, building, structure, artifact, ruin, object, work of art, architecture, or natural feature, which was important in human history at the national, state, or local level.

Cumulative effect: The effects that results from identified actions when they are added to other past, present, and reasonably foreseeable future actions regardless of who undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time.

Degradates: Compounds resulting from degradation.

Drift: That part of a sprayed herbicide that is moved from the target area by wind while it is still airborne.

Ecological amplitude: The limits of environmental conditions within which an organism can live and function.

Effect: Environmental change resulting from a proposed action. Direct effects are caused by the action and occur at the same time and place, while indirect effects are caused by the action but are later in time, further removed in distance, or secondary. Effect and impact are synonymous as used in this document.

Endangered species: Any species listed under the *Endangered Species Act* as being in danger of extinction throughout all or a significant portion of its range.

Endangered Species Act (ESA): A law passed in 1973 to conserve species of wildlife and plants determined by the Director of the Fish and Wildlife Service or the National Marine Fisheries Service to be endangered or threatened with extinction in all or a significant portion of its range. Among other measures, ESA requires all Federal agencies to conserve these species and consult with the Fish and Wildlife Service or National Marine Fisheries Service on Federal actions that may affect these species or their designated critical habitat.

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

Entrainment: The unintentional loss of freshwater fish during water diversions.

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

Environmental justice: Equal protection from environmental hazards for individuals, groups, or communities regardless of race, ethnicity, or economic status. This applies to the development, implementation, and enforcement of environmental laws, regulations, and policies, and implies that no population of people should be forced to shoulder a disproportionate share of negative environmental impacts of pollution or environmental hazard due to a lack of political or economic strength.

Ephemeral stream: A stream that contains running water only sporadically, such as during and following storm events.

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

Eutrophication: Excessive nutrients in a lake or other body of water, usually caused by runoff of nutrients (animal waste, fertilizers, sewage) from the land, which causes a dense growth of plant life; the decomposition of the plants depletes the supply of oxygen, leading to the death of animal life.

Fate: The course of an applied herbicide in an ecosystem or biological system, including metabolism, microbial degradation, leaching, and photodecomposition.

Federal Land Policy and Management Act of 1976 (FLPMA): Public Law 94-579. October 21, 1976, often referred to as the BLM' s "Organic Act," which provides the majority of the BLM's legislated authority, direction, policy, and basic management guidance.

Federally listed: Species listed as threatened or endangered under the *Endangered Species Act*.

Fire return interval: The average time between fires in a given area.

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

Forb: Small broad-leafed plant; broad-leaved herb other than a grass, especially one growing in a field, prairie, or meadow.

Formulation: The commercial mixture of an herbicide that includes both the active and inactive (inert) ingredients.

Fungi: Molds, mildews, yeasts, mushrooms, and puffballs, a group of organisms that lack chlorophyll and therefore are not photosynthetic.

Gastropod: A class of mollusks typically having a one-piece coiled shell and flattened muscular foot with a head bearing stalked eyes; includes snails, slugs, limpets and cowries.

General Habitat Management Area: BLM-administered lands where special management would apply to sustain Greater Sage-Grouse populations, but that are not as important as priority habitat. These areas are important for habitat and connectivity between populations.

Goal: A broad statement of a desired outcome. Goals are usually not quantifiable and may not have established time frames for achievement.

Good water quality: Water that contains needed substances and where pollutants are not present**.**

Gravel: In soil, particle sizes between 2 and 64 mm in diameter.

Green-stripping: The practice of establishing or using patterns of fire resilient vegetation and / or material to reduce wildfire occurrence and size.

Gross infested area or treatment area: An area of land occupied by one or more invasive plant species; the area of land defined by drawing a line around the general perimeter of the infestation, not the canopy cover of the plants; the gross area of a logical treatment unit. May contain large parcels of land that are not occupied by the weed.

Groundwater: Subsurface water that is in the zone of saturation; the top surface of the groundwater is the "water table"; source of water for wells, seeps, and springs.

Groundwater contaminant: Chemical detected in ground waters. Does not necessarily infer levels are toxic or harmful.

Habitat: The natural environment of a plant or animal, including all biotic, climatic, and soil conditions, or other environmental influences affecting living conditions; the place where an organism lives.

Half-life: The amount of time required for half of a compound to degrade.

Hazard quotient (HQ): The ratio of the estimated level of exposure to a substance from a specific substance from a specific pesticide application to the reference dose (RfD) for that substance, or to some other index of acceptable exposure or toxicity. An HQ less than or equal to 1 is presumed to indicate an acceptably low level of risk for that specific application. Analogous to BLM risk quotient.

Herbicide: A pesticide used to control, suppress, or kill vegetation, or severely interrupt normal growth processes.

Herbicide resistance: Naturally occurring heritable characteristics that allow individual weeds to survive and reproduce, producing a population, over time, in which the majority of the plants of the weed species have the resistant characteristics.

Herd Management Area: Public land under the jurisdiction of the BLM that has been designated for the maintenance of an established wild horse and burro herd.

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

Inerts: Ingredients that are added to the commercial product (formulation) of an herbicide and are not herbicidally active.

Infested: An area having one or more of the subject invasive species – either plants or plant pathogens. Infested areas are not necessarily 100 percent infested.

Integrated vegetation / weed management (IVM / IWM): A long-standing, science-based, decision-making process that identifies and reduces risks from vegetation and vegetation management related strategies. It coordinates the use of vegetation biology, environmental information, and available technology to prevent unacceptable levels of damage by the most economical means, while posing the least possible risk to people, property, resources, and the environment. IVM provides an effective strategy for managing vegetation in all arenas from developed agricultural, residential, and public areas to wild lands. IVM serves as an umbrella to provide an effective, all encompassing, low-risk approach to manage problem vegetation. A sustainable approach to managing vegetation by combining biological, cultural, physical, and chemical tools in a way that minimizes economic, health, and environmental risks.

Interagency Special Status / Sensitive Species Program (ISSSSP): The BLM and FS shared program to coordinate record keeping and other management of the Bureau Special Status and Forest Service Sensitive species programs. See also *Special Status species*.

Intermittent stream: Any non-permanent flowing drainage feature having a definable channel and evidence of annual scour or deposition. This includes what are sometimes referred to as ephemeral streams if they meet these two criteria.

Invasive plants: Nonnative aggressive plants with the potential to cause significant damage to native ecosystems and / or cause significant economic losses. *This Oregon FEIS definition differs from the 2007 PEIS definition by not including species native to the ecosystem under consideration.*

Issue: A matter of controversy, dispute, or general concern over resource management activities or land uses.

K_{oc}: Organic carbon-water partition coefficient. A measure of a material's tendency to adsorb to soil particles. High K_{oc} values indicate a tendency for the material to be adsorbed by soil particles rather than remain dissolved in the soil solution. Strongly adsorbed molecules will not leach or move unless the soil particle to which they are adsorbed moves (as in erosion).

Label: All printed material attached to or part of the pesticide container, and which contains instructions for the legal application of the pesticide.

LC_{50} (median lethal concentration): A concentration of a chemical in air or water to which exposure for a specific length of time is expected to cause death in 50 percent of a defined experimental animal population.

LD_{50} (median lethal dose): The dose of a chemical calculated to cause death in 50% of a defined experimental animal population over a specified observation period. The observation period is typically 14 days.

Leaching: The movement of chemicals through the soil by water; may also refer to the movement of herbicides out of leaves, stems, or roots into the air or soil.

Lek: An area where male sage-grouse display during the breeding season to attract females (also referred to as strutting-ground).

Level of concern (LOC): The concentration or other estimate of exposure above which there may be effects.

Listed species: Formally listed as a threatened or endangered species under the *Endangered Species Act*. Designations are made by the U.S. Fish and Wildlife Service or National Marine Fisheries Service.

Lotic: of, relating to, or living in actively moving water.

Lowest observed adverse effect level (LOAEL): The lowest dose of a chemical in a study, or group of studies, that produces statistically or biologically significant increases in frequency or severity of adverse effects between the exposed and control populations.

Maximum application rate: The maximum application rate analyzed in risk scenarios in the Risk Assessments. The rate may be the rate on the label of the formulated product, but in certain cases, the maximum application rate is lower. For example, the label for Plateau, the formulated product that has imazapic as its active ingredient, states that no more than 12.0 fluid ounces of product are to be applied on a per acre basis. According to the label there are two pounds of imazapic acid equivalent in a gallon of formulated product, so the maximum application rate is 0.1875 lb. a.i. / acre. However, herbicide products that include 2,4-D list 4 lbs. / acre as the rate, but Risk Assessments analyze a maximum application rate of 1.9 lbs. / acre.

Mechanical control: The use of any mechanized approach to control or eliminate invasive plants (i.e. mowing, weed whipping, or cutting with a chainsaw).

Mitigation: Actions that would: 1) avoid an impact altogether by not taking a certain action or parts of an action; 2) minimize an impact by limiting the degree or magnitude of the action and its implementation; 3) rectify an impact by repairing, rehabilitating, or restoring the affected environment; 4) reduce or eliminate an impact over time by preserving and maintaining operations during the life of the action; and, 5) compensate for an impact by replacing or providing substitute resources or environments.

Mitigation Measures: Measures adopted with the 2007 *Vegetation Treatments using Herbicides on BLM Lands in 17 Western States* EIS and Record of Decision, the 2016 *Vegetation Treatments using Aminopyralid, Fluroxypyr, and Rimsulfuron* PEIS and Record of Decision, or the 2010 *Vegetation Treatments using Herbicides on BLM Lands in Oregon* FEIS and Record of Decision to prevent or reduce herbicide effects. These measures all apply to this analysis and are included in Appendix A.

Monoculture: a culture dominated by a single element; a prevailing culture marked by homogeneity

Monitoring: The orderly collection, analysis, and interpretation of resource data to evaluate progress toward meeting management objectives.

Nematode: Any of a phylum (*Nematoda* or *Nemata*) of elongated cylindrical worms parasitic in animals or plants or free-living in soil or water —called also roundworm.

No Action Alternative: The most likely condition to exist in the future if current management direction were to continue unchanged.

No observed adverse effect level (NOAEL): The exposure level at which there are no statistically or biological significant differences in the frequency or severity of any adverse effect between the exposed and control populations.

No observed effect level (NOEL): Exposure level at which there are no statistically or biological significant differences in the frequency or severity of any effect between the exposed and control populations.

Non-selective herbicide: An herbicide that is generally toxic to plants without regard to species or group.

Non-target: Any organism that is not the objective of a control treatment.

Noxious weed: A subset of invasive plants that are County, State, or federally listed as injurious to public health, agriculture, recreation, wildlife, or any public or private property.

Parent material: The unconsolidated and more or less chemically weathered mineral or organic matter from which the soil has developed by pedogenic processes.

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

Pasture: A subsection of a grazing allotment; a grazing allotment may contain one or more separate pastures.

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

Perched aquifer: An aquifer that occurs above the regional water table. This occurs when there is an impermeable layer above the main water table / aquifer but below the surface of the land.

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

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

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

pH: A measure of how acidic or alkaline (basic) a solution is on a scale of 0 to 14 with 0 being very acidic, 14 being very alkaline, and 7 being neutral. The abbreviation stands for the potential of hydrogen.

Photo degradation: The photochemical transformation of a molecule into lower molecular weight fragments, usually in an oxidation process. This term is widely used in the destruction (oxidation) of pollutants by ultraviolet-based processes.

Playas: Flat land surfaces underlain by fine sediment or evaporate minerals deposited from a shallow lake on the floor of a topographic depression.

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

Pre-emergent (herbicide): A soil applied herbicide used to keep seeds from germinating.

Prescribed fire: A wildland fire that burns under specified conditions and in predetermined area, to produce the fire behavior and fire characteristics required to attain resource management objectives.

Prevention: To detect and ameliorate conditions that cause or favor the introduction, establishment, or spread of invasive organisms or conditions.

Priority Habitat Management Area: BLM-administered lands identified as having the highest value to maintaining sustainable Greater Sage-Grouse populations. These areas have large, undisturbed expanses of breeding habitat and the highest densities of sage-grouse.

Project Design Features: Features adopted as part of this analysis to prevent adverse effects from Invasive Plant Treatments. These are in addition to Standard Operating Procedures and Mitigation Measures adopted as part of the National PEIS (USDI 2007a) and Oregon FEIS (USDI 2010a) (to which this EA tiers), as well as the Conservation Measures adopted as part of listed species consultation on the National PEIS (USDI 2007f).

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

Proper functioning condition (PFC): The condition of riparian and wetland areas when adequate vegetation, landform, or large woody debris are present to dissipate stream energy associated with high water flows. This reduces erosion and improves water quality; filters sediment, captures bedload, and aids in floodplain development; improves floodwater retention and groundwater recharge; develops root masses that stabilize stream banks against cutting; develops diverse ponding and channel characteristics to provide habitat and water depth, duration, and temperature necessary for fish production, avian breeding habitat, and other uses; and supports greater biodiversity.

Proposed threatened or endangered species: Plant or animal species proposed by the U.S. Fish and Wildlife Service or National Marine Fisheries Service to be biologically appropriate for listing as threatened or endangered and that is published in the Federal Register. It is not a final designation. Proposed species are, at minimum, managed as Bureau Sensitive until a decision is made about Federal listing.

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

Research natural areas (RNAs): Parts of a national network of reserved areas under various ownerships, containing important ecological and scientific values and are managed for minimum human disturbance. They are established and managed to protect ecological processes, conserve biological diversity, and provide opportunities for observation for research and education.

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

Residue: Herbicide or its metabolites remaining in or on soil, water, plants, animals, or surfaces.

Resource Management Plan (RMP): Current generation of land use plans developed by BLM under the FLPMA; replaces the older generation management framework plans; provides long-term (up to 20 years) direction for the management of a particular area of land, usually corresponding to a BLM resource area, and its resources.

Revegetation: Establishing or re-establishing desirable plants where desirable plants are absent or of inadequate density, either by controlling site conditions (including the suppression of unwanted competition) so existing vegetation can reseed and spread, or by direct seeding or transplanting.

Right-of-way (ROW): A permit or an easement that authorizes the use of lands for certain specified purposes, such as the construction of forest access roads, gas pipelines, or power lines.

Rill erosion: An erosion process in which many small channels a few centimeters deep are formed. It occurs mainly on recently denuded soils.

Riparian area (from Oregon FEIS): Those terrestrial areas where the vegetation complex and microclimate conditions are products of the combined presence and influence of perennial and / or intermittent water, associated high water tables, and soils that exhibit some wetness characteristics. Normally used to refer to the zone within which plants grow rooted in the water table of these rivers, streams, lakes, ponds, reservoirs, springs, marshes, seeps, bogs, and wet meadows.

Riparian buffer: A strip of vegetation planted along the bank of a body of water that slows the rate of flow of runoff from adjoining uplands, causing sediment and other materials to deposit onto the land before the runoff enters and pollutes the body of water.

Riparian habitat: Areas adjacent to rivers and streams with a high density, diversity, and productivity of plant and animal species relative to nearby uplands.

Risk: The likelihood that a given exposure to an item or substance (e.g. herbicide dose) will produce illness or injury.

Risk Assessment: The process of gathering data and making assumptions to estimate short- and long-term harmful effects to human health or elements of the environment from particular products or activities. See Appendix 8.

Risk quotient: The Estimated Environmental Concentration (EEC), as calculated through computer modeling, divided by the LD_{50} (lethal dose where 50% of test population dies) or LC_{50} (lethal concentration for aquatic forms, where 50% of the test population dies). RQs were developed to provide a more realistic scenario of herbicide exposure. Even so, results assume 100 percent exposure and animals confined to the treatment area. For species that are at all mobile, such exposures are unlikely from the applications proposed by the action alternatives. Analogous to Hazard Quotient. An RQ less than or equal to 1 is presumed to indicate an acceptably low level of risk for a specific application.

Runoff: Overland flow; the part of precipitation, as well as any other flow contributions, that does not soak into soil or stay held on the site for evaporation or transpiration, but runs into streams.

Safety data sheet (SDS): A compilation of information required under the Occupational Safety and Health Administration Communication Standard on the identity of hazardous chemicals, health and physical hazards, exposure limits, and precautions.

Salmonids: Fishes of the family *Salmonidae*, including salmon, trout, chars, whitefish, ciscoes, and grayling.

Sand: In soil, particles 0.05 to 2 mm in diameter.

Satellite populations: Small populations spatially separated from other existing populations.

Scoping: A process at the beginning of a NEPA analysis whereby the public is asked to provide oral or written comments about the scope of the analysis and the range of alternatives, to help ensure the analysis appropriately addresses potential effects on individuals, communities, and the environment.

Sediments: Unweathered geologic materials generally laid down by or within water bodies; the rocks, sand, mud, silt, and clay at the bottom and along the edge of lakes, streams, and oceans.

Selective herbicide: A chemical designed to affect only certain groups or types of plants, leaving other tolerant plants unharmed.

Senescence: the growth phase in a plant or plant part (as a leaf) from full maturity to death.

Sensitive species (Bureau Sensitive): Native species designated by the BLM State Director as sensitive because they are found on BLM-administered lands for which the BLM has the capability to significantly affect the conservation status of the species through management, and either: 1. There is information that a species has recently undergone, is undergoing, or is predicted to undergo a downward trend such that the viability of the species or a distinct population segment of the species is at risk across all or a significant portion of the species range, or 2. The species depends on ecological refugia or specialized or unique habitats on BLM-administered lands, and there is evidence that such areas are threatened with alteration such that the continued viability of the species in that area would be at risk.

Significant: The description of an impact that exceeds a certain threshold level. Requires consideration of both context and intensity. The significance of an action must be analyzed in several contexts, such as society as a whole, and the affected region, interests, and locality. Intensity refers to the severity of effects, which should be weighed along with the likelihood of its occurrence. Determination of significance for effects is a management decision considering multiple factors, and not one made by technical specialists to indicate the quantity of effects are above or below some level.

Silt: In soil, particles between 0.002 and 0.05 mm in diameter.

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

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

Sodic: Sodic soils are characterized by a disproportionately high concentration of sodium (Na) in their cation exchange complex. They are usually defined as containing an exchangeable sodium percentage greater than 15%.

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

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

Standard Operating Procedures : Procedures that would be followed by the BLM to ensure that risk to human health and the environment from treatment actions were kept to a minimum. See Appendix A. Since they originate from Manual and other direction, they may appear in resource management and other plans under other titles. When specific to water, they are often referred to as best management practices (BMPs).

Subsistence: Customary and traditional uses of wild renewable resources (plants and animals) for food, shelter, fuel, clothing, tools, etc.

Sulfonylurea: A group of herbicides that interfere with acetolactate synthase, an enzyme needed for plant cell growth.

Surfactant: A material that improves the emulsifying, dispersing, spreading, wetting, droplet size, or other surface-modifying properties of liquids.

Target species: A species (in this EA, a plant species) that is a target or goal of a treatment or control effort.

Targeted grazing: The carefully controlled grazing of livestock, such as cattle, sheep or goats, to accomplish specific vegetation management objectives. Livestock can be used as a tool for improving land health by performing weed control, reducing wildland fire, and aiding in restoration projects.

Threatened species: A plant or animal species federally listed as *threatened* under the *Endangered Species Act*, and status defined as likely to become an endangered species throughout all or a significant portion of its range within the foreseeable future.

Traditional use areas (Native American plant gathering): Areas where tribes continue to gather plant materials for food, basketry, and other traditional uses. These may or may not be treaty reserved rights and / or areas.

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

Tribe: Term used to designate any American Indian band, nation, or other organized group or community, which is recognized as eligible for the special programs and services provided by the U.S. to American Indians because of their status as Indians.

Typical rate or typical application rate: One of two application rates considered in many Risk Analyses (the other being Maximum Rate); a rate based upon a general summary of actual applications that have been made of the different formulations of a particular active ingredient on BLM-administered lands. Under some situations, this value may be higher or lower than what is going to be applied for a specific job. The rate of application of any pesticide is based upon several factors, including, but not limited to, the species to be controlled, the environment for which the application is to be made, the timing of the application, and other factors. For example, a typical rate of application for imazapic is about 2.0 fluid ounces of Plateau, which, when taking into the concentration of the formulated product (2.0 pounds acid equivalent / per gallon) equates to 0.0313 lb. a.e. / acre. It is known that 2.0 fluid ounces of Plateau will achieve a specific level of control under a specific set of conditions. Rates around 4.0 to 6.0 fluid ounces of imazapic appear to be the more common range for activity, based on the experience of researchers, for downy brome. The rate is based upon what is identified as what is normally considered for application under a normal condition. See *Background for Effects Analysis* in Chapter 3 for table of amounts of a.e. / acre.

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

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

Weed: When not preceded by "noxious," this term generally means invasive plants (including noxious weeds) in this EA. Its use in this EA is avoided except when it is used in citations and paraphrases of other documents, or is part of titles or common phrases. Within such documents, the intent is usually noxious weeds and other invasive plants.

Wetlands: An area that is saturated by surface or ground water with vegetation adapted for life under those soil conditions, as swamps, bogs, fens, marshes, and estuaries.

Wild and Scenic Rivers: Rivers designated in the National Wild and Scenic Rivers System that are classified in one of three categories (wild, scenic, or recreational), depending on the extent of development and accessibility along each section. In addition to being free flowing, these rivers and their immediate environments must possess at least one outstandingly remarkable value: scenic, recreational, geologic, fish and wildlife, historical, cultural, or other similar values.

Wilderness: Land designated by Congress as a component of the National Wilderness Preservation System.

Wilderness Inventory: All public lands outside of designated Wilderness and WSAs in Vale District were inventoried between 2007-2012 for wilderness characteristics. Characteristics qualifying an area for Wilderness are: 1) naturalness - lands that are natural and primarily affected by the forces of nature; 2) roadless and having at least 5,000 acres of contiguous public lands; and 3) outstanding opportunities for solitude or primitive and unconfined recreation, non-motorized types of recreation. In addition, areas may contain "supplemental values," consisting of ecological, geological, or other features of scientific, educational, scenic, or historical importance.

Wilderness Study Area – A roadless area under the jurisdiction of the BLM that has been inventoried and found to have wilderness characteristics as described in Section 2(c) of the *Wilderness Act* of 1964 (78 Stat. 891) and is currently in an interim management status awaiting official Wilderness designation or release from further wilderness study by Congress.

Wildfire: Unplanned ignitions or prescribed fires that are declared wildfires. Wildfires may be managed to meet one or more objectives as specified in Resource Management Plans and the objectives can change as the fire spreads across the landscape.

Wildland fires: Fires occurring on wildlands, regardless of ignition source, damages, or benefits, and including wildfire and prescribed fire.

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Consultation and Coordination

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Geographic Information Specialist	Marissa Russell
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Review Opportunities

In December 2015, the EA and FONSI were made available for a 45-day review period on BLM’s website. A legal notice was also published in the Argus Observer (Ontario, OR), Baker City Herald, and the Malheur Enterprise (Vale, OR) announcing the availability of the documents for review and the comment period end date. Agencies, Native American tribes, permittees / grant holders / lessees, and interested members of the public were notified of the availability of the EA and FONSI for review. This mailing list is contained in the project record file. In September 2016, the Revised EA (including an additional alternative, the Revised Proposed Action) and FONSI were made available for a 30-day internal review period. In addition to the newspapers described previously, a legal notice was also sent to the Humboldt Sun (Winnemucca, NV). Other public notifications were made as described previously.

Appendix A – Project Design Features, Standard Operating Procedures, Mitigation Measures, Conservation Measures, Prevention Measures, and Best Management Practices

Information included in this Appendix is a compilation of information originally presented in the 2007 *Vegetation Treatments Using Herbicides on BLM Lands in 17 Western States PEIS* (USDI 2007a), *Record of Decision* (USDI 2007c), and *Biological Assessment* (USDI 2007f), as well as the *Vegetation Treatments on BLM Lands in 17 Western States Programmatic Environmental Report* (USDI 2007b), the 2016 *Vegetation Treatments Using Aminopyralid, Fluroxypyr, and Rimsulfuron PEIS* (USDI 2016a), *Record of Decision* (USDI 2016b), and *Biological Assessment* (USDI 2016e), and the 2010 Oregon FEIS (USDI 2010a) and Record of Decision (USDI 2010b).

Since Standard Operating Procedures, Conservation Measures, and some Mitigation Measures are taken from national level documents, not all attributes are applicable. For example, Alaska Natives would not be consulted with (see *Social and Economic Values Standard Operating Procedures*) and Alaskan crab and scallop habitat does not exist on the District (see *Fish Conservation Measures*).

Project Design Features

The following Project Design Features were included in the analysis of this EA.

Invasive Plants

- Monitoring will be done to determine anticipated production of invasive annual grasses and targeted grazing use rates and implementation timing. Monitoring plans for each targeted grazing prescription would be developed as part of the Annual Treatment Plan. The monitoring plan and associated monitoring efforts would determine the biomass of the invasive annual grass infestation, the timing of the targeted grazing treatments, and the level of grazing needed to aid in the control of invasive annual grasses or pre-treatment to improve the effectiveness of herbicide treatments.

Special Status Plants

- If locations of Macfarlane's four-o'clock or Howell's spectacular thelypody are located on the Vale District near invasive plant treatments, site-specific control measures would be developed in coordination with the U.S. Fish and Wildlife Service.
- For all projects with the potential to affect listed plant populations, all Project Design Criteria outlined in the Aquatic Restoration Biological Opinions II (ARBO II, USDI 2013a) from the U.S. Fish and Wildlife Service would be applied (see Appendix F). If the project cannot be covered by ARBO II (see Figures 3-2 and 3-4 in Chapter 3), additional consultation with U.S. Fish and Wildlife Service would occur before treatment.

- Apply Conservation Measures as appropriate for Bureau Sensitive plants (see Figure 3-3 in Chapter 3).

Soils

- Review and consider updated soil survey information from on-going soil surveys prior to conducting projects in areas that are currently unmapped and apply appropriate Standard Operating Procedures and Mitigation Measures.

Water

- Areas with shallow groundwater and areas of groundwater-surface water interaction will be identified during the review of the Annual Treatment Plan to help inform selection of treatment method.
- Treatments that may affect 303(d)-listed streams will be noted on the Annual Treatment Plan. Where invasive plant control would remove plants contributing to bank stability or stream shading, control would be delayed or phased as necessary in order to make treatments consistent with 303(d) restoration plans.

Riparian Habitats

- Do not drill seed in riparian areas.
- In riparian areas, targeted grazing will only occur on armored stream banks with sheep or goats (not cattle).

Fish and Other Aquatic Species

- For waterbodies that contain federally threatened or endangered fish species or provide critical habitat, all Project Design Criteria outlined in the Aquatic Restoration Biological Opinion II (ARBO II, USDI 2013a, NMFS 2013) from the U.S. Fish and Wildlife Service and National Marine Fisheries Service would be applied (see Appendix F). If a treatment project cannot be covered by ARBO II, additional consultation with U.S. Fish and Wildlife Service or NMFS would occur before treatment.

Wildlife

- Where domestic sheep or goat grazing is proposed, follow *Recommendations for Domestic Sheep and Goat Management in Wild Sheep Habitat* (Wild Sheep Working Group 2012) for determining appropriate separation. Standards call for site-specific evaluations when domestic sheep and goat use is proposed within 20 miles of wild sheep.

Livestock Grazing

- In monocultures of invasive annual grasses (generally Category 6), livestock grazing would not resume at permitted levels in the treatment area until desired seeded grass species were mature enough to be grazed without suffering damage (generally three growing seasons post treatment, but potentially longer).
- A label restriction states that 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 (Dow AgroSciences 2014). Pastures would be confirmed as not having desirable broadleaf plants through vegetation mapping, monitoring data, and on the ground surveys. In addition, utilizing pastures during time periods when desirable broadleaf plants are dormant would also be emphasized.

Wild Horses

- Minimize activities to limit unintentional movements of wild horses, especially repeated movement of horse herds within the same day.
- Avoid or minimize treatment techniques during peak foaling season (March 1 - June 31)[84].
- Minimize potential adverse impacts to wild horse and burro habitat when using targeted 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.
- Minimize effects to horse preferred habitat that could adversely affect wild horse populations.

Cultural Resources and Resources Important to Native American Tribes

- At least one month prior to beginning treatments, Annual Treatment Plans will be presented to the tribes showing planned treatments as well as major survey and treatment areas. Any resultant coordination will identify where treatments can be delayed, where cultural features must be avoided or protected, and where posting would help tribe members avoid areas. Maps of known invasive plant infestations (see Figure 2-1, Documented Invasive Plants, for example) can also be shared with the tribes at this time.
- Where coordination with the tribes about the Annual Treatment Plan identifies areas where herbicide use would not be consistent with cultural values and uses, alternatives will be implemented where feasible.

Lands with Wilderness Characteristics

- In any lands on the Malheur Resource Area found to contain wilderness characteristics, treatments would be designed so that there would be no effects on those values that would diminish the size of, or otherwise cause the inventory unit to not meet the wilderness criteria. This direction applies until BLM has completed a Resource Management Plan Amendment that addresses how to manage lands with wilderness characteristics.

Standard Operating Procedures and Mitigation Measures

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

Standard Operating Procedures have been identified to reduce adverse effects to environmental and human resources from vegetation treatment activities based on guidance in BLM manuals and handbooks, regulations, and standard BLM and industry practices.[85] The list is not all encompassing, but is designed to give an overview of practices that would be considered when designing and implementing a vegetation treatment project on public lands (USDI 2007b:2-29). Effects described in this EA are predicated on application of the Standard Operating Procedures or equivalent, unless an on-site determination is made that their application is unnecessary to achieve

[84] This is a site-specific application/clarification of the Standard Operating Procedure reading, “Avoid critical periods and minimize impacts to habitat that could adversely affect wild horse and burro populations.”
[85] Manual-directed Standard Operating Procedures and other standing direction may be referred to as best management practices in resource management and other plans, particularly when they apply to water.

their intended purpose or protection. For example, the Standard Operating Procedure to "use herbicides of low toxicity to wild horses and burros, where feasible" would not need to be applied to treatments where wild horses and burros are not expected to occur.

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

2016 PEIS Mitigation Measures (marked as 2016 MMs in the list below) were identified for all potential adverse effects identified for herbicide applications in the *Vegetation Treatments Using Aminopyralid, Fluroxypyr, and Rimsulfuron PEIS* (USDI 2016a), and adopted by its Record of Decision. In other words, NO potentially significant adverse effect identified in the analysis remained at the programmatic scale after the PEIS Mitigation Measures were adopted. Like the Standard Operating Procedures, application of the Mitigation Measures is assumed in the analysis in this EA, and on-site determinations can decide if their application is unnecessary to achieve the intended purpose or protection.

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

Additional guidance, direction, orders, and protection measures can be found in numerous other BLM or Department of the Interior handbooks, manual, and management plans. Exclusion from this Appendix does not indicate that these additional measures are not also potentially applicable. BLM manuals and handbooks are available online at http://www.blm.gov/wo/st/en/info/blm-library/publications/blm_publications/manuals.html

Guidance Documents

Fire Use

BLM handbooks H-9211-1 (*Fire Management Activity Planning Procedures*) and H-9214-1 (*Prescribed Fire Management*), and manuals 1112 (*Safety*), 9210 (*Fire Management*), 9211 (*Fire Planning*), 9214 (*Prescribed Fire*), and 9215 (*Fire Training and Qualifications*).

Mechanical

BLM Handbook H-5000-1 (*Public Domain Forest Management*), and manuals 1112 (*Safety*) and 9015 (*Integrated Weed Management*).

Manual

BLM Domain Forest Management, and manuals 1112 (Safety), and 9015 (Integrated Weed Management).

Biological

BLM manuals 1112 (*Safety*), 4100 (*Grazing Administration*), 9014 (*Use of Biological Control Agents on Public Lands*), and 9015 (*Integrated Weed Management)* and Handbook H-4400-1 (*Rangeland Health Standards*).

Chemical

BLM Handbook H-9011-1 (Chemical Pest Control), and manuals 1112 (Safety), 9011 (Chemical Pest Control), 9015 (Integrated Weed Management), and 9220 (Integrated Pest Management).

General

Fire Use

- Prepare fire management plan.
- Use trained personnel with adequate equipment.
- Minimize frequent burning in arid environments.
- Avoid burning herbicide-treated vegetation for at least 6 months.

Mechanical

- Ensure that power cutting tools have approved spark arresters.
- Ensure that crews have proper fire-suppression tools during the fire season.
- Wash vehicles and equipment before leaving weed infested areas to avoid infecting weed-free areas.
- Keep equipment in good operating condition.

Manual

- Ensure that crews have proper fire-suppression tools during fire season.
- Minimize soil disturbance, which may encourage new weeds to develop.

Biological

- Use only biological control agents that have been tested and approved to ensure they are host specific.
- If using domestic animals, select sites with weeds that are palatable and non-toxic to the animals.
- Manage the intensity and duration of containment by domestic animals to minimize overutilization of desirable plant species.
- Utilize domestic animals to contain the target species in the treatment areas prior to weed seed set. Or if seed set has occurred, do not move the domestic animals to uninfested areas for a period of 7 days.

Chemical

- Prepare an operational and spill contingency plan in advance of treatment.
- Conduct a pretreatment survey before applying herbicides.
- Select the herbicide that is least damaging to the environment while providing the desired results.
- Select herbicide products carefully to minimize additional impacts from degradates, adjuvants, other ingredients, and tank mixtures.
- Apply the least amount of herbicide needed to achieve the desired result.
- Follow herbicide product label for use and storage.
- Have licensed or certified applicators or State-licensed “trainees” apply herbicides, or they can be applied by BLM employees under the direct supervision of a BLM-certified applicator.
- Use only USEPA-approved herbicides and follow product label directions and “advisory” statements.
- Review, understand, and conform to the “Environmental Hazards” section on the herbicide product label. This section warns of known herbicide risks to the environment and provides practical ways to avoid harm to organisms or to the environment.
- Consider surrounding land use before assigning aerial spraying as a treatment method and avoid aerial spraying near agricultural or densely populated areas.
- Minimize the size of application area, when feasible.
- Comply with herbicide-free buffer zones to ensure that drift will not affect crops or nearby residents/ landowners.
- Post treated areas and specify reentry or rest times, if appropriate.
- Notify adjacent landowners prior to treatment, if appropriate.
- Keep a copy of Material Safety Data Sheets (MSDSs) at work sites. MSDSs are available for review at http:// www.cdms.net/.

- Keep records of each application, including the active ingredient, formulation, application rate, date, time, and location.
- Avoid accidental direct spray and spill conditions to minimize risks to resources.
- Avoid aerial spraying during periods of adverse weather conditions (snow or rain imminent, fog, or air turbulence).
- Make helicopter applications at a target airspeed of 40 to 50 miles per hour (mph), and at about 30 to 45 feet above ground.
- Take precautions to minimize drift by not applying herbicides when winds exceed >10 mph (>6 mph for aerial applications), or a serious rainfall event is imminent.
- Use drift control agents and low volatile formulations.
- Conduct pre-treatment surveys for sensitive habitat and Special Status species within or adjacent to proposed treatment areas.
- Consider site characteristics, environmental conditions, and application equipment in order to minimize damage to non-target vegetation.
- Use drift reduction agents, as appropriate, to reduce the drift hazard to non-target species.
- Turn off application equipment at the completion of spray runs and during turns to start another spray run.
- Refer to the herbicide product label when planning revegetation to ensure that subsequent vegetation would not be injured following application of the herbicide.
- Clean OHVs to remove plant material.

The BLM has suspended the use of the adjuvant R-11.

Land Use

Fire Use

- Carefully plan fires in the WUI to avoid or minimize loss of structures and property.
- Notify nearby residents and landowners who could be affected by smoke intrusions or other fire effects.

Mechanical

- Collaborate on project development with nearby landowners and agencies.

Manual

- Collaborate on project development with nearby landowners and agencies.

Biological

- Notify nearby residents and landowners who could be affected by biological control agents.

Chemical

- Consider surrounding land uses before aerial spraying.
- Comply with herbicide-free buffer zones to ensure that drift will not affect crops or nearby residents and landowners.
- Post treated areas and specify reentry times, if appropriate

Air Quality

See Manual 7000 (Soil, Water, and Air Management).

Fire Use

- Have clear smoke management objectives.
- Evaluate weather conditions, including wind speed and atmospheric stability, to predict effects of burn and impacts from smoke.
- Burn when weather conditions favor rapid combustion and dispersion.
- Burn under favorable moisture conditions.
- Use backfires, when applicable.

- Burn small vegetation blocks, when appropriate.
- Manage smoke to prevent air quality violations and minimize impacts to smoke-sensitive areas.
- Coordinate with air pollution and fire control officials, and obtain all applicable smoke management permits, to ensure that burn plans comply with federal, state, and local regulations.

Mechanical
- Maintain equipment in optimal working order.
- Conduct treatment activities during the wetter seasons.
- Use heavy equipment under adequate soil moisture conditions to minimize soil erosion.
- Minimize vehicle speeds on unpaved roads.
- Minimize dust impacts to the extent practicable.

Manual
- Maintain equipment in optimal working order.
- Conduct treatment activities during the wetter seasons.
- Minimize vehicle speeds on unpaved roads.
- Minimize dust impacts to the extent practicable.

Chemical
- Consider the effects of wind, humidity, temperature inversions, and heavy rainfall on herbicide effectiveness and risks.
- Apply herbicides in favorable weather conditions to minimize drift. For example, do not treat when winds exceed 10 mph (>6 mph for aerial applications) or rainfall is imminent.
- Use drift reduction agents, as appropriate, to reduce the drift hazard.
- Select proper application equipment (e.g., spray equipment that produces 200- to 800-micron diameter droplets [spray droplets of 100 microns and less are most prone to drift]).
- Select proper application methods (e.g., set maximum spray heights, use appropriate buffer distances between spray sites and non-target resources).

Soil Resources

See Manual 7000 (Soil, Water, and Air Management).

General
- Assess the susceptibility of the treatment site to soil damage and erosion prior to treatment.

Fire Use
- Prescribe broadcast and other burns that are consistent with soil management activities.
- Plan burns so as to minimize damage to soil resources.
- Conduct burns when moisture content of large fuels, surface organic matter, and soil is high to limit the amount of heat penetration into lower soil surfaces and protect surface organic matter.
- Time treatments to encourage rapid recovery of vegetation.
- Further facilitate revegetation by seeding or planting following treatment.
- When appropriate, reseed following burning to re- introduce species, or to convert a site to a less flammable plant association, rather than to specifically minimize erosion.

Mechanical
- Time treatments to avoid intense rainstorms.
- Time treatments to encourage rapid recovery of vegetation.
- Further facilitate revegetation by seeding or planting following treatment.
- Use equipment that minimizes soil disturbance and compaction.
- Minimize use of heavy equipment on slopes >20%.
- Conduct treatments when the ground is sufficiently dry to support heavy equipment.
- Implement erosion control measures in areas where heavy equipment use occurs.
- Minimize disturbances to biological soil crusts (e.g., by timing treatments when crusts are moist).
- Reinoculate biological crust organisms to aid in their recovery, if possible.

- Conduct mechanical treatments along topographic contours to minimize runoff and erosion.
- When appropriate, leave plant debris on site to retain moisture, supply nutrients, and reduce erosion.
- Consider chaining when soils are frozen and plants are brittle to minimize soil disturbance.
- 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.
- Minimize disturbance to biological soil crusts (e.g., by timing treatments when crusts are moist).
- Reinoculate biological crust organisms to aid in their recovery, if possible.

When appropriate, leave plant debris on site to retain moisture, supply nutrients, and reduce erosion.Biological
- Minimize use of domestic animals if removal of vegetation may cause significant soil erosion or impact biological soil crusts.
- Closely monitor timing and intensity of biological control with domestic animals.
- Avoid grazing on wet soil to minimize compaction and shearing.

Chemical
- Minimize treatments in areas where herbicide runoff is likely, such as steep slopes when heavy rainfall is expected.
- Minimize use of herbicides that have high soil mobility, particularly in areas where soil properties increase the potential for mobility.
- Do not apply granular herbicides on slopes of more than 15% where there is the possibility of runoff carrying the granules into non-target areas.
- To avoid the loss of finer-sized soil particles and avoid having herbicide-treated soils blown or washed off-site, avoid exposing large areas of wind-erosion group 1 or 2 soils when a combination of dry soil and seasonal winds are expected. Mitigation Measures could include the use of selective herbicides to retain some vegetation on site; reseeding so cover is present before the windy season affects dry soils; staggering treatment of strips until stubble regrows enough to provide an acceptable filter strip; rescheduling treatments away from the windy season; or, other measures to prevent wind erosion on these soil groups. (Oregon FEIS MM)

Water Resources

See Manual 7000 (Soil, Water, and Air Management).

Fire Use
- Prescribe burns that are consistent with water management objectives.
- Plan burns to minimize negative impacts to water resources.
- Minimize burning on hillslopes, or revegetate hillslopes shortly after burning.
- Maintain a vegetated buffer between treatment areas and water bodies.

Mechanical
- Minimize removal of desirable vegetation near residential and domestic water sources.
- Do not wash equipment or vehicles in water bodies.
- Maintain minimum 25 foot wide vegetated buffer near streams and wetlands.

Manual
- Maintain vegetated buffer near residential and domestic water sources.
- Minimize removal of desirable vegetation near residential and domestic water sources.
- Minimize removal of desirable vegetation near water bodies.
- Minimize use of domestic animals near residential or domestic water sources.

- Minimize use of domestic animals adjacent to water bodies if trampling or other activities are likely to cause soil erosion or impact water quality.

Chemical

- Consider climate, soil type, slope, and vegetation type when developing herbicide treatment programs.
- Select herbicide products to minimize impacts to water. This is especially important for application scenarios that involve risk from active ingredients in a particular herbicide, as predicted by risk assessments.
- Use local historical weather data to choose the month of treatment.
- Considering the phenology of target aquatic species, schedule treatments based on the condition of the water body and existing water quality conditions.
- Plan to treat between weather fronts (calms) and at appropriate time of day to avoid high winds that increase water movements, and to avoid potential stormwater runoff and water turbidity.
- Review hydrogeologic maps of proposed treatment areas. Note depths to groundwater and areas of shallow groundwater and areas of surface water and groundwater interaction. Minimize treating areas with high risk for groundwater contamination.
- Conduct mixing and loading operations in an area where an accidental spill would not contaminate an aquatic body.
- Do not rinse spray tanks in or near water bodies.
- Do not broadcast pellets where there is danger of contaminating water supplies.
- Minimize the potential effects to surface water quality and quantity by stabilizing terrestrial areas as quickly as possible following treatment.
- Establish appropriate (herbicide-specific) buffer zones for species/populations (Tables A-1 and A-2). (MM)
- Areas with potential for groundwater for domestic or municipal use shall be evaluated through the appropriate, validated model(s) to estimate vulnerability to potential groundwater contamination, and appropriate Mitigation Measures shall be developed if such an area requires the application of herbicides and cannot otherwise be treated with non-herbicide methods. (MM)
- Use appropriate herbicide-free buffer zones for herbicides not labeled for aquatic use based on risk assessment guidance, with minimum widths from water of 100 feet for aerial, 25 feet for vehicle, and 10 feet for hand spray applications.
- Maintain buffers between treatment areas and water bodies. Buffer widths should be developed based on herbicide and site-specific conditions to minimize impacts to water bodies.
- To protect domestic water sources, no herbicide treatments should occur within 100 feet of a well or 200 feet of a spring or known diversion used as a domestic water source unless a written waiver is granted by the user or owner. (Oregon FEIS MM)
- Site-specific analyses for roadside treatments should specifically consider that drainage ditches and structures lead to streams and that normal buffer distances, herbicide selection, and treatment method selection may need to be changed accordingly, particularly where those ditches are connected to streams with Federally Listed or other Special Status species. (Oregon FEIS MM)
- Buffer intermittent stream channels when there is a prediction of rain (including thunderstorms) within 48 hours. (Oregon FEIS MM)
- Proposals to boom or aerially spray herbicides within 200 feet of streams that are within 1,000 feet upstream from a public water supply intake, or spot apply herbicides within 100 feet of streams that are within 500 feet upstream from a public water supply intake, will include coordination with the Oregon Department of Environmental Quality and the municipality to whom the intake belongs. (Oregon FEIS MM)

Wetlands and Riparian Areas

Fire Use
- Following treatment, reseed or replant with native vegetation if the native plant community cannot recover and occupy the site sufficiently.

Mechanical
- Manage riparian areas to provide adequate shade, sediment control, bank stability, and recruitment of wood into stream channels.
- Following treatment, reseed or replant with native vegetation if the native plant community cannot recover and occupy the site sufficiently.

Manual
- Following treatment, reseed or replant with native vegetation if the native plant community cannot recover and occupy the site sufficiently.

Biological
- Manage animals to prevent overgrazing and minimize damage to wetlands.
- Following treatment, reseed or replant with native vegetation if the native plant community cannot recover and occupy the site sufficiently.

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

Vegetation

See Handbook H-4410-1 (National Range Handbook), and manuals 5000 (Forest Management) and 9015 (Integrated Weed Management).

General
- Use weed-free feed for horses and pack animals. Use weed-free straw and mulch for revegetation and other activities.

Fire Use
- Keep fires as small as possible to meet the treatment objectives.
- Conduct low intensity burns to minimize adverse impacts to large vegetation.
- Limit area cleared for fire breaks and clearings to reduce potential for weed infestations.
- Where appropriate, use mechanical treatments to prepare forests for the reintroduction of fire.
- Use plant stock or seed from the same seed zone and from sites of similar elevation when conducting revegetation activities.

Mechanical
- Power wash vehicles and equipment to prevent the introduction and spread of weed and exotic species.
- Remove damaged trees and treat woody residue to limit subsequent mortality by bark beetles.
- Use plant stock or seed from the same seed zone and from sites of similar elevation when conducting revegetation activities.
- Identify and implement any temporary domestic livestock grazing and/or supplemental feeding restrictions needed to enhance desirable vegetation recovery following treatment.

Manual
- Remove damaged trees and treat woody residue to limit subsequent mortality by bark beetles.
- Use plant stock or seed from the same seed zone and from sites of similar elevation when conducting revegetation activities.

Biological

- Use domestic animals at the time they are most likely to damage invasive species.
- Manage animals to prevent overgrazing and minimize damage to sensitive areas.
- Identify and implement any temporary domestic livestock grazing and/or supplemental feeding restrictions needed to enhance desirable vegetation recovery following treatment.
- Consider adjustments in the existing grazing permit, including the application of state or regional grazing administration guidelines, needed to maintain desirable vegetation on the treatment site.
- Use plant stock or seed from the same seed zone and from sites of similar elevation when conducting revegetation activities.

Chemical

- Refer to the herbicide label when planning revegetation to ensure that subsequent vegetation would not be injured following application of the herbicide.
- Use native or sterile plants for revegetation and restoration projects to compete with invasive plants until desired vegetation establishes.
- Minimize the use of terrestrial herbicides (especially sulfometuron methyl) in watersheds with downgradient ponds and streams if potential impacts to aquatic plants are identified. (MM)
- Establish appropriate (herbicide-specific) buffer zones (Tables A-1 and A-2) around downstream water bodies, habitats, and species/populations of interest. Consult the Risk Assessments prepared for the PEIS for more specific information on appropriate buffer distances under different soil, moisture, vegetation, and application scenarios. (MM)
- Limit the aerial application of chlorsulfuron and metsulfuron methyl to areas with difficult land access, where no other means of application are possible. (MM)
- Do not apply sulfometuron methyl aerially. (MM)
- When necessary to protect Special Status plant species, implement all Conservation Measures for plants presented in the *2007 Vegetation Treatments on Bureau of Land Management Lands in 17 Western States and* 2016 *Vegetation Treatments Using Aminopyralid, Fluroxypyr, and Rimsulfuron Biological Assessments* (see *Conservation Measures* later in this Appendix). (MM, 2016 MM)
- Use Table A-5 to establish herbicide-specific buffer zones around downstream water bodies, and associated habitats and non-target plant species/populations of interest for aminopyralid, fluroxypyr, and rimsulfuron. Consult the Risk Assessments for more specific information on appropriate buffer distances under different soil, moisture, vegetation, and application scenarios. (2016 MM)

Pollinators

Chemical

- Complete vegetation treatments seasonally before pollinator foraging plants bloom.
- Time vegetation treatments to take place when foraging pollinators are least active both seasonally and daily.
- Design vegetation treatment projects so that nectar and pollen sources for important pollinators and resources are treated in patches rather than in one single treatment.
- Minimize herbicide application rates. Use typical rather than maximum rates where there are important pollinator resources.
- Maintain herbicide free buffer zones around patches of important pollinator nectar and pollen sources.
- Maintain herbicide free buffer zones around patches of important pollinator nesting habitat and hibernacula.
- Make special note of pollinators that have single host plant species, and minimize herbicide spraying on those plants and in their habitats.

Fish and Other Aquatic Species

See manuals 6500 (Wildlife and Fisheries Management) and 6780 (Habitat Management Plans)

Fire Use

- Maintain vegetated buffers near fish-bearing streams to minimize soil erosion and soil runoff into streams.
- Minimize treatments near fish-bearing streams during periods when fish are in sensitive life stages (e.g., embryo).

Mechanical

- Minimize treatments adjacent to fish-bearing waters.
- Do not wash vehicles in streams or wetlands.
- Refuel and service equipment at least 100 feet from water bodies to reduce the chance for pollutants to enter water.
- Maintain adequate vegetated buffer between treatment area and water body to reduce the potential for sediments and other pollutants to enter the water body.

Manual

- Refuel and service equipment at least 100 feet from water bodies to reduce the chance for pollutants to enter water.
- Minimize removal of desirable vegetation near fish-bearing streams and wetlands.

Biological

- Limit access of domestic animals to streams and other water bodies to minimize sediments entering water and potential for damage to fish habitat.

Chemical

- Use appropriate buffer zones based on label and risk assessment guidance.
- Minimize treatments near fish-bearing water bodies during periods when fish are in life stages most sensitive to the herbicide(s) used, and use spot rather than broadcast or aerial treatments.
- Use appropriate application equipment/method near water bodies if the potential for off-site drift exists.
- For treatment of aquatic vegetation, 1) treat only that portion of the aquatic system necessary to meet vegetation management objectives, 2) use the appropriate application method to minimize the potential for injury to desirable vegetation and aquatic organisms, and 3) follow water use restrictions presented on the herbicide label.
- Limit the use of terrestrial herbicides in watersheds with characteristics suitable for potential surface runoff that have fish-bearing streams during periods when fish are in life stages most sensitive to the herbicide(s) used. (MM)
- To protect Special Status fish and other aquatic organisms, implement all Conservation Measures for aquatic animals presented in the *2007 Vegetation Treatments on Bureau of Land Management Lands in 17 Western States and* 2016 *Vegetation Treatments Using Aminopyralid, Fluroxypyr, and Rimsulfuron Biological Assessments* (see *Conservation Measures* later in this Appendix). (MM, 2016 MM)
- Establish appropriate herbicide-specific buffer zones for water bodies, habitats, or fish or other aquatic species of interest (Tables A-3 and A-4, and recommendations in individual ERAs). (MM)
- Consider the proximity of application areas to salmonid habitat and the possible effects of herbicides on riparian and aquatic vegetation. Maintain appropriate buffer zones around salmonid-bearing streams. (MM)
- At the local level, consider effects to Special Status fish and other aquatic organisms when designing treatment programs. (MM)
- Use of adjuvants with limited toxicity and low volumes is recommended for applications near aquatic habitats. (Oregon FEIS MM)

Wildlife Resources

See manuals 6500 (Wildlife and Fisheries Management) and 6780 (Habitat Management Plans)

Fire Use

- Minimize treatments during nesting and other important periods for birds and other wildlife.
- Minimize treatments of important forage areas immediately prior to important use period(s), unless the burn is designed to stimulate forage growth.

Mechanical

- Minimize treatments during nesting and other important periods for birds and other wildlife.
- Retain wildlife trees and other unique habitat features where practical.

Manual

- Minimize treatments during nesting and other important periods for birds and other wildlife.
- Retain wildlife trees and other unique habitat features where practical.

Biological

- Minimize the use of livestock grazing as a vegetation control measure where and/or when it could impact nesting and/or other important periods for birds and other wildlife.
- Consider and minimize potential adverse impacts to wildlife habitat and minimize the use of livestock grazing as a vegetation control measure where it is likely to result in removal or physical damage to vegetation that provides a critical source of food or cover for wildlife.

Chemical

- Use herbicides of low toxicity to wildlife, where feasible.
- Use spot applications or low-boom broadcast operations where possible to limit the probability of contaminating non-target food and water sources, especially non-target vegetation over areas larger than the treatment area.
- Use timing restrictions (e.g., do not treat during critical wildlife breeding or staging periods) to minimize impacts to wildlife.
- To minimize risks to terrestrial wildlife, do not exceed the typical application rate for applications of dicamba, glyphosate, hexazinone, or triclopyr, where feasible. (MM)
- Minimize the size of application areas, where practical, when applying 2,4-D and Overdrive® to limit impacts to wildlife, particularly through contamination of food items. (MM)
- Where practical, limit glyphosate and hexazinone to spot applications in grazing land and wildlife habitat areas to avoid contamination of wildlife food items. (MM)
- Do not use the adjuvant R-11 (MM)
- Either avoid using glyphosate formulations containing POEA, or seek to use formulations with the least amount of POEA, to reduce risks to amphibians. (MM)
- To protect Special Status wildlife species, implement Conservation Measures for terrestrial animals presented in the *2007 Vegetation Treatments on Bureau of Land Management Lands in 17 Western States and* 2016 *Vegetation Treatments Using Aminopyralid, Fluroxypyr, and Rimsulfuron Biological Assessments* (see *Conservation Measures* later in this Appendix). (MM, 2016 MM)
- Impacts to wildlife from herbicide applications can be reduced by treating habitat during times when the animals are not present or are not breeding, migrating or confined to localized areas (such as crucial winter range). (Oregon FEIS MM)
- When treating native plants in areas where herbivores are likely to congregate, choose herbicides with lower risks due to ingestion. This Mitigation Measure is applicable if large areas of the herbivores’ feeding range would be treated, either because the treatment areas are large or the feeding area for an individual animal is small. (Oregon FEIS MM)
- Where there is a potential for herbivore consumption of treated vegetation, apply dicamba, imazapyr, and metsulfuron methyl at the typical, rather than maximum, application rate to minimize risks. (Oregon FEIS MM)

- Where possible, design native vegetation treatment areas to mimic natural disturbance mosaics. Patchiness is usually beneficial to most wildlife, and patchiness is usually tolerated by species that prefer contiguous habitat. (Oregon FEIS MM)
- Use of adjuvants with limited toxicity and low volumes is recommended for applications near aquatic habitats. (Oregon FEIS MM)
- When conducting herbicide treatments in or near habitats used by special status and listed terrestrial arthropods, design treatments to avoid the use of fluroxypyr, where feasible. If pre-treatment surveys determine the presence of listed terrestrial arthropods, do not use fluroxypyr to treat vegetation. (2016 MM)

Threatened and Endangered Species

See Manual 6840 (Special Status Species) and Vegetation Treatments Using Herbicides on BLM Lands in 17 Western States Programmatic Biological Assessment.

Fire Use

- Survey for Special Status species of concern if project may impact federally- and state-listed species.
- Minimize direct impacts to species of concern, unless studies show that species will benefit from fire.

Mechanical

- Minimize use of ground- disturbing equipment near Special Status species of concern.
- Survey for species of concern if project could impact these species.
- Use temporary roads when long-term access is not required.

Manual

- Survey for Special Status species of concern if project could impact these species.

Biological

- Survey for Special Status species of concern if project could impact these species.

Chemical

- Provide clearances for Special Status species before treating an area as required by Special Status Species Program policy. Consider effects to Special Status species when designing herbicide treatment programs.
- Use a selective herbicide and a wick or backpack sprayer to minimize risks to Special Status plants.
- Avoid treating vegetation during time-sensitive periods (e.g., nesting and migration, sensitive life stages) for Special Status species in area to be treated.

Livestock

See Handbook H-4120-1 (Grazing Management).

General

- Notify permittees of proposed treatments and identify any needed livestock grazing, feeding, or slaughter restrictions.Design treatments to take advantage of normal livestock grazing rest periods, when possible, and minimize impacts to livestock grazing permits.
- Provide alternative forage sites for livestock, if possible.
- Notify permittees of the project to improve coordination and avoid potential conflicts and safety concerns during implementation of the treatment.

Chemical

- Whenever possible and whenever needed, schedule treatments when livestock are not present in the treatment area. Design treatments to take advantage of normal livestock grazing rest periods, when possible.
- As directed by the herbicide product label, remove livestock from treatment sites prior to herbicide application, where applicable.
- Use herbicides of low toxicity to livestock, where feasible.

- Take into account the different types of application equipment and methods, where possible, to reduce the probability of contamination of non-target food and water sources.
- Minimize potential risks to livestock by applying glyphosate, hexazinone, or triclopyr at the typical application rate where feasible. (MM)
- Do not apply 2,4-D, dicamba, Overdrive®, picloram, or triclopyr across large application areas, where feasible, to limit impacts to livestock, particularly through contamination of food items. (MM)
- Where feasible, limit glyphosate and hexazinone to spot applications in rangeland. (MM)
- Where there is a potential for livestock consumption of treated vegetation, apply dicamba, imazapyr, and metsulfuron methyl at the typical, rather than maximum, application rate to minimize risks to livestock. (Oregon FEIS MM)

Wild Horses and Burros

General

- Avoid critical periods and minimize impacts to critical habitat that could adversely affect wild horse or burro populations[86].

Fire Use

- Minimize potential hazards to horses and burros by ensuring adequate escape opportunities.

Chemical

- Minimize using herbicides in areas grazed by wild horses and burros.
- Use herbicides of low toxicity to wild horses and burros, where feasible.
- Remove wild horses and burros from identified treatment areas prior to herbicide application, in accordance with herbicide product label directions for livestock.
- Take into account the different types of application equipment and methods, where possible, to reduce the probability of contaminating non-target food and water sources.
- Minimize potential risks to wild horses and burros by applying glyphosate, hexazinone, and triclopyr at the typical application rate, where feasible, in areas associated with wild horse and burro use. (MM)
- Consider the size of the application area when making applications of 2,4-D, dicamba, Overdrive®, picloram, and triclopyr in order to reduce potential impacts to wild horses and burros. (MM)
- Apply herbicide label grazing restrictions for livestock to herbicide treatment areas that support populations of wild horses and burros. (MM)
- Where practical, limit glyphosate and hexazinone to spot applications in rangeland. (MM)
- Do not apply 2,4-D in HMAs during peak foaling season. (MM)
- Do not exceed the typical application rate of Overdrive® or hexazinone in HMAs during the peak foaling season in areas where foaling is known to take place. (MM)
- Where there is a potential for wild horse or burro consumption of treated vegetation, apply dicamba, imazapyr, and metsulfuron methyl at the typical, rather than maximum, application rate to minimize risks. (Oregon FEIS MM)
- Do not broadcast spray 2,4-D, clopyralid, diflufenzopyr + dicamba, glyphosate, hexazinone, picloram, or triclopyr where wild horses have unrestricted access to treated areas, or reduce risks to wild horses from these herbicides by herding wild horses out of treatment areas. (Oregon FEIS MM)
- To limit adverse effects to wild horses and burros, particularly through the contamination of food items, treatments should not exceed 15 percent of any Herd Management Area at any given time. (Oregon FEIS MM)

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[86] A Project Design Feature adopted by the Vale District clarifies this to “Avoid or minimize treatment techniques during peak foaling season (March 1 - June 31).”

Paleontological and Cultural Resources

See handbooks H-8120-1 (Guidelines for Conducting Tribal Consultation) and H-8270-1 (General Procedural Guidance for Paleontological Resource Management), and manuals 8100 (The Foundations for Managing Cultural Resources), 8120 (Tribal Consultation Under Cultural Resource Authorities), and 8270 (Paleontological Resource Management). See also: Programmatic Agreement among the Bureau of Land Management, the Advisory Council on Historic Preservation, and the National Conference of State Historic Preservation Officers Regarding the Manner in Which BLM Will Meet Its Responsibilities Under the *National Historic Preservation Act* (1997) and the State Protocol between the Oregon-Washington State Director of the Bureau of Land Management (BLM) and The Oregon State Historic Preservation Officer (SHPO) regarding the manner in which the Bureau of Land Management will meet its responsibilities under the *National Historic Preservation Act* and the National Programmatic Agreement among the BLM, the Advisory Council on Historic Preservation, and The National Conference of State Historic Preservation Officers. (2015).

General

- Follow standard procedures for compliance with Section 106 of the *National Historic Preservation Act* as implemented through the National Programmatic Agreement and state protocols or 36 CFR Part 800, including necessary consultations with the State Historic Preservation Officers and affected tribes.
- Follow BLM Handbook H-8270-1 to determine known Condition 1 and Condition 2 paleontological areas, or collect information through inventory to establish Condition 1 and Condition 2 areas, determine resource types at risk from the proposed treatment, and develop appropriate measures to minimize or mitigate adverse impacts.
- Identify opportunities to meet tribal cultural use plant objectives for projects on public lands.

Fire Use

- Identify cultural resource types at risk from fire use and design inventories that are sufficient to locate these resources. Provide measures to minimize impacts. Monitor significant paleontological and cultural resources for potential looting of materials where they have been exposed by fire.

Mechanical

- Identify cultural resource types at risk from mechanical treatments and design inventories that are sufficient to locate these resources. Provide measures to minimize impacts.
- Consult with tribes to locate any areas of vegetation that are of significance to the tribe and that might be affected, adversely or beneficially, by mechanical treatments.

Manual

- Identify cultural resource types at risk from manual treatments and design inventories that are sufficient to locate these resources. Provide measures to minimize impacts.
- Consult with tribes to locate any areas of vegetation that are of significance to the tribe and that might be affected, adversely or beneficially, by manual treatments.

Biological

- Consult with tribes to locate any areas of vegetation that are of significance to the tribe and that might be affected, adversely or beneficially, by biological treatments.

Chemical

- Consult with tribes to locate any areas of vegetation that are of significance to the tribe and that might be affected by herbicide treatments; work with tribes to minimize impacts to these resources.
- Follow guidance under Human Health and Safety in the PEIS in areas that may be visited by Native peoples after treatments.
- Do not exceed the typical application rate when applying 2,4-D, fluridone, hexazinone, and triclopyr in known traditional use areas. (MM)

Visual Resources

See handbooks H-8410-1 (Visual Resource Inventory) and H-8431-1 (Visual Resource Contrast Rating), and Manual 8400 (Visual Resource Management).

General
- At areas such as visual overlooks, leave sufficient vegetation in place, where possible, to screen views of vegetation treatments.
- Design activities to repeat the form, line, color, and texture of the natural landscape character

Fire Use
- Minimize use of fire in sensitive watersheds to reduce the creation of large areas of browned vegetation.
- Consider the surrounding land use before assigning fire as a treatment method.Avoid use of fire near agricultural or densely populated areas, where feasible.
- Lessen visual effects in Class I and Class II visual resource areas.

Mechanical
- Minimize dust drift, especially near recreational or other public use areas.
- Minimize loss of desirable vegetation near high public use areas.
- Minimize earthwork and locate away from prominent topographic features.
- Revegetate treated sites.
- Lessen visual effects in Class I and Class II visual resource areas.

Manual
- Minimize dust drift, especially near recreational or other public use areas.
- Minimize loss of desirable vegetation near high public use areas.
- Lessen visual effects in Class I and Class II visual resource areas.

Biological
- At areas such as visual overlooks, leave sufficient vegetation in place, where possible, to screen views of vegetation treatments.
- Lessen visual effects in Class I and Class II visual resource areas.

Chemical
- Minimize the use of broadcast foliar applications in sensitive watersheds to avoid creating large areas of browned vegetation.
- Consider the surrounding land use before assigning aerial spraying as an application method.
- Minimize off-site drift and mobility of herbicides (e.g., do not treat when winds exceed 10 mph; minimize treatment in areas where herbicide runoff is likely; establish appropriate buffer widths between treatment areas and residences) to contain visual changes to the intended treatment area.
- If the area is a Class I or II visual resource, ensure that the change to the characteristic landscape is low and does not attract attention (Class I), or if seen, does not attract the attention of the casual viewer (Class II).
- Lessen visual impacts by: 1) designing projects to blend in with topographic forms; 2) leaving some low growing trees or planting some low-growing tree seedlings adjacent to the treatment area to screen short-term effects; and 3) revegetating the site following treatment.
- When restoring treated areas, design activities to repeat the form, line, color, and texture of the natural landscape character conditions to meet established Visual Resource Management (VRM) objectives.

Wilderness and Other Special Areas

See handbooks H-8550-1 (Management of Wilderness Study Areas (WSAs)), and H-8560-1 (Management of Designated Wilderness Study Areas), and Manual 8351 (Wild and Scenic Rivers).

General

- Encourage backcountry pack and saddle stock users to feed their livestock only weed-free feed for several days before entering a Wilderness Area, and to bring only weed-free hay and straw onto BLM lands.
- Encourage stock users to tie and/or hold stock in such a way as to minimize soil disturbance and loss of native vegetation.
- Revegetate disturbed sites with native species if there is no reasonable expectation of natural regeneration.
- Provide educational materials at trailheads and other Wilderness entry points to educate the public on the need to prevent the spread of weeds.
- Use the least intrusive methods possible to achieve objectives, and use non-motorized equipment in Wilderness and off existing routes in Wilderness Study Areas, and where possible in other areas.
- Address Wilderness and special areas in management plans.
- Control of weed infestations shall be carried out in a manner compatible with the intent of Wild and Scenic River management objectives.

Fire Use

- Minimize soil-disturbing activities during fire control or prescribed fire activities.
- Revegetate sites with native species if there is no reasonable expectation of natural regeneration.
- Maintain adequate buffers for Wild and Scenic Rivers.

Mechanical

- If mechanized equipment is required, use the minimum amount of equipment needed.
- Time the work for weekdays or off-season.
- Require shut down of work before evening if work is located near campsites.
- If aircraft are used, plan flight paths to minimize impacts on visitors and wildlife.
- Revegetate sites with native species if there is no reasonable expectation of natural regeneration.
- Maintain adequate buffers for Wild and Scenic Rivers.

Manual

- Revegetate sites with native species if there is no reasonable expectation of natural regeneration.
- Maintain adequate buffers for Wild and Scenic Rivers.

Biological

- Maintain adequate buffers for Wild and Scenic Rivers.

Chemical

- Use the “minimum tool” to treat noxious weeds and other invasive plants, relying primarily on the use of ground based tools, including backpack pumps, hand sprayers, and pumps mounted on pack and saddle stock.
- Use herbicides only when they are the minimum treatment method necessary to control weeds that are spreading within the Wilderness or threaten lands outside the Wilderness.
- Give preference to herbicides that have the least impact on non-target species and the wilderness environment.
- Implement herbicide treatments during periods of low human use, where feasible. Mitigation Measures that may apply to Wilderness and other special area resources are associated with human and ecological health and recreation (see Mitigation Measures for Vegetation, Fish and Other Aquatic Species, Wildlife Resources, Recreation, and Human Health and Safety). (MM)

Recreation

See Handbook H-1601-1 (Land Use Planning Handbook).

General

- Notify the public of treatment methods, hazards, times, and nearby alternative recreation areas.

Fire Use
- Control public access to potential burn areas.
- Schedule treatments to avoid peak recreational use times, unless treatments must be timed during peak times to maximize effectiveness.

Mechanical
- Control public access until potential treatment hazards no longer exist.
- Schedule treatments to avoid peak recreational use times, unless treatments must be timed during peak times to maximize effectiveness.

Manual
- Control public access until potential treatment hazards no longer exist.
- Schedule treatments to avoid peak recreational use times, unless treatments must be timed during peak times to maximize effectiveness.

Biological
- Control public access in areas with control agents to ensure that agents are effective.
- Schedule treatments to avoid peak recreational use times, unless treatments must be timed during peak times to maximize effectiveness.
- Notify the public of treatment methods, hazards, times, and nearby alternative recreation areas.

Chemical
- Schedule treatments to avoid peak recreational use times, while taking into account the optimum management period for the targeted species.
- Adhere to entry restrictions identified on the herbicide product label for public and worker access.
- Post signs noting exclusion areas and the duration of exclusion, if necessary.
- Mitigation Measures that may apply to recreational resources are associated with human and ecological health (see Mitigation Measures for Vegetation, Fish and Other Aquatic Species, Wildlife Resources, and Human Health and Safety). (MM)

Social and Economic Values

General
- Post treatment areas.
- Notify adjacent landowners, grazing permittees, the public, and emergency personnel of treatments.
- Control public access to treatment areas.
- Consult with Native American tribes and Alaska Natives whose health and economies might be affected by the project.
- To the extent feasible, hire local contractors and purchase supplies locally.

Chemical
- Consider surrounding land use before selecting aerial spraying as a treatment method, and avoid aerial spraying near agricultural or densely-populated areas.
- Post treated areas and specify reentry or rest times, if appropriate.
- Notify grazing permittees of livestock feeding restrictions in treated areas, if necessary, as per herbicide product label instructions.
- Notify the public of the project to improve coordination and avoid potential conflicts and safety concerns during implementation of the treatment.
- Control public access until potential treatment hazards no longer exist, per herbicide product label instructions.
- Observe restricted entry intervals specified by the herbicide product label.
- Notify local emergency personnel of proposed treatments.
- Use spot applications or low-boom broadcast applications where possible to limit the probability of contaminating non-target food and water sources.
- Consult with Native American tribes to locate any areas of vegetation that are of significance to the tribes and Native groups and that might be affected by herbicide treatments.

- To the degree possible within the law, hire local contractors and workers to assist with herbicide application projects and purchase materials and supplies for herbicide treatment projects (including the herbicides) through local suppliers.
- To minimize fears based on lack of information, provide public educational information on the need for vegetation treatments and the use of herbicides in an integrated vegetation management program for projects proposing local use of herbicides.
- For herbicides with label-specified re-entry intervals, post information at access points to recreation sites or other designated public use or product collection areas notifying the public of planned herbicide treatments in languages known to be used by persons likely to be using the area to be treated. Posting should include the date(s) of treatment, the herbicide to be used, the date or time the posting expires, and a name and phone number of who to call for more information. (Oregon FEIS MM)
- Consider the potential for treatments to affect communities from herbicide-contaminated resources originating from the BLM, such as subsistence resources or water used downstream for human or agricultural uses. (Oregon FEIS MM)
- Coordinate with and/or notify neighboring landowners who may want to treat, or are already treating, adjacent lands. (Oregon FEIS MM)
- To the extent permitted by normal contracting authority, ensure materials safety data sheets and other informational or precautionary materials are available in languages spoken by the work crews implementing treatments. This includes but is not limited to material such as Occupational Safety and Health Administration standards along with agency, industry and manufacturers' recommendations and Human Health and Safety Standard Operating Procedures and Mitigation Measures or equivalent. (Oregon FEIS MM)

Rights-of-way

General
- Coordinate vegetation management activities where joint or multiple use of a ROW exists.
- Notify other public land users within or adjacent to the ROW proposed for treatment.

Fire Use
- Manage burns under powerlines so as to avoid negative impacts to the powerline.

Mechanical
- Apply appropriate safety measures when operating equipment within utility ROW corridors.
- Minimize exposed soil areas during treatment.
- Keep operations within prescribed ROW.

Manual
- Always use appropriate safety equipment and operating procedures.
- Utilize methods for disposal of vegetation that prevent spreading or reinfestation of unwanted vegetation.

Chemical
- Use only herbicides that are approved for use in ROW areas.

Human Health and Safety

General
- Wear appropriate safety equipment and clothing, and use equipment that is properly maintained.

Fire Use
- Use some form of pretreatment, such as mechanical or manual treatment, in areas where fire cannot be safely introduced because of hazardous fuel buildup.
- Notify nearby residents who could be affected by smoke.
- Maintain adequate safety buffers between treatment area and residences/structures.

- Burn vegetation debris off ROWs to ensure that smoke does not provide a conductive path from the transmission line or electrical equipment to the ground.

Mechanical

- Cut all brush and tree stumps flat, where possible, to eliminate sharp points that could injure a worker or the public.
- Ensure that only qualified personnel cut trees near powerlines.

Manual

- Cut all brush and tree stumps flat, where possible, to eliminate sharp points that could injure a worker or the public.

Chemical

- Establish a buffer between treatment areas and human residences based on guidance given in the HHRA, with a minimum buffer of ¼ mile for aerial applications and 100 feet for ground applications, unless a written waiver is granted.
- Use protective equipment as directed by the herbicide product label.
- Post treated areas with appropriate signs at common public access areas.
- Observe restricted entry intervals specified by the herbicide product label.
- Provide public notification in newspapers or other media where the potential exists for public exposure.
- Store herbicides in secure, herbicide-approved storage.
- Have a copy of MSDSs at work site.
- Notify local emergency personnel of proposed treatments.
- Contain and clean up spills and request help as needed.
- Secure containers during transport.
- Follow label directions for use and storage.
- Dispose of unwanted herbicides promptly and correctly.
- Use the typical application rate, where feasible, when applying 2,4-D, fluridone, hexazinone, and triclopyr to reduce risk to workers and the public. (MM)
- Do not apply sulfometuron methyl aerially. (MM)
- Limit application of chlorsulfuron via ground broadcast applications at the maximum application rate. (MM)
- Do not apply hexazinone with an over-the-shoulder broadcast applicator (backpack sprayer). (MM)
- Consideration should be given to herbicides other than 2,4-D; use of 2,4-D should be limited to situations where other herbicides are ineffective or in situations in which the risks posed by 2,4-D can be mitigated (Oregon FEIS MM).
- Do not apply triclopyr by any broadcast method (Oregon FEIS MM). (This Mitigation Measure is not applied in this analysis because an updated Risk Assessment for triclopyr found zero risk for all worker and public exposure scenarios at the typical rate.)

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

Application Scenario	Chlorsulfuron	Fluridone	Imazapic	Overdrive	Sulfometuron methyl
Buffer Distance (feet) from Non-target Aquatic Plants					
Typical Application Rate					
Aerial	0	NE	0	NA	1,300
Low Boom[1]	0	NE	0	100	900
High Boom[1]	0	NE	0	900	900
Maximum Application Rate					
Aerial	300	NE	300	NA	1,500
Low Boom[2]	0	NE	0	900	900
High Boom[2]	0	NE	0	900	900

Application Scenario	Chlorsulfuron	Fluridone	Imazapic	Overdrive	Sulfometuron methyl
Buffer Distance (feet) from Non-target Terrestrial Plants					
Typical Application Rate					
Aerial	1,350	NE	0	NA	0
Low Boom[1]	900	NE	0	0	0
High Boom[1]	900	NE	0	100	0
Maximum Application Rate					
Aerial	1,350	NE	900	NA	0
Low Boom[1]	1,000	NE	0	100	0
High Boom[1]	1,000	NE	0	100	0
Buffer Distance (feet) from Threatened, Endangered, and Sensitive Plants					
Typical Application Rate					
Aerial	1,400	NE	0	NA	1,500
Low Boom[1]	1,000	NE	0	100	1,100
High Boom[1]	1,000	NE	0	900	1,000
Maximum Application Rate					
Aerial	1,400	NE	900	NA	1,500
Low Boom[1]	1,050	NE	0	900	1,100
High Boom[1]	1,000	NE	0	900	1,000

1High boom is 50 inches above ground and low boom is 20 inches above ground.
NE =Not evaluated and NA =not applicable.
Buffer distances are the smallest modeled distance at which no risk was predicted. In some cases, buffer distances were extrapolated if the largest distance modeled still resulted in risk, or interpolated if greater precision was required.

Table A-2. Buffer Distances to Minimize Risk to Vegetation from Off-Site Drift of Forest Service-Evaluated Herbicides

Application Scenario	2,4-D	Dicamba	Clopyralid	Glyphosate	Hexazinone	Imazapyr	Metsulfuron methyl	Picloram	Triclopyr
Buffer Distance (feet) from Susceptible Plants[1]									
Typical Application Rate									
Aerial	NE	>900	900	300	300	900	900	>900	500
Low Boom	NE	300	900	50	NE	900	900	>900	300
Maximum Application Rate									
Aerial	NE	>900	1,000	300	900	>900	>900	>900	>900
Low Boom	NE	900	1 000	300	NE	>900	>900	>900	>900
Buffer Distance (feet) from Tolerant Terrestrial Plants									
Typical Application Rate									
Aerial	NE	0	0	25	NE	100	50	25	NE
Low Boom	NE	0	0	25	0	25	25	25	NE
Maximum Application Rate									
Aerial	NE	0	25	50	NE	300	100	50	NE
Low Boom	NE	0	25	25	100	50	25	25	NE

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

Table A-3. Buffer Distances to Minimize Risk to Non-Special Status Fish and Aquatic Invertebrates from Off-Site Drift of BLM-Evaluated Herbicides from Broadcast and Aerial Treatments

Application Scenario	Chlorsulfuron	Fluridone	Imazapic	Overdrive	Sulfometuron methyl
Minimum Buffer Distance (feet) from Fish and Aquatic Invertebrates					
Typical Application Rate					
Aerial	0	NA	0	NA	0
Low boom	0	NA	0	0	0
High boom	0	NA	0	0	0
Maximum Application Rate					
Aerial	0	NA	0	NA	0
Low boom	0	NA	0	0	0
High boom	0	NA	0	0	0

NA Not applicable. Boom height= The Tier I ground application model allows selection of a low (20 inches) or a high (50 inches) boom height.

Table A-4. Buffer Distances to Minimize Risk to Special Status Fish and Aquatic Invertebrates from Off-Site Drift of BLM-Evaluated Herbicides from Broadcast and Aerial Treatments

Application Scenario	Chlorsulfuron	Fluridone	Imazapic	Overdrive	Sulfometuron methyl
Minimum Buffer Distance (feet) from Fish and Aquatic Invertebrates					
Typical Application Rate					
Aerial	0	NA	0	NA	0
Low boom	0	NA	0	0	0
High boom	0	NA	0	0	0
Maximum Application Rate					
Aerial	0	NA	0	NA	0
Low boom	0	NA	0	0	0
High boom	0	NA	0	0	0

NA= Not applicable. Boom height= The Tier I ground application model allows selection of a low (20 inches) or a high (50 inches) boom height.

Table A-5. Buffer Distances (in feet) to Minimize Risk to Non-target Vegetation from Off-site Drift

Application Scenario	Aminopyralid	Fluroxypyr	Rimsulfuron
Buffer Distance (feet) from Non-Target Terrestrial Plants			
Typical Application Rate			
Plane[1]	1,300	1,200	1,600
Helicopter[1]	1,200	900	1,400
High Boom[2]	200	400	400
Low Boom[2]	25	100	100
Maximum Application Rate			
Plane	1,800	1,500	1,900
Helicopter	1,600	1,400	1,600
High Boom	400	600	700
Low Boom	100	400	400
Buffer Distance (feet) from Terrestrial Threatened, Endangered, and Sensitive Plants			
Typical Application Rate			
Plane	1,800	1,200	1,600
Helicopter	1,600	900	1,400
High Boom	400	400	400
Low Boom	100	100	100

Application Scenario	Aminopyralid	Fluroxypyr	Rimsulfuron
Maximum Application Rate			
Plane	2,000	1,500	1,900
Helicopter	1,700	1,500	1,600
High Boom	600	700	700
Low Boom	400	600	400
Buffer Distance (feet) from Non-Target Aquatic Plants[3]			
Typical Application Rate			
Plane	NA[4]	NA	1,300
Helicopter	NA	NA	1,000
High Boom	NA	NA	200
Low Boom	NA	NA	100
Maximum Application Rate			
Plane	NA	NA	1,400
Helicopter	NA	NA	1,800
High Boom	NA	NA	300
Low Boom	NA	NA	100

1 Aerial applications over both forested and non-forested land were considered in the ERAs. The largest buffer distances are presented in this table.
2 High boom is 50 inches above ground and low boom is 20 inches above ground.
3 Aquatic plants in ponds and streams were considered in the ERAs. The largest buffer distances are presented in this table.
4 NA means that no buffers are required, since direct spray of plants was not predicted to result in adverse effects. However, a direct spray into an aquatic habitat is not an approved use of these herbicides.
Buffer distances are the smallest modeled distance at which no risk was predicted. In some cases, buffer distances were extrapolated if the largest distance modeled still resulted in risk, or interpolated if greater precision was required.

Oregon Greater Sage-Grouse Approved Resource Management Plan Amendment

The Oregon Greater Sage-Grouse Approved Resource Management Plan Amendment (USDI 2015a) amends all of the Resource Management Plans in place on the Vale District. The amendments include Greater Sage-Grouse habitat management direction that avoids and minimizes additional disturbance in Greater Sage-Grouse habitat management areas. Relevant objectives, management direction, and required design features can be found in Chapter 1, *Conformance with Conformance with Land Use Plans, Laws, Policies, and other Decisions*.

Best Management Practices for Noxious Weed Management

Best Management Practices (BMPs) are those land and resource management techniques designed to maximize beneficial results and minimize negative impacts of management actions. Interdisciplinary site-specific analysis is necessary to determine which management practices would be necessary to meet specific goals. BMP's described are designed to assist in achieving the objectives for maintaining or improving water quality, soil productivity, and the protection of watershed resources. The ones specific to noxious weed management are provided below. They are included in the District's *Resource Management Plan* under a variety of resource headings. The ones specific to noxious weed management are provided below.

- All contractors and land-use operators moving surface-disturbing equipment in or out of weed-infested areas should clean their equipment before and after use on public land.

- Control weeds annually in areas frequently disturbed such as gravel pits, recreation sites, road sides, live-stock concentration areas.
- Consider livestock quarantine, removal, or timing limitations in weed-infested areas.
- All seed, hay, straw, mulch, or other vegetation material transported and used on public land weed-free zones for site stability, rehabilitation, or project facilitation should be certified by a qualified Federal, state or county officer as free of noxious weeds and noxious weed seed. All baled feed, pelletized feed, and grain transported into weed-free zones and used to feed livestock should also be certified as free of noxious weed seed.
- It is recommended that all vehicles, including off-road and all-terrain, traveling in or out of weed-infested areas should clean their equipment before and after use on public land.

Invasive Plant Prevention Measures

Invasive Plant Prevention Measures are designed to prevent the spread of invasive plants by minimizing the amount of existing non-target vegetation that is disturbed or destroyed during project or vegetation treatment actions (USDI 2007a:2-20). They are designed to work in conjunction with BLM's policy requiring that planning for ground-disturbing projects in the Resource Area, or those that have the potential to alter plant communities, include an assessment of the risk of introducing noxious weeds, and if there is a moderate or high risk of spread, actions to reduce the risk must be implemented and monitoring of the site must be conducted to prevent establishment of new infestations.

Project Planning

- Incorporate prevention measures into project layout and design, alternative evaluation, and project decisions to prevent the introduction or spread of weeds.
- Determine prevention and maintenance needs, including the use of herbicides, at the onset of project planning.
- Before ground-disturbing activities begin, inventory weed infestations and prioritize areas for treatment in project operating areas and along access routes.
- Remove sources of weed seed and propagules to prevent the spread of existing weeds and new weed infestations.
- Pre-treat high-risk sites for weed establishment and spread before implementing projects.
- Post weed awareness messages and prevention practices at strategic locations such as trailheads, roads, boat launches, and public land kiosks.
- Coordinate project activities with nearby herbicide applications to maximize the cost-effectiveness of weed treatments.

Project Development

- Minimize soil disturbance to the extent practical, consistent with project objectives.
- Avoid creating soil conditions that promote weed germination and establishment.
- To prevent weed germination and establishment, retain native vegetation in and around project activity areas and keep soil disturbance to a minimum, consistent with project objectives.
- Locate and use weed-free project staging areas. Avoid or minimize all types of travel through weed-infested areas, or restrict travel to periods when the spread of seeds or propagules is least likely.
- Prevent the introduction and spread of weeds caused by moving weed-infested sand, gravel, borrow, and fill material.

- Inspect material sources on site, and ensure that they are weed-free before use and transport. Treat weed-infested sources to eradicate weed seed and plant parts, and strip and stockpile contaminated material before any use of pit material.
- Survey the area where material from treated weed-infested sources is used for at least 3 years after project completion to ensure that any weeds transported to the site are promptly detected and controlled.
- Prevent weed establishment by not driving through weed-infested areas.
- Inspect and document weed establishment at access roads, cleaning sites, and all disturbed areas; control infestations to prevent spread within the project area.
- Avoid acquiring water for dust abatement where access to the water is through weed-infested sites.
- Identify sites where equipment can be cleaned. Clean equipment before entering public lands.
- Clean all equipment before leaving the project site if operating in areas infested with weeds.
- Inspect and treat weeds that establish at equipment cleaning sites.
- Ensure that rental equipment is free of weed seed.
- Inspect, remove, and properly dispose of weed seed and plant parts found on workers' clothing and equipment. Proper disposal entails bagging the seeds and plant parts and incinerating them.

Revegetation

- Include weed prevention measures, including project inspection and documentation, in operation and reclamation plans.
- Retain bonds until reclamation requirements, including weed treatments, are completed, based on inspection and documentation.
- To prevent conditions favoring weed establishment, re-establish vegetation on bare ground caused by project disturbance as soon as possible using either natural recovery or artificial techniques.
- Maintain stockpiled, uninfested material in a weed-free condition.
- Revegetate disturbed soil (except travel ways on surfaced projects) in a manner that optimizes plant establishment for each specific project site. For each project, define what constitutes disturbed soil and objectives for plant cover revegetation. Revegetation may include topsoil replacement, planting, seeding, fertilization, liming, and weed-free mulching, as necessary.
- Where practical, stockpile weed-seed-free topsoil and replace it on disturbed areas (e.g., road embankments or landings).
- Inspect seed and straw mulch to be used for site rehabilitation (for wattles, straw bales, dams, etc.) and certify that they are free of weed seed and propagules.
- Inspect and document all limited term ground-disturbing operations in noxious weed infested areas for at least 3 growing seasons following completion of the project.
- Use native material where appropriate and feasible. Use certified weed-free or weed-seed-free hay or straw where certified materials are required and/or are reasonably available.
- Provide briefings that identify operational practices to reduce weed spread (for example, avoiding known weed infestation areas when locating fire lines).
- Evaluate options, including closure, to regulate the flow of traffic on sites where desired vegetation needs to be established. Sites could include road and trail ROW, and other areas of disturbed soils.

Conservation Measures from the 2007 and 2016 PEISs Biological Assessments

Mitigation Measures (above) include "when necessary to protect Special Status [plant/fish/wildlife species], implement all Conservation Measures for [plant/fish/wildlife species] presented in the *Vegetation Treatments on Bureau of Land Management Lands in 17 Western States Programmatic Biological Assessment*" (USDI 2007f). Those Conservation Measures are presented here for use with Special Status species as needed. Conservation Measures for mammals, birds, arthropods, and terrestrial mollusks are generally species specific. Special Status species with Conservation Measures are included below; all Bureau Sensitive species do not have Conservation Measures. However, Conservation Measures for similar species can be found in the 2007 and 2016 PEIS Biological Assessments (for example, there are no Conservation Measures to protect the Bureau Sensitive American white pelican, but, when necessary, implementation of Conservation Measures for the Brown Pelican may be appropriate).

Given the low toxicity of aminopyralid, fluroxypyr, and rimsulfuron to fauna, likely uses of the herbicides, and Standard Operating Procedures for minimizing the risk of spills, no new aquatic or terrestrial animal Conservation Measures have been developed for herbicide treatments using aminopyralid, fluroxypyr, or rimsulfuron. Additional plant Conservation Measures were adopted as part of the *Biological Assessment for Vegetation Treatments Using Aminopyralid, Fluroxypyr, and Rimsulfuron* (USDI 2016e) and are included below.

Plant Conservation Measures

As dictated in BLM Manual 6840 (*Special Status Species Management*), local BLM offices are required to develop and implement management plans and programs that will conserve listed species and their habitats. In addition, NEPA documentation related to treatment activities (i.e., projects) will be prepared that identify any TEP[87] plant species or their critical habitat that are present in the proposed treatment areas, and that list the measures that will be taken to protect them.

Many local BLM offices already have management plans in place that ensure the protection of these plant species during activities on public land. However, a discussion of these existing plans is outside the scope of this programmatic BA. The following general guidance applies to all management plans developed at the local level.

Required steps include the following:

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

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

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

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

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

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

The following Conservation Measures refer to sites where broadcast spraying of herbicides, either by ground or aerial methods, is desired. Manual spot treatment of undesirable vegetation can occur within the listed buffer zones if it is determined by local biologists that this method of herbicide application would not pose risks to TEP plant species in the vicinity. Additional precautions during spot treatments of vegetation within habitats where TEP plant species occur should be considered while planning local treatment programs, and should be included as Conservation Measures in local-level NEPA documentation.

The buffer distances provided below are conservative estimates, based on the information provided by ERAs, and are designed to provide protection to TEP plants. Some ERAs used regression analysis to predict the smallest buffer distance to ensure no risks to TEP plants. In most cases, where regression analyses were not performed, suggested buffers extend out to the first modeled distance from the application site for which no risks were predicted. In some instances the jump between modeled distances was quite large (e.g., 100 feet to 900 feet). Regression analyses could be completed at the local level using the interactive spreadsheets developed for the ERAs, using information in ERAs and for local site conditions (e.g., soil type, annual precipitation, vegetation type, and treatment method), to calculate more precise, and possibly smaller buffers for some herbicides.

2,4-D

- Because the risks associated with this herbicide were not assessed, do not spray within ½ mile of terrestrial plant species or aquatic habitats where TEP aquatic plant species occur.
- Do not use aquatic formulations in aquatic habitats where TEP aquatic plant species occur.
- Assess local site conditions when evaluating the risks from surface water runoff to TEP plants located within ½ mile downgradient from the treatment area.
- In areas where wind erosion is likely, do not apply within ½ mile of TEP plant species.

Aminopyralid

Ground Application

- If using a low boom at the typical application rate, do not apply within 100 feet of TEP terrestrial plants[88].
- If using a low boom at the maximum application rate or a high boom at the typical application rate, do not apply within 400 feet of TEP terrestrial plants.
- If using a high boom at the maximum application rate, do not apply within 600 feet of TEP terrestrial plants.

Aerial Application Over Forested Land

- Do not apply by airplane at the typical application rate within 1,700 feet of TEP terrestrial plants.
- Do not apply by airplane at the maximum application rate within 1,900 feet of TEP terrestrial plants.
- Do not apply by helicopter at the typical or maximum application rate within 300 feet of TEP terrestrial plants.

Aerial Application Over Non-Forested Land

- Do not apply by airplane at the typical application rate within 1,800 feet of TEP terrestrial plants.
- Do not apply by airplane at the maximum application rate within 2,000 feet of TEP terrestrial plants.
- Do not apply by helicopter at the typical application rate within 1,600 feet of TEP terrestrial plants.
- Do not apply by helicopter at the maximum application rate within 1,700 feet of TEP terrestrial plants.

General

- In areas where wind erosion is likely, do not apply within 1.2 miles of TEP plant species (an alternative suitable buffer may be developed at the local level based on an analysis of site conditions).

Chlorsulfuron

- Do not apply by ground methods within 1,200 feet of terrestrial TEP species.
- Do not apply by aerial methods within 1,500 feet of terrestrial TEP species.
- Do not apply by ground methods within 25 feet of aquatic habitats where TEP plant species occur.
- Do not apply by aerial methods at the maximum application rate within 300 feet of aquatic habitats where TEP plant species occur.
- Do not apply by aerial methods at the typical application rate within 100 feet of aquatic habitats where TEP plant species occur.
- In areas where wind erosion is likely, do not apply within ½ mile of TEP plant species.

Clopyralid

- Since the risks associated with using a high boom are unknown, use only a low boom during ground applications of this herbicide within ½ mile of terrestrial TEP plant species or aquatic habitats in which TEP plant species occur.
- Do not apply by ground methods at the typical application rate within 900 feet of terrestrial TEP species.
- Do not apply by ground methods at the typical application rate within ½ mile of terrestrial TEP species.

[88] 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.

- Do not apply by aerial methods within ½ mile of terrestrial TEP species.
- In areas where wind erosion is likely, do not apply within ½ mile of TEP plant species.

Dicamba
- If using a low boom at the typical application rate, do not apply within 1,050 feet of terrestrial TEP plant species.
- If using a low boom at the maximum application rate, do not apply within 1,050 feet of terrestrial TEP plant species.
- If using a high boom, do not apply within 1,050 feet of terrestrial TEP plant species.
- Do not apply within 25 feet of aquatic habitats where TEP plant species occur.
- In areas where wind erosion is likely, do not apply within ½ mile of TEP plant species.

Diflufenzopyr
- If using a low boom at the typical application rate, do not apply within 100 feet of terrestrial TEP plant species.
- If using a high boom, or a low boom at the maximum application rate, do not apply within 900 feet of terrestrial TEP plant species.
- If using a high boom, do not apply within 500 feet of terrestrial TEP plant species.
- Do not apply within 25 feet of aquatic habitats where TEP plant species occur.
- In areas where wind erosion is likely, do not apply within ½ mile of TEP plant species.

Fluridone
- Since effects on terrestrial TEP plant species are unknown, do not apply within ½ mile of terrestrial TEP species.

Fluroxypyr

Ground Application
- If using a low boom at the typical application rate, do not apply within 100 feet of TEP terrestrial plants.
- If using a low boom at the maximum application rate, do not apply within 600 feet of TEP terrestrial plants.
- If using a high boom at the typical application rate, do not apply within 400 feet of TEP terrestrial plants.
- If using a high boom at the maximum application rate, do not apply within 700 feet of TEP terrestrial plants.

Aerial Application Over Forested Land
- Do not apply by airplane at the typical application rate within 1,200 feet of TEP terrestrial plants.
- Do not apply by airplane at the maximum application rate within 1,400 feet of TEP terrestrial plants.
- Do not apply by helicopter at the typical application rate within 200 feet of TEP terrestrial plants.
- Do not apply by helicopter at the maximum application rate within 400 feet of TEP terrestrial plants.

Aerial Application Over Non-Forested Land
- Do not apply by airplane at the typical application rate within 1,100 feet of TEP terrestrial plants.
- Do not apply by helicopter at the typical application rate within 900 feet of TEP terrestrial plants.
- Do not apply by airplane or helicopter at the maximum application rate within 1,500 feet of TEP terrestrial plants.

General
- In areas where wind erosion is likely, do not apply within 1.2 miles of TEP plant species (an alternative suitable buffer may be developed at the local level based on an analysis of site conditions).

Glyphosate

- Since the risks associated with using a high boom are unknown, use only a low boom during ground applications of this herbicide within ½ mile of terrestrial TEP plant species.
- Do not apply by ground methods at the typical application rate within 50 feet of terrestrial TEP plant species.
- Do not apply by ground methods at the maximum application rate within 300 feet of terrestrial TEP plant species.
- Do not apply by aerial methods within 300 feet of terrestrial TEP plant species.

Hexazinone

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

Imazapic

- Do not apply by ground methods within 25 feet of terrestrial TEP species or aquatic habitats where TEP plant species occur.
- Do not apply by helicopter at the typical application rate within 25 feet of terrestrial TEP plant species.
- Do not apply by helicopter at the maximum application rate, or by plane at the typical application rate, within 300 feet of terrestrial TEP plant species.
- Do not apply by plane at the maximum application rate within 900 feet of terrestrial TEP species.
- Do not apply by aerial methods at the maximum application rate within 300 feet of aquatic TEP species.
- Do not apply by aerial methods at the typical application rate within 100 feet of aquatic TEP species.
- In areas where wind erosion is likely, do not apply within ½ mile of TEP plant species.

Imazapyr

- Since the risks associated with using a high boom are unknown, use only a low boom for ground applications of this herbicide within ½ mile of terrestrial TEP plant species or aquatic habitats in which TEP plant species occur.
- Do not apply at the typical application rate, by ground or aerial methods, within 900 feet of terrestrial TEP plant species or aquatic habitats in which aquatic TEP species occur.
- Do not apply at the maximum application rate, by ground or aerial methods, within ½ mile of terrestrial TEP plant species or aquatic habitats in which aquatic TEP species occur.
- Do not use aquatic formulations in aquatic habitats where TEP aquatic plant species occur.
- In areas where wind erosion is likely, do not apply within ½ mile of TEP plant species.

Metsulfuron Methyl

- Since the risks associated with using a high boom are unknown, use only a low boom for ground applications of this herbicide within ½ mile of terrestrial TEP plant species or aquatic habitats in which TEP plant species occur.
- Do not apply at the typical application rate, by ground or aerial methods, within 900 feet of terrestrial TEP plant species or aquatic habitats in which aquatic TEP species occur.
- Do not apply at the maximum application rate, by ground or aerial methods, within ½ mile of terrestrial TEP plant species or aquatic habitats in which aquatic TEP species occur.
- In areas where wind erosion is likely, do not apply within ½ mile of TEP plant species.

Overdrive®

- If using a low boom at the typical application rate, do not apply within 100 feet of terrestrial TEP plant species.
- If using a low boom at the maximum application rate, do not apply within 900 feet of terrestrial TEP plant species.
- If using a high boom, do not apply within 900 feet of terrestrial TEP plant species.
- Do not apply within 25 feet of aquatic habitats where TEP plant species occur.
- In areas where wind erosion is likely, do not apply within ½ mile of TEP plant species.

Picloram

- Do not apply by ground or aerial methods, at any application rate, within ½ mile of terrestrial TEP plant species.
- Assess local site conditions when evaluating the risks from surface water runoff to TEP plants located within ½ mile downgradient from the treatment area.
- In areas where wind erosion is likely, do not apply within ½ mile of TEP plant species.

Rimsulfuron

Ground Application

- If using a low boom at the typical application rate, do not apply within 200 feet of TEP terrestrial plants.
- If using a low boom at the maximum application rate or a high boom at the typical application rate, do not apply within 400 feet of TEP terrestrial plants.
- If using a high boom at the maximum application rate, do not apply within 700 feet of TEP terrestrial plants.

Aerial Application Over Forested Land

- Do not apply by airplane at the typical application rate within 1,600 feet of TEP terrestrial plants.
- Do not apply by airplane at the maximum application rate within 1,700 feet of TEP terrestrial plants.
- Do not apply by helicopter at the typical or application rate within 300 feet of TEP terrestrial plants.

Aerial Application Over Non-Forested Land

- Do not apply by airplane at the typical application rate within 1,600 feet of TEP terrestrial plants.
- Do not apply by airplane at the maximum application rate within 1,900 feet of TEP terrestrial plants.
- Do not apply by helicopter at the typical application rate within 1,400 feet of TEP terrestrial plants.
- Do not apply by airplane or helicopter at the maximum application rate within 1,600 feet of TEP terrestrial plants.

General

- In areas where wind erosion is likely, do not apply within 1.2 miles of TEP plant species (an alternative suitable buffer may be developed at the local level based on an analysis of site conditions).
- Do not use in watersheds where annual precipitation exceeds 50 inches.
- In watersheds where annual precipitation exceeds 10 inches, prior to use of rimsulfuron conduct a local-level analysis of site conditions and develop suitable conservation measures for protection of TEP plant species from surface runoff.

Sulfometuron Methyl

- Do not apply by ground or aerial methods within 1,500 feet of terrestrial TEP species.
- Do not apply by ground methods within 900 feet of aquatic habitats where TEP plant species occur, or by aerial methods within 1,500 feet of aquatic habitats where TEP plant species occur.
- In areas where wind erosion is likely, do not apply within ½ mile of TEP plant species.

Triclopyr Acid

- Since the risks associated with using a high boom are unknown, use only a low boom during ground applications of this herbicide within ½ mile of terrestrial TEP plant species.

- Since the risks associated with using a high boom are unknown, use only a low boom during ground applications at the maximum application rate of this herbicide within ½ mile of aquatic habitats in which TEP plant species occur.
- Do not apply by ground methods at the typical application rate within 300 feet of terrestrial TEP plant species.
- Do not apply by aerial methods at the typical application rate within 500 feet of terrestrial TEP plant species.
- Do not apply by ground or aerial methods at the maximum application rate within ½ mile of terrestrial TEP plant species or aquatic habitats in which TEP plant species occur.
- If applying to aquatic habitats in which aquatic TEP plant species occur, do not exceed the targeted water concentration on the product label.
- In areas where wind erosion is likely, do not apply within ½ mile of TEP plant species.

Triclopyr BEE

- Since the risks associated with using a high boom are unknown, use only a low boom for ground applications of this herbicide within ½ mile of terrestrial TEP plant species or aquatic habitats in which TEP plant species occur.
- Do not apply by ground methods at the typical application rate within 300 feet of terrestrial TEP plant species or aquatic habitats in which TEP plant species occur.
- Do not apply by aerial methods at the typical application rate within 500 feet of terrestrial TEP plant species or aquatic habitats in which TEP plant species occur.
- Do not apply by ground or aerial methods at the maximum application rate within ½ mile of terrestrial TEP plant species or aquatic habitats in which TEP plant species occur.
- Do not use aquatic formulations in aquatic habitats where TEP aquatic plant species occur.
- In areas where wind erosion is likely, do not apply within ½ mile of TEP plant species.

If a tank mix of one of these chemicals with another approved herbicide is desired, an additional assessment of potential effects to non-target TEP species must be made with the assumption that effects of the herbicides are at a minimum additive. Larger buffers may be warranted. At the local level, the BLM must make determinations as to the suitability of herbicide treatments for the populations of TEP species that are managed by local offices. The following information should be considered: the timing of the treatment in relation to the phenology of the TEP plant species; the intensity of the treatment; the duration of the treatment; and the tolerance of the TEP species to the treatment. When information about species tolerance is unavailable or is inconclusive, local offices must assume an adverse effect to plant populations, and protect those populations from direct or indirect exposure to the treatment in question. Treatment plans must also address the presence of and expected impacts on noxious weeds on the project site. These plans must be coordinated with BLM weed experts and/or appropriate county weed supervisors to minimize the spread of weeds.

The information provided in Table 4-4 (of the 2007 PEIS Biological Assessment, USDI 2007f:4-113-126) provides a general guideline as to the types of habitats in which treatments (particularly fire) may be utilized to improve growing conditions for TEP plant species. However, at the local level, the BLM must make a further determination as to the suitability of vegetation treatments for the populations of TEP species that are managed by local offices. The following information should be considered: the timing of the treatment in relation to the phenology of the TEP plant species; the intensity of the treatment; the duration of the treatment; and the tolerance of the TEP species to the particular type of treatment to be used. When information about species tolerance is unavailable or is inconclusive, local offices must assume a negative effect to plant populations, and protect those populations from direct exposure to the treatment in question.

Treatment plans must also address the presence of and expected impacts on noxious weeds on the project site. These plans must be coordinated with BLM weed experts and/or appropriate county weed supervisors to minimize the spread of weeds. In order to prevent the spread of noxious weeds and other unwanted vegetation in occupied or suitable habitat, the following precautions should be taken:

- Cleared areas that are prone to downy brome or other noxious weed invasions should be seeded with an appropriate seed mixture to reduce the probability of noxious weeds or other undesirable plants becoming established on the site.
- Where seeding is warranted, bare sites should be seeded as soon as appropriate after treatment, and at a time of year when it is likely to be successful.
- In suitable habitat for TEP species, nonnative species should not be used for revegetation.
- Certified noxious weed seed free seed must be used in suitable habitat, and preference should be given to seeding appropriate plant species when rehabilitation is appropriate.
- Straw and hay bales used for erosion control in suitable habitat must be certified weed- and seed-free.
- Vehicles and heavy equipment used during treatment activities should be washed prior to arriving at a new location to avoid the transfer of noxious weeds.

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

Aquatic Animals Conservation Measures

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

The aquatic TEP species considered in this programmatic BA occur in varied habitats, over a large geographic area. The Conservation Measures guidance presented below is intended to apply broadly to aquatic species and habitats over the entire region covered by this BA, based on the common features found in nearly all aquatic and riparian habitats. Some species with alternate or unusual habitat requirements may require additional Conservation Measures to ensure a Not Likely to Adversely Affect determination at the local level. Such additional Conservation Measures are outside the scope of this BA, and will be completed at the local level.

Some local BLM plans have delineated protected riparian areas, or portions of watersheds where riparian-dependent resources receive primary emphasis, and management activities are subject to specific standards and guidelines (USDA Forest Service 1995). These protected riparian areas include traditional riparian corridors, wetlands, intermittent streams, and other areas that help maintain the integrity of aquatic ecosystems by 1) influencing the delivery of coarse sediment, organic matter, and woody debris to streams; 2) providing root strength for channel stability; 3) shading the stream; and 4) protecting water quality. Examples of protected riparian areas are the BLM's Riparian Reserves of the Pacific Northwest and the Interior Columbia Basin, as described in the Aquatic Conservation Strategy (USDA Forest Service and USDI BLM 1994). The term "riparian areas," as used in the Conservation Measures guidance below, refers to riparian protected areas, wherever such designations apply. However, since not all local BLM plans have made such designations, "riparian areas," when the above-mentioned use is not applicable, generally refers to: 1) for streams, the stream channel and the extent of the 100-year floodplain; and 2) for wetlands, ponds, and lakes, and other aquatic habitats, the area extending to the edges of the riparian vegetation, provided it is no less than the minimum buffer distance for a given site established by local BLM biologists.

Conservation Measures for Site Access and Fueling/Equipment Maintenance

For treatments occurring in watersheds with TEP species or designated or undesignated critical habitat (i.e., unoccupied habitat critical to species recovery):

- Where feasible, access work site only on existing roads, and limit all travel on roads when damage to the road surface will result or is occurring.
- Where TEP aquatic species occur, consider ground-disturbing activities on a case by case basis, and implement Standard Operating Procedures to ensure minimal erosion or impact to the aquatic habitat.
- Within riparian areas, do not use vehicle equipment off of established roads.
- Outside of riparian areas, allow driving off of established roads only on slopes of 20% or less.
- Except in emergencies, land helicopters outside of riparian areas.
- Within 150 feet of wetlands or riparian areas, do not fuel/refuel equipment, store fuel, or perform equipment maintenance (locate all fueling and fuel storage areas, as well as service landings outside of protected riparian areas).
- Prior to helicopter fueling operations prepare a transportation, storage, and emergency spill plan and obtain the appropriate approvals; for other heavy equipment fueling operations use a slip-tank not greater than 250 gallons; Prepare spill containment and cleanup provisions for maintenance operations.
- Do not conduct biomass removal (harvest) activities that will alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows outside the range of natural variability.

Conservation Measures Related to Revegetation Treatments

- Outside riparian areas, avoid hydro-mulching within buffer zones established at the local level. This precaution will limit adding sediments and nutrients and increasing water turbidity.
- Within riparian areas, engage in consultation at the local level to ensure that revegetation activities incorporate knowledge of site-specific conditions and project design.

Conservation Measures Related to Herbicide Treatments

The complexity of this action within riparian areas requires local consultation, which will be based on herbicide risk assessments.

Possible Conservation Measures:

- Maintain equipment used for transportation, storage, or application of chemicals in a leak proof condition.
- Do not store or mix herbicides, or conduct post-application cleaning within riparian areas.
- Ensure that trained personnel monitor weather conditions at spray times during application.
- Strictly enforce all herbicide labels.
- Do not broadcast spray within 100 feet of open water when wind velocity exceeds 5 mph.
- Do not broadcast spray when wind velocity exceeds 10 mph.
- Do not spray if precipitation is occurring or is imminent (within 24 hours).
- Do not spray if air turbulence is sufficient to affect the normal spray pattern.
- Do not broadcast spray herbicides in riparian areas that provide habitat for TEP aquatic species. Appropriate buffer distances should be determined at the local level to ensure that overhanging vegetation that provides habitat for TEP species is not removed from the site. Buffer distances provided as Conservation Measures in the assessment of effects to plants (Chapter 4 of this BA) and fish and aquatic invertebrates should be consulted as guidance. (Note: the Forest Service did not determine appropriate

buffer distances for TEP fish and aquatic invertebrates when evaluating herbicides in Forest Service ERAs; buffer distances were only determined for non-TEP species.)

- Do not use fluridone, terrestrial formulations of glyphosate, or triclopyr BEE, to treat aquatic vegetation in habitats where aquatic TEP species occur or may potentially occur.
- Avoid using glyphosate formulations that include R-11 in the future, and either avoid using any formulations with POEA, or seek to use the formulation with the lowest amount of POEA available, to reduce risks to aquatic organisms.
- Follow all instructions and Standard Operating Procedures to avoid spill and direct spray scenarios into aquatic habitats. Special care should be followed when transporting and applying 2,4-D, clopyralid, glyphosate, hexazinone, imazapyr, metsulfuron methyl, picloram, and triclopyr.
- Do not broadcast spray glyphosate, picloram, or triclopyr BEE in upland habitats adjacent to aquatic habitats that support (or may potentially support) aquatic TEP species under conditions that would likely result in off-site drift.
- In watersheds that support TEP species or their habitat, do not apply triclopyr BEE in upland habitats within ½ mile upslope of aquatic habitats that support aquatic TEP species under conditions that would likely result in surface runoff.

Numerous Conservation Measures were developed from information provided in ERAs. The measures listed below would apply to TEP fish and other aquatic species at the programmatic level in all 17 western states. However, local BLM field offices could use interactive spreadsheets and other information contained in the ERAs to develop more site-specific Conservation Measures and management plans based on local conditions (soil type, rainfall, vegetation type, and herbicide treatment method). It is possible that Conservation Measures would be less restrictive than those listed below if local site conditions were evaluated using the ERAs when developing project-level Conservation Measures.

Conservation Measures Related to Prescribed Fire

Within riparian areas, in watersheds with TEP species or their habitats:

- Conduct prescribed burning only when long-term maintenance of the riparian area is the primary objective, and where low intensity fires can be maintained.
- Do not construct black lines, except by non-mechanized methods.
- Utilize/create only the following firelines: natural barriers; hand-built lines parallel to the stream channel and outside of buffer zones established at the local level; or hand built lines perpendicular to the stream channel with waterbars and the same distance requirement.
- Do not ignite fires using aerial methods.
- In forested riparian areas, keep fires to low severity levels to ensure that excessive vegetation removal does not occur.
- Do not camp, unless allowed by local consultation.
- Have a fisheries biologist determine whether pumping activity can occur in streams with TEP species.
- During water drafting/pumping, maintain a continuous surface flow of the stream that does not alter original wetted stream width.
- Do not alter dams or channels in order to pump in streams occupied by TEP species.
- Do not allow helicopter dipping from waters occupied by TEP species, except in lakes outside of the spawning period.
- Consult with a local fisheries biologist prior to helicopter dipping in order to avoid entrainment and harassment of TEP species.

Conservation Measures Related to Mechanical Treatments

Note: these measures apply only to treatments occurring in watersheds that support TEP species or in unoccupied habitat critical to species recovery (including but not limited to critical habitat, as designated by USFWS).

Outside riparian areas in watersheds with TEP species or designated or undesignated critical habitat (i.e., unoccupied habitat critical to species recovery):

- Conduct soil-disturbing treatments only on slopes of 20% or less, where feasible.
- Do not conduct log hauling activities on native surface roads prone to erosion, where feasible.

Within riparian areas in these watersheds, more protective measures will be required to avoid negatively affecting TEP species or their habitat:

- Do not use vehicles or heavy equipment, except when crossing at established crossings.
- Do not remove large woody debris or snags during mechanical treatment activities.
- Do not conduct ground disturbing activities (e.g., disking, drilling, chaining, and plowing).
- Ensure that all mowing follows guidance to avoid negative effects to streambanks and riparian vegetation and major effects to streamside shade.
- Do not use equipment in perennial channels or in intermittent channels with water, except at crossings that already exist.
- Leave suitable quantities (to be determined at the local level) of excess vegetation and slash on site.
- Do not apply fertilizers or seed mixtures that contain chemicals by aerial methods.
- Do not apply fertilizer within 25 feet of streams and supersaturated soils; apply fertilizer following labeling instructions.
- Do not apply fertilizer in desert habitats.
- Do not completely remove trees and shrubs.

Conservation Measures Related to Biological Control Treatments using Livestock

For treatments occurring in watersheds that support TEP species or in critical habitat:

- Where terrain permits, locate stock handling facilities, camp facilities, and improvements at least 300 feet from lakes, streams, and springs.
- Educate stock handlers about at-risk fish species and how to minimize negative effects to the species and their associated habitat.
- Employ appropriate dispersion techniques to range management, including judicial placement of saltblocks, troughs, and fencing, to prevent damage to riparian areas but increase weed control.
- Equip each watering trough with a float valve.

Within riparian areas of these watersheds, more protective measures are required.

- Do not conduct weed treatments involving domestic animals, except where it is determined that these treatments will not damage the riparian system, or will provide long-term benefits to riparian and adjacent aquatic habitats.
- Do not locate troughs, storage tanks, or guzzlers near streams with TEP species, unless their placement will enhance weed-control effectiveness without damaging the riparian system.

Terrestrial Animals

Butterfly or Moth Conservation Measures

Many local BLM offices already have management plans in place that ensure the protection of these species during activities on public lands. The following Conservation Measures are the minimum steps required of the BLM to ensure that treatment methods would be unlikely to negatively affect TEP species.

Each local BLM office is required to draw up management plans related to treatment activities that identify any TEP butterfly or moth species or their critical habitat that are present in the proposed treatment areas, as well as the measures that will be taken to protect these species.

Management plans should, at a minimum, follow this general guidance:

- Use an integrated pest management approach when designing programs for managing pest outbreaks.
- Survey treatment areas for TEP butterflies/moths and their host/nectar plants (suitable habitat) at the appropriate times of year.
- Minimize the disturbance area with a pre-treatment survey to determine the best access routes. Areas with butterfly/moth host plants and/or nectar plants should be avoided.
- Minimize mechanical treatments and OHV activities on sites that support host and/or nectar plants.
- Carry out vegetation removal in small areas, creating openings of 5 acres or less in size.
- Avoid burning all of a species' habitat in any 1 year. Limit area burned in butterfly/moth habitat in such a manner that the unburned units are of sufficient size to provide a refuge for the population until the burned unit is suitable for recolonization. Burn only a small portion of the habitat at any one time, and stagger timing so that there is a minimum 2-year recovery period before an adjacent parcel is burned.
- Where feasible, mow or wet around patches of larval host plants within the burn unit to reduce impacts to larvae.
- In TEP butterfly/moth habitat, burn while butterflies and/or moths of concern are in the larval stage, when the organisms would receive some thermal protection.
- Wash equipment before it is brought into the treatment area.
- Use a seed mix that contains host and/or nectar plant seeds for road/site reclamation.
- To protect host and nectar plants from herbicide treatments, follow recommended buffer zones and other Conservation Measures for TEP plants species when conducting herbicide treatments in areas where populations of host and nectar plants occur.
- Do not broadcast spray herbicides in habitats occupied by TEP butterflies or moths; do not broadcast spray herbicides in areas adjacent to TEP butterfly/moth habitat under conditions when spray drift onto the habitat is likely.
- Do not use 2,4-D in TEP butterfly/moth habitat.
- When conducting herbicide treatments in or near habitat used by TEP butterflies or moths, avoid use of the following herbicides, where feasible: clopyralid, glyphosate, hexazinone, imazapyr, picloram, and triclopyr.
- If conducting manual spot applications of glyphosate, hexazinone, or triclopyr to vegetation in TEP butterfly or moth habitat, utilize the typical, rather than the maximum, application rate.

Amphibians and Reptiles Conservation Measures

Many local BLM offices already have management plans in place that ensure the protection of these species during activities on public lands. In addition, the following Conservation Measures are the minimum steps required of the BLM to ensure that treatment methods would be unlikely to negatively affect TEP species.

Conservation Measures:

- Survey all areas that may support TEP amphibians and/or reptiles prior to treatments.
- Conduct burns during periods when the animals are in aquatic habitats or are hibernating in burrows.
- For species with extremely limited habitat, such as the desert slender salamander, avoid prescribed burning in known habitat.
- Do not use water from aquatic habitats that support TEP amphibians and/or reptiles for fire abatement.
- Install sediment traps upstream of aquatic habitats to minimize the amount of ash and sediment entering aquatic habitats that support TEP species.
- Do not conduct prescribed burns in desert tortoise habitat.
- In habitats where aquatic herpetofauna occur, implement all Conservation Measures identified for aquatic organisms in Chapter 4.
- Within riparian areas, wetlands, and aquatic habitats, conduct herbicide treatments only with herbicides that are approved for use in those areas.
- Do not broadcast spray herbicides in riparian areas or wetlands that provide habitat for TEP herpetofauna.
- Do not use fluridone, glyphosate, or triclopyr BEE to treat aquatic vegetation in habitats where TEP amphibians occur or may potentially occur.
- In desert tortoise habitat, conduct herbicide treatments during the period when desert tortoises are less active.
- To the greatest extent possible, avoid desert tortoise burrows during herbicide treatments.
- When conducting herbicide treatments in upland areas adjacent to aquatic or wetland habitats that support TEP herpetofauna, do not broadcast spray during conditions under which off-site drift is likely.
- In watersheds where TEP amphibians occur, do not apply triclopyr BEE in upland habitats upslope of aquatic habitats that support (or may potentially support) TEP amphibians under conditions that would likely result in surface runoff.
- Follow all instructions and Standard Operating Procedures to avoid spill and direct spray scenarios into aquatic habitats that support TEP herpetofauna.
- Do not use 2,4-D in terrestrial habitats occupied by TEP herpetofauna; do not broadcast spray 2,4-D within ¼ mile of terrestrial habitat occupied by TEP herpetofauna.
- When conducting herbicide treatments in or near terrestrial habitat occupied by TEP herpetofauna, avoid using the following herbicides, where feasible: clopyralid, glyphosate, hexazinone, imazapyr, metsulfuron methyl, picloram, and triclopyr.
- When conducting herbicide treatments in upland habitats occupied by TEP herpetofauna, do not broadcast spray 2,4-D, clopyralid, glyphosate, hexazinone, picloram or triclopyr; do not broadcast spray these herbicides in areas adjacent to habitats occupied by TEP herpetofauna under conditions when spray drift onto the habitat is likely.
- If conducting manual spot applications of glyphosate, hexazinone, or triclopyr to vegetation in upland habitats occupied by TEP herpetofauna, utilize the typical, rather than the maximum, application rate.
- If spraying imazapyr or metsulfuron methyl in or adjacent to upland habitats occupied by TEP herpetofauna, apply at the typical, rather than the maximum, application rate.
- If conducting herbicide treatments in or near upland habitats occupied by TEP herpetofauna, consult Table 6-3 on a species by species basis to determine additional Conservation Measures that should be enacted to avoid negative effects via ingestion of contaminated prey.

Bird Conservation Measures

Bald Eagles

The following programmatic level conservation measures are the minimum steps required of the BLM to ensure that treatment methods would not negatively affect the bald eagle or its habitat. Additional, site-specific conservation measures would also be developed at the local level, as appropriate.

- Do not allow human disturbance within a suitable buffer distance of known bald eagle nest sites during the breeding season (as determined by a qualified wildlife biologist). For active bald eagle nests in open country, buffer distances should be 1 mile. In other habitats, with a shorter line-of-site distance, buffer distances may be reduced, based on consultation with the USFWS.
- Do not allow ground disturbing activities within ½ mile of active roost sites year round,
- Avoid human disturbance within 1 mile of a winter roost during the wintering period (as determined by a qualified wildlife biologist).
- Complete treatment activities that must occur within 1 mile of a winter roost within the hours of 9 a.m. to 3 p.m., during the winter roosting period.
- Do not allow helicopter/aircraft activity within 1 mile of bald eagle nest sites or winter roost sites during the breeding or roosting period.
- Conduct prescribed burn activities in a manner that ensures that nest and winter roost sites are greater than 1 mile from downwind smoke effects.
- Do not cut trees within ¼ mile of any known nest trees.
- Do not use 2,4-D in bald eagle habitats; do not broadcast spray 2,4-D within ¼ mile of bald eagle habitat.
- Where feasible, avoid use of the following herbicides in bald eagle habitat: clopyralid, glyphosate, hexazinone, imazapyr, metsulfuron methyl, picloram, and triclopyr.
- Do not broadcast spray clopyralid, glyphosate, hexazinone, picloram, or triclopyr in bald eagle habitat; do not broadcast spray these herbicides in areas adjacent to bald eagle habitat under conditions when spray drift onto the habitat is likely.
- If broadcast spraying imazapyr or metsulfuron methyl in or adjacent to bald eagle habitat, apply at the typical, rather than the maximum, application rate.
- If conducting manual spot applications of glyphosate, hexazinone, or triclopyr to vegetation in bald eagle habitat, utilize the typical, rather than the maximum, application rate.

Riparian Birds

To minimize or avoid negative effects to riparian bird species (such as the yellow-billed cuckoo), the BLM would be required to implement the following programmatic-level conservation measures in habitats utilized by these three species.

- Conduct surveys prior to vegetation treatments within potential or suitable habitat.
- Where surveys detect birds, do not burn, broadcast spray herbicides, use domestic animals to control weeds, or conduct mechanical treatments.
- Do not conduct vegetation treatments within ½ mile (or further if deemed necessary to prevent smoke from inundating the nest area) of known nest sites or unsurveyed suitable habitat during the breeding season (as determined by a qualified wildlife biologist).
- Adjust spatial and temporal scales of treatments to that not all suitable habitat is affected in any given year.
- Following treatments, replant or reseed treated areas with native species, if needed.
- Closely follow all application instructions and use restrictions on herbicide labels; in wetland habitats use only those herbicides that are approved for use in wetlands.
- Do not use 2,4-D in least Bell’s vireo, Inyo California towhee, or southwestern willow flycatcher habitats; do not broadcast spray 2,4-D within ¼ mile of least Bell’s vireo, Inyo California towhee, or southwestern willow flycatcher habitat.
- Where feasible, avoid use of the following herbicides in least Bell’s vireo, Inyo California towhee, and southwestern willow flycatcher habitat: clopyralid, glyphosate, hexazinone, imazapyr, metsulfuron methyl, picloram, and triclopyr.
- Do not broadcast spray clopyralid, glyphosate, hexazinone, picloram, or triclopyr in least Bell’s vireo or southwestern willow flycatcher habitat; do not broadcast spray these herbicides in areas adjacent to least Bell’s vireo or southwestern willow flycatcher habitat under conditions when spray drift onto the habitat is likely.

- Do not broadcast spray clopyralid, glyphosate, hexazinone, picloram, or triclopyr in Inyo California towhee habitat; do not broadcast spray these herbicides in areas adjacent to Inyo California towhee habitat under conditions when spray drift onto the habitat is likely.
- If broadcast spraying imazapyr or metsulfuron methyl in or adjacent to least Bell's vireo or southwestern willow flycatcher habitat, apply at the typical, rather than the maximum, application rate.
- If broadcast spraying imazapyr or metsulfuron methyl in or adjacent to Inyo California towhee habitat, apply at the typical, rather than the maximum, application rate.
- If conducting manual spot applications of glyphosate, hexazinone, or triclopyr to vegetation in least Bell's vireo, Inyo California towhee, or southwestern willow flycatcher habitat, utilize the typical, rather than the maximum, application rate.

Mammal Conservation Measures

Canada Lynx

In order to minimize or avoid impacts to lynx, the BLM must follow, at a minimum, the conservation measures listed below:

- Prior to vegetation treatments, map lynx habitat within areas in which treatments are proposed to occur. Identify potential denning and foraging habitat, and topographic features that may be important for lynx movement (major ridge systems, prominent saddles, and riparian corridors).
- Design vegetation treatments in lynx habitat to approximate historical landscape patterns and disturbance processes.
- Avoid the construction of permanent firebreaks on ridges or saddles in lynx habitat.
- Where possible, keep linear openings out of mapped potential habitat and away from key habitat components, such as denning areas.
- When planning vegetation treatments, minimize the creation of linear openings (fire lines, access routes, and escape routes) that could result in permanent travel ways for competitors and humans.
- Obliterate any linear openings constructed within lynx habitat in order to deter future uses by humans and competitive species.
- Design burn prescriptions to regenerate or create snowshoe hare habitat (e.g., regeneration of aspen and lodgepole pine).
- Ensure that no more than 30% of lynx habitat within a Lynx Analysis Unit (as defined in Ruediger et al. 2000) would be in an unsuitable condition at any time.
- If deemed necessary, defer livestock grazing following vegetation treatments to ensure the re-establishment of key plant species. Bureau of Land Management personnel should use resource goals and objectives to determine the need for this restriction and the length of deferment on a case by case basis.
- Give particular consideration to amounts of denning habitat, condition of summer and winter foraging habitat, as well as habitat linkages, to ensure that that treatments do not negatively impact lynx. If there is less than 10% lynx habitat in a Lynx Analysis Unit, defer vegetation treatments that would delay development of denning habitat structure. Protect habitat connectivity within and between Lynx Analysis Units.
- Do not use 2,4-D in Canada lynx habitat; do not broadcast spray 2,4-D within ¼ mile of Canada lynx habitat.
- Where feasible, avoid use of the following herbicides in Canada lynx habitat: clopyralid, glyphosate, hexazinone, imazapyr, metsulfuron methyl, picloram, and triclopyr.
- Do not broadcast spray clopyralid, glyphosate, hexazinone, picloram, or triclopyr in Canada lynx habitat; do not broadcast spray these herbicides in areas adjacent to Canada lynx habitat under conditions when spray drift onto the habitat is likely.
- If broadcast spraying imazapyr or metsulfuron methyl in or near Canada lynx habitat, apply at the typical, rather than the maximum, application rate.

- If conducting manual spot applications of glyphosate, hexazinone, or triclopyr to vegetation in Canada lynx habitat, utilize the typical, rather than the maximum, application rate.

Gray Wolf

Although the proposed vegetation treatments would not be likely to have negative effects on wolves or their habitat, the following programmatic-level conservation measures are recommended to ensure protection of the species. Additional or more specific guidance would also be provided at the project level, as appropriate.

- Avoid human disturbance and/or associated activities within 1 mile of a den site during the breeding period (as determined by a qualified biologist).
- Avoid human disturbance and/or associated activities within 1 mile of a rendezvous site during the breeding period (as determined by a qualified biologist).
- Do not use 2,4-D in areas where gray wolves are known to occur; do not broadcast spray within ¼ mile of areas where gray wolves are known to occur.
- Where feasible, avoid use of the following herbicides in gray wolf habitat: clopyralid, glyphosate, hexazinone, imazapyr, metsulfuron methyl, picloram, and triclopyr.
- Do not broadcast spray clopyralid, 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 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.

Pygmy Rabbits

In order to avoid or minimize potential effects to the pygmy rabbit resulting from the proposed vegetation treatments, the BLM would be required to implement the conservation measures listed below. Although only the Columbia Basin Distinct Population Segment of the pygmy rabbit is currently listed, these mitigation measures should be considered for treatments throughout the species' entire range, and implemented as appropriate.

- Prior to treatments, survey all suitable habitat for pygmy rabbits.
- Address pygmy rabbits in all management plans prepared for treatments within the range of the species' historical habitat.
- Do not burn, graze, or conduct mechanical treatments within 1 mile of known pygmy rabbit habitat.
- Do not use 2,4-D in pygmy rabbit habitats; do not broadcast spray within ¼ mile of pygmy rabbit habitat.
- Where feasible, avoid use of the following herbicides in pygmy rabbit habitat: clopyralid, fluridone, glyphosate, hexazinone, imazapyr, metsulfuron methyl, picloram, and triclopyr.
- Where feasible, spot treat vegetation in pygmy rabbit habitat rather than broadcast spraying.
- Do not broadcast spray clopyralid, glyphosate, hexazinone, picloram, or triclopyr in pygmy rabbit habitat; do not broadcast spray these herbicides in areas adjacent to pygmy rabbit habitat under conditions when spray drift onto the habitat is likely.
- If broadcast spraying imazapyr, fluridone, or metsulfuron methyl in or near pygmy rabbit habitat, apply at the typical, rather than the maximum, application rate.
- If conducting manual spot applications of glyphosate, hexazinone, or triclopyr to vegetation in pygmy rabbit habitat, utilize the typical, rather than the maximum, application rate.

Bats

In order to prevent or minimize the potential effects to bats from vegetation treatments, the following conservation measures should be followed:

- Prior to treatments, survey all potentially suitable habitat for the presence of bats or their nectar plants.

- At the local level, incorporate protection of lesser and Mexican long-nosed bats into management plans developed for proposed treatment programs.
- Instruct all field personnel on the identification of bat nectar plants and the importance of their protection.
- Protect nectar plants from modification by treatment activities to the greatest extent possible. Do not remove nectar plants during treatments. Avoid driving over plants, piling slash on top of plants, burning, and using domestic animals to control weeds.
- Do not burn within a mile upwind of known bat roosts.
- To protect nectar plants and roost trees from herbicide treatments, follow recommended buffer zones and other conservation measures for TEP plant species in areas where populations of nectar plants and roost trees occur.
- Do not use 2,4-D in lesser or Mexican long-nosed bat habitats; do not broadcast spray within ¼ mile of lesser or Mexican long-nosed bat habitat.
- Where feasible, avoid use of the following herbicides in lesser and Mexican long-nosed bat habitat: clopyralid, fluridone, glyphosate, hexazinone, imazapyr, metsulfuron methyl, picloram, and triclopyr.
- Do not broadcast spray clopyralid, glyphosate, hexazinone, picloram, or triclopyr in lesser or Mexican long-nosed bat habitat; do not broadcast spray these herbicides in areas adjacent to lesser or Mexican long-nosed bat habitat under conditions when spray drift onto the habitat is likely.
- If broadcast spraying imazapyr or metsulfuron methyl in or near lesser or Mexican long-nosed bat habitat, apply at the typical, rather than the maximum, application rate.
- If conducting manual spot applications of glyphosate, hexazinone, or triclopyr to vegetation in lesser or Mexican long-nosed bat habitat, utilize the typical, rather than the maximum, application rate.
- If conducting spot treatments of herbicides in lesser or Mexican long-nosed bat habitats, avoid potential roost sites.

Essential Fish Habitat Conservation Measures

Conservation Measures have been incorporated into the proposed action to reduce negative effects to the point where they do not reduce the quantity or quality of essential fish habitat (EFH). For the purposes of developing Conservation Measures for salmon, riparian areas include traditional riparian corridors, wetlands, intermittent streams, and other areas that help maintain the integrity of aquatic ecosystems by 1) influencing the delivery of coarse sediment, organic matter, and woody debris to streams, 2) providing root strength for channel stability, 3) shading the stream, and 4) protecting water quality.

Activities associated with the proposed vegetation treatments would have the potential to negatively affect salmonids, pelagic fish and groundfish, and Alaskan crabs and scallops and their habitat. Implementation of the measures listed below would minimize these potential impacts to a negligible level such that the quantity and quality of EFH is not reduced.

General Measures

- Establish riparian, estuarine, and coastal buffer strips adjacent to salmonid, groundfish and pelagic fish, and Alaskan crab and scallop habitats to reduce direct impacts to the various life stages of these species. Buffers widths should depend on the specific ecological function for which protection is desired (e.g., streambanks stabilization, control of sediment inputs from surface erosion, or maintenance of shade to stream channels). Local BLM field offices would consult BLM and Forest Service ERAs prepared for the BA and PEIS to obtain programmatic guidance on appropriate buffer distances. Field offices can also input information on local site conditions (e.g., soil type, vegetation type, precipitation, treatment method) into interactive spreadsheets developed for the ERAs to develop more site-specific, and in most cases less restrictive, buffers for individual projects.

- Implement Standard Operating Procedures to minimize sedimentation and disturbance of riparian, estuarine, and coastal vegetation.
- To avoid erosion and future recreational uses within close vicinity of aquatic areas, limit or exclude construction of new permanent or temporary roads within the boundary of treatment riparian areas.
- Where possible, to avoid increased instream sedimentation, choose low-intensity burns and manual treatment methods over mechanical treatment methods and use of domestic animals.

Prescribed Burning Treatments

- Where feasible, avoid ignition of fires within buffer strips.

Mechanical Treatments

- Minimize the use of mechanical treatment methods (including timber harvest and timber salvage) within buffer strips.
- To avoid damaging potential spawning areas, do not use mechanical equipment in perennial channels, or in intermittent channels with water, except at crossings that already exist. Do not use mechanical equipment in estuaries.
- Minimize log hauling during wet weather, and on non-paved roads.
- Minimize skidding or ground-based yarding within buffer strips.
- Do not remove large woody debris from buffer strips

Herbicide Treatments

- Where feasible, minimize spray operations around aquatic habitats to days when winds are > 10 miles per hour for ground applications, and > 6 miles per hours for aerial applications, to avoid wind drift or direct application of herbicides into these habitats.
- Where feasible, minimize the use of terrestrial herbicides in watersheds with downgradient ponds and streams if potential impacts to salmonids are of concern.
- Time herbicide applications near salmonid-bearing streams, and estuaries and coastal/marine habitats used by salmon and FMP species so that they do not overlap with sensitive life-history stages of these fish (would vary at the local level).

Biological Treatments

- In watersheds that support salmonids or that flow into watersheds where salmonids occur, to minimize the cumulative effect of grazing in areas that have been burned, do not conduct weed control by domestic animals in burned areas until they have recovered enough to control ash and sediment produced by the treatment.
- Prohibit livestock grazing in estuaries.

Appendix B – The Herbicides, Formulations, and Adjuvants

The Herbicides - The 14 herbicides proposed for use in Oregon are a subset of the hundreds of herbicides registered for use in the U.S. They were chosen by the BLM nationally for maximum effectiveness against wildland weeds and least environmental and non-target species' risks. Table 2-9 in Chapter 2 shows the 14 herbicides with some sample trade names, common plant targets, plant types it is selective for, how it is used, land types it is registered for, typical and maximum rates, and whether it can be applied aerially. **Table B-1 - *General Constraints from Herbicide Labels*** supplements the Table 2-9 information by listing a summary of general label constraints.

Herbicides can be categorized as selective or non-selective (see Table 2-9). Selective herbicides kill only a specific type of plant. For example, an herbicide selective for broadleaved plants can be used to manage such species while maintaining desirable grass species in rangeland communities. Non-selective herbicides kill all types of plants, and thus must be applied only to the target species. Herbicides can be used selectively to control specific types of vegetation (e.g., killing a specific invasive plant species), or non-selectively in monocultures of invasive plants where there is no objective to retain some plants. Some herbicides are post-emergent, which means they can be used to kill existing vegetation; others are pre-emergent, which stops vegetation before it grows (e.g., prohibiting seeds from germinating) (Table 2-9).

Table B-2 – *Herbicide Formulations Approved for use on BLM-Administered Lands* displays the BLM National list of approved herbicides, which is reviewed and updated at least annually. This list identifies herbicides that are known to be consistent with the formulations analyzed in the Risk Assessments (see Appendix C) and otherwise suitable for wildland use.

Table B-3 – *Adjuvants Approved for Use on BLM Administered Lands* displays the adjuvants approved for use on BLM-administered lands nationally. This list is also reviewed at least annually. This list identifies adjuvants that are known to be consistent with the formulations analyzed in the Risk Assessments (see Appendix C) and are known not to contain R-11, petroleum, and other products prohibited by Mitigation Measures (see Appendix A), or that are otherwise considered unsuitable for wildland use. Table B-3 also identifies those adjuvants identified by the US Fish and Wildlife Service in their 2013 *Biological Opinion for Fish Habitat Restoration Activities Affecting ESA-listed Animal and Plant Species and their Designated Critical Habitat found in Oregon, Washington and parts of California, Idaho and Nevada* (USFWS 2013) as appropriate for use near streams with listed fish. These adjuvants are designated under the column "ARBO II", for the second programmatic Aquatic Restoration Biological Opinion.

Table B-1. General Constraints from Herbicide Labels

Herbicides	**General Constraints from Labels** ***(follow all label requirements)***
2,4-D	• Some formulations aretoxic 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 CRP treatments. • Do not treat frozen soil. • Applications to powdery, dry soil when there is low likelihood of rain soon may result in off-site damage by wind-borne soil particles.
Clopyralid	• 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. • 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 which favor runoff. Do not apply to impervious substrates such as paved or highly compacted surfaces in areas with high potential for ground water contamination. Ground water contamination may occur in areas where soils are permeable or coarse and ground water is near the surface.
Dicamba + Diflufenzopyr	• No aerial application of this mix (BLM Nat'l EIS). • 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 which favor runoff. Do not apply to soils which classify as sand. • Be cognizant of leaching where soils are permeable or where water table is shallow.
Fluridone	• Do not apply in tidewater/brackish water.

Herbicides	**General Constraints from Labels** ***(follow all label requirements)***
Fluroxypyr	• Do not apply directly to water, to areas where surface water is present or to intertidal areas below the mean high water mark. • Do not contaminate water when cleaning equipment or disposing of equipment washwaters. • Do not apply where drift may be a problem due to proximity to susceptible crops or other non-target broadleaf plants.
Glyphosate	• Only use approved aquatic formulations for aquatic applications. • Do not contaminate water when cleaning equipment or disposing of equipment washwaters. • Treatment of aquatic weeds can result in oxygen depletion or loss due to decomposition of plants which can cause fish suffocation. • This is a non-selective herbicide. • Avoid drift.
Hexazinone	• Do not apply directly to water, or to areas where surface water is present, or to intertidal areas below the mean high water mark. Do not contaminate water when disposing of equipment wash-water. • Use care where soils are permeable to avoid groundwater contamination. • Will kill grasses.
Imazapic	• Do not apply directly to water, or to areas where surface water is present, or to intertidal areas below the mean high water mark. • Do not contaminate water when disposing of equipment wash-water. • To reduce run-off, avoid applications when rain is forecast w/in 48 hours.
Imazapyr	• Aquatic applications (with approved products) can only be made within the restrictions outlined on the label. • Otherwise, do not apply directly to water, or to areas where surface water is present, or to intertidal areas below the mean high water mark. • Do not contaminate water when disposing of equipment wash-water.
Metsulfuron methyl	• Do not apply directly to water, or to areas where surface water is present, or to intertidal areas below the mean high water mark. • Do not contaminate water when disposing of equipment wash-water. • This herbicide is injurious to plants at extremely low concentrations. Non-target plants may be adversely affected from drift and run-off.
Picloram	• Do not use manure from animals grazing treated areas or feeding on treated hay on land used for growing broadleaf crops, ornamentals, orchards or other susceptible, desirable plants. Manure may contain enough picloram to cause injury to susceptible plants. • Do not use grass or hay from treated areas for composting or mulching of susceptible broadleaf plants or crops. • Do not transfer livestock from treated grazing areas (or feeding of treated hay) onto sensitive broadleaf crop areas without first allowing 7 days of grazing on an untreated grass pasture (or feeding of untreated hay). Otherwise, urine and manure may contain enough picloram to cause injury to sensitive broadleaf plants. • Restricted use. May injure susceptible, non-target plants. This herbicide is injurious to plants at extremely low concentrations. Non-target plants may be adversely affected from drift and run-off. • Do not apply directly to water, or to areas where surface water is present, or to intertidal areas below the mean high water mark. • Do not make application when circumstances favor movement from treatment site. Do not contaminate water or water sources when mixing, loading, or disposing of equipment wash-water. • May leach thru soil and contaminate ground water where soils are permeable, particularly where water table is shallow. • Do not apply within the root zone of desirable trees unless such injury can be tolerated.
Rimsulfuron	• Do not graze treated sites or cut for forage or hay for a minimum of 1 year after application in order to allow newly emerged grasses sufficient time to become established. • Do not apply directly to water, or to areas where surface water is present, or to intertidal areas below the mean high water mark.

Herbicides	General Constraints from Labels *(follow all label requirements)*
	• Do not contaminate water by cleaning of equipment or disposal of equipment washwaters or rinsate. • Rainfall or irrigation is needed for herbicide activation.
Sulfometuron methyl	• Do not apply directly to water, or to areas where surface water is present, or to intertidal areas below the mean high water mark. Do not contaminate water when disposing of equipment wash-water. • Applications to powdery, dry soil when there is low likelihood of rain soon may result in off-site damage by wind-borne soil particles. • Do not treat frozen soil. • Do not apply in or on irrigation ditches or canals, including their outer banks.
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.

Table B-2. Herbicide Formulations Approved for use on BLM-Administered Lands[1]

Common Name	Trade Name	Manufacturer	EPA Reg. Number	Concentration	Units of Concentration
2, 4-D	Agrisolution 2,4-D LV6	Agriliance, L.L.C.	1381-101	5.6	Lbs. a.e[2]. / gal.
2, 4-D	Agrisolution 2,4-D Amine 4	Agriliance, L.L.C.	1381-103	3.8	Lbs. a.e. / gal.
2, 4-D	Agrisolution 2,4-D LV4	Agriliance, L.L.C.	1381-102	3.8	Lbs. a.e. / gal.
2, 4-D	2,4-D Amine 4	Albaugh, Inc./Agri Star	42750-19	3.8	Lbs. a.e. / gal.
2, 4-D	2,4-D LV 4	Albaugh, Inc./Agri Star	42750-15	3.8	Lbs. a.e. / gal.
2, 4-D	Solve 2,4-D	Albaugh, Inc./Agri Star	42750-22	3.76	Lbs. a.e. / gal.
2, 4-D	2,4-D LV 6	Albaugh, Inc./Agri Star	42750-20	5.5	Lbs. a.e. / gal.
2, 4-D	Five Star	Albaugh, Inc./Agri Star	42750-49	5.0	Lbs. a.e. / gal.
2, 4-D	D-638	Albaugh, Inc./Agri Star	42750-36	2.8	Lbs. a.e. / gal.
2, 4-D	Alliagre 2,4-D Amine	Alligare, LLC	81927-38	3.8	Lbs. a.e. / gal.
2, 4-D	2,4-D LV6	Helena Chemical Company	42750-20-5905	5.5	Lbs. a.e. / gal.
2, 4-D	2,4-D Amine	Helena Chemical Company	5905-72	3.76	Lbs. a.e. / gal.
2, 4-D	2,4-D Amine 4	Helena Chemical Company	42750-19-5905	3.8	Lbs. a.e. / gal.
2, 4-D	Opti-Amine	Helena Chemical Company	5905-501	3.8	Lbs. a.e. / gal.
2, 4-D	Barrage HF	Helena Chemical Company	5905-529	4.7	Lbs. a.e. / gal.
2, 4-D	HardBall	Helena Chemical Company	5905-549	1.74	Lbs. a.e. / gal.
2, 4-D	Unison	Helena Chemical Company	5905-542	1.74	Lbs. a.e. / gal.
2, 4-D	Clean Amine	Loveland Products Inc.	34704-120	3.74	Lbs. a.e. / gal.
2, 4-D	Low Vol 4 Ester Weed Killer	Loveland Products Inc.	34704-124	3.8	Lbs. a.e. / gal.
2, 4-D	Low Vol 6 Ester Weed Killer	Loveland Products Inc.	34704-125	5.6	Lbs. a.e. / gal.
2, 4-D	Saber	Loveland Products Inc.	34704-803	3.8	Lbs. a.e. / gal.
2, 4-D	Salvo	Loveland Products Inc.	34704-609	5	Lbs. a.e. / gal.

Common Name	Trade Name	Manufacturer	EPA Reg. Number	Concentration	Units of Concentration
2, 4-D	Savage DS	Loveland Products Inc.	34704-606	78.9	% a.e.
2, 4-D	Aqua-Kleen	Nufarm Americas Inc.	71368-4	19	% a.e.
2, 4-D	Aqua-Kleen	Nufarm Americas Inc.	228-378	19	% a.e.
2, 4-D	Esteron 99C	Nufarm Americas Inc.	62719-9-71368	3.8	Lbs. a.e. / gal.
2, 4-D	Weedar 64	Nufarm Americas Inc.	71368-1	3.8	Lbs. a.e. / gal.
2, 4-D	Weedone LV-4	Nufarm Americas Inc.	228-139-71368	3.84	Lbs. a.e. / gal.
2, 4-D	Weedone LV-4 Solventless	Nufarm Americas Inc.	71368-14	3.8	Lbs. a.e. / gal.
2, 4-D	Weedone LV-6	Nufarm Americas Inc.	71368-11	5.4	Lbs. a.e. / gal.
2, 4-D	Formula 40	Nufarm Americas Inc.	228-357	3.67	Lbs. a.e. / gal.
2, 4-D	2,4-D LV 6 Ester	Nufarm Americas Inc.	228-95	5.5	Lbs. a.e. / gal.
2, 4-D	Platoon	Nufarm Americas Inc.	228-145	3.8	Lbs. a.e. / gal.
2, 4-D	WEEDstroy AM-40	Nufarm Americas Inc.	228-145	3.8	Lbs. a.e. / gal.
2, 4-D	Hi-Dep	PBI Gordon Corp.	2217-703	3.8	Lbs. a.e. / gal.
2, 4-D	2,4-D Amine	Setre (Helena)	5905-72	3.76	Lbs. a.e. / gal.
2, 4-D	Barrage LV Ester	Setre (Helena)	5905-504	4.7	Lbs. a.e. / gal.
2, 4-D	2,4-D LV4	Setre (Helena)	5905-90	3.8	Lbs. a.e. / gal.
2, 4-D	2,4-D LV6	Setre (Helena)	5905-93	5.8	Lbs. a.e. / gal.
2, 4-D	Clean Crop Amine 4	UAP-Platte Chem. Co.	34704-5 CA	3.8	Lbs. a.e. / gal.
2, 4-D	Clean Crop Low Vol 6 Ester	UAP-Platte Chem. Co.	34704-125	5.6	Lbs. a.e. / gal.
2, 4-D	Salvo LV Ester	UAP-Platte Chem. Co.	34704-609	5.0	Lbs. a.e. / gal.
2, 4-D	2,4-D 4# Amine Weed Killer	UAP-Platte Chem. Co.	34704-120	3.74	Lbs. a.e. / gal.
2, 4-D	Clean Crop LV-4 ES	UAP-Platte Chem. Co.	34704-124	3.8	Lbs. a.e. / gal.
2, 4-D	Savage DS	UAP-Platte Chem. Co.	34704-606	78.9	% a.e.
2, 4-D	Cornbelt 4 lb. Amine	Van Diest Supply Co.	11773-2	3.8	Lbs. a.e. / gal.
2, 4-D	Cornbelt 4# LoVol Ester	Van Diest Supply Co.	11773-3	3.8	Lbs. a.e. / gal.
2, 4-D	Cornbelt 6# LoVol Ester	Van Diest Supply Co.	11773-4	5.6	Lbs. a.e. / gal.
2, 4-D	Amine 4	Wilbur-Ellis Co.	2935-512	3.8	Lbs. a.e. / gal.
2, 4-D	Base Camp Amine 4	Wilbur-Ellis Co.	71368-1-2935	3.8	Lbs. a.e. / gal.
2, 4-D	Base Camp LV6	Wilbur-Ellis Co.	2935-553	5.5	Lbs. a.e. / gal.
2, 4-D	Broadrange 55	Wilbur-Ellis Co.	2217-813-2935	5.03	Lbs. a.e. / gal.
2, 4-D	Lo Vol-4	Wilbur-Ellis Co.	228-139-2935	3.8	Lbs. a.e. / gal.
2, 4-D	Lo Vol-6 Ester	Wilbur-Ellis Co.	228-95-2935	5.5	Lbs. a.e. / gal.
2, 4-D	Agrisolution 2,4-D LV6	Winflied Solutions, LLC	1381-101	5.6	Lbs. a.e. / gal.
2, 4-D	Agrisolution 2,4-D Amine 4	Winfield Solutions, LLC	1381-103	3.8	Lbs. a.e. / gal.
2, 4-D	Agrisolution 2,4-D LV4	Winfield Solutions, LLC	1381-102	3.8	Lbs. a.e. / gal.
2, 4-D	Phenoxy 088	Winfield Solutions, LLC	42750-36-9779	2.8	Lbs. a.e. / gal.
2,4-D	Alligare 2,4-D LV 6	Alligare, LLC	81927-39	5.5	Lbs. a.e. / gal.

Common Name	Trade Name	Manufacturer	EPA Reg. Number	Concentration	Units of Concentration
2,4-D	Rugged	Winfield Solutions, LLC	1381-247	3.5	Lbs. a.e. / gal.
2,4-D	Shredder	Winfield Solutions, LLC	1381-195	6.0	Lbs. a.e. / gal.
Aminopyralid	Milestone	Dow AgroSciences	62719-519	2.0	Lbs. a.e. / gal.
Aminopyralid	Milestone VM	Dow AgroSciences	62719-537	2.0	Lbs. a.e. / gal.
Aminopyralid + 2,4-D	GrazonNext	Dow AgroSciences	62719-587	0.33 + 2.67	Lbs. a.e. / gal.
Aminopyralid + 2,4-D	GrazonNext HL	Dow AgroSciences	62719-628	0.41 + 3.33	Lbs. a.e. / gal.
Aminopyralid + 2,4-D	ForeFront HL	Dow AgroSciences	62719-630	0.41 + 3.33	Lbs. a.e. / gal.
Aminopyralid + 2,4-D	ForeFront R&P	Dow AgroSciences	62719-524	0.33 + 2.67	Lbs. a.e. / gal.
Aminopyralid + 2,4-D	PasturAll	Dow AgroSciences	62719-579	0.075 + 2.67	Lbs. a.e. / gal.
Aminopyralid + 2,4-D	PasturAll HL	Dow AgroSciences	62719-629	0.1 + 3.54	Lbs. a.e. / gal.
Aminopyralid + Clopyralid	Sendero	Dow AgroSciences	62719-645	0.5 + 2.3	Lbs. a.e. / gal.
Aminopyralid + Metsulfuron methyl	Opensight	Dow AgroSciences	62719-597	0.525 + 0.0945	% a.i.[3]
Aminopyralid + Metsulfuron methyl	Chaparral	Dow AgroSciences	62719-597	0.525 + 0.0945	% a.i.
Aminopyralid + Triclopyr	Milestone VM Plus	Dow AgroSciences	62719-572	0.1 + 1.0	Lbs. a.e. / gal.
Aminopyralid + Triclopyr	Captone	Dow AgroSciences	62719-572	0.1 + 1.0	Lbs. a.e. / gal.
Chlorsulfuron	Alligare Chlorsulfuron	Alligare, LLC	81927-43	75	% a.i.
Chlorsulfuron	Chlorsulfuron	Alligare, LLC	81927-43	75	% a.i.
Chlorsulfuron	Telar DF	DuPont Crop Protection	352-522	75	% a.i.
Chlorsulfuron	Telar XP	DuPont Crop Protection	352-654	75	% a.i.
Chlorsulfuron	Nufarm Chlorsulf SPC 75 WDG Herbicide	Nufarm Americas Inc.	228-672	75	% a.i.
Chlorsulfuron	Chlorsulfuron E-Pro 75 WDG	Nufarm Americas Inc.	79676-72	75	% a.i.
Clopyralid	Spur	Albaugh, Inc.	42750-89	3.0	Lbs. a.e. / gal.
Clopyralid	Pyramid R&P	Albaugh, Inc.	42750-94	3.0	Lbs. a.e. / gal.
Clopyralid	Clopyralid	Alligare, LLC	81927-14	3.0	Lbs. a.e. / gal.
Clopyralid	Clopyralid 3	Alligare, LLC	42750-94-81927	3.0	Lbs. a.e. / gal.
Clopyralid	Cody Herbicide	Alligare, LLC	81927-28	3.0	Lbs. a.e. / gal.
Clopyralid	Reclaim	Dow AgroSciences	62719-83	3.0	Lbs. a.e. / gal.
Clopyralid	Stinger	Dow AgroSciences	62719-73	3.0	Lbs. a.e. / gal.
Clopyralid	Transline	Dow AgroSciences	62719-259	3.0	Lbs. a.e. / gal.
Clopyralid	CleanSlate	Nufarm Americas Inc.	228-491	3.0	Lbs. a.e. / gal.
Clopyralid + 2, 4-D	Commando	Albaugh, Inc.	42750-92	0.38 + 2.0	Lbs. a.e. / gal.
Clopyralid + 2, 4-D	Curtail	Dow AgroSciences	62719-48	0.38 + 2.0	Lbs. a.e. / gal.
Clopyralid + 2, 4-D	Cutback	Nufarm Americas Inc.	71368-72	0.38 + 2.0	Lbs. a.e. / gal.

Common Name	Trade Name	Manufacturer	EPA Reg. Number	Concentration	Units of Concentration
Dicamba	Dicamba DMA	Albaugh, Inc./Agri Star	42750-40	4.0	Lbs. a.e. / gal.
Dicamba	Vision	Albaugh, Inc.	42750-98	3.8	Lbs. a.e. / gal.
Dicamba	Cruise Control	Alligare, LLC	42750-40-81927	4.0	Lbs. a.e. / gal.
Dicamba	Banvel	Arysta LifeScience N.A. Corp.	66330-276	4.0	Lbs. a.e. / gal.
Dicamba	Clarity	BASF Corporation	7969-137	4.0	Lbs. a.e. / gal.
Dicamba	Vision	Helena Chemical Company	5905-576	4.0	Lbs. a.e. / gal.
Dicamba	Rifle	Loveland Products Inc.	34704-861	4.0	Lbs. a.e. / gal.
Dicamba	Banvel	Micro Flo Company	51036-289	4.0	Lbs. a.e. / gal.
Dicamba	Diablo	Nufarm Americas Inc.	228-379	4.0	Lbs. a.e. / gal.
Dicamba	Vanquish Herbicide	Nufarm Americas Inc.	228-397	4.0	Lbs. a.e. / gal.
Dicamba	Vanquish	Syngenta	100-884	4.0	Lbs. a.e. / gal.
Dicamba	Sterling Blue	Winfield Solutions, LLC	7969-137-1381	4.0	Lbs. a.e. / gal.
Dicamba + 2, 4-D	Range Star	Albaugh, Inc./Agri Star	42750-55	1.0 + 2.87	Lbs. a.e. / gal.
Dicamba + 2, 4-D	Dicamba + 2,4-D DMA	Alligare, LLC	81927-42	1.0 + 2.87	Lbs. a.e. / gal.
Dicamba + 2, 4-D	Weedmaster	BASF Corporation	7969-133	1.0 + 2.87	Lbs. a.e. / gal.
Dicamba + 2, 4-D	Brush-Rhap	Helena Chemical Company	5905-568	1.8 + 2.4	Lbs. a.e. / gal.
Dicamba + 2, 4-D	Latigo	Helena Chemical Company	5905-564	1.8 + 2.4	Lbs. a.e. / gal.
Dicamba + 2, 4-D	Outlaw	Helena Chemical Company	5905-574	1.09 + 1.45	Lbs. a.e. / gal.
Dicamba + 2, 4-D	Rifle-D	Loveland Products Inc.	34704-869	1.0 + 2.88	Lbs. a.e. / gal.
Dicamba + 2, 4-D	KambaMaster	Nufarm Americas Inc.	71368-34	1.0 + 2.87	Lbs. a.e. / gal.
Dicamba + 2, 4-D	Weedmaster	Nufarm Americas Inc.	71368-34	1.0 + 2.87	Lbs. a.e. / gal.
Dicamba + 2, 4-D	Veteran 720	Nufarm Americas Inc.	228-295	1.0 + 1.9	Lbs. a.e. / gal.
Dicamba + 2, 4-D	Brash	Winfield Solutions, LLC	1381-202	1.0 + 2.87	Lbs. a.e. / gal.
Dicamba + Diflufenzopyr	Distinct	BASF Corporation	7969-150	50 + 20	% a.e.
Dicamba + Diflufenzopyr	Overdrive	BASF Corporation	7969-150	50 + 20	% a.e.
Fluridone	Avast!	SePRO	67690-30	4.0	Lbs. a.i. / gal.
Fluridone	Sonar AS	SePRO	67690-4	4.0	Lbs. a.i. / gal.
Fluridone	Sonar Precision Release	SePRO	67690-12	5	% a.i.
Fluridone	Sonar Q	SePRO	67690-3	5	% a.i.
Fluridone	Sonar SRP	SePRO	67690-3	5	% a.i.
Fluroxypyr	Comet	Nufarm Americas Inc.	71368-87	1.5	Lbs. a.i. / gal.
Fluroxypyr	Fluroxypyr Herbicide	Alligare, LLC	66330-385-81927	2.8	Lbs. a.i. / gal.
Fluroxypyr	Vista XRT	Dow AgroSciences	62719-586	2.8	Lbs. a.i. / gal.
Fluroxypyr + Clopyralid	Truslate	Nufarm Americas Inc.	71368-86	0.75 + 0.75	Lbs. a.i. / gal.
Fluroxypyr + Picloram	Surmount	Dow AgroSciences	62719-586	0.67 + 0.67	Lbs. a.i. / gal.
Fluroxypyr + Picloram	Trooper Pro	Nufarm Americas Inc.	228-599	1.0 + 1.0	Lbs. a.i. / gal.
Fluroxypyr + Triclopyr	PastureGard	Dow AgroSciences	62719-477	0.5 + 1.5	Lbs. a.i. / gal.

Common Name	Trade Name	Manufacturer	EPA Reg. Number	Concentration	Units of Concentration
Fluroxypyr + Triclopyr	PastureGard HL	Dow AgroSciences	62719-637	1.0 + 3.0	Lbs. a.i. / gal.
Glyphosate	Aqua Star	Albaugh, Inc./Agri Star	42750-59	4.0	Lbs. a.e. / gal.
Glyphosate	Forest Star	Albaugh, Inc./Agri Star	42570-61	3.0	Lbs. a.e. / gal.
Glyphosate	Gly Star Gold	Albaugh, Inc./Agri Star	42750-61	3.0	Lbs. a.e. / gal.
Glyphosate	Gly Star Original	Albaugh, Inc./Agri Star	42750-60	3.0	Lbs. a.e. / gal.
Glyphosate	Gly Star Plus	Albaugh, Inc./Agri Star	42750-61	3.0	Lbs. a.e. / gal.
Glyphosate	Gly Star Pro	Albaugh, Inc./Agri Star	42750-61	3.0	Lbs. a.e. / gal.
Glyphosate	Glyphosate 4 PLUS	Alligare, LLC	81927-9	3.0	Lbs. a.e. / gal.
Glyphosate	Glyphosate 4 +	Alligare, LLC	81927-9	3.0	Lbs. a.e. / gal.
Glyphosate	Glyphosate 5.4	Alligare, LLC	81927-8	4.0	Lbs. a.e. / gal.
Glyphosate	Glyfos	Cheminova	4787-31	3.0	Lbs. a.e. / gal.
Glyphosate	Glyfos PRO	Cheminova	67760-57	3.0	Lbs. a.e. / gal.
Glyphosate	Glyfos Aquatic	Cheminova	4787-34	4.0	Lbs. a.e. / gal.
Glyphosate	ClearOut 41 Plus	Agrisel USA, Inc.	70829-3	3.0	Lbs. a.e. / gal.
Glyphosate	Accord Concentrate	Dow AgroSciences	62719-324	4.0	Lbs. a.e. / gal.
Glyphosate	Accord SP	Dow AgroSciences	62719-322	3.0	Lbs. a.e. / gal.
Glyphosate	Accord XRT	Dow AgroSciences	62719-517	4.0	Lbs. a.e. / gal.
Glyphosate	Accord XRT II	Dow AgroSciences	62719-556	4.0	Lbs. a.e. / gal.
Glyphosate	Glypro	Dow AgroSciences	62719-324	4.0	Lbs. a.e. / gal.
Glyphosate	Glypro Plus	Dow AgroSciences	62719-322	3.0	Lbs. a.e. / gal.
Glyphosate	Rodeo	Dow AgroSciences	62719-324	4.0	Lbs. a.e. / gal.
Glyphosate	Showdown	Helena Chemical Company	71368-25-5905	3.0	Lbs. a.e. / gal.
Glyphosate	Mirage	Loveland Products Inc.	34704-889	3.0	Lbs. a.e. / gal.
Glyphosate	Mirage Plus / Mad Dog Plus	Loveland Products Inc.	34704-890	3.0	Lbs. a.e. / gal.
Glyphosate	Aquamaster	Monsanto	524-343	4.0	Lbs. a.e. / gal.
Glyphosate	Roundup Custom	Monsanto	524-343	4.0	Lbs. a.e. / gal.
Glyphosate	Roundup Original	Monsanto	524-445	3.0	Lbs. a.e. / gal.
Glyphosate	Roundup Original II	Monsanto	524-454	3.0	Lbs. a.e. / gal.
Glyphosate	Roundup Original II CA	Monsanto	524-475	3.0	Lbs. a.e. / gal.
Glyphosate	Honcho	Monsanto	524-445	3.0	Lbs. a.e. / gal.
Glyphosate	Honcho Plus	Monsanto	524-454	3.0	Lbs. a.e. / gal.
Glyphosate	Roundup PRO	Monsanto	524-475	3.0	Lbs. a.e. / gal.
Glyphosate	Roundup PRO Concentrate	Monsanto	524-529	3.7	Lbs. a.e. / gal.
Glyphosate	Roundup PRO Dry	Monsanto	524-505	64.9	% a.e.
Glyphosate	Roundup PROMAX	Monsanto	524-579	4.5	Lbs. a.e. / gal.
Glyphosate	Aqua Neat	Nufarm Americas Inc.	228-365	4.0	Lbs. a.e. / gal.
Glyphosate	Credit Xtreme	Nufarm Americas Inc.	71368-81	4.5	Lbs. a.e. / gal.

Common Name	Trade Name	Manufacturer	EPA Reg. Number	Concentration	Units of Concentration
Glyphosate	Foresters	Nufarm Americas Inc.	228-381	4.0	Lbs. a.e. / gal.
Glyphosate	Razor	Nufarm Americas Inc.	228-366	3.0	Lbs. a.e. / gal.
Glyphosate	Razor Pro	Nufarm Americas Inc.	228-366	3.0	Lbs. a.e. / gal.
Glyphosate	GlyphoMate 41	PBI/Gordon Corporation	2217-847	2.8	Lbs. a.e. / gal.
Glyphosate	AquaPro Aquatic Herbicide	SePRO Corporation	62719-324-67690	4.0	Lbs. a.e. / gal.
Glyphosate	Rattler	Setre (Helena)	524-445-5905	3.0	Lbs. a.e. / gal.
Glyphosate	Buccaneer	Tenkoz	55467-10	3.0	Lbs. a.e. / gal.
Glyphosate	Buccaneer Plus	Tenkoz	55467-9	3.0	Lbs. a.e. / gal.
Glyphosate	Mirage Herbicide	UAP-Platte Chem. Co.	524-445-34704	3.0	Lbs. a.e. / gal.
Glyphosate	Mirage Plus Herbicide	UAP-Platte Chem. Co.	524-454-34704	3.0	Lbs. a.e. / gal.
Glyphosate	Gly-4 Plus	Universal Crop Protection Alliance	72693-1	3.0	Lbs. a.e. / gal.
Glyphosate	Gly-4 Plus	Universal Crop Protection Alliance	42750-61-72693	3.0	Lbs. a.e. / gal.
Glyphosate	Gly-4	Universal Crop Protection Alliance	42750-60-72693	3.0	Lbs. a.e. / gal.
Glyphosate	Glyphosate 4	Vegetation Man., LLC	73220-6-74477	3.0	Lbs. a.e. / gal.
Glyphosate	Agrisolutions Cornerstone	Winfield Solutions, LLC	1381-191	3.0	Lbs. a.e. / gal.
Glyphosate	Agrisolutions Cornerstone Plus	Winfield Solutions, LLC	1381-192	3.0	Lbs. a.e. / gal.
Glyphosate	Agrisolutions Rascal	Winfield Solutions, LLC	1381-191	3.0	Lbs. a.e. / gal.
Glyphosate	Agrisolutions Rascal Plus	Winfield Solutions, LLC	1381-192	3.0	Lbs. a.e. / gal.
Glyphosate	Cornerstone 5 Plus	Winfield Solutions, LLC	1381-241	4.0	Lbs. a.e. / gal.
Glyphosate + 2, 4-D	Landmaster BW	Albaugh, Inc./Agri Star	42570-62	0.9 + 1.5	Lbs. a.e. / gal.
Glyphosate + 2, 4-D	Campaign	Monsanto	524-351	0.9 + 1.5	Lbs. a.e. / gal.
Glyphosate + 2, 4-D	Landmaster BW	Monsanto	524-351	0.9 + 1.5	Lbs. a.e. / gal.
Hexazinone	Velpar ULW	DuPont Crop Protection	352-450	75	% a.i.
Hexazinone	Velpar L	DuPont Crop Protection	352-392	2.0	Lbs. a.i. / gal.
Hexazinone	Velpar DF	DuPont Crop Protection	352-581	75	% a.i.
Hexazinone	Velosa	Helena Chemical Company	5905-579	2.4	Lbs. a.i. / gal.
Hexazinone	Pronone MG	Pro-Serve	33560-21	10	% a.i.
Hexazinone	Pronone 10G	Pro-Serve	33560-21	10	% a.i.
Hexazinone	Pronone 25G	Pro-Serve	33560-45	25	% a.i.
Hexazinone	Pronone Power Pellet	Pro-Serve	33560-41	75	% a.i.
Hexazinone + Sulfometuron methyl	Oustar	DuPont Crop Protection	352-603	63.2 + 11.8	% a.i.
Hexazinone + Sulfometuron methyl	Westar	DuPont Crop Protection	352-626	68.6 + 6.5	% a.i.

Common Name	Trade Name	Manufacturer	EPA Reg. Number	Concentration	Units of Concentration
Imazapic	Panoramic 2SL	Alligare, LLC	66222-141-81927	2.0	Lbs. a.e. / gal.
Imazapic	Plateau	BASF Corporation	241-365	2.0	Lbs. a.e. / gal.
Imazapic	Nufarm Imazapic 2SL	Nufarm Americas Inc.	71368-99	2.0	Lbs. a.e. / gal.
Imazapic + Glyphosate	Journey	BASF Corporation	241-417	0.75 + 1.5	Lbs. a.e. / gal.
Imazapyr	Imazapyr 2SL	Alligare, LLC	81927-23	2.0	Lbs. a.e. / gal.
Imazapyr	Imazapyr 4SL	Alligare, LLC	81927-24	4.0	Lbs. a.e. / gal.
Imazapyr	Ecomazapyr 2SL	Alligare, LLC	81927-22	2.0	Lbs. a.e. / gal.
Imazapyr	Rotary 2 SL	Alligare, LLC	81927-6	2.0	Lbs. a.e. / gal.
Imazapyr	Arsenal Railroad Herbicide	BASF Corporation	241-273	2.0	Lbs. a.e. / gal.
Imazapyr	Chopper	BASF Corporation	241-296	2.0	Lbs. a.e. / gal.
Imazapyr	Arsenal Applicators Conc.	BASF Corporation	241-299	4.0	Lbs. a.e. / gal.
Imazapyr	Arsenal	BASF Corporation	241-346	2.0	Lbs. a.e. / gal.
Imazapyr	Arsenal PowerLine	BASF Corporation	241-431	2.0	Lbs. a.e. / gal.
Imazapyr	Stalker	BASF Corporation	241-398	2.0	Lbs. a.e. / gal.
Imazapyr	Habitat	BASF Corporation	241-426	2.0	Lbs. a.e. / gal.
Imazapyr	Polaris	Nufarm Americas Inc.	228-534	2.0	Lbs. a.e. / gal.
Imazapyr	Polaris AC	Nufarm Americas Inc.	241-299-228	4.0	Lbs. a.e. / gal.
Imazapyr	Polaris AC	Nufarm Americas Inc.	228-480	4.0	Lbs. a.e. / gal.
Imazapyr	Polaris AC Complete	Nufarm Americas Inc.	228-570	4.0	Lbs. a.e. / gal.
Imazapyr	Polaris AQ	Nufarm Americas Inc.	241-426-228	2.0	Lbs. a.e. / gal.
Imazapyr	Polaris RR	Nufarm Americas Inc.	241-273-228	2.0	Lbs. a.e. / gal.
Imazapyr	Polaris SP	Nufarm Americas Inc.	228-536	2.0	Lbs. a.e. / gal.
Imazapyr	Polaris SP	Nufarm Americas Inc.	241-296-228	2.0	Lbs. a.e. / gal.
Imazapyr	Polaris Herbicide	Nufarm Americas Inc.	241-346-228	2.0	Lbs. a.e. / gal.
Imazapyr	Habitat Herbicide	SePRO	241-426-67690	2.0	Lbs. a.e. / gal.
Imazapyr	SSI Maxim Arsenal 0.5G	SSI Maxim Co., Inc.	34913-23	0.5	% a.e.
Imazapyr	SSI Maxim Arsenal 5.0 G	SSI Maxim Co., Inc.	34913-24	5	% a.e.
Imazapyr	Ecomazapyr 2 SL	Vegetation Man., LLC	74477-6	2.0	Lbs. a.e. / gal.
Imazapyr	Imazapyr 2 SL	Vegetation Man., LLC	74477-4	2.0	Lbs. a.e. / gal.
Imazapyr	Imazapyr 4 SL	Vegetation Man., LLC	74477-5	4.0	Lbs. a.e. / gal.
Imazapyr + Metsulfuron methyl	Lineage Clearstand	DuPont Crop Protection	352-766	63.2 + 9.5	% a.i.
Imazapyr + Sulfometuron methyl + Metsulfuron methyl	Lineage HWC	DuPont Crop Protection	352-765	37.5 + 28.1 + 7.5	% a.i.
Imazapyr + Sulfometuron methyl +	Lineage Prep	DuPont Crop Protection	352-767	54.5 + 15.3 + 4.1	% a.i.

Common Name	Trade Name	Manufacturer	EPA Reg. Number	Concentration	Units of Concentration
Metsulfuron methyl					
Metsulfuron methyl	MSM 60	Alligare, LLC	81927-7	60	% a.i.
Metsulfuron methyl	AmTide MSM 60DF Herbicide	AmTide, LLC	83851-3	60	% a.i.
Metsulfuron methyl	Escort DF	DuPont Crop Protection	352-439	60	% a.i.
Metsulfuron methyl	Escort XP	DuPont Crop Protection	352-439	60	% a.i.
Metsulfuron methyl	MSM E-Pro 60 EG Herbicide	Etigra, LLC	81959-14	60	% a.i.
Metsulfuron methyl	MSM E-AG 60 EG Herbicide	Etigra, LLC	81959-14	60	% a.i.
Metsulfuron methyl	Patriot	Nufarm Americas Inc.	228-391	60	% a.i.
Metsulfuron methyl	PureStand	Nufarm Americas Inc.	71368-38	60	% a.i.
Metsulfuron methyl	Metsulfuron Methyl DF	Vegetation Man., LLC	74477-2	60	% a.i.
Metsulfuron methyl + Chlorsulfuron	Cimarron X-tra	DuPont Crop Protection	352-669	30 + 37.5	% a.i.
Metsulfuron methyl + Chlorsulfuron	Cimarron Plus	DuPont Crop Protection	352-670	48 + 15	% a.i.
Metsulfuron methyl + Dicamba + 2, 4-D	Cimarron MAX	DuPont Crop Protection	352-615	60 and 1.0 + 2.87	% a.i. and lbs. a.e., respectively
Picloram	Triumph K	Albaugh, Inc.	42750-81	2.0	Lbs. a.e. / gal.
Picloram	Triumph 22K	Albaugh, Inc.	42750-79	2.0	Lbs. a.e. / gal.
Picloram	Picloram K	Alligare, LLC	81927-17	2.0	Lbs. a.e. / gal.
Picloram	Picloram 22K	Alligare, LLC	81927-18	2.0	Lbs. a.e. / gal.
Picloram	Grazon PC	Dow AgroSciences	62719-181	2.0	Lbs. a.e. / gal.
Picloram	OutPost 22K	Dow AgroSciences	62719-6	2.0	Lbs. a.e. / gal.
Picloram	Tordon K	Dow AgroSciences	62719-17	2.0	Lbs. a.e. / gal.
Picloram	Tordon 22K	Dow AgroSciences	62719-6	2.0	Lbs. a.e. / gal.
Picloram	Trooper 22K	Nufarm Americas Inc.	228-535	2.0	Lbs. a.e. / gal.
Picloram + 2, 4-D	GunSlinger	Albaugh, Inc.	42750-80	0.54 + 2.0	Lbs. a.e. / gal.
Picloram + 2, 4-D	Picloram + D	Alligare, LLC	81927-16	0.54 + 2.0	Lbs. a.e. / gal.
Picloram + 2, 4-D	Tordon 101 Mixture	Dow AgroSciences	62719-5	0.54 + 2.0	Lbs. a.e. / gal.
Picloram + 2, 4-D	Tordon 101 R Forestry	Dow AgroSciences	62719-31	0.28 + 1.057	Lbs. a.e. / gal.
Picloram + 2, 4-D	Tordon RTU	Dow AgroSciences	62719-31	0.28 + 1.057	Lbs. a.e. / gal.
Picloram + 2, 4-D	Grazon P+D	Dow AgroSciences	62719-182	0.54 + 2.0	Lbs. a.e. / gal.
Picloram + 2, 4-D	HiredHand P+D	Dow AgroSciences	62719-182	0.54 + 2.0	Lbs. a.e. / gal.
Picloram + 2, 4-D	Pathway	Dow AgroSciences	62719-31	0.28 + 1.057	Lbs. a.e. / gal.
Picloram + 2, 4-D	Trooper 101	Nufarm Americas Inc.	228-561	0.54 + 2.0	Lbs. a.e. / gal.
Picloram + 2, 4-D	Trooper P + D	Nufarm Americas Inc.	228-530	0.54 + 2.0	Lbs. a.e. / gal.
Picloram + 2, 4-D + Dicamba	Trooper Extra	Nufarm Americas Inc.	228-586	0.5 + 2.0 + 0.5	Lbs. a.e. / gal.

Common Name	Trade Name	Manufacturer	EPA Reg. Number	Concentration	Units of Concentration
Rimsulfuron	Matrix	DuPont Crop Protection	352-556	25	% a.i.
Sulfometuron methyl	SFM 75	Alligare, LLC	81927-26	75	% a.i.
Sulfometuron methyl	Oust DF	DuPont Crop Protection	352-401	75	% a.i.
Sulfometuron methyl	Oust XP	DuPont Crop Protection	352-601	75	% a.i.
Sulfometuron methyl	SFM E-Pro 75EG	Etigra, LLC	79676-16	75	% a.i.
Sulfometuron methyl	Spyder	Nufarm Americas Inc.	228-408	75	% a.i.
Sulfometuron methyl	SFM 75	Vegetation Man., L.L.C.	72167-11-74477	75	% a.i.
Sulfometuron methyl + Chlorsulfuron	Landmark XP	DuPont Crop Protection	352-645	50 + 25	% a.i.
Sulfometuron methyl + Metsulfuron methyl	Oust Extra	DuPont Crop Protection	352-622	56.25 + 15	% a.i.
Sulfometuron methyl + Metsulfuron methyl	SFM Extra	DuPont Crop Protection	81927-5	56.25 + 15	% a.i.
Triclopyr	Triclopry 4	Alligare, LLC	81927-11	4.0	Lbs. a.e. / gal.
Triclopyr	Triclopyr 3	Alligare, LLC	81927-13	3.0	Lbs. a.e. / gal.
Triclopyr	Triclopyr RTU	Alligare, LLC	81927-33	0.8	Lbs. a.e. / gal.
Triclopyr	Element 3A	Dow AgroSciences	62719-37	3.0	Lbs. a.e. / gal.
Triclopyr	Element 4	Dow AgroSciences	62719-40	4.0	Lbs. a.e. / gal.
Triclopyr	Forestry Garlon XRT	Dow AgroSciences	62719-553	6.3	Lbs. a.e. / gal.
Triclopyr	Garlon 3A	Dow AgroSciences	62719-37	3.0	Lbs. a.e. / gal.
Triclopyr	Garlon 4	Dow AgroSciences	62719-40	4.0	Lbs. a.e. / gal.
Triclopyr	Garlon 4 Ultra	Dow AgroSciences	62719-527	4.0	Lbs. a.e. / gal.
Triclopyr	Remedy	Dow AgroSciences	62719-70	4.0	Lbs. a.e. / gal.
Triclopyr	Remedy Ultra	Dow AgroSciences	62719-552	4.0	Lbs. a.e. / gal.
Triclopyr	Pathfinder II	Dow AgroSciences	62719-176	0.75	Lbs. a.e. / gal.
Triclopyr	Trycera	Helena Chemical Company	5906-580	2.87	Lbs. a.e. / gal.
Triclopyr	Relegate	Nufarm Americas Inc.	228-521	4.0	Lbs. a.e. / gal.
Triclopyr	Relegate RTU	Nufarm Americas Inc.	228-522	0.75	Lbs. a.e. / gal.
Triclopyr	Tahoe 3A	Nufarm Americas Inc.	228-384	3.0	Lbs. a.e. / gal.
Triclopyr	Tahoe 3A	Nufarm Americas Inc.	228-518	3.0	Lbs. a.e. / gal.
Triclopyr	Tahoe 3A	Nufarm Americas Inc.	228-520	3.0	Lbs. a.e. / gal.
Triclopyr	Tahoe 4E	Nufarm Americas Inc.	228-385	4.0	Lbs. a.e. / gal.
Triclopyr	Tahoe 4E Herbicide	Nufarm Americas Inc.	228-517	4.0	Lbs. a.e. / gal.
Triclopyr	Renovate 3	SePRO Corporation	62719-37-67690	3.0	Lbs. a.e. / gal.
Triclopyr	Renovate OTF	SePRO Corporation	67690-42	10	% a.e.
Triclopyr	Ecotriclopyr 3 SL	Vegetation Man., LLC	72167-49-74477	3.0	Lbs. a.e. / gal.
Triclopyr	Triclopyr 3 SL	Vegetation Man., LLC	72167-53-74477	3.0	Lbs. a.e. / gal.

Common Name	Trade Name	Manufacturer	EPA Reg. Number	Concentration	Units of Concentration
Triclopyr + 2, 4-D	Everett	Alligare, LLC	81927-29	1.0 + 2.0	Lbs. a.e. / gal.
Triclopyr + 2, 4-D	Crossbow	Dow AgroSciences	62719-260	1.0 + 2.0	Lbs. a.e. / gal.
Triclopyr + 2, 4-D	Aquasweep	Nufarm Americas Inc.	228-316	1.07 + 2.78	Lbs. a.e. / gal.
Triclopyr + 2, 4-D	Candor	Nufarm Americas Inc.	228-565	1.0 + 2.0	Lbs. a.e. / gal.
Triclopyr + Clopyralid	Prescott Herbicide	Alligare, LLC	81927-30	2.25 + 0.75	Lbs. a.e. / gal.
Triclopyr + Clopyralid	Redeem R&P	Dow AgroSciences	62719-337	2.25 + 0.75	Lbs. a.e. / gal.
Triclopyr + Clopyralid	Brazen	Nufarm Americas Inc.	228-564	2.25 + 0.75	Lbs. a.e. / gal.

1. Updated September 2015 /March 2016.
2. a.e.= acid equivalent
3. a.i. = active ingredient

Table B-3. Adjuvants Approved for Use on BLM Administered Lands[1]

Adjuvant Type	Trade Name	Manufacturer	ARBO II[2]
Non-ionic	90-10 Surfactant	Brewer International	
Non-ionic	A-90	Alligare, LLC	
Non-ionic	Activate Plus	Winfield Solutions, LLC	
Non-ionic	Activator 90	Loveland Products, Inc.	
Non-ionic	Ad Spray 90	Helena Chemical Company	
Non-ionic	Alligare Surface	Alligare, LLC	
Non-ionic	Alligare Surface West	Alligare, LLC	
Non-ionic	Alligare Trace	Alligare, LLC	
Non-ionic	Aquafact	Crop Production Services	
Non-ionic	Aqufact	Aqumix, Inc.	
Non-ionic	Audible 80	Exacto, Inc.	
Non-ionic	Audible 90	Exacto, Inc.	
Non-ionic	Brewer 90-10	Brewer International	
Non-ionic	Chempro S-820	Chemorse, Ltd	
Non-ionic	Chempro S-910	Chemorse, Ltd	
Non-ionic	Chemsurf 80	Chemorse, Ltd	
Non-ionic	Chemsurf 90	Chemorse, Ltd	
Non-ionic	Cornbelt Premier 90	Van Diest Supply Co.	
Non-ionic	Cornbelt Trophy Gold	Van Diest Supply Co.	
Non-ionic	Elite Platinum	Red River Specialties, Inc.	
Non-ionic	EP-90	Eco-Pak, LLC	
Non-ionic	Haf-Pynt	Drexel Chemical Company	
Non-ionic	Hum-AC 820	Drexel Chemical Company	
Non-ionic	Induce	Setre (Helena)	
Non-ionic	Induce	Helena Chemical Company	
Non-ionic	Induce pH	Helena Chemical Company	
Non-ionic	Inlet	Helena Chemical Company	
Non-ionic	LI-700	Loveland Products, Inc.	✓
Non-ionic	Magnify	Monterey AgResources	✓
Non-ionic	NIS 90:10	Precision Laboratories, LLC	
Non-ionic	NIS-EA	Wilbur-Ellis Co.	
Non-ionic	No Foam A	Creative Marketing & Research, Inc.	
Non-ionic	Optima	Helena Chemical Company	
Non-ionic	PAS-800	Drexel Chemical Company	
Non-ionic	Preference	Winfield Solutions, LLC	
Non-ionic	R-900	Wilbur-Ellis Co.	
Non-ionic	Range Master	ORO Agri Inc.	
Non-ionic	Red River 90	Red River Specialties, Inc.	
Non-ionic	Red River NIS	Red River Specialties, Inc.	
Non-ionic	Scanner	Loveland Products, Inc.	
Non-ionic	Spec 90/10	Helena Chemical Company	
Non-ionic	Spray Activator 85	Van Diest Supply Co.	
Non-ionic	Spreader 90	Loveland Products, Inc.	
Non-ionic	Spret	Helena Chemical Company	
Non-ionic	Super Spread 90	Wilbur-Ellis Co.	
Non-ionic	Super Spread 7000	Wilbur-Ellis Co.	
Non-ionic	Surf-Ac 910	Drexel Chemical Company	
Non-ionic	Surf-Ac 820	Drexel Chemical Company	
Non-ionic	UAP Surfactant 80/20	Loveland Products, Inc.	
Non-ionic	Wetcit	ORO Agri Inc.	
Non-ionic	X-77	Loveland Products, Inc.	
Spreader/Sticker	Agri-Trend Spreader	Agri-Trend	
Spreader/Sticker	Attach	Loveland Products, Inc.	

Adjuvant Type	Trade Name	Manufacturer	ARBO II[2]
Spreader/Sticker	Aqua-King Plus	Winfield Solutions, LLC	
Spreader/Sticker	Bond	Loveland Products, Inc.	✓
Spreader/Sticker	Bond Max	Loveland Products, Inc.	
Spreader/Sticker	Chempro S-196	Chemorse, Ltd	
Spreader/Sticker	Cohere	Helena Chemical Company	
Spreader/Sticker	CWC 90	CWC Chemical, Inc.	
Spreader/Sticker	Gulfstream	Winfield Solutions, LLC	
Spreader/Sticker	Insist 90	Wilbur-Ellis Co.	
Spreader/Sticker	Lastick	Setre (Helena)	
Spreader/Sticker	Nu-Film-IR	Miller Chem. & Fert. Corp.	
Spreader/Sticker	Nu Film 17	Miller Chem. & Fert. Corp.	
Spreader/Sticker	Nu Film P	Miller Chem. & Fert. Corp.	
Spreader/Sticker	Onside Kick	Exacto, Inc.	
Spreader/Sticker	Pinene II	Drexel Chemical Company	
Spreader/Sticker	Protyx	Precision Laboratories, LLC	
Spreader/Sticker	R-56	Wilbur-Ellis Co.	
Spreader/Sticker	Rocket DL	Monterey AgResources	
Spreader/Sticker	Tactic	Loveland Products, Inc.	✓
Spreader/Sticker	TopFilm	Biosorb, Inc.	
Spreader/Sticker	Widespread Max	Loveland Products, Inc.	
Silicone-based	Aero Dyne-Amic	Helena Chemical Company	
Silicone-based	Aircover	Winfield Solutions, LLC	
Silicone-based	Alligare OSS/NIS	Alligare, LLC	
Silicone-based	Chempro S-172	Chemorse, Ltd	
Silicone-based	Dyne-Amic	Helena Chemical Company	✓
Silicone-based	Elite Marvel	Red River Specialties, Inc.	
Silicone-based	Freeway	Loveland Products, Inc.	
Silicone-based	Kinetic	Setre (Helena)	✓
Silicone-based	Phase	Loveland Products, Inc.	
Silicone-based	Phase II	Loveland Products, Inc.	
Silicone-based	Scrimmage	Exacto, Inc.	
Silicone-based	SilEnergy	Brewer International	
Silicone-based	Sil-Fact	Drexel Chemical Company	
Silicone-based	Sil-MES 100	Drexel Chemical Company	
Silicone-based	Silnet 200	Brewer International	
Silicone-based	Silwet L-77	Loveland Products, Inc.	
Silicone-based	Speed	Precision Laboratories, LLC	
Silicone-based	Sun Spreader	Red River Specialties, Inc.	
Silicone-based	Syl-coat	Wilbur-Ellis Co.	
Silicone-based	Sylgard 309	Wilbur-Ellis Co.	
Silicone-based	Syl-Tac	Wilbur-Ellis Co.	
Oil-based			
Crop Oil Concentrate	60/40 Crop Oil Concentrate	Chemorse, Ltd	
Crop Oil Concentrate	Agri-Dex	Helena Chemical Company	✓
Crop Oil Concentrate	Alligare Forestry Oil	Alligare, LLC	
Crop Oil Concentrate	Brewer 83-17	Brewer International	
Crop Oil Concentrate	Cornbelt Crop Oil Concentrate	Van Diest Supply Co.	
Crop Oil Concentrate	Cornbelt Premium Crop Oil Concentrate	Van Diest Supply Co.	
Crop Oil Concentrate	Crop Oil Concentrate	Helena Chemical Company	
Crop Oil Concentrate	Crop Oil Concentrate	Loveland Products, Inc.	
Crop Oil Concentrate	CWR Herbicide Activator	Creative Marketing & Research, Inc.	
Crop Oil Concentrate	Exchange	Precision Laboratories, LLC	
Crop Oil Concentrate	Herbimax	Loveland Products, Inc.	

Adjuvant Type	Trade Name	Manufacturer	ARBO II[2]
Crop Oil Concentrate	Maximizer Crop Oil Conc.	Loveland Products, Inc.	
Crop Oil Concentrate	Monterey M.S.O.	Monterey AgResources	
Crop Oil Concentrate	Mor-Act	Wilbur-Ellis Co.	
Crop Oil Concentrate	Peptoil	Drexel Chemical Company	
Crop Oil Concentrate	Power-Line Crop Oil	Land View Inc.	
Crop Oil Concentrate	Primary	Drexel Chemical Company	
Crop Oil Concentrate	Prime Oil	Winfield Solutions, LLC	
Crop Oil Concentrate	R.O.C. Rigo Oil Conc.	Wilbur-Ellis Co.	
Crop Oil Concentrate	Red River Forestry Oil	Red River Specialties, Inc.	
Crop Oil Concentrate	Red River Pacer Crop Oil	Red River Specialties, Inc.	
Crop Oil Concentrate	Superb HC	Winfield Solutions, LLC	✓
Methylated Seed Oil	60/40 MSO	Chemorse, Ltd	
Methylated Seed Oil	Alligare MSO	Alligare, LLC	
Methylated Seed Oil	Alligare MSO West	Alligare, LLC	
Methylated Seed Oil	Atmos	Winfield Solutions, LLC	
Methylated Seed Oil	Conquer	Chemorse, Ltd	
Methylated Seed Oil	Cornbelt Base	Van Diest Supply Co.	
Methylated Seed Oil	Cornbelt Methylates Soy-Stik	Van Diest Supply Co.	
Methylated Seed Oil	Destiny HC	Winfield Solutions, LLC	✓
Methylated Seed Oil	Elite Supreme	Red River Specialties, Inc.	
Methylated Seed Oil	Hasten	Wilbur-Ellis Co.	
Methylated Seed Oil	Hot MES	Drexel Chemical Company	
Methylated Seed Oil	Kixyt	Precision Laboratories, LLC.	
Methylated Seed Oil	MES-100	Drexel Chemical Company	
Methylated Seed Oil	Methylated Spray Oil Conc.	Helena Chemical Company	
Methylated Seed Oil	MSO Concentrate	Alligare, LLC	
Methylated Seed Oil	MSO Concentrate	Loveland Products, Inc.	
Methylated Seed Oil	Premium MSO	Helena Chemical Company	
Methylated Seed Oil	Persist Ultra	Precision Laboratories, LLC.	
Methylated Seed Oil	Red River Supreme	Red River Specialties, Inc.	
Methylated Seed Oil	Renegade 2.0	Wilbur-Ellis Co.	
Methylated Seed Oil	Sunburn	Red River Specialties, Inc.	
Methylated Seed Oil	SunEnergy	Brewer International	
Methylated Seed Oil	Sunset	Red River Specialties, Inc.	
Methylated Seed Oil	Sun Wet	Brewer International	
Methylated Seed Oil	Super Kix	Wilbur-Ellis Co.	
Methylated Seed Oil	Super Spread MSO	Wilbur-Ellis Co.	
Methylated Seed Oil + Organosilicone	Alligare MVO Plus	Alligare, LLC	
Methylated Seed Oil + Organosilicone	Turbulence	Winfield Solutions, LLC	
Methylated Seed Oil + Organosilicone	Amigo	Loveland Products, Inc.	
Methylated Seed Oil + Organosilicone	BeanOil	Drexel Chemical Company	
Methylated Seed Oil + Organosilicone	Competitor	Wilbur-Ellis Co.	✓
Methylated Seed Oil + Organosilicone	Elite Natural	Red River Specialties, Inc.	
Methylated Seed Oil + Organosilicone	Noble	Winfield Solutions, LLC	
Methylated Seed Oil + Organosilicone	Vegetoil	Drexel Chemical Company	
Fertilizer-based			
Nitrogen-based	Actamaster Soluble Spray Adjuvant	Loveland Products, Inc.	
Nitrogen-based	Actamaster Spray Adjuvant	Loveland Products, Inc.	
Nitrogen-based	Alliance	Winfield Solutions, LLC	
Nitrogen-based	AMS-All	Drexel Chemical Company	
Nitrogen-based	AMS-Supreme	Drexel Chemical Company	
Nitrogen-based	AMS-Xtra	Drexel Chemical Company	
Nitrogen-based	Bronc	Wilbur-Ellis Co.	

Adjuvant Type	Trade Name	Manufacturer	ARBO II[2]
Nitrogen-based	Bronc Max	Wilbur-Ellis Co.	✓
Nitrogen-based	Bronc Max EDT	Wilbur-Ellis Co.	
Nitrogen-based	Bronc Plus Dry	Wilbur-Ellis Co.	
Nitrogen-based	Bronc Plus Dry EDT	Wilbur-Ellis Co.	✓
Nitrogen-based	Bronc Total	Wilbur-Ellis Co.	
Nitrogen-based	Cayuse Plus	Wilbur-Ellis Co.	
Nitrogen-based	Class Act NG	Winfield Solutions, LLC	✓
Nitrogen-based	Cornbelt Gardian	Van Diest Supply Co.	
Nitrogen-based	Cornbelt Gardian Plus	Van Diest Supply Co.	
Nitrogen-based	Corral AMS Liquid	Winfield Solutions, LLC	
Nitrogen-based	Dispatch	Loveland Products, Inc.	
Nitrogen-based	Dispatch 111	Loveland Products, Inc.	
Nitrogen-based	Dispatch 2N	Loveland Products, Inc.	
Nitrogen-based	Dispatch AMS	Loveland Products, Inc.	
Nitrogen-based	Flame	Loveland Products, Inc.	
Nitrogen-based	Holzit	Drexel Chemical Company	
Nitrogen-based	Nitro-Surf	Drexel Chemical Company	
Nitrogen-based	Quest	Helena Chemical Company	
Nitrogen-based	TransActive HC	Helena Chemical Company	
Special Purpose or Utility			
Buffering Agent	Brimstone	Wilbur-Ellis Co.	
Buffering Agent	BS-500	Drexel Chemical Company	
Buffering Agent	Buffers P.S.	Helena Chemical Company	
Buffering Agent	Oblique	Red River Specialties, Inc.	
Buffering Agent	Spray-Aide	Miller Chem. & Fert. Corp.	
Buffering Agent	Tri-Fol	Wilbur-Ellis Co.	
Buffering Agent	Yardage	Exacto, Inc.	
Colorants/Dyes	BullsEye	Milliken Chemical	
Colorants/Dyes	Elite Ruby	Red River Specialties, Inc.	
Colorants/Dyes	Elite Sapphire	Red River Specialties, Inc.	
Colorants/Dyes	Elite Sapphire WSB	Red River Specialties, Inc.	
Colorants/Dyes	Elite Splendor	Red River Specialties, Inc.	
Colorants/Dyes	Hash Mark Blue Liquid	Exacto, Inc.	
Colorants/Dyes	Hash Mark Blue Liquid HC	Exacto, Inc.	
Colorants/Dyes	Hash Mark Blue Powder	Exacto, Inc.	
Colorants/Dyes	Hash Mark Green Liquid	Exacto, Inc.	
Colorants/Dyes	Hash Mark Green Powder	Exacto, Inc.	
Colorants/Dyes	Hi-Light	Becker-Underwood	
Colorants/Dyes	Hi-Light WSP	Becker-Underwood	
Colorants/Dyes	Marker Dye	Loveland Products, Inc.	
Colorants/Dyes	Mark-It Blue	Monterey AgResources	
Colorants/Dyes	Mark-It Red	Monterey AgResources	
Colorants/Dyes	Mystic HC	Winfield Solutions, LLC	
Colorants/Dyes	Signal	Precision Laboratories, LLC	
Colorants/Dyes	SPI-Max Blue Spray Marker	PROKoZ	
Colorants/Dyes	Spray Indicator XL	Helena Chemical Company	
Colorants/Dyes	TurfTrax	Loveland Products, Inc.	
Colorants/Dyes	TurfTrax Blue Spray Indicator	Loveland Products, Inc.	
Compatibility/Suspension Agent	Blendex VHC	Setre (Helena)	
Compatibility/Suspension Agent	Convert	Precision Laboratories, LLC	
Compatibility/Suspension Agent	E Z MIX	Loveland Products, Inc.	
Compatibility/Suspension Agent	Mix	Drexel Chemical Company	
Compatibility/Suspension Agent	Support	Loveland Products, Inc.	
Deposition Aid	Agripharm Drift Control	Walco International	

Adjuvant Type	Trade Name	Manufacturer	ARBO II[2]
Deposition Aid	Alligare Pattern	Alligare, LLC	
Deposition Aid	Bivert	Wilbur-Ellis Co.	
Deposition Aid	Border AQ	Precision Laboratories, LLC	
Deposition Aid	Chem-Trol	Chemorse, Ltd	
Deposition Aid	Clasp	Helena Chemical Company	
Deposition Aid	Compadre	Loveland Products, Inc.	
Deposition Aid	Coverage G-20	Wilbur-Ellis Co.	
Deposition Aid	Crosshair	Wilbur-Ellis Co.	
Deposition Aid	CWC Sharpshooter	CWC Chemical, Inc.	
Deposition Aid	Cygnet Plus	Brewer International	✓
Deposition Aid	Direct	Precision Laboratories, LLC	
Deposition Aid	Droplex	Winfield Solutions, LLC	
Deposition Aid	EDT Concentrate	Wilbur-Ellis Co.	
Deposition Aid	Elite Secure Ultra	Red River Specialties, Inc.	
Deposition Aid	Exit	Miller Chem. & Fert. Corp.	
Deposition Aid	Grounded	Helena Chemical Company	
Deposition Aid	Grounded - CA	Helena Chemical Company	
Deposition Aid	Infuse	Loveland Products, Inc.	
Deposition Aid	Intac Plus	Loveland Products, Inc.	
Deposition Aid	Interlock	Winfield Solutions, LLC	✓
Deposition Aid	Liberate	Loveland Products, Inc.	✓
Deposition Aid	LOX	Drexel Chemical Company	
Deposition Aid	LOX PLUS	Drexel Chemical Company	
Deposition Aid	Mist-Control	Miller Chem. & Fert. Corp.	
Deposition Aid	Offside	Exacto, Inc.	
Deposition Aid	Pointblank	Helena Chemical Company	
Deposition Aid	Poly Control 2	Brewer International	
Deposition Aid	ProMate Impel	Helena Chemical Company	
Deposition Aid	Reign	Loveland Products, Inc.	
Deposition Aid	Reign LC	Loveland Products, Inc.	
Deposition Aid	Secure Ultra	Red River Specialties, Inc.	
Deposition Aid	Sta Put	Setre (Helena)	
Deposition Aid	Strike Zone DF	Helena Chemical Company	
Deposition Aid	Sustain	Miller Chem. & Fert. Corp.	
Deposition Aid	Syndetic	Chemorse, Ltd	
Deposition Aid	Volare DC	Precision Laboratories, LLC	
Deposition Aid	Weather Gard	Loveland Products, Inc.	
Defoaming Agent	Alligare Anti-Foamer	Alligare, LLC	
Defoaming Agent	Cornbelt Defoamer	Van Diest Supply Co.	
Defoaming Agent	Defoamer	Brewer International	
Defoaming Agent	Fast Break	Winfield Solutions, LLC	
Defoaming Agent	Fighter-F 10	Loveland Products, Inc.	
Defoaming Agent	Fighter-F Dry	Loveland Products, Inc.	
Defoaming Agent	Foam Buster	Setre (Helena)	
Defoaming Agent	Foambuster Max	Helena Chemical Company	
Defoaming Agent	Foam Fighter	Miller Chem. & Fert. Corp.	
Defoaming Agent	Fome-Kil	Drexel Chemical Company	
Defoaming Agent	FTF Defoamer	Wilbur-Ellis Co.	
Defoaming Agent	Gundown Max	Precision Laboratories, LLC	
Defoaming Agent	No Foam	Wilbur-Ellis Co.	
Defoaming Agent	Red River Defoamer	Red River Specialties, Inc.	
Defoaming Agent	Reverse	Exacto, Inc.	
Defoaming Agent	Suppression	Chemorse, Ltd	
Defoaming Agent	Tripleline	Creative Marketing & Research, Inc.	

Adjuvant Type	Trade Name	Manufacturer	ARBO II[2]
Defoaming Agent	Unfoamer	Loveland Products, Inc.	
Diluent/Deposition Agent	Bark Oil	Crop Production Services	
Diluent/Deposition Agent	Bark Oil EC	Crop Production Services	
Diluent/Deposition Agent	Elite Premier	Red River Specialties, Inc.	
Diluent/Deposition Agent	Elite Premier Blue	Red River Specialties, Inc.	
Diluent/Deposition Agent	Hy-Grade EC	CWC Chemical, Inc.	
Diluent/Deposition Agent	Hy-Grade I	CWC Chemical, Inc.	
Diluent/Deposition Agent	Improved JLB Oil Plus	Brewer International	
Diluent/Deposition Agent	In-Place	Wilbur-Ellis Co.	
Diluent/Deposition Agent	JLB Oil Plus	Brewer International	
Diluent/Deposition Agent	Red River Basal Oil	Red River Specialties, Inc.	
Diluent/Deposition Agent	Thinvert TRU	Waldrum Specialties, Inc.	
Diluent/Deposition Agent	Thinvert Concentrate	Waldrum Specialties, Inc.	
Diluent/Deposition Agent	W.E.B. Oil	Wilbur-Ellis Co.	
Foam Marker	Align	Helena Chemical Company	
Foam Marker	F.M.-160	Drexel Chemical Company	
Foam Marker	R-160	Wilbur-Ellis Co.	
Foam Marker	Red River Foam Marker	Red River Specialties, Inc.	
Foam Marker	Trekker Trax	Loveland Products, Inc.	
Foam Marker	Tuff Trax Foam Concentrate	Loveland Products, Inc.	
Invert Emulsion Agent	Redi-vert II	Wilbur-Ellis Co.	
Tank Cleaner	All Clear	Loveland Products, Inc.	
Tank Cleaner	Back Field	Exacto, Inc.	
Tank Cleaner	Cornbelt Tank-Aid	Van Diest Supply Co.	
Tank Cleaner	Elite Vigor	Red River Specialties, Inc.	
Tank Cleaner	Kutter	Wilbur-Ellis Co.	
Tank Cleaner	Neutral-Clean	Wilbur-Ellis Co.	
Tank Cleaner	Pro Tank	Winfield Solutions, LLC	
Tank Cleaner	Red River Tank Cleaner	Red River Specialties, Inc.	
Tank Cleaner	SSC-11	Wilbur-Ellis Co.	
Tank Cleaner	Tank and Equipment Cleaner	Loveland Products, Inc.	
Tank Cleaner	Wipe Out	Helena Chemical Company	
Water Conditioning	AccuQuest WM	Helena Chemical Company	
Water Conditioning	Alligare Water Conditioner	Alligare, LLC	
Water Conditioning	Blendmaster	Loveland Products, Inc.	
Water Conditioning	Breeze	Winfield Solution, LLC	
Water Conditioning	Choice	Loveland Products, Inc.	
Water Conditioning	Choice Weather Master	Loveland Products, Inc.	
Water Conditioning	Choice Xtra	Loveland Products, Inc.	
Water Conditioning	Climb	Wilbur-Ellis Co.	
Water Conditioning	Completion	Exacto, Inc.	
Water Conditioning	Cornbelt N-Tense	Van Diest Supply Co.	
Water Conditioning	Cut-Rate	Wilbur-Ellis Co.	✓
Water Conditioning	Elite Imperial	Red River Specialties, Inc.	
Water Conditioning	Hel-Fire	Helena Chemical Company	
Water Conditioning	Import	Precision Laboratories, LLC	
Water Conditioning	Sequestra	Drexel Chemical Company	
Water Conditioning	Smoke	Helena Chemical Company	
Water Conditioning	Transport LpH	Precision Laboratories, LLC	
Water Conditioning	Transport Plus	Precision Laboratories, LLC	

1. Updated September 30, 2015.
2. Approved for use near water under ARBO II

Appendix C - Herbicide Risk Assessment Summaries

See the *Human Health and Ecological Risk Assessments* section early in Chapter 3 for an introduction to the Risk Assessments, and to the risk tables presented in this Appendix and used in the individual resource analysis in Chapter 3.

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

Risk[89]

EPA Labels

The *Federal Insecticide, Fungicide and Rodenticide Act* (FIFRA) establishes procedures for the registration, classification, and regulation of all herbicides. Before any herbicides may be sold legally, the EPA must register it. The EPA may classify an herbicide for general use if it determines that the herbicide is not likely to cause unreasonable adverse effects to applicators or the environment, or it may be classified for restricted use if the herbicide must be applied by a certified applicator and in accordance with other restrictions. Aquatic herbicides require extra testing over and above what is required for the normal registration process before they can be registered for aquatic application. This includes dissipation studies in water and aquatic sediments, accumulation in non-target organisms and fish and shellfish tolerances. The herbicide label is a legal document specifying allowable uses; all applicators that apply herbicides on public lands must comply with the application rates, uses, handling, and all other instructions on the herbicide label, and where more restrictive, the rates, uses, and handling instructions developed by the BLM.

Acute toxicity: The quality or potential of a substance to cause injury or illness shortly after exposure through a single or short-term exposure.

Chronic toxicity: The ability of a substance or mixture of substances to cause harmful effects over an extended period, usually upon repeated or continuous exposure sometimes lasting for the entire life of the exposed organism.

In addition to sub-chronic and chronic toxicity, EPA herbicide registration looks at the acute toxicity of an herbicide. Acute toxicity is the most common basis for comparing the relative toxicities of herbicides. Acute toxicity can be measured by LD_{50}[90]. LD_{50} (LD = lethal dose) represents the amount of herbicide that results in the death of 50 percent of a test population. Therefore, the lower the LD_{50}, the more toxic the herbicide. Table C-1 shows the three categories that the EPA uses for classifying herbicides (USDI 1992a).

[89] Adapted from the Oregon FEIS pp. 85-91 (USDI 2010a).
[90] or LC_{50} (lethal concentration) in the case of aquatic organisms.

Table C-1. Herbicide Label Categories

Categories	Signal Word Required on Label	Oral LD_{50} (mg/ kg)	Dermal LD_{50} (mg/kg)	Inhalation LD_{50} (mg/kg)	Probable Oral Lethal Dose for 150 lb. Human
I – Highly Toxic	DANGER, POISON, skull & crossbones	Up to and including 50	Up to and including 200	Up to and including 0.2	A few drops to a teaspoonful
II – Moderately Toxic	WARNING	From 50 to 500	From 200 to 2,000	From 0.2 to 2	Over one teaspoonful to one ounce
III – Slightly Toxic	CAUTION	From 500 to 5,000	From 2,000 to 20,000	From 2 to 20	Over one ounce to one pint or one pound.

In addition, the EPA has established Levels of Concern (LOC) for herbicides, which is the dose of the herbicide above which effects would be expected. The LOCs are used by EPA for registration, and to indicate potential risk to non-target organisms and the need to consider regulatory action (EPA 2007b). In the absence of information indicating otherwise, the LOC is generally 1/10th of the Lowest Observed Adverse Effect Level (LOAEL); that is, the lowest dose level where there was a statistically significant increase in frequency or severity of adverse effects[91] to the test organism. In some cases, no adverse reaction happens at any dose (or at any reasonable dose), and the LOC is the No Observed Adverse Effect Level (NOAEL). LOCs include uncertainty factors based on the amount and nature of the toxicity testing on which they are based.

Risk Assessments

One of the *Purposes* identified in Chapter 1 of this EA is: *d. Prevent control treatments from having unacceptable adverse effects to applicators and the public, to desirable flora and fauna, and to soil, air, and water.* To help address this *Purpose*, this EA relies on BLM and/or Forest Service-prepared Human Health and Ecological Risk Assessments for the 14 herbicides analyzed in this EA. These complete Risk Assessments are included in the Oregon FEIS as *Appendix 8: Risk Assessments* (uncirculated). The Risk Assessments are used to quantitatively evaluate the probability (i.e., risk) that herbicide use in wildland settings might pose harm to humans or other species in the environment. As such, they address many of the risks that would be faced by humans, plants, and animals, including federally listed and other Special Status species, from the use of the herbicides. The level of detail in the Risk Assessments far exceeds that normally found in EPA's registration examination.

Risk is defined as the likelihood that an effect (injury, disease, death, or environmental damage) may result from a specific set of circumstances. It can be expressed in quantitative or qualitative terms. While all human activities carry some degree of risk, some risks are known with a relatively high degree of accuracy because data have been collected on the historical occurrence of related problems (e.g., lung cancer caused by smoking, auto accidents caused by alcohol impairment, and fatalities resulting from airplane travel). For several reasons, risks associated with exposure to herbicides (at least in wildland settings) cannot be so readily determined. The Risk Assessments help evaluate the risks resulting from these situations.

Risk Assessments are necessarily done on a surrogate species in laboratory conditions, identified to represent a species group, as toxicological data does not exist for most native non-target species. Survival, growth, reproduction, and other important sub-lethal processes of both terrestrial and aquatic non-target species were considered. Assessments considered acute and chronic toxicity data. Exposures of receptors[92] 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 (FS) for the 2005 *Pacific Northwest Region Invasive Plant Program EIS* (see Table

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

C-2). The Risk Assessments, related separate analyses, and the PEISs includes 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 significant human or ecological risk, the BLM has undertaken analysis to assess its impacts through Risk Assessments. More detailed information about uncertainty in the Risk Assessment process is included in Appendix 13 of the Oregon FEIS.

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

	Human Health	Ecological
2,4-D	Forest Service	
Aminopyralid	BLM (2016)	
Chlorsulfuron	Forest Service	BLM (2007)
Clopyralid	Forest Service	
Dicamba	Forest Service	
Dicamba + diflufenzopyr	NA	BLM (2007)
Diflufenzopyr	BLM (2007)	NA
Fluridone	BLM (2007)	
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	

When evaluating risks from the use of herbicides proposed in a NEPA planning document, reliance on EPA's herbicide registration process as the sole demonstration of safety is insufficient. The U.S. Forest Service and BLM were involved in court cases in the early 1980s that specifically addressed this question (principally *Save Our Ecosystems v. Clark*, 747 F.2d 1240, 1248 (9th Cir. 1984) and *Southern Oregon Citizens v. Clark*, 720 F. 2d 1475, 1480 (9th Cir. 1983)). These court decisions and others affirmed that although the BLM can use EPA toxicology data, it is still required to do an independent assessment of the potential risks of using herbicides rather than relying on FIFRA registration alone. The Courts have also found that FIFRA does not require the same examination of impacts that the BLM is required to undertake under NEPA. Further, Risk Assessments consider data collected from both published scientific literature and data submitted to EPA to support FIFRA product registration, whereas EPA utilizes the latter data only. The EPA also considers many wildland herbicide uses to be minor. Thus, the project-specific application rates, spectrum of target and non-target organisms, and specialized exposure scenarios evaluated by the BLM are frequently not evaluated by EPA in its generalized registration assessments.

The Risk Assessments and their distillation in the Oregon FEIS are the source for much of the individual herbicide information presented in each of the resource sections in this EA, including the high-moderate-low risk categories shown in the tables in this Appendix.

Drift

Assuming non-target animals and plants are not directly sprayed, drift is the process most likely to result in herbicides getting onto non-target plants and animals, as well as herbicides moving outside the treatment area. Drift, defined as that part of a sprayed herbicide that is moved from the target area by wind while it is still airborne, is primarily dependent upon the elevation of the spray nozzle, droplet size and air movement. The smaller the droplet, the longer it stays suspended and the farther it can travel. Drift is one exposure scenario examined in the Risk Assessments and summarized on the risk tables at the end of this Chapter.

Spray drift can be reduced by increasing droplet size since wind will move large droplets less than small droplets. Droplet size can be increased by: 1) reducing spray pressure; 2) increasing nozzle orifice size; 3) using special drift reduction nozzles; 4) using additives that increase spray viscosity; and, 5) using rearward orientation in aircraft. Commercial drift reduction agents are available that are designed to reduce drift beyond the capabilities of the determinants described above. These products create larger and more cohesive droplets that are less apt to break into small particles as they fall through the air. They reduce the percentage of smaller, lighter particles, which are most apt to drift. Standard Operating Procedures for air quality provide techniques for controlling drift, including specifying selection of equipment that produces 200-800-micron diameter droplets.

Drift includes droplets and vapor. In general, however, herbicides have very low vapor pressures and BLM spray mixtures do not produce much vapor. One study showed that with more volatile insecticides, little or no vapor drift was detected 9-27 meters downwind for insecticides with vapor pressures less than 1x10^{-4} mm Hg (Woodward et al. 1997). All of the herbicides covered by the EIS have very low vapor pressures (maximum is 4x10^{-6} mm Hg and they range to as low as 5.5x10^{-16} mm Hg; Vencill et al. 2002).

High, Moderate, and Low Risk in BLM and Forest Service Risk Assessments

The Risk Assessments attempt to measure both acute toxicity and chronic toxicity. Chronic toxicity is difficult to measure, especially in humans, but shows the results of sub-lethal doses that could result in cumulative deposits that could cause long-term problems in a vital body function. There is no standard measure for chronic toxicity.

BLM Ecological Risk Assessments

The BLM Ecological Risk Assessments established a Risk Quotient (RQ) for every herbicide and defined risk categories as follows:

0	No Risk	RQ < most conservative LOC for the species
L	Low Risk	RQ = 1 to 10 times the most conservative LOC for the species
M	Moderate Risk	RQ = 10 to 100 times the most conservative LOC for the species (generally equal to LOAEL to 10-times LOAEL)
H	High Risk	RQ > 100 times the most conservative LOC for the species

The RQ is calculated using the Estimated Exposure Concentration (EEC) and the Toxicity Reference Value (TRV). The EEC is the dose that an organism would be exposed to under the test scenario; e.g., *consumption* would indicate the amount of herbicide eaten on a sprayed material (a cow eating only sprayed grass for a day, for example), and *direct spray* indicates that the organism was sprayed directly with a wand or was in a flight path (a non-target plant species, for example). The TRV is the toxicity of the herbicide – usually the LOAEL or NOAEL. The RQ is the EEC divided by the TRV. An uncertainty factor can be brought in if it is thought that a species (or a particular individual within the species) is particularly susceptible to herbicide use, or that the single dose does not represent long-term exposure.

For example, the TRV (the dose that can be consumed with a potentially adverse effect) for a mule deer consuming vegetation contaminated with bromacil is 170 milligrams per kilogram of body weight per day (a mule deer weighs an estimated 70 kg). Assuming a daily consumption rate of 6.2 kg of forage, all contaminated with bromacil sprayed at the typical application rate (4 lbs/acre), the EEC (the amount of herbicide that the mule deer will be exposed to by eating the contaminated vegetation) is 33.7 milligrams per kilograms of body weight per day. Therefore, the RQ is 33.7 mg/kg divided by 170 mg/kg, or 0.198, which is a risk category of 0 (or no risk).

Tank Mixes **-** The BLM evaluated risks from mixing two herbicides together in a tank mix. The BLM assumed that products in a tank mix act in an additive manner. Therefore, to simulate a tank mix of two herbicides RQs for those two herbicides were combined (see Appendix 8 in the Oregon FEIS; fluridone is not generally tank mixed by the BLM and was not included in the analysis). The application rates within the tank mix are not necessarily the same as those of each individual active ingredient applied alone. The percent of RQs exceeding LOCs for each of the ten

BLM herbicide active ingredients was compared to the percent of RQs exceeding LOCs for tank mixes, to determine whether additional risks were predicted for tank mixes.

BLM Human Health Risk Assessments (2005 and 2016)

The BLM Human Health Risk Assessments used the Aggregated Risk Index (ARI) and defined risk categories as follows:

0	No Risk	Majority of ARIs > 1
L	Low Risk	Majority of ARIs < 1 but > 0.1
M	Moderate Risk	Majority of ARIs < 0.1 but > 0.01
H	High Risk	Majority of ARIs < 0.01

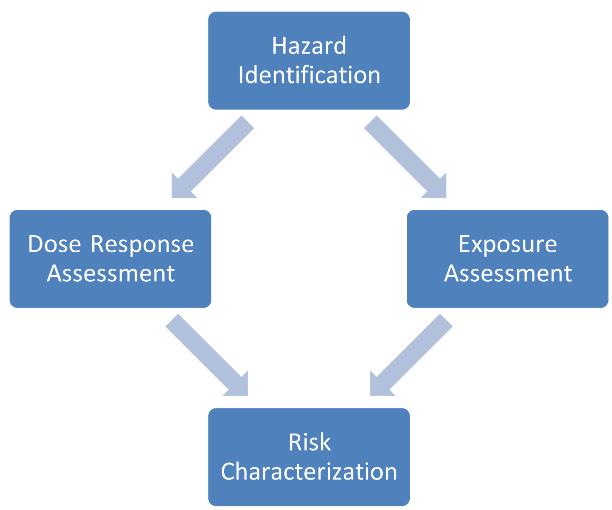
The ARI is a formula for combining LOCs for all exposure avenues (oral, dermal, inhalation), each with different uncertainty factors, and comparing them with the exposure levels that would occur in the scenarios in the Risk Assessments. ARIs less than 1 indicate a concern from at least one of the exposure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

Forest Service Risk Assessments

The Forest Service Risk Assessments are very similar to the BLM's. The Forest Service Risk Assessments established a Hazard Quotient (HQ) for every herbicide and established risk categories as follows:

0	No Risk	HQ < LOC for the species
L	Low Risk	HQ = 1 to 10 times the LOC[93] for the species
M	Moderate Risk	HQ = 10 to 100 times the LOC for the species
H	High Risk	HQ > 100 times the LOC for the species

Figure C-1. Basis for Risk Assessments



The HQ is calculated using the Reference Dose (RfD) and the Toxicity Index (TI). The RfD is the dose that an organism would be exposed to under the test scenario; the TI is the toxicity of the herbicide and the HQ is the RfD divided by the TI. An uncertainty factor can be brought in if it is thought that a species (or a particular individual within the species) is particularly susceptible to herbicide use, or that the single dose does not represent long-term exposure.

Figure C-1 shows the basis for Risk Assessments, which consists of the following parts:

- *Hazard Identification*: what are the dangers inherent with the herbicide? (e.g., endocrine disruption, cancer causing, etc.)
- *Exposure Assessment*: who could come into contact and how much? (specific exposure scenarios)

[93] As noted in the previous discussion, LOCs are generally set at 1/10th of the LOAEL. Thus, an HQ of 1 to 10 times LOC is equivalent to an HQ of 0.1 to 1 in the 2005 Forest Service Invasive Plant EIS (USDA 2005a:4-73). The Forest Service EIS goes on to explain "The threshold is intended to help reviewers distinguish moderate risks (HQ=2 to 10 [HQ = 20-100 in this EIS]), which could in most cases be mitigated through exposure-reducing project design criteria from significant health risks (HQ>10 [HQ>100 in this EIS]) that could be difficult to mitigate if Worst-Case situations occur at the project level. For specific situations where a HQ>10 [HQ>100 in this EIS] is identified, the specific physiologic effect and the relationship between the NOAEL and the LOAEL may be evaluated to more precisely determine whether a toxic effect is actually likely to occur (Durkin, personal communication)." (USDA 2005a:4-73)

- *Dose Response Assessment*: how much is too much? At what dose are observable effects observed?
- *Risk Characterization*: indicates whether or not there is a plausible basis for concern (HQ or RQ).

Stated another way, the lower range for the L, or low, risk category is theoretically the level at which an effect began to be discernable in testing or modeling (theoretically, because uncertainty factors have the effect of reducing the dose identified as having the adverse effect). The minimum identified effect may have been skin or eye irritation, leaf damage, and so forth. Uncertainty factors are added to address hypersensitive individuals, or accommodate uncertainties in the measurements, such as inferring effects to one species based on actual tests on other species. Uncertainty factors are typically multiples of 10, so the assumed Lowest Observable Effects (LOAEL) dose could have been inflated 10, 100, or even 1,000 times for uncertainties. Thus, exposure of the average individual to the dose identified as having an effect, probably would not. Nevertheless, the L or low rating indicates risks start at that point. Moderate risk categories indicate risk starts at doses one-tenth those of the low ratings; high is one-hundredth of the testing scenario dose. Testing scenarios are severe – e.g., soaking the test animal – so Standard Operating Procedures and PEIS Mitigation Measures such as buffers, wind speed limits, and so forth, as well as required safety equipment, limit exposure to substantially less than tested doses. For herbicides with moderate and high risk categories for a particular receptor, special cautions are implemented. For example, buffers for Special Status plant species are as large as 1,500 feet for some herbicides (Table A-1). The low, moderate, or high human health risk categories shown on Tables C-3 through C-8 are more conservative than the EPA ratings used to apply the Caution, Warning, or Danger/Poison signal words to herbicide labels.

The Risk Assessments are summarized on tables showing herbicide risk categories at BLM maximum and typical application rates to vegetation, wildlife, and humans, in a variety of application scenarios. Tables C-3 and C-6 show herbicide risks to vegetation, from BLM and Forest Service Risk Assessments respectively. Tables C-4 and C-7 show herbicide risks to wildlife, fish, and aquatic invertebrates and Tables C-5 and C-8 show the risks to human health. Further information about the Human Health Risk Assessments can be found in the *Human Health and Safety* section of Chapter 4 of the Oregon FEIS.

Uncertainty in the Risk Assessment Process

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

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

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

Table C-3. BLM-Evaluated Herbicide Risk Categories for Vegetation

Application Scenario	Chlorsulfuron		Fluridone		Imazapic		Overdrive ©[3]		Sulfometuron		Aminopyralid		Fluroxypyr		Rimsulfuron	
	Typ.[1]	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max
Direct Spray																
Terrestrial plants	H[2] [1:1]	H [1:1]	NE	NE	L [1:1]	M [1:1]	M [1:1]	H [1:1]	0 [1:1]	L [1:1]	H [1:1]	H [1:1]	H [1:1]	H [1:1]	H [1:1]	H [1:1]
Special Status terrestrial plants	H [1:1]	H [1:1]	NE	NE	L [1:1]	M [1:1]	H [1:1]	H [1:1]	H [1:1]	H [1:1]	H [1:1]	H [1:1]	H [1:1]	H [1:1]	H [1:1]	H [1:1]
Aquatic plants, pond	M [1:2]	M [2:2]	0 [2:2]	0 [2:2]	L [1:2]	L [2:2]	M [1:2]	M [1:2]	H [2:2]	H [2:2]	0 [2:2]	0 [4:4]	0 [2:2]	L [2:4]	H [1:2]	M [2:4]
Aquatic plants, stream	M [2:2]	M [2:2]	0 [2:2]	0 [2:2]	L [2:2]	M [2:2]	M [1:2]	H [1:2]	H [2:2]	H [2:2]	0 [2:2]	0 [2:2]	0 [2:2]	0 [2:2]	H [1:2]	H [1:2]
Accidental Spill to a Pond																
Aquatic plants, pond	NE	H [1:2]	NE	L [2:2]	NE	H [2:2]	NE	M [1:1]	NE	H [2:2]	0 [2:2]	0 [4:4]	0 [2:2]	L [2:4]	H [1:2]	M [2:4]
Off-Site Drift																
Terrestrial plants	M [5:12]	M [8:12]	NE	NE	0 [18:18]	0 [13:18]	0 [5:6]	0 [4:6]	0 [12:12]	0 [12:12]	L [10:18]	L [10:18]	L [11:18]	L [11:18]	L [9:18]	L [9:18]
Special Status terrestrial plants	M [7:12]	M [7:12]	NE	NE	0 [17:18]	0 [13:18]	L [3:6]	L [4:6]	H [5:12]	H [8:12]	L [10:18]	L [10:18]	L [13:18]	L [11:18]	L [9:18]	L [8:18]
Aquatic plants, pond	0 [24:24]	0 [24:24]	NE	NE	0 [36:36]	0 [34:36]	0 [12:12]	0 [12:12]	L [13:24]	L [12:24]	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]	0 [24:36]	0 [23:36]
Aquatic plants, stream	0 [24:24]	0 [22:24]	NE	NE	0 [36:36]	0 [33:36]	0 [8:12]	0 [6:12]	L [14:24]	L [10:24]	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]	0 [24:36]	0 [23:36]
Surface Runoff																
Terrestrial plants	0 [42:42]	0 [42:42]	NE	NE	0 [42:42]	0 [42:42]	0 [42:42]	0 [42:42]	0 [42:42]	0 [42:42]	0 [42:42]	0 [42:42]	0 [42:42]	0 [42:42]	0 [42:42]	0 [42:42]
Special Status terrestrial plants	0 [42:42]	0 [42:42]	NE	NE	0 [42:42]	0 [42:42]	0 [34:42]	0 [33:42]	0 [32:42]	0 [28:42]	0 [42:42]	0 [42:42]	0 [42:42]	0 [42:42]	0 [42:42]	0 [42:42]
Aquatic plants, pond	0 [64:84]	0 [53:84]	NE	NE	0 [80:84]	0 [62:84]	0 [70:84]	0 [67:84]	L [42:84]	L [38:84]	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]	0 [55:84]	0 [54:84]
Aquatic plants, stream	0 [80:84]	0 [77:84]	NE	NE	0 [84:84]	0 [83:84]	0 [84:84]	0 [84:84]	0 [69:84]	0 [60:84]	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]
Wind Erosion																
Terrestrial plants	0 [9:9]	0 [9:9]	NE	NE	0 [9:9]	0 [9:9]	0 [9:9]	0 [9:9]	0 [9:9]	0 [9:9]	0 [9:9]	0 [8:9]	0 [9:9]	0 [8:9]	0 [8:9]	0 [8:9]
Special Status terrestrial plants	0 [9:9]	0 [9:9]	NE	NE	0 [9:9]	0 [9:9]	0 [9:9]	0 [9:9]	0 [9:9]	0 [9:9]	0 [8:9]	0 [8:9]	0 [8:9]	0 [7:9]	0 [8:9]	0 [8:9]
Aquatic plants, pond	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
Aquatic plants, stream	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE

Shading denotes herbicides that are limited by Mitigation Measures to typical application rates where feasible.
1 Typ = Typical application rate; and Max = Maximum application rate.

2 Risk categories: = 0 = No risk (majority of RQs < most conservative LOC for non-Special Status species); L = Low risk (majority of RQs 1-10x most conservative LOC for non-Special Status species); M = Moderate risk (majority of RQs 10-100x most conservative LOC for non-Special Status species); H = High risk (majority of RQs >100 most conservative LOC for non-Special Status species); and NE = Not evaluated. The Risk Category is based on the risk level of the majority of risk quotients observed in any of the scenarios for a given exposure group and receptor type. See more information at the risk tables in Chapter 4 of the Ecological Risk Assessments (ENSR 2005b-k, AECOM 2014a, b, 2015) to determine the specific scenarios that result in the displayed level of risk for a given receptor group. The number in brackets represents the number of RQs in the indicated risk category: number of scenarios evaluated.
3. Overdrive is a formulation of diflufenzopyr + dicamba.

Table C-4. BLM-Evaluated Herbicide Risk Categories for Wildlife, Fish, and Aquatic Species

Application Scenario	Chlorsulfuron		Fluridone		Imazapic		Overdrive ©[3]		Sulfometuron		Aminopyralid		Fluroxypyr		Rimsulfuron	
	Typ.[1]	Max[1]	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max
Direct Spray																
Non Special Status Species																
Small mammal – 100% absorption	0[2]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pollinating insect – 100% absorption	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small mammal – 1st order dermal absorption	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fish pond	0	0	0	0	0	0	0	0	0	0	0 [2:2]	0 [4:4]	0 [2:2]	0 [4:4]	0 [2:2]	0 [4:4]
Fish stream	0	0	0	L	0	0	0	0	0	0	0 [2:2]	0 [2:2]	0 [2:2]	0 [2:2]	0 [2:2]	0 [2:2]
Aquatic invertebrates pond	0	0	0	L	0	0	0	0	0	0	0 [2:2]	0 [4:4]	0 [2:2]	0 [4:4]	0 [2:2]	0 [4:4]
Aquatic invertebrates stream	0	0	0	L	0	0	0	0	0	0	0 [2:2]	0 [2:2]	0 [2:2]	0 [2:2]	0 [2:2]	0 [2:2]
Special Status Species																
Small mammal – 100% absorption	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pollinating insect – 100% absorption	0	0	0	0	0	0	0	0	0	0	0	0	L	L	0	0
Small mammal – 1st order dermal absorption	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fish pond	0	0	0	M	0	0	0	0	0	0	0 [2:2]	0 [4:4]	0 [2:2]	0 [2:4]	0 [2:2]	0 [4:4]
Fish stream	0	0	0	L	0	0	0	0	0	0	0 [2:2]	0 [2:2]	0 [2:2]	0 [2:2]	0 [2:2]	0 [2:2]
Aquatic invertebrates pond	0	0	0	H	0	0	0	0	0	0	0 [2:2]	0 [4:4]	0 [2:2]	0 [3:4]	0 [2:2]	0 [4:4]
Aquatic invertebrates stream	0	0	0	L	0	0	0	0	0	0	0 [2:2]	0 [2:2]	0 [2:2]	0 [2:2]	0 [2:2]	0 [2:2]

Application Scenario	Chlorsulfuron		Fluridone		Imazapic		Overdrive ©[3]		Sulfometuron		Aminopyralid		Fluroxypyr		Rimsulfuron	
	Typ.[1]	Max[1]	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max
Indirect Contact with Foliage After Direct Spray																
Non Special Status Species																
Small mammal – 100% absorption	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pollinating insect – 100% absorption	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small mammal – 1st order dermal absorption	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Special Status Species																
Small mammal – 100% absorption	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pollinating insect – 100% absorption	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small mammal – 1st order dermal absorption	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ingestion of Food Items Contaminated by Direct Spray																
Non Special Status Species																
Small mammalian herbivore – acute	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small mammalian herbivore – chronic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Large mammalian herbivore – acute	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Large mammalian herbivore – chronic	0	0	0	0	0	0	L	M	0	0	0	0	0	0	0	0
Small avian insectivore – acute	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small avian insectivore – chronic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Large avian herbivore – acute	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Large avian herbivore – chronic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Large mammalian carnivore – acute	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Large mammalian carnivore – chronic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Special Status Species																
Small mammalian herbivore – acute	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small mammalian herbivore – chronic	0	0	0	L	0	0	0	0	0	0	0	0	0	0	0	0
Large mammalian herbivore – acute	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Large mammalian herbivore – chronic	0	0	0	0	0	0	L	M	0	0	0	0	0	0	0	0
Small avian insectivore – acute	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small avian insectivore – chronic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Large avian herbivore – acute	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Large avian herbivore – chronic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Large mammalian carnivore – acute	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Large mammalian carnivore – chronic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Application Scenario	Chlorsulfuron		Fluridone		Imazapic		Overdrive ©[3]		Sulfometuron		Aminopyralid		Fluroxypyr		Rimsulfuron	
	Typ.[1]	Max[1]	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max
Accidental Spill to Pond																
Non Special Status Species																
Fish pond	NE	0	NE	M	NE	0	NE	0	NE	0	0 [2:2]	0 [4:4]	0 [2:2]	0 [4:4]	0 [2:2]	0 [4:4]
Aquatic invertebrates, pond	NE	0	NE	H	NE	0	NE	0	NE	0	0 [2:2]	0 [4:4]	0 [2:2]	0 [4:4]	0 [2:2]	0 [4:4]
Special Status Species																
Fish pond	NE	0	NE	M	NE	0	NE	0	NE	0	0 [2:2]	0 [4:4]	0 [2:2]	0 [2:4]	0 [2:2]	0 [4:4]
Aquatic invertebrates, pond	NE	0	NE	H	NE	0	NE	0	NE	0	0 [2:2]	0 [4:4]	0 [2:2]	0 [3:4]	0 [2:2]	0 [4:4]
Off-Site Drift																
Non Special Status Species																
Fish, pond	0	0	NE	NE	0	0	0	0	0	0	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]
Fish, stream	0	0	NE	NE	0	0	0	0	0	0	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]
Aquatic invertebrates, pond	0	0	NE	NE	0	0	0	0	0	0	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]
Aquatic invertebrates, stream	0	0	NE	NE	0	0	0	0	0	0	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]
Special Status Species																
Fish, pond	0	0	NE	NE	0	0	0	0	0	0	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]
Fish, stream	0	0	NE	NE	0	0	0	0	0	0	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]
Aquatic invertebrates, pond	0	0	NE	NE	0	0	0	0	0	0	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]
Aquatic invertebrates, stream	0	0	NE	NE	0	0	0	0	0	0	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]	0 [36:36]
Surface Runoff																
Non Special Status Species																
Fish, pond	0	0	NE	NE	0	0	0	0	0	0	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]
Fish, stream	0	0	NE	NE	0	0	0	0	0	0	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]

Application Scenario	Chlorsulfuron		Fluridone		Imazapic		Overdrive ©[3]		Sulfometuron		Aminopyralid		Fluroxypyr		Rimsulfuron	
	Typ.[1]	Max[1]	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max
Aquatic invertebrates, pond	0	0	NE	NE	0	0	0	0	0	0	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]
Aquatic invertebrates, stream	0	0	NE	NE	0	0	0	0	0	0	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]
Special Status Species																
Fish, pond	0	0	NE	NE	0	0	0	0	0	0	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]
Fish, stream	0	0	NE	NE	0	0	0	0	0	0	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]
Aquatic invertebrates, pond	0	0	NE	NE	0	0	0	0	0	0	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]
Aquatic invertebrates, stream	0	0	NE	NE	0	0	0	0	0	0	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]	0 [84:84]

Shading denotes herbicides that are limited by Mitigation Measures to typical application rates where feasible.
1 Typ = Typical application rate; and Max = Maximum application rate.
2 Risk categories: 0 = No risk (majority of RQs < most conservative LOC for non-Special Status species); L = Low risk (majority of RQs 1-10x most conservative LOC for non-Special Status species); M = Moderate risk (majority of RQs 10-100x most conservative LOC for non-Special Status species); H = High risk (majority of RQs >100 most conservative LOC for non-Special Status species); and NE = Not evaluated. The risk category is based on the risk level of the majority of risk quotients observed in any of the scenarios for a given exposure group and receptor type. See the risk tables in Chapter 4 of the Ecological Risk Assessments (ENSR 2005b-k, AECOM 2014a, b, 2015) to determine the specific scenarios that result in the displayed level of risk for a given receptor group. The number in brackets represents the number of RQs in the indicated risk category: number of scenarios evaluated.
3. Overdrive is a formulation of diflufenzopyr + dicamba.

Table C-5. BLM-Evaluated Herbicide Risk Categories for Human Health

Receptor	Diflufenzopyr			Fluridone[2]			Imazapic			Sulfometuron			Aminopyralid			Fluroxypyr			Rimsulfuron[3]		
	Typ.[1]	Max[1]	Accid	Typ.	Max	Accid	Typ.	Max	Accid	Typ.	Max	Accid	Typ.	Max	Accid	Typ.	Max	Accid	Typ.	Max	Accid
Hiker/hunter (adult)	0[4]	0	0	0	0	0	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0	0	0
Berry picker (child)	0	0	0	0	0	L	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0	0	0
Berry picker (adult)	0	0	0	0	0	0	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0	0	0
Angler (adult)	0	0	0	0	0	0	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0	0	0
Residential – contaminated water (child)	0	0	0	0	0	L	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0	0	0
Residential – contaminated water (adult)	0	0	0	0	0	L	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	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
Plane - pilot	NE	NE	NE	0	0	L-H	0	0	NE	0	0	NE	0	0	NE	0	0	NE	0	0	L - M

Receptor	Diflufenzopyr			Fluridone[2]			Imazapic			Sulfometuron			Aminopyralid			Fluroxypyr			Rimsulfuron[3]		
	Typ.[1]	Max[1]	Accid	Typ.	Max	Accid	Typ.	Max	Accid	Typ.	Max	Accid	Typ.	Max	Accid	Typ.	Max	Accid	Typ.	Max	Accid
Plane - mixer/loader	NE	NE	NE	0	L	L-H	0	0	NE	0	0	NE	0	0	NE	0	0	NE	0	0	L - M
Helicopter - pilot	NE	NE	NE	0	0	L-H	0	0	NE	0	0	NE	0	0	NE	0	0	NE	0	0	L - M
Helicopter - mixer/loader	NE	NE	NE	0	L	L-H	0	0	NE	0	0	NE	0	0	NE	0	0	NE	0	0	L - M
Human/backpack - applicator/mixer/loader	0	0	NE	0	0	L-H	0	0	NE	0	0	NE	0	0	NE	0	0	NE	0	0	L - M
Human/horseback - applicator	0	0	NE	0	0	L-H	0	0	NE	0	0	NE	0	0	NE	0	0	NE	0	0	L - M
Human/horseback - mixer/loader	0	0	NE	0	0	L-H	0	0	NE	0	0	NE	0	0	NE	0	0	NE	0	0	L - M
Human/horseback - applicator/mixer/loader	0	0	NE	0	0	L-H	0	0	NE	0	0	NE	0	0	NE	0	0	NE	0	0	L - M
ATV – applicator[5]	0	0	NE	0	0	L-H	0	0	NE	0	0	NE	0	0	NE	0	0	NE	0	0	L - M
ATV - mixer/loader	0	0	NE	0	0	L-H	0	0	NE	0	0	NE	0	0	NE	0	0	NE	0	0	L - M
ATV - applicator/mixer/loader	0	0	NE	0	0	L-H	0	0	NE	0	0	NE	0	0	NE	0	0	NE	0	0	L - M
Truck - applicator[5]	0	0	NE	0	0	L-H	0	0	NE	0	0	NE	0	0	NE	0	0	NE	0	0	L - M
Truck - mixer/loader	0	0	NE	0	0	L-H	0	0	NE	0	0	NE	0	0	NE	0	0	NE	0	0	L - M
Truck - applicator/mixer/loader	0	0	NE	0	0	L-H	0	0	NE	0	0	NE	0	0	NE	0	0	NE	0	0	L - M
Boat - applicator	NE	NE	NE	0	0	L-H	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
Boat - mixer/loader	NE	NE	NE	0	0	L-H	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
Boat - applicator/mixer/loader	NE	NE	NE	0	0	L-H	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE

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

1 Typ = Typical application rate; Max = Maximum application rate; and Accid = Accidental rate. Typical and maximum application rate categories include short-, intermediate-, and long-term exposures. Accidental scenario category includes accidents with herbicide mixed at both the typical and maximum application rates and with a concentrated herbicide.

2 For all worker receptors accidentally exposed to fluridone, there is low risk from exposure to solutions mixed with water to the typical application rate, moderate risk from exposure to solutions mixed with water to the maximum application rate, and high risk from exposure to concentrated solutions (prior to mixing with water).

3 For all worker receptors accidentally exposed to rimsulfuron, there is low risk from exposure to solutions mixed with the typical application rate, moderate risk from exposure to solutions mixed with the maximum application rate.

4 Risk categories: 0 = No risk (majority of ARIs > 1); L = Low risk (majority of ARIs >1 but < 0.1); M = Moderate risk (majority of ARIs > 0.1 but < 0.01); H = High risk (majority of ARIs < 0.01); and NE = Not evaluated. The reported risk category represents the typical/most common risk level for estimated risks from various time periods. See the Vegetation Treatments Programmatic EISs Human Health Risk Assessments Final Reports (ENSR 2005l, AECOM 2014c) and for the range of risk levels for each scenario.

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

Table C-6. Forest Service-Evaluated Herbicide Risk Categories for Vegetation

	2,4-D[1,3]		**Clopyralid**		**Dicamba**		**Glyphosate[2,3]**		**Hexazinone**		**Imazapyr[2]**		**Metsulfuron**		**Picloram2**		**Triclopyr[2,3]**	
	Typ.[4]	Max[4]	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max
Terrestrial Plants																		
Direct spray, susceptible plants	H[5]	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
Direct spray, tolerant plants	L	L	0	L	0	0	L	M	M	M	L	L	L	M	L	M	0	L
Off-site drift, low boom, susceptible plants	L [3:6]	L [3:6]	L [4:6]	M [3:6]	L [3:6]	H [3:6]	M [3:6]	M [4:6]	L [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]
Off-site drift, low boom, tolerant plants	0 [6:6]	0 [6:6]	0 [6:6]	0 [6:6]	0 [6:6]	0 [6:6]	0 [6:6]	0 [6:6]	0 [5:6]	0 [4:6]	0 [6:6]	0 [6:6]	0 [6:6]	0 [6:6]	0 [6:6]	0 [6:6]	0 [6:6]	0 [6:6]
Off-site drift, aerial, susceptible plants	NE	NE	M [2:6]	H [2:6]	M [3:6]	H [3:6]	H [3:6]	H [5:6]	M [4:6]	H [3:6]	H [5:6]	H [6:6]	M [2:6]	H [2:6]	H [6:6]	H [6:6]	M [4:6]	H [4:6]
Off-site drift, aerial, tolerant plants	NE	NE	0 [6:6]	0 [6:6]	0 [6:6]	0 [6:6]	0 [5:6]	L [3:6]	L [4:6]	L [3:6]	0 [6:6]	0 [6:6]	0 [5:6]	0 [4:6]	0 [4:6]	L [3:6]	0 [6:6]	0 [5:6]
Off-site drift, backpack directed foliar, susceptible plants	0 [5:6]	0 [4:6]	NE	NE	NE	NE	L [3:6]	M [3:6]	L [3:6]	L [4:6]	M [3:6]	M [4:6]	NE	NE	M [3:6]	M [4:6]	0 [4:6]	0 [4:6]
Off-site drift, backpack directed foliar, tolerant plants	0 [6:6]	0 [6:6]	NE	NE	NE	NE	0 [6:6]	0 [6:6]	0 [6:6]	0 [6:6]	0 [6:6]	0 [6:6]	NE	NE	0 [6:6]	0 [6:6]	0 [6:6]	0 [6:6]
Surface runoff, susceptible plants	0 [22:30]	0 [21:30]	0 [23:30]	0 [22:30]	0 [22:30]	0 [22:30]	0	0	0 [18:30]	0 [17:30]	H	H	0 [21:30]	0 [18:30]	H	H	L	M
Surface runoff, tolerant plants	0 [30:30]	0 [29:30]	0 [30:30]	0 [28:30]	0 [30:30]	0 [30:30]	0	0	0 [22:30]	0 [22:30]	L	M	0 [25:30]	0 [22:30]	0	0	0	0
Aquatic Plants																		
Accidental spill, susceptible macrophytes	H	H	H	H	NE	NE	H	H	NE	NE	H	H	H	H	NE	NE	H	H
Accidental spill, susceptible algae	H	H	L	L	H	H	H	H	H	H	L	L	M	H	H	H	H	H
Accidental spill, tolerant algae	L	M	0	0	0	L	M	M	H	H	0	0	L	M	0	0	M	H

	2,4-D[1,3]		Clopyralid		Dicamba		Glyphosate[2,3]		Hexazinone		Imazapyr[2]		Metsulfuron		Picloram2		Triclopyr[2,3]	
	Typ.[4]	Max[4]	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max
Acute exposure, susceptible macrophytes	M	M	0	0	NE	NE	L	L	NE	NE	M	H	L	L	NE	NE	0	L
Acute exposure, susceptible algae	L	L	0	0	0	L	L	L	H	H	0	0	0	0	L	L	M	H
Acute exposure, tolerant algae	0	0	0	0	0	0	0	0	L	M	0	0	0	0	0	0	0	0
Chronic exposure, susceptible macrophytes	0	L	0	0	NE	NE	0	0	NE	NE	M	M	0	0	NE	NE	H	H
Chronic exposure, susceptible algae	0	0	0	0	0	0	0	0	M	M	0	0	0	0	0	0	0	0
Chronic exposure, tolerant algae	0	0	0	0	0	0	0	0	0	L	0	0	0	0	0	0	0	0

Shading denotes herbicides that are limited by Mitigation Measures to typical application rates where feasible.
1 In the 2010 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.
2 Glyphosate, imazapyr, picloram, and triclopyr risk assessments were updated in 2011. The risk ratings in this table reflect these 2011 Risk Assessments and may differ from the risk ratings shown in the 2010 FEIS.
3 Risk categories for the more toxic formulations are presented here.
4 Typ = Typical application rate; and Max = Maximum application rate.
5 0 = No risk (HQ < LOC); L = Low risk (HQ = 1 to 10 x LOC); M = Moderate Risk (HQ = 10 to 100 x LOC); H = High risk (HQ > 100 LOC); and NE = Not evaluated. Risk categories are based on upper estimates of hazard quotients and the LOC of 1.0. If more than one scenario is involved in an exposure pathway (i.e., off-site drift and surface runoff), then the number of scenarios with the given risk category (out of the total number of evaluated scenarios) is displayed in parentheses. The reported risk category is that of the majority of the HQs for all the scenarios. As a result, risk may be higher than the reported risk category for some scenarios within each category. For more information, see the individual Forest Service Risk Assessments.

Table C-7. Forest Service-Evaluated Herbicide Risk Categories for Wildlife, Fish, and Aquatic Species

	2,4-D[1,3]		Clopyralid		Dicamba		Glyphosate[2,3]		Hexazinone		Imazapyr[2]		Metsulfuron methyl		Picloram		Triclopyr[2,3]	
	Typ[4]	Max[4]	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max
Mammals																		
Acute/Accidental Exposures																		
Direct spray, small mammal, 1st order absorption	0[5]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Direct spray, small animal, 100% absorption	L	L	L	L	0	0	0	L	L	L	0	0	0	L	0	0	0	L
Consumption of contaminated fruit, small mammal	L	L	0	0	0	L	0	L	0	0	0	0	0	0	0	0	0	L

	2,4-D[1,3]		Clopyralid		Dicamba		Glyphosate[2,3]		Hexazinone		Imazapyr[2]		Metsulfuron methyl		Picloram		Triclopyr[2,3]	
	Typ[4]	Max[4]	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max
Consumption of contaminated grass, large mammal	L	L	L	L	L	M	L	L	L	L	0	0	0	L	0	0	M	H
Consumption of contaminated water, small mammal, spill	0	0	0	0	0	L	0	0	0	0	0	0	0	0	0	0	0	0
Consumption of contaminated water, small mammal, stream	NE	NE	0	0	0	0	NE	NE	0	0	NE	NE	0	0	NE	NE	NE	NE
Consumption of contaminated insects, small mammal	L	L	L	L	L	M	L	L	L	L	0	0	0	L	0	0	0	L
Consumption of contaminated small mammal, predatory mammal	L	L	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	L
Chronic Exposures																		
Consumption of contaminated vegetation, small mammal, on- site	M	M	0	0	0	0	L	L	0	0	0	0	0	0	L	M	L	M
Consumption of contaminated vegetation, small mammal, off- site	NE	NE	0	0	0	0	NE	NE	0	0	NE	NE	0	0	NE	NE	NE	NE
Consumption of contaminated vegetation, large mammal, on- site	L	L	0	L	0	0	0	0	L	M	0	0	0	0	0	L	M	H
Consumption of contaminated vegetation, large mammal, off -site	NE	NE	0	0	0	0	NE	NE	0	0	NE	NE	0	0	NE	NE	NE	NE
Consumption of contaminated water, small mammal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Birds																		
Acute/Accidental Exposures																		
Consumption of contaminated grass, large bird	0	0	0	L	L	M	0	L	L	L	0	0	0	0	0	0	L	M
Consumption of contaminated insects, small bird	0	L	0	L	L	M	0	L	L	L	0	0	0	0	0	0	L	M
Consumption of contaminated small mammal, predatory bird	0	0	0	0	0	0	0	L	0	0	0	0	0	0	0	0	0	0
Consumption of contaminated fish, predatory bird, spill	0	0	0	0	0	0	0	L	0	0	0	0	0	0	0	0	0	0
Chronic Exposures																		
Consumption of contaminated vegetation, large bird, on-site	0	0	0	L	0	0	L	L	0	0	0	0	0	0	0	L	L	M
Consumption of contaminated vegetation, large bird, off-site	NE	NE	0	0	0	0	NE	NE	0	0	NE	NE	0	0	NE	NE	NE	NE

	2,4-D[1,3]		**Clopyralid**		**Dicamba**		**Glyphosate[2,3]**		**Hexazinone**		**Imazapyr[2]**		**Metsulfuron methyl**		**Picloram**		**Triclopyr[2,3]**	
	Typ[4]	Max[4]	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max
Consumption of contaminated fish, predatory bird	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aquatic Species																		
Acute/Accidental Exposures																		
Fish (susceptible species) – accidental spill	H	H	L	L	0	L	H	H	L	L	0	L	0	L	M	M	H	H
Fish (tolerant species) – accidental spill	L	L	0	0	0	0	M	H	0	L	NE	NE	0	0	0	L	M	H
Fish (susceptible species) – acute exposure, peak EEC	L	L	0	0	0	0	L	M	0	0	0	0	0	0	0	0	0	L
Fish (tolerant species) – acute exposure, peak EEC	0	0	0	0	0	0	0	L	0	0	NE	NE	0	0	0	0	0	0
Aquatic invertebrates – accidental spill	0	0	L	M	L	M	M	M	L	L	0	0	0	0	0	0	L	M
Aquatic invertebrates – acute exposure, peak EEC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chronic Exposures																		
Fish – chronic exposure	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aquatic invertebrates – chronic exposure	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insects																		
Acute Exposures																		
Direct spray, bee, 100% absorption	NE	NE	0	L	NE	NE	NE	NE	L	L	NE	NE	0	0	NE	NE	NE	NE
Consumption of fruit by a herbivorous insect	NE	NE	NE	NE	NE	NE	0	0	NE	NE	0	0	NE	NE	0	0	0	0
Consumption of broadleaf/small Insects by a herbivorous Insect	NE	NE	NE	NE	NE	NE	L	L	NE	NE	0	0	NE	NE	0	0	0	L
Consumption of short grass by a herbivorous insect	NE	NE	NE	NE	NE	NE	L	L	NE	NE	0	0	NE	NE	0	0	0	L
Consumption of tall grass by a herbivorous insect	NE	NE	NE	NE	NE	NE	L	L	NE	NE	0	0	NE	NE	0	0	0	L

Shading denotes herbicides that are limited by Mitigation Measures to typical application rates where feasible.
1 In the 2010 FEIS, 2,4-D maximum risk ratings were calculated at 4 lbs./acre, although the FEIS stated that the BLM maximum rate was 1.9 lbs./acre. The risk ratings in this table reflect a maximum rate of 1.9 lbs./acre.
2 Glyphosate, imazapyr, picloram, and triclopyr risk assessments were updated in 2011. The risk ratings in this table reflect these 2011 Risk Assessments and may differ from the risk ratings shown in the 2010 FEIS.
3 Risk levels for the more toxic formulations are presented here.
4 Typ = typical application rate; and Max = maximum application rate.
5 Risk categories: 0 = No risk (HQ < LOC); L = Low risk (HQ = 1 to 10 x LOC); M = Moderate risk (HQ = 10 to 100 x LOC); H = High risk (HQ > 100 LOC); and NE = Not evaluated. Risk categories are based on upper estimates of hazard quotients and the BLM LOCs of 0.1 for acute scenarios and 1.0 for chronic scenarios. The reader should consult the text of this section of the individual Forest Service Risk Assessments to evaluate risks at central estimates of hazard quotients.
Fish susceptible species include coldwater fish, such as trout, salmon, and Federally Listed species. Fish tolerant species include warm water fish, such as fathead minnows.

Table C-8. Forest Service-Evaluated Herbicide Risk Categories for Human Health

	2,4-D[1,3]		**Chlorsulfuron**		**Clopyralid**		**Dicamba**		**Glyphosate**[2,3]		**Hexazinone**		**Imazapyr**[2]		**Metsulfuron methyl**		**Picloram**		**Triclopyr**[2,3]	
	Typ[4]	Max[4]	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max
Workers																				
General Exposures																				
Directed foliar and spot treatments (backpack)	L[5]	L	0	0	0	0	0	0	0	0	0	L	0	0	0	0	0	0	0	L
Broadcast ground spray (boom spray)	L	L	0	L	0	0	0	L	0	0	0	L	0	0	0	0	0	0	0	L
Aerial applications (pilots and mixer/loaders)	NE	NE	0	0	0	0	0	0	0	0	0	L	0	0	0	0	0	0	0	L
Aquatic applications	L	L	NE	NE	NE	NE	NE	NE	0	0	NE	NE	0	0	NE	NE	NE	NE	NE	NE
Accidental/Incidental Exposures																				
Immersion of hands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wearing contaminated gloves	M	M	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	L
Spill on hands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spill on lower legs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Public																				
Acute/Accidental Exposures																				
Direct spray - child, entire body	0	L	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Direct spray - woman, lower legs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	L
Dermal - contaminated vegetation, woman	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	L
Consumption of contaminated fruit	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	L
Consumption of contaminated water - pond, spill	NE	NE	0	0	0	L	0	L	NE	NE	0	0	NE	NE	0	0	NE	NE	NE	NE
Consumption of contaminated water - stream, ambient	NE	NE	0	0	0	0	0	0	NE	NE	0	0	NE	NE	0	0	NE	NE	NE	NE
Consumption of contaminated water - child	0	0	NE	NE	NE	NE	NE	NE	0	L	NE	NE	0	0	NE	NE	0	0	0	L

	2,4-D[1,3]		**Chlorsulfuron**		**Clopyralid**		**Dicamba**		**Glyphosate[2,3]**		**Hexazinone**		**Imazapyr[2]**		**Metsulfuron methyl**		**Picloram**		**Triclopyr[2,3]**	
	Typ[4]	Max[4]	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max	Typ	Max
Consumption of contaminated fish - general public	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Consumption of contaminated fish - subsistence populations	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chronic/Longer-term Exposures																				
Consumption of contaminated fruit	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	L
Consumption of contaminated water	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Consumption of contaminated fish - general public	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Consumption of contaminated fish - subsistence populations	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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

1 In the 2010 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.

2 Glyphosate, imazapyr, picloram, and triclopyr risk assessments were updated in 2011. The risk ratings in this table reflect these 2011 Risk Assessments and may differ from the risk ratings shown in the 2010 FEIS.

3 Where different formulations exist, risks reported are the most conservative.

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

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

Appendix D –Weed Prevention Schedule

General Prevention Activity	**Description** *(Describe the activity and where it will take place)*	**When** *(season)*	Who
Equipment / Operations			
Require contractors to power or pressure wash off-road equipment to remove mud, dirt and plant parts.	Before moving onto public lands and after working in infested areas, prior to moving to relatively weed-free areas.	All year	Contracting Officers, Project Inspectors, Field Managers
Check body and undercarriage of off-road vehicles for plant material and clean with best available method.	Before leaving weed-infested areas	All year	All Field Personnel
Power or pressure wash equipment to remove mud, dirt and plant parts.	After working in infested areas before moving to relatively uninfested areas	All year	Equipment Operators, Force Acct Personnel
Ensure that the BLM compounds are kept free of noxious weeds.	Main offices, Fire and Resource compounds.	Spring/ Summer	Weed Team, AO, Fire and Resource personnel
Road Construction / Maintenance			
Minimize soil disturbance and reseed where appropriate to reduce the likelihood of weed establishment.	Includes, but not limited to, road construction/maintenance; project construction/maintenance such as cattleguards, springs, reservoirs.	All year	Equipment Operators, Road Maintenance, Project leads
Inspect gravel pits and fill sources to identify infestations. Require relatively weed-free gravel and fill to be used in relatively weed-free areas.	Community pits/fill sites across the District.	Spring/ Summer	Weed Team, Botanists, Force Account, Engineering staff
Include noxious weed management in Transportation Management Plan	Established roads on Transportation Management Plan.	All year	Force Account Manager, Engineers, and District Weed Coordinators
Recreation			
Inspect recreation sites regularly for noxious weeds. Report infestations to Weed Team.	Established recreation sites across the District as well as known, undeveloped high-use areas for hunting, fishing, camping and OHV use.	All year	Recreation Specialists, Weed Team, Botanists, others as assigned
Encourage weed free hay/straw/mulch for all public land users.	Until weed-free Hay/Straw/Mulch IM is enacted, educate and encourage public land users on the new regulations.	Spring/ Summer/Fall	Recreation Technicians, District Rangers, Weed Personnel, Operation Recreation Personnel
Livestock Management			
Regularly inspect handling facilities and turn-out areas for noxious and invasive weeds.	District-wide.	Spring/ Summer	Range Management Specialists
Consider timing of livestock movement from infested to noninfested areas to minimize weed seed transport in areas of moderate to high ecological risk.	District-wide. Do not move livestock from infested areas in which seeds have ripened and can be transported on coat or hooves to uninfested areas.	All year	Range Management Specialists

General Prevention Activity	**Description** *(Describe the activity and where it will take place)*	**When** *(season)*	Who
Timber Management			
Include weed prevention in timber management project design.	District-wide. Include stipulations for equipment cleaning and plans for reseeding disturbed areas. Avoid areas that are weed infested.	All year	Forester
Consider winter logging to prevent noxious weed spread.	District-wide. Logging over snow would reduce ground disturbance and most weed seed would be under the snow and not easily transported.	Winter	Forester
Minerals Management			
Retain bonds for weed control on all mineral activity until the site is successfully revegetated, when appropriate.	District-wide. Avoid areas that are already weed infested if possible. If not, control weeds prior to ground disturbing activity, during the mining activity, and as part of mining reclamation plan.	All year	Minerals Specialist, mining claim holder
Require all Mineral Operation Plans to include weed prevention, monitoring and control or eradication strategies.	District-wide. Include stipulations for equipment cleaning and plans for reseeding disturbed areas. Avoid areas that are weed infested if possible.	All year	Minerals Specialist, Weed Team
Wildlife Management			
Environmental analysis for habitat improvement projects will include weed-risk considerations.		All year	Wildlife Biologist, Weed Specialist
Fire and Fuels Management			
Implement noxious weed prevention strategies in all fire suppression, fuels reduction and rehabilitation efforts.	District-wide. Consider using weed-wash stations on all large fires and, at a minimum, hose down engines/equipment on smaller fires using engine hoses and untreated water.	All year	Fire Biologists, Resource Advisors, Weed Team
Survey and monitor areas of likely introduction and establishment of weeds in burned areas at regular intervals 1-5 years following a burn/fire.	District-wide, especially in areas of known noxious weed infestations	Spring, Summer, Fall	Weed Team, Fire Staff Biologists, Botanists, Range Staff, or others as assigned
Lands & Realty			
Include assessment for weed control in all land tenure adjustments. Include weed prevention stipulations in all rights-of-way authorizations.	District-wide. Include weed prevention stipulations in all authorizations.	All year	Realty Specialist, Weed Specialists
Employee Awareness			
Conduct noxious weed training for all personnel.	Vale and Baker offices	Winter, Spring	District Weed Coordinator and Weed Team, Contractor or Cooperator
Conduct inventories for noxious weeds. Include weed inventories in all clearance surveys for proposed actions.	District-wide	All year	Weed Team, Project Proponents, Contractors
Systematically inventory the District to detect new invaders and expansions of established noxious weeds.	Especially in vicinities of known weed infestations and areas of high potential such as rec sites, road systems, mining areas, and heavily grazed areas.	Spring/ Summer/Fall	District Weed Coordinators

General Prevention Activity	**Description** *(Describe the activity and where it will take place)*	**When** *(season)*	Who
Report known and suspected weed infestations when found.	District-wide. Collect samples for identification and assessment by Weed Team. GPS the infestation if possible and fill out a Weed Site Report Form if plant identity is not known.	All year	All Field Personnel
Maintain records of known noxious weed locations on District lands.	Collect GPS data using Junos following NISIMS protocols. Upload into Citrix every two weeks and keep the GIS layer current.	All year	Weed Team, GIS Specialists
Control new small outlier infestations by hand or other methods, as appropriate.	District-wide. GPS the infestation if possible and fill out a Weed Site Report Form. Give the information to the Weed Team.	All year	All Field Personnel
Ground Disturbing Activities			
Monitor project sites to detect new infestations 2-5 years after completion.	District-wide. Prioritize monitoring efforts according to the degree of risk of weed invasion.	Spring, Summer, Fall	Project leads, Weed Team and others as assigned
Revegetate disturbed soil. Use native species when available and appropriate to the site use.	Use native species in native communities. Assess use of nonnative, desirable species in nonnative communities as a step in assisted succession, to speed reclamation efforts or in sites that are constantly being disturbed through maintenance activities.	Spring, Summer, Fall	Project Leads, Field Office Botanists
Use all-states/ certified "noxious weed-free" seed in all revegetation projects.	District-wide. Include as a stipulation in all contracts, permits, and projects.	Spring, Summer, Fall	Project Leads, Field Office Botanists
Use certified weed-free straw/mulch in all projects where straw/mulch is used.	District-wide. Include as a stipulation in all contracts, permits, and projects.	All year	Project Leads
Purchase weed free gravel and fill material	District-wide	All year	Project Leads, Force Account, Engineers
Public Awareness & Outreach			
Distribute public information, brochures & pamphlets. Post weed information at high use recreation sites.	County fairs, other public and school functions, range turnout meetings, front desk, etc.	All year	Weed Team, Public Affairs Officer, Reception, Recreation, Range and fire staff and others as assigned
Coordinate noxious weed control activities with County Weed Boards, Oregon Department of Agriculture, Oregon Department of Transportation, and other agencies and districts	Continue to use Assistance Agreements, Contracts, and Partnerships to share funding, resources and expertise.	All year	District Weed Coordinator and Weed Team
Work with adjacent landowners on weed awareness and control strategies.	Utilize CWMAs and County Weed Inspectors to help facilitate communication between the District and landowners.	All year	District Weed Coordinator and Weed Team
Planning Documents			
Include noxious weeds as a critical element in all NEPA documents and plans.	Any Resource Management Plan, EIS, EA, Categorical Exclusions, etc., District-wide.	All year	Weed Coordinators, NEPA Coordinator, Project Leads, Planners

Appendix E - Invasive Plant Infestations

NISIMS (described in the *Inventory* section in Chapter 2) includes 12,544 acres of documented invasive plant sites on the Vale District. These are summarized on Table 2-1, and are displayed in Map 2-1 (maps are located at the end of this EA).Table E-5 shows invasive plants mapped in NISIMS by infestation size.

An additional 185,238 acres of invasive plants sites are known, but infestation acres at each site are estimated. The location of both the NISIMS and project areas with their estimated acres are shown, by species and within broad complex or smaller project area mapping units, on Tables E-1 through E-4. These acres are also summarized on Table 2-1. A map of the project areas and complexes is also included as Map E-1.

Category 5 pastures are those where at least 20 percent of the area on BLM-administered land is in the “moderate” or “heavy” invasive annual grass range, or 20-50 percent of the pasture is in the “severe” range. Pastures in Category 5 are displayed in Map 2-4 and occur on approximately 3.5 million acres (approximately three-fourths of the Vale District). Category 6 pastures are those where more than 50 percent of the area on BLM-administered land is in the “severe” invasive annual grass range. In the Baker Resource Area, all historic large areas of invasive annual grass monocultures have been seeded to nonnative, non-invasive perennial grass species (crested wheatgrass and intermediate wheatgrass). Therefore, none of the Baker Resource Area was classified as Category 6. Table E-6 is a list of pastures in Categories 5 and 6.

Table E-1. Estimated Project Area Acres: Malheur Resource Area, North

Complex	Project Area	Buffalobur	Bull thistle	Canada thistle	Dalmatian toadflax	Diffuse knapweed	Halogeton	Jointed goatgrass	Kochia	Leafy spurge	Mediterranean sage	Medusahead	Musk thistle	Myrtle spurge	Perennial pepperweed	Poison hemlock	Puncturevine	Rush skeletonweed	Russian knapweed	Saltcedar	Scotch thistle	Spotted knapweed	Spiny cocklebur	Ventenata	Whitetop	Yellow starthistle	Yellow / white sweetclover
Highway 20 North Complex	*Other Areas*			75	25						350				300		50	100	100		700	50			800		
	Bully Creek Reservoir				15						50	1,000			200			300		50	500				500		
	Castle Rock Rail Canyon				250	50						1,000							25		500	250			500		
	Cottonwood Mountain											500						75			500				600		
	Indian Creek											250							300		100	15			300		
	Jonesboro											300			50			250			50				50		
	Vines Hill Fire										10							25			250				100		
Highway 20 South Complex	*Other Areas*		75	75		50					50	2,500			800				400	25	450				800		
	Crowley Road											1,000	50		100				100		800				250		
	Lytle Blvd	10				100			25					10				10,000			2,000				150		
	Owyhee Views																		100	1,000	50				1,000		
	Owyhee W & SR							50					50		325		40		175	75	150				250		
	Riverside Road										50	500					100		25		50				100		
	Shumway Road											600			100				25		100				500		
	Twin Springs Road					25		25				2,000			50			7,500	25	1,500	1,000		1		500	5	
	Vines Hill				10		150				50	100						500		2,000	250				100	25	
Highway 26 North Complex	Oregon Trail	250			10	75						2,000			1,000			50,000	100	500	8,000	75			2,000		
	Willow Creek					100				600					150	50			50		1,000				1,000		
Owyhee River East Complex	*Other Areas*						300												25	25					25		
	Blowout Reservoir					50						4,000							25		100				500		
	Highway 95					50				50					25			25	25		50	50		1,000	200		10
	Owyhee Ridge		25		5		500	50				7,000			200			2,000	100	150	500	25			300	500	
	Spring Mountain			25				15		25		250							50	25	150			100	100		

Table E-2. Estimated Project Area Acres: Malheur Resource Area, South

Complex	Project Area	Bull thistle	Canada thistle	Dalmation toadflax	Diffuse knapweed	Halogeton	Jointed goatgrass	Leafy spurge	Mediterranean sage	Medusahead	Musk thistle	Perennial pepperweed	Puncturevine	Rush skeletonweed	Russian knapweed	Saltcedar	Scotch thistle	Spotted knapweed	Ventenata	Whitetop	Yellow starthistle	Yellow / white sweetclover
Highway 95 Southeast Complex	*Other Areas*	10	10							500					45		75			50		
	Bowden					25						50			100		25			100		
	Caviatta													50			2,500			500		
	Crooked Creek Fire					100														25		
	Five Point Loop														5		50		25	250		
	Hwy 95		25		150		25			100		100	50		150		100	100		240	50	30
	Jackie's Butte Fire														50		50			100		
	Jackson to Star Valley Road														50		100	5	500	100		
	Loveland Horse Camp														25	5	250			250		
	Tent Creek-Cow Camp														150		150			200		
	West Little Fire																250			250		
Highway 95 Southwest Complex	*Other Areas*				50	600			25						10		50			50	50	
	Opalite Loop				50										25		200	25		250		
	Whitehorse Road					500						150					250			100		
	Willow Creek Waterholes											500			250	1,000				500		
Owyhee W & SR Northeast Complex	*Other Areas*														50		100			200		
	Bogus-Mud Lake									2,000							50			250		
	Bogus Fire																150			150		
	Clarks Butte Fire									50							50			50		
	Cow Lakes-Danner		150		25							75			25		150			200		
	Pascual				50										50		1,500			150	1,500	
Owyhee W & SR Southeast	*Other Areas*	15	15							2,500					50		25			150		
	Antelope Flat		25							1,000	10		50				300	150	250	400		
	Pinto Horse									1,000							500			100		
	Three Forks Loop									2,000					15		300			400	25	

Complex	**Project Area**	Bull thistle	Canada thistle	Dalmation toadflax	Diffuse knapweed	Halogeton	Jointed goatgrass	Leafy spurge	Mediterranean sage	Medusahead	Musk thistle	Perennial pepperweed	Puncturevine	Rush skeletonweed	Russian knapweed	Saltcedar	Scotch thistle	Spotted knapweed	Ventenata	Whitetop	Yellow starthistle	Yellow / white sweetclover
	Three Forks Rec							75		300			75		50		150			50		
Saddle Butte	*Other Areas*					400						150			25		50			250		
	Highway 78			25	300		10			200		50	25		25		50	25		150		

Table E-3. Estimated Project Area Acres: Baker Resource Area (North)

Complex	**Project Area**	Armenian blackberry	Bur chervil	Canada thistle	Common crupina	Dalmation toadflax	Diffuse knapweed	Houndstongue	Leafy spurge	Meadow hawkweed	Medusahead	Oregano	Oxeye daisy	Perennial pepperweed	Poison hemlock	Puncturevine	Rose campion	Rush skeletonweed	Russian knapweed	Russian olive	Scotch broom	Scotch thistle	Spotted knapweed	Sulfur cinqefoil	Sweetbriar rose	Tree of heaven	Whitetop	yellow starthistle
Grande Ronde Complex	*Other Areas*		10						2		100							2						40	20			40
	Rogersburg						1		2		45			2				10				15	3	5		2	4	180
	Joseph Canyon				100													250				4,000		400				900
	Lower Grande Ronde		100						25		400				25			20				150		75				100
	Horseshoe						15		45		800				10			30				100		100	20			
	Muddy Wild Sickfoot					1	6	1	20		20		20				1						30	100				
	Courtney			10			2		20		25							2				25		15				30
	Minam Sheep						10		40	5	500	1	3								3		10	300				10
Umatilla County Complex	*Other Areas*						8							2					6	10		2	2				2	2
	South Fork Walla Walla	<1					1															1	5					
	Juniper Canyon						5											10										90
	Echo Meadows						5							1		1		3										1

Table E-4. Estimated Project Area Acres: Baker Resource Area (South)

Complex	Project Area	Armenian blackberry	Black henbane	Bouncingbet	Bull thistle	Canada thistle	Common tansy	Dalmation toadflax	Diffuse knapweed	Field bindweed	Houndstongue	Indigobush	Jointed goatgrass	Leafy spurge	Mediterranean sage	Medusahead	Myrtle spurge	Oxeye daisy	Perennial pepperweed	Puncturevine	Purple loosestrife	Rush skeletonweed	Russian knapweed	Russian olive	Saltcedar	Scotch thistle	Spotted knapweed	Squarrose knapweed	Sulfur cingefoil	Tree of heaven	Whitetop	Yellow flag iris	Yellow starthistle	Yellow toadflax	Yellow / white sweetclover
Snake River Complex	*Other Areas*							2	1		3		2	1		100				2		6		1	1	10	1		2		5	1	1		
	Shovel Creek															200																	300		
	Copper Hess	10		3				10	1		10	10				500			1	1		1,000				10	10		300	5	30	7	10		
	Sheep Mountain											4	20			600						150					5				10	1			
	Officer Butte								3			5	10	2		500			7			300				10					10	3			
	Tartar Gulch											5				300						400				5			4		70	3			
	Coyote										1	8								2		250				10					20	5	5		
	Morgan Mountain		3			5		10	1	1	2	2	16			500			1	2	1	10	2	1	1	150					30	1			
84 Northeast Complex	*Other Areas*		1		3	8		1	5	10	10		3	4		1,000		1		5						20	3				50		5		
	Dry Creek																					25													
	Foster Gulch								6							500	1			2		200				20					100				
	Love					1			1							300				5		10		1		4					10		1		
	Pritchard		3			2			1					20		30			1			1				10					10				
	Virtue					1		1	7				1							5			1			12					35				1
	Keating				3	30			2	30	40		3			3,000		1		4		10				150			10		200		200		
	Big Creek					1			5		5		5			1,000				3		1				30					100				
	Crystal Palace				1	4			1	1	2					1,200				2		1	1	8		100	1				1,500		20		
84 South Complex	Durbin Creek				2	4		10	3				1			100			2	3		3	1			60	20				30				
	The Hogback		2		1				10				5			100	1			3		10				50	3				10				
	Clark /Amelia /Pedro				20	40			10		60			15	5	30				3						50	10	1			20		5	5	
	Burnt River				4	30	5	1	20		20			40		100						1				20	16				25				
	Pine Creek Bald Mountain					1			3						8										<1	2	2								
	Blue Poker Elk				230	180		5	530		220					100						1				150	15		10		10				
	Denny Flat				1	2		3			1								1							2					100				

Table E-5. Invasive Plants Mapped in NISIMS by Infestation Size

Species Name	< 0.1 acres		0.1 to < 0.5 acres		0.5 to < 1 acres		1 to < 5 acres		5 to < 20 acres		20 to <100 acres		100 to 500 acres		> 500 acres	
	# sites	acres	# sites	acres	# sites	acres	# sites	acres	# sites	acres	# sites	acres	# sites	acres	# sites	acres
Black Henbane	35	1.49	2	0.33												
Buffalobur	3	0.23							1	11.15						
Bull Thistle	226	3.63	35	8.72	7	5.18	10	18.97	6	76.82	4	102.08				
Canada Thistle	280	7.16	50	12.41	19	14.24	23	41.18	14	130.85	1	23.22				
Common bugloss	1	0.04														
Common tansy	1	0.01														
Dalmatian Toadflax	152	12.40	6	1.08	4	3.49			3	42.50						
Diffuse Knapweed	498	20.27	16	3.55	13	12.18	12	26.98	9	84.53			1	497.47		
Field bindweed	2	0.10							1	7.32						
Halogeton	6	0.38					2	5.70								
Houndstongue	251	5.28	57	13.32	15	10.30	23	60.51	13	127.90	1	32.28				
Jointed goatgrass	36	1.39	2	0.57												
Kochia	2	0.13														
Leafy spurge	587	50.97	22	4.61	20	19.00	3	7.58	3	30.51						
Meadow hawkweed	2	0.00														
Mediterranean sage	61	4.79	16	3.86	5	4.13	4	10.20	3	27.04						
Medusahead rye	95	4.36	78	19.42	27	20.13	39	89.06	24	231.90	12	656.34	4	763.88		
Musk Thistle	1	0.10														
Myrtle spurge	6	0.60	1	0.20												
Oxeye daisy	4	0.24	1	0.17												
Perennial pepperweed	157	6.08	5	0.93	2	1.55	8	22.26	3	27.94	2	89.78				
Puncturevine	55	1.23	4	1.19	5	4.97	5	11.64	1	19.52						
Purple loosestrife			1	0.14												
Rush skeletonweed	16,468	1,078.73	1,400	275.56	87	57.87	24	43.15	6	52.42			1	160.48		
Russian Knapweed	211	10.96	5	1.54	37	35.95	21	45.97	7	56.12	1	34.62				
Russian olive	4	0.11														
Scotch Broom	8	0.30														
Scotch Thistle	1,815	63.26	185	46.33	59	42.80	88	201.24	45	442.32	11	403.15	1	116.42		
Spotted Knapweed	332	18.79	15	3.53	4	2.57	6	12.74	5	39.02						
Squarrose knapweed	2	0.01														
St. John's wort	10	0.51														
Sulfur cinquefoil	29	0.47	6	1.77	1	0.56	2	2.76	1	11.50						
Tamarisk	277	24.65	1	0.16	1	1.00			1	12.63	1	79.00	3	855.74	1	2,616.50
Whitetop	2,290	90.29	171	39.68	50	36.86	62	146.76	24	196.06	10	398.75	1	116.71		
Yellow flag iris	81	7.12	1	0.16												
Yellow starthistle	430	25.79	90	20.21	23	18.59	19	33.16	9	77.62	3	74.68				
Yellow Toadflax	4	0.28	2	0.22												

Table E-6. Pastures in Categories 5 and 6.

Allotment Name	Pasture Name	Acres	Category
	Birch Creek Ranch	476	5
	Jordan Craters	16,467	5
	Leslie Gulch	13,401	5
	Luscher	3,084	5
	Owyhee Reservoir State Park	2,994	5
	Three Forks - Trailing	2,281	5
15-Mile Community	Angel Canyon Native	17,099	5
15-Mile Community	Basque Seeding East	2,051	5
15-Mile Community	Basque Seeding West	1,788	5
15-Mile Community	Blue Mountain	70,993	5
15-Mile Community	Burro Seeding	1,812	5
15-Mile Community	Cascade Brush Control	13,637	5
15-Mile Community	Dry Farm South	3,948	5
15-Mile Community	Etchart Seeding	531	5
15-Mile Community	Etchart Seeding	2,460	5
15-Mile Community	Frenchie North	9,273	5
15-Mile Community	Green Ponds	33,449	5
15-Mile Community	Jaca Seeding	3,536	5
15-Mile Community	Jackson Creek FFR	367	5
15-Mile Community	Jackson Creek North	30,437	5
15-Mile Community	Jackson Creek South	7,374	5
15-Mile Community	McDermitt Seeding East	5,824	5
15-Mile Community	Oregon Canyon Brush Control	4,272	5
15-Mile Community	Oregon Canyon Seeding East	3,050	5
15-Mile Community	Oregon Canyon Seeding West	2,496	5
15-Mile Community	Overshoe Seeding North	7,454	5
15-Mile Community	Overshoe Seeding South	4,975	5
15-Mile Community	Pronghorn	15,068	5
15-Mile Community	Schoolhouse Seeding West	1,348	5
15-Mile Community	Sheep Corral Brush Control	2,318	5
15-Mile Community	Summit North	1,537	5
15-Mile Community	Summit South	1,655	5
15-Mile Community	Twelve Mile Seeding	2,564	6
Agency Mountain	Water Gulch	3,419	5
Albisu-Alcorta	Andy Fife	2,783	5
Albisu-Alcorta	Lower Lazy T	1,481	5
Albisu-Alcorta	The Breaks	8,893	5
Albisu-Alcorta	Upper Lazy T	1,763	5
Alder Creek	Middle	1,096	5
Alder Creek	Northwest	1,076	5
Alder Creek	Southwest	522	5
Alkali Spring	Bierman Seeding	3,417	5
Allotment #6	Juniper Gulch	7,339	5
Allotment No.2	Bully Creek Seeding	2,677	5
Allotment No.2	Cottonwood Fire Rx	117	5
Allotment No.2	Dry Creek	1,687	5
Allotment No.2	FFR	595	5
Allotment No.2	Harper Seeding	2,964	5
Allotment No.2	Holding	1,482	5
Allotment No.2	Mesa	5,612	5
Allotment No.2	Mountain	10,839	5
Allotment No.2	N.G. Holding	83	5
Allotment No.2	North Bully Creek	6,504	5

Allotment Name	Pasture Name	Acres	Category
Allotment No.2	North Bully Holding	87	5
Allotment No.2	South Ng Seeding	3,560	5
Allotment No.3	Becker FFR	1,509	5
Allotment No.3	Dice FFR	1,057	5
Allotment No.3	East Cottonwood Seeding	1,913	5
Allotment No.3	Frog	3,384	5
Allotment No.3	Hanna Station FFR	2,081	5
Allotment No.3	Indian Creek	3,800	5
Allotment No.3	Jones	11,885	5
Allotment No.3	Lower Pole Creek	3,140	5
Allotment No.3	North Black Canyon	5,915	5
Allotment No.3	North Gregory Creek	6,724	5
Allotment No.3	North Studhorse	10,449	5
Allotment No.3	South Black Canyon	4,630	5
Allotment No.3	South Gregory Creek	6,022	5
Allotment No.3	South Studhorse	5,342	5
Allotment No.3	Swamp Creek Seeding	4,370	5
Allotment No.3	Upper Pole Creek	6,537	5
Allotment No.3	West Cottonwood Seeding	4,910	5
Allotment No.3	Westfall FFR	2,145	5
Allotment No.3	Wilson Creek FFR	274	5
Allotment No.4	Coyne Riparian Stex	285	5
Allotment No.4	East Middle Chicken Creek Seeding	2,282	5
Allotment No.4	East Miller Creek	6,307	5
Allotment No.4	East Willow Creek Seeding	3,095	5
Allotment No.4	Hog Creek	10,518	5
Allotment No.4	Hog Creek Stex	809	5
Allotment No.4	North Chicken Creek Seeding	2,194	5
Allotment No.4	North Gravel	8,056	5
Allotment No.4	South Chicken Seeding	2,899	5
Allotment No.4	South Gravel	7,648	5
Allotment No.4	West Middle Chicken Creek Seeding	1,652	5
Allotment No.4	West Miller Creek	9,894	5
Allotment No.4	West Willow Creek Seeding	2,637	5
Ambrose-Maher	Ambrose Maher	3,781	5
Antelope	Antelope Flat	4,914	5
Antelope	Black Butte North	1,959	5
Antelope	Black Butte South	2,890	5
Antelope	Cantor North	160	5
Antelope	Cantor South	1,888	5
Antelope	Native Annex Rsex	837	5
Antelope	Parsnip East	2,578	5
Antelope	Parsnip West	7,372	5
Antelope	Rock	11,444	5
Antelope	Sheep Spring Seeding	806	5
Antelope	Soldier Creek Seeding East	945	5
Antelope	Soldier Creek Seeding South East	505	5
Antelope	Soldier Creek Seeding West	1,056	5
Arock	Bull Pasture	1,698	5
Arock	Dry Creek East	4,058	5
Arock	Dry Creek West	4,878	5
Arock	Field #1	2,420	5
Arock	Field #2	1,461	5
Arock	Field #3	3,062	5

Allotment Name	Pasture Name	Acres	Category
Arock	Field #4	2,021	5
Arock	Little Grassy North	7,812	5
Arock	Little Grassy South	4,068	5
Arock	Monument Native North	3,119	5
Arock	Monument South Sdg East	1,358	5
Arock	Monument South Sdg West	836	5
Arock	Noon	7,245	5
Arock	Pinto Horse	5,362	6
Arock	Round Mountain North	2,004	5
Arock	Round Mountain South	2,141	6
Arock	Tankey East	3,854	5
Arock	Tankey West	5,367	5
Baldy Mountain	Baldy Mtn	5,172	5
Balm Creek	Lower	472	5
Balm Creek	Poorman	1,974	5
Balm Creek	Upper	1,275	5
Barren Valley	South	3,406	5
Barren Valley	The Gap	5,774	5
Barren Valley	Three Man Butte Well	3,617	5
Benson Creek	North	1,401	5
Benson Creek	South	1,971	5
Benson Creek	South Durbin Creek	797	5
Beulah Reservoir	Burnt Field	320	5
Beulah Reservoir	Jack Creek	2,025	5
Beulah Reservoir	Lower Poverty	717	5
Beulah Reservoir	Mccallan	472	5
Beulah Reservoir	Moonshine	1,049	5
Beulah Reservoir	Upper Poverty	1,138	5
Big Creek	West Seeding	804	5
Bighorn	East	2,303	5
Bighorn	Mud Flat	695	5
Bighorn	West	2,859	5
Birch Creek	Birch Creek	2,777	5
Birch Creek	Island Field	2,859	5
Birch Creek	South Blackrocks	1,015	5
Birch Creek	West Blue Canyon	4,588	5
Black Butte	Bentz FFR	18,926	5
Black Butte	Blaylock	254	5
Black Butte	Butte	4,631	5
Black Butte	FFR	268	5
Black Butte	Juniper Basin	1,166	5
Black Butte	Juntura Seeding	1,157	5
Black Butte	Mcgetrick	2,069	5
Black Butte	Meeker Mtn	6,265	5
Black Butte	Moritz	679	5
Black Butte	ODFW- State	644	5
Black Butte	Parks	3,066	5
Black Butte	Potholes	10,225	5
Black Butte	Riverside	100	5
Black Butte	Riverside FFR	3,361	5
Black Butte	Sheep Rock	3,700	5
Black Butte	Terry Basin	4,858	5
Black Butte	Water Gulch	7,683	5
Black Butte	Weisner	4,107	5

Allotment Name	Pasture Name	Acres	Category
Blackjack	East	9,703	6
Blackjack	West	8,138	6
Board Corrals	Alkali	18,267	6
Board Corrals	Antelope	17,404	6
Board Corrals	Board Corral	6,231	5
Board Corrals	FFR	1,485	6
Board Corrals	Wildhorse Basin	17,568	5
Bogus Creek	Bogus Creek	4,068	5
Boney Basin	Bull Canyon	138	5
Boney Basin	Lower Field	10,079	5
Boney Basin	Private	4,861	5
Boney Basin	Upper Field	7,142	5
Boston Horse Camp	Boston Horse Camp	2,313	5
Boswell Spring	Boswell Spring	5,956	5
Bowden Hills	Bowden Hills	84,944	5
Brian Creek	North Mountain	1,019	5
Brian Creek	North Ng Seeding	1,258	5
Brian Creek	South Mountain	1,724	5
Brian Creek	South Ng Seeding	1,023	5
Bridge Creek	Dugout-Bridge Gulch	4,758	5
Bridge Creek	Tables	5,226	5
Bridge Creek	Willow Spring	3,969	5
Bridge Creek East	South Bridge Creek	5,678	5
Brogan Canyon	Chrome Mine	486	5
Brogan Canyon	Diversion Dam	232	5
Brogan Canyon	Lower Canyon	775	5
Brogan Canyon	Smith Private	447	5
Brogan Canyon	Upland	1,328	6
Buckbrush	Buckbrush Seeding	2,775	5
Buckbrush	Gathering	560	5
Buckbrush	Lower Buckbrush	3,460	5
Buckbrush	Lower Mountain	2,548	5
Buckbrush	State Pasture	2,315	5
Buckbrush	Turnout	2,836	6
Buckbrush	Upper Buckbrush	3,462	5
Buckbrush	Upper Mountain	2,709	5
Bully Creek	Bully Creek	12,959	5
Butte	Harper Jct	1,391	5
Butte	King Brown Enclosure	301	5
Butte	North Butte Creek	4,228	5
Butte	North Racehorse	4,474	5
Butte	Racehorse Well Enclosure	96	6
Butte	South Racehorse	7,628	5
Calf Creek	Cave Creek	551	5
Calf Creek	Cave Creek Stex	422	5
Calf Creek	Chalk Camp	2,276	5
Calf Creek	Dishrag	6,384	5
Calf Creek	Lake Ridge	3,530	5
Calf Creek	Lower Calf Creek	1,678	5
Calf Creek	Stemler Basin	4,174	5
Calf Creek	Upper Calf Creek	830	5
Campbell	Lucky Seven FFR	2,921	5
Campbell	Peacock	28,560	5
Campbell	Twin Springs Middle	7,162	5

Allotment Name	Pasture Name	Acres	Category
Campbell	Twin Springs North	14,787	5
Canal	Canal	1,815	5
Chalk Butte	Chalk Butte Cust M	221	6
Chalk Butte	Chalk Butte Cust N	403	5
Chalk Butte	Chalk Butte Cust W	1,395	5
Cherry Creek	Cherry Creek	610	5
Chukar Park	Chukar Park FFR South	224	5
Chukar Park	Chukar Park Stex	1,373	5
Clover Creek	Lower	402	5
Clover Creek	Middle	348	5
Clover Creek	Upper	401	5
Clover Creek Individual	Clover Creek	16,397	5
Cottonwood Creek	Cottonwood Creek	2,057	5
Cottonwood Creek	Cottonwood Creek	1,333	5
Cottonwood Mountain	Hope Butte Seeding	3,720	6
Cottonwood Mountain	Hope Flat Seeding	2,517	6
Cottonwood Mountain	Kern Creek	16,456	6
Cottonwood Mountain	Morrison	2,061	6
Cottonwood Mountain	Poison Creek	2,381	6
Cottonwood Mountain	Red Rock Exclosure	129	6
Cottonwood Mountain	Turner Creek	6,866	6
Cow Creek	Cow Creek	7,593	5
Coyote Lake	Air Strip Exclosure	146	5
Coyote Lake	Coyote Lake	161,996	5
Crews Creek	North	1,122	5
Dearmond-Murphy	Butler	2,012	5
Dearmond-Murphy	Mahogany Mountain	4,223	5
Dearmond-Murphy	North Munker	1,829	5
Dearmond-Murphy	Pole Gulch	3,585	5
Dearmond-Murphy	South Munker	1,849	5
Dearmond-Murphy	Upper Warm Spring Creek	837	5
Dearmond-Murphy	Warm Spring Creek	438	5
Dearmond-Murphy	West Munker	1,185	5
Dry Creek	Cow Hollow Seeding	1,599	6
Dry Creek	Double Mountain	12,640	6
Dry Creek	E Freezeout Cr FFR	1,186	5
Dry Creek	Hurley Spring	33,631	5
Dry Creek	South Freezeout	13,025	5
Dry Gulch	Dry	2,039	5
Dry Gulch	West	2,025	5
East Cow Creek	Barlow Brush Control	5,250	5
East Cow Creek	Bennett North	920	5
East Cow Creek	Bennett South	516	5
East Cow Creek	Big Ridge North	1,772	5
East Cow Creek	Big Ridge South	1,592	5
East Cow Creek	Boulder	8,972	5
East Cow Creek	Cowgill	5,049	5
East Cow Creek	Downey Canyon	1,260	5
East Cow Creek	Downey Canyon FFR	2,018	5
East Cow Creek	Hooker Creek North	1,004	5
East Cow Creek	Hooker Creek South	1,453	5
East Cow Creek	Jordan Valley North	1,388	5
East Cow Creek	Lava	12,439	5
East Cow Creek	Little Sandy North East	1,141	5

Allotment Name	Pasture Name	Acres	Category
East Cow Creek	Little Sandy South	997	5
East Cow Creek	Little Sandy West	1,597	5
East Table Mountain	East	606	5
Echave	Battle Mountain	6,004	5
Echave	Rattlesnake	4,792	5
Eiguren	Beber Seeding	1,834	6
Eiguren	Bull Creek Seeding	4,230	5
Eiguren	Chimney Creek	20,094	5
Eiguren	Winter Area North	4,629	6
Eiguren	Winter Area South	2,863	5
Five Mile	East	641	5
Foster Gulch	South	3,489	5
Gilbert	Battle Creek North	5,891	6
Gilbert	Battle Creek South	5,922	5
Gilbert	Battle Mountain	14,449	5
Gilbert	Potomac Private	403	5
Gilbert	Rattlesnake	11,971	5
Gilbert	Woolhawk	17,917	5
Goose Creek	Lower	686	5
Goose Creek	Middle	902	5
Gordon Gulch	Gordon Gulch	1,856	5
Harper	Indian Camp Pasture	10,464	5
Harper	Perry FFR	1,025	5
Harper	Rufino Butte	9,621	5
Harper	Shearing Plant	10,234	5
Harper	Shearing Plant Stock Driveway	500	5
Harper	Simmons Gulch	26,278	5
Huntington	North	3,657	5
Huntington	South	4,818	5
Immigrant Gulch	Immigrant Gulch	1,871	5
Jackies Butte Summer	China Gulch Seeding North	6,672	5
Jackies Butte Summer	China Gulch Seeding South	3,326	5
Jackies Butte Summer	Dry Creek Native	65,260	6
Jackies Butte Summer	Dry Creek Seeding	8,578	5
Jackies Butte Summer	Dry Ranch FFR	335	6
Jackies Butte Summer	Eastside	44,213	5
Jackies Butte Summer	Hardin Stex	104	5
Jackies Butte Summer	Hill	5,190	5
Jackies Butte Summer	Indian Fort	50,864	5
Jackies Butte Summer	Owyhee Springs	267	5
Jackies Butte Summer	Rome South	32,030	5
Jackies Butte Summer	Sand Hollow Water Gap	188	5
Jackies Butte Winter	Jackies Butte	20,202	6
Jonesboro	Antelope Swales	908	5
Jonesboro	Canyon Creek Strm Exclosure	90	5
Jonesboro	Dinner Creek	3,899	5
Jonesboro	Hunter Creek Strm Exclosure	766	5
Jonesboro	Indian Creek	2,723	5
Jonesboro	Jonesboro FFR	2,591	5
Jonesboro	Saddle Horse	5,352	5
Jonesboro	Sperry Creek	2,020	5
Jonesboro	Tims Peak	1,087	5
Jonesboro	Trail Creek	5,623	5
Jonesboro	Upper Hunter Creek	1,324	5

Allotment Name	Pasture Name	Acres	Category
Keating Highway	Lower	989	5
Keeney Creek	Callahan	10,616	6
Keeney Creek	Chucker	1,721	6
Keeney Creek	Drip Springs Wg	762	5
Keeney Creek	Drip Springs	4,397	5
Keeney Creek	East Hunter	4,460	6
Keeney Creek	Fenceline Spr Enclosure	396	5
Keeney Creek	Freezout	6,621	5
Keeney Creek	Hunter	11,044	5
Keeney Creek	Keeney Creek	3,382	5
Keeney Creek	Little Valley Seeding	2,065	6
Keeney Creek	Quicksand Pasture	9,726	5
Keeney Creek	Riley Place FFR No.1	1,009	5
Keeney Creek	Riley Place FFR No.2	187	5
Keeney Creek	Riley Place State Block	2,659	5
Keeney Creek	Winter Spring Seeding North	1,277	6
Keeney Creek	Winter Spring Seeding South	862	5
Lava Ridge	East Lava Seeding	2,182	5
Lava Ridge	Hay Canyon	2,370	5
Lava Ridge	North Bully	2,625	5
Lava Ridge	South Bully	2,109	5
Lava Ridge	South Hay Canyon	772	5
Lava Ridge	West Lava Seeding	2,025	5
Little Valley	East Vines Hill	2,489	6
Little Valley	Little Valley	4,802	5
Little Valley	Little Valley Bc	4,443	6
Little Valley	North Vines Hill	1,081	6
Little Valley	Rabbit Farm	5,578	6
Little Valley	South Vines Hill	1,933	6
Lodge	East	11,485	5
Lodge	West	6,086	5
Lost Valley	Lost Valley	6,543	5
Louse Canyon Community	Drummond Basin	15,050	5
Louse Canyon Community	Frenchman Creek Seeding	1,480	5
Louse Canyon Community	Wilkinson Fence	2,976	5
Love Creek	Love Creek	1,885	5
Lower Owyhee	River	2,409	5
Lower Spring Creek	Lower Spring Creek	1,266	5
Mahogany Mountain	FFR	1,414	5
Mahogany Mountain	FFR	935	5
Mahogany Mountain	Fish Creek	6,480	5
Mahogany Mountain	Gin	4,094	5
Mahogany Mountain	Grasshopper	3,622	5
Mahogany Mountain	Mahogany Mtn	6,062	5
Mahogany Mountain	Schnable Creek Seeding North	1,541	5
Mahogany Mountain	Shellrock North	4,634	5
Mahogany Mountain	Shellrock South	6,690	5
Mahogany Mountain	Stove	2,940	5
Mahogany Mountain	Tableland Annex	5,378	5
Malheur City	Malheur City	1,426	5
Mccain Springs	East Blue Canyon	2,569	6
Mccain Springs	Mccain Spring Seeding	3,975	6
Mccain Springs	Mccain Springs FFR	651	5
Mccain Springs	Road Reservoir	3,485	6

Allotment Name	Pasture Name	Acres	Category
Mccormick	Defenbaugh Rip	13,751	5
Mcewen	Andy Wilson Custodial	302	5
Mcewen	Big Flat	7,064	5
Mcewen	Duck Pond	12,484	5
Mcewen	East Swamp Creek	7,686	5
Mcewen	Hickey	11,071	5
Mcewen	Hickey Creek Custodial	1,710	5
Mcewen	Hughes	9,665	5
Mcewen	Lower Swamp	10,223	5
Mcewen	Stockade	28,631	5
Mcewen	Swamp Creek FFR	4,499	5
Mcewen	Vischer	13,487	5
Mitchell Butte	M. Mitchell Butte	2,820	6
Mitchell Butte	Mitchell Butte Ne	196	6
Mitchell Butte	Mitchell Butte Nw	156	6
Morcom	Greeley Bar Excl	744	5
Morcom	Morcom	5,129	5
North Harper	Boulevard Seeding	1,940	6
North Harper	East Cow Hollow	1,147	6
North Harper	East Page Seeding	1,108	6
North Harper	FFR	290	5
North Harper	Johnson Gulch	5,666	6
North Harper	Lincoln Bench	5,483	6
North Harper	Needham Well	4,947	6
North Harper	North Harper Seeding East	2,063	6
North Harper	North Harper Seeding West	2,210	6
North Harper	West Canal	4,839	6
North Harper	West Page Seeding	1,107	6
North Star Mtn	Arrien No.2 FFR	4,318	5
North Star Mtn	Basque	9,370	5
North Star Mtn	Bunyard Field	676	5
North Star Mtn	Cold Spring	724	5
North Star Mtn	Cold Spring State Block	3,848	5
North Star Mtn	Cottonwood Basin	8,008	5
North Star Mtn	Monument	32,361	5
North Star Mtn	Mosquito Creek Sdg	4,429	5
North Star Mtn	Slaughter Gulch	10,450	5
North Star Mtn	Wildcat Coldspring	29,645	5
Nyssa	Chalk Butte E	198	6
Nyssa	Chalk Butte W	639	6
Nyssa	Grassy Mtn	29,764	5
Nyssa	Grassy Seeding	3,035	5
Nyssa	North Mud Sdg	4,174	6
Nyssa	North Rock Creek	7,130	6
Nyssa	Ryefield Seeding	3,720	5
Nyssa	Sagebrush	11,877	6
Nyssa	Schweizer FFR	1,175	6
Nyssa	Shellbark Spr Exclosure	72	6
Nyssa	Snively Gathering	1,138	6
Nyssa	South Mud Sdg	2,927	6
Nyssa	South Rock Creek	7,057	5
Nyssa	South Rock Creek	2,947	6
Oliver	Oliver	6,889	5
Park	Park	967	5

Allotment Name	Pasture Name	Acres	Category
Phipps Creek (N)	Mine Hill Pasture East	2,665	6
Phipps Creek (N)	Rim Rock Pasture	3,661	6
Phipps Creek West	West	3,087	5
Poall Creek	Poall Creek	4,421	5
Quartz Mountain	Cedar Mtn	21,918	5
Quartz Mountain	Hole-In-The-Ground	7,643	5
Quartz Mountain	Long Waterhole FFR	680	5
Quartz Mountain	Morcom Cow Camp FFR	281	5
Quartz Mountain	Red Butte	47,989	5
Quartz Mountain	South Mcnulty	11,172	5
Quartz Mountain	Willow Spring	16,323	5
Radar Hill	N.Radar Hill	3,366	6
Radar Hill	S.Radar Hill Seeding	2,097	5
Rail Canyon	East Chastain	2,123	5
Rail Canyon	East Rock Creek	627	5
Rail Canyon	Home FFR	1,643	5
Rail Canyon	West Rock Creek	1,994	5
Rattlesnake	Rattlesnake Individual FFR	1,297	5
Rattlesnake	Rattlesnake Individual FFR	2,566	5
Rattlesnake	Rattlesnake Individual FFR	1,517	5
Rattlesnake	Rattlesnake Individual FFR	3,295	5
Red Hills	Cherry Creek	14,838	5
Red Hills	Coyote Well State Block	7,266	5
Red Hills	Lake Ridge	22,565	5
Red Hills	Littlefield Cemetery	218	5
Red Hills	Red Butte	9,700	5
Red Hills	Squaw Creek Seeding	5,505	5
Richie Flat	East Log Creek	4,332	5
Richie Flat	North Ridge	3,764	5
Richie Flat	Richie Flat Seeding	1,398	5
Richie Flat	South Ridge	2,684	5
Richie Flat	West Log Creek	5,555	5
Rockville	Mcbride Creek	6,721	5
Rockville	Rockville Seeding North	2,225	5
Rockville	Rockville Seeding South	1,634	5
Rockville	Top Spray North	6,086	6
Rockville	Top Spray South	3,945	5
Rome Individual	Rome Individual	2,720	5
Ruckles Creek	Friday Mine	3,717	5
Ruth Gulch	Snake River	2,940	5
Saddle Butte	Fletcher Trail Watergap	500	5
Saddle Butte	Saddle Butte	185,826	5
Saddle Butte	Sand Sp/Granite-Ryegrass/Navarro	2,818	5
Salt Creek	Whiskey Gulch	867	5
Schnable Creek	P Pot	4,004	5
Schnable Creek	Schnable Creek Sdg.S.	1,089	5
Scratch Post Butte	Scratch	9,713	5
Sheepheads	East Ryegrass	17,956	5
Sheepheads	Palomino Hills	51,183	5
Sheepheads	Sheepheads	68,580	5
Sheepheads	West Ryegrass	16,892	5
Sherburn	Hanson Flat North	12,812	5
Sherburn	High Peak	15,010	5
Sherburn	High Peak Brush Control	2,323	5

Allotment Name	Pasture Name	Acres	Category
Sherburn	High Peak Seeding	2,468	5
Skull Creek	East Pasture	1,753	5
Skull Creek	West Pasture	2,131	5
Soda Creek	Camp Creek	592	5
Soda Creek	Douglas Creek	3,034	5
Soda Creek	Quicksand	1,516	5
Soda Creek	Swedes Landing	646	5
Sourdough	Bishop FFR	6,559	5
Sourdough	Canyon	21,121	5
Sourdough	Double Mtn Sdg	935	5
Sourdough	Freezeout Lake	22,215	5
Sourdough	Hoodoo State FFR	3,153	5
Sourdough	North Kane Springs	10,863	6
Sourdough	Poison Spring FFR	272	5
Sourdough	Rye Field FFR	1,440	5
Sourdough	Sand Hollow Gathering	119	6
Sourdough	Sand Hollow Seeding	3,310	6
Sourdough	South Kane Springs	8,238	5
Sourdough	W Freezeout Cr FFR	915	5
Sourdough	West Sand Hollow Seeding	901	6
South Alkali	Alkali Flat	4,225	6
South Alkali	East Sandhills	4,098	6
South Alkali	Henry Gulch	1,732	6
South Alkali	Tub Mountain	19,585	6
South Alkali	West Sandhills	7,341	6
South Star Mtn	Atturbury	9,634	5
South Star Mtn	Canyon	3,694	5
South Star Mtn	Chapman FFR	480	5
South Star Mtn	Creston Bc	5,243	5
South Star Mtn	Creston FFR	4,873	5
South Star Mtn	Granite Creek	3,878	5
South Star Mtn	Horse Queen	4,662	5
South Star Mtn	Road Canyon	16,067	5
South Star Mtn	West Chapman	6,118	5
Spring Mountain	Carter Creek Seeding	2,823	5
Spring Mountain	Falen Seeding	550	5
Spring Mountain	FFR	692	5
Spring Mountain	Sagehen Basin	2,223	5
Spring Mountain	Shalerock	5,277	5
Spring Mountain	Sheaville	978	5
Spring Mountain	Spring Basin Seeding North	1,614	5
Spring Mountain	Spring Mtn Native Range	19,475	5
Spring Mountain	Sticky Joe Seeding	948	5
Spring Mountain	Thomas Cr FFR	1,638	5
Squaw Creek	Squaw Creek	4,271	5
Table Mountain North	Table Mountain North	602	5
Ten Mile	Ten Mile Seeding	3,604	5
Thorn Flat	Black Creek	2,271	6
Thorn Flat	Gum Creek	1,820	6
Three Fingers	Bannock	13,699	5
Three Fingers	Blackrocks	15,016	5
Three Fingers	Camp Kettle North	7,804	6
Three Fingers	Camp Kettle South	6,206	5
Three Fingers	Devil’s Gate	4,114	5

Allotment Name	Pasture Name	Acres	Category
Three Fingers	FFR	411	5
Three Fingers	FFR	8,300	5
Three Fingers	FFR	15,967	5
Three Fingers	FFR	1,863	5
Three Fingers	FFR	1,171	5
Three Fingers	Mcintyre	7,703	5
Three Fingers	Riverside	53,933	5
Three Fingers	Saddle Butte	9,309	5
Three Fingers	Sheephead Seeding	8,229	5
Tunnel Canyon	Basque Brush Control	3,599	5
Tunnel Canyon	Tunnel Canyon	9,524	6
Turnbull	Clark Flat	26,317	5
Turnbull	Dowell	1,213	5
Turnbull	Frying Pan FFR	1,799	5
Turnbull	Jackson Creek	1,195	5
Turnbull	Juniper Mtn	25,667	5
Turnbull	Private Land Pasture	12,169	5
Turnbull	Rinehart Ranch FFR	907	5
Turnbull	Sand Basin	18,569	5
Turnbull	Slaten	5,055	5
Turnbull	Whiskey Spring	6,007	5
Upper Clover Creek	Balm Creek	574	5
Vale Butte (N)	North	506	6
Vale Butte (S)	South Vale Butte	278	6
Venator	3 Road Flat	1,259	5
Venator	Heifer	3,990	5
Venator	Jake Hughes	2,471	5
Venator	North Deadman	4,999	5
Venator	North Field	1,066	5
Venator	South Deadman	6,937	5
Venator	Steer	2,664	5
Wallrock	Dry Creek Butte	49,344	5
Wallrock	Page Place State Blk	3,994	5
Wallrock	Schaeffer	17,371	5
Wallrock	West Juniper	15,866	5
Wallrock	West Page Place FFR	118	5
West Bench	East	627	6
West Bench	West	445	6
West Clover Creek	West Clover	10,232	5
West Cow Creek	Arock	16,018	6
West Cow Creek	Bogus Creek Seeding	4,887	5
West Cow Creek	Clarks Butte	26,176	5
West Cow Creek	Dog Lake East	5,853	5
West Cow Creek	Dog Lake West	6,111	5
West Cow Creek	Lodge Annex East	1,120	5
West Cow Creek	Lodge Annex West	881	5
West Cow Creek	Lower Bogus Rprn	865	5
West Cow Creek	Mid Bogus Rprn	305	5
West Cow Creek	Mud Creek East	7,229	5
West Cow Creek	Mud Creek West	10,959	5
West Cow Creek	Navarro V	8,813	5
West Cow Creek	Owyhee Butte #1	3,633	5
West Cow Creek	Owyhee Butte #2	2,684	5
West Cow Creek	Owyhee Butte #3	1,722	5

Allotment Name	Pasture Name	Acres	Category
West Cow Creek	Owyhee Butte #4	3,080	5
West Cow Creek	Riley Horn	11,506	5
West Cow Creek	Spray	7,817	5
West Cow Creek	Upper Bogus Rprn	604	5
West Cow Creek	West Crater	17,324	5
West Goose Creek	West Goose Creek	145	5
Westfall	Arriola Individual	1,013	5
Westfall	Westfall Seeding	537	5
Whitehorse	East	14,538	5
Whitehorse	West	10,873	5
Whitehorse Butte	Fish Creek Seeding North	3,345	6
Whitehorse Butte	Fish Creek Seeding South	3,845	5
Whitehorse Butte	Frenchie South	11,472	5
Whitehorse Butte	Lower Luscher	236	5
Whitehorse Butte	Whitehorse Seeding	3,888	5
Whitley Canyon	Burnt Mountain	4,657	5
Whitley Canyon	Petes Mountain	4,141	5
Whitley Canyon	Pj #2 FFR	1,306	5
Whitley Canyon	West Juniper	3,247	5
Willow Basin	Indian Creek	5,424	5
Willow Basin	Juniper Springs	7,229	5
Willow Basin	North Cottonwood Seeding	1,560	5
Willow Basin	Pan Handle	3,406	5
Willow Basin	Shroyer FFR.	555	5
Willow Basin	State Block	2,435	5
Willow Basin	Willow Basin Creek	9,057	5
Willow Creek	Arritola FFR	2,624	5
Willow Creek	Black Butte	2,395	5
Willow Creek	Dry Lake	9,572	5
Willow Creek	Flat Creek	7,925	5
Willow Creek	Flat Creek North	2,670	5
Willow Creek	Frank Maher FFR	2,741	5
Willow Creek	Frank Maher Flat Brush Control	3,716	5
Willow Creek	Gluch Seeding East	1,717	5
Willow Creek	Gluch Seeding North	2,402	5
Willow Creek	Gluch Seeding West	1,385	5
Willow Creek	Groundhog	1,566	5
Willow Creek	Horse Ridge	4,383	5
Willow Creek	Indian Canyon East	2,047	5
Willow Creek	Indian Canyon West	2,906	5
Willow Creek	Jaca Seeding East	1,856	5
Willow Creek	Jaca Seeding West	1,613	5
Willow Creek	Rim Basin Seeding	4,156	5
Willow Creek	Willow Creek East	5,675	5
Willow Creek	Willow Creek North	2,812	5
Willow Creek	Willow Creek West	6,834	5
Willow Creek Livestock	East	1,645	6
Willow Creek Livestock	West	2,211	6
Wroten	Brickey North Seeding	548	5
Wroten	Brickey Springs Seeding	3,488	5
Wroten	Coffee Pot	6,256	5
Wroten	Wildcat	2,827	5

FFR = Fenced Federal Range

Appendix F – Aquatic Restoration Biological Opinion (ARBO II) Project Design Criteria

Adopted as a Project Design Feature for federally listed species. Taken from:

- USDI Fish and Wildlife Service. 2013. Endangered Species Act - Section 7 Consultation Programmatic Biological Opinion for Aquatic Restoration Activities in the States of Oregon, Washington and portions of California, Idaho and Nevada (ARBO II)
- National Marine Fisheries Service. 2013. Endangered Species Act – Section 7 Programmatic Consultation Conference and Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for Reinitiation of Aquatic Restoration Activities in States of Oregon and Washington (ARBO II). NMFS Consultation Number: NWR-2013-9664

Text (in italics) was added to the ARBO II Project Design Criteria below to clarify intent.

1.3 Proposed Action

1.3.1 Program Administration

33. Nonnative Invasive Plant Control includes manual, mechanical, biological, and chemical methods to remove invasive nonnative plants within Riparian Reserves, Riparian Habitat Conservation Areas, or equivalent and adjacent uplands. In monoculture areas (*e.g.*, areas dominated by blackberry or knotweed) heavy machinery can be used to help remove invasive plants. This activity is intended to improve the composition, structure, and abundance of native riparian plant communities important for bank stability, stream shading, LW, 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, and BIA administrative units until such units complete a local or provincial consultation for this activity type.)

a) **Project Extent** – Nonnative invasive plant control projects will not exceed 10% of acres within a Riparian Reserve under the Northwest Forest Plan (USDA and USDI 1994b) or RHCA under PACFISH/INFISH (USDA-Forest Service 1995; USDA and USDI 1994a) 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):[94]
    1. aminopyralid (e.g., terrestrial: Milestone VM)
    2. chlorsulfuron (e.g., terrestrial: Telar, Glean, Corsair) (c) clopyralid (e.g., terrestrial: Transline)
    3. clopyralid (e.g., terrestrial: Transline)
    4. dicamba (e.g., terrestrial: Vanquish, Banvel)
    5. diflufenzopyr + dicamba (e.g., terrestrial: Overdrive)
    6. glyphosate (e.g., aquatic: Aquamaster, AquaPro, Rodeo, Accord) (g) imazapic (e.g., terrestrial: Plateau)
    7. imazapic (e.g., terrestrial: Plateau)
    8. imazapyr (e.g., aquatic: Habitat; terrestrial: Arsenal, Chopper)
    9. metsulfuron methyl (e.g., terrestrial: Escort)
    10. picloram (e.g., terrestrial: Tordon, Outpost 22K)
    11. sethoxydim (e.g., terrestrial: Poast, Vantage)[95]
    12. sulfometuron methyl (e.g., terrestrial: Oust, Oust XP)
    13. triclopyr (e.g., aquatic: Garlon 3A, Tahoe 3A, Renovate 3, Element 3A; terrestrial: Garlon 4A, Tahoe 4E, Pathfinder II)
    14. 2,4-D (e.g., aquatic: 2,4-D Amine, Clean Amine; terrestrial: Weedone, Hi-Dep)

  iii. **Herbicide Adjuvants –** When recommended by the label, an approved aquatic surfactant would be used to improve uptake. When aquatic herbicides are required, the

[94] 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.
[95] *Sethoxydim is not proposed for use in this analysis.*

only surfactants and adjuvants permitted are those allowed for use on aquatic sites, as listed by the Washington State Department of Ecology: http://www.ecy.wa.gov/programs/wq/pesticides/regpesticides.html. (Oregon Department of Agriculture also often recommends this list for aquatic site applications). The surfactants R-11, Polyethoxylated tallow amine (POEA), and herbicides that contain POEA (*e.g.*, Roundup) will not be used.

iv. **Herbicide Carriers –** Herbicide carriers (solvents) are limited to water or specifically labeled vegetable oil.

v. **Herbicide Mixing –** Herbicides will be mixed more than 150 feet from any natural waterbody to minimize the risk of an accidental discharge. Impervious material will be placed beneath mixing areas in such a manner as to contain any spills associated with mixing/refilling. Spray tanks shall be washed further than 300 feet away from surface water. All hauling and application equipment shall be free from leaks and operating as intended.

vi. **Herbicide Application Methods** – Liquid forms of herbicides will be applied as follows:
   1. Broadcast spraying using booms mounted on ground-based vehicles (this consultation does not include aerial applications).
   2. Spot spraying with hand held nozzles attached to back pack tanks or vehicles and hand-pumped sprayers to apply herbicide directly onto small patches or individual plants.
   3. Hand/selective through wicking and wiping, basal bark, frill (“hack and squirt”), stem injection, or cut-stump.
   4. Dyes or colorants, (*e.g.*, Hi-Light, Dynamark) will be used to assist in treatment assurance and minimize over-spraying within 100 feet of live water.

vii. **Minimization of Herbicide Drift and Leaching –** Herbicide drift and leaching will be minimized as follows:
   1. Do not spray when wind speeds exceed 10 miles per hour to reduce the likelihood of spray/dust drift. Winds of 2 mph or less are indicative of air inversions. The applicator must confirm the absence of an inversion before proceeding with the application whenever the wind speed is 2 mph or less.
   2. Be aware of wind directions and potential for herbicides to affect aquatic habitat area downwind.
   3. Keep boom or spray as low as possible to reduce wind effects. (d) Avoid or minimize drift by utilizing appropriate equipment and settings (*e.g.*, nozzle selection, adjusting pressure, drift reduction agents, *etc.*). Select proper application equipment (*e.g.*, spray equipment that produces 200-800 micron diameter droplets [Spray droplets of 100 microns or less are most prone to drift]).
   4. Follow herbicide label directions for maximum daytime temperature permitted (some types of herbicides volatilize in hot temperatures).
   5. Do not spray during periods of adverse weather conditions (snow or rain imminent, fog, *etc.*). Wind and other weather data will be monitored and reported for all pesticide applicator reports.
   6. Herbicides shall not be applied when the soil is saturated or when a precipitation event likely to produce direct runoff to fish-bearing waters from a treated site is forecasted by NOAA National Weather Service or other similar forecasting service within 48 hours following application. Soil-activated herbicides can be applied as long as label is followed. Do not conduct any applications during periods of heavy rainfall.

viii. **Herbicide buffer distances –** The following no-application buffers— which are measured in feet and are based on herbicide formula, stream type, and application method—will be observed during herbicide applications (Table 4). Herbicide applications based on a combination of approved herbicides will use the most conservative buffer for any herbicide included. Buffer widths are measured as map distance perpendicular to the bankfull for streams, the upland boundary for wetlands, or the upper bank for roadside ditches.

Table 4. No-application buffer widths[1] in feet for herbicide application, by stream types and application methods.

Herbicide	Perennial Streams and Wetlands, and Intermittent Streams and Roadside Ditches with flowing or standing water present			Dry Intermittent Streams, Dry Intermittent Wetlands, Dry Roadside Ditches		
	Broadcast Spraying	Spot Spraying	Hand Selective	Broadcast Spraying	Spot Spraying	Hand Selective
Labeled for Aquatic Use						
Aquatic Glyphosate	100	waterline	waterline	50	0	0
Aquatic Imazapyr	100	waterline	waterline	50	0	0
Aquatic Triclopyr-TEA	Not Allowed	15	waterline	***Not Allowed***	0	0
Aquatic 2,4-D (amine)	100	waterline	waterline	50	0	0
Low Risk to Aquatic Organisms						
Aminopyralid	100	waterline	waterline	50	0	0
Dicamba	100	15	15	50	0	0
Dicamba + diflufenzopyr	100	15	15	50	0	0
Imazapic	100	15	bankfull elevation	50	0	0
Clopyralid	100	15	bankfull elevation	50	0	0
Metsulfuron methyl	100	15	bankfull elevation	50	0	0
Moderate Risk to Aquatic Organisms						
Imazapyr	100	50	bankfull elevation	50	15	bankfull elevation
Sulfometuron-methyl	100	50		50	15	bankfull elevation
Chlorsulfuron	100	50	bankfull elevation	50	15	bankfull elevation
High Risk to Aquatic Organisms						
Triclopyr-BEE	***Not Allowed***	150	150	***Not Allowed***	150	150
Picloram	100	50	50	100	50	50
Sethoxydim[3]	100	50	50	100	50	50
2,4-D (ester)	100	50	50	100	50	50
Not Addressed in ARBO II						
Fluridone[2]	*Not allowed within 300 feet of water bodies that contain federally threatened or endangered fish or provide critical habitat (Not addressed in ARBO II)*					
Fluroxypyr						
Hexazinone						
Rimsulfuron						

1. ARBO II does not address the aerial application of herbicides. If an infestation of invasive plants requires aerial application within 1,500 feet of a water body that contains federally threatened or endangered anadromous fish or provides critical habitat, additional consultation would be done with NMFS. For listed resident fish, aerial application in the same watershed (5th field Hydrologic Unit Code (HUC)) as a water body that contains federally threatened or endangered species or provides critical habitat would require additional consultation with U.S. Fish and Wildlife Service.
2. Fluridone is an aquatic herbicide that requires prolonged plant contact, so it can only be used on aquatic plants in still water. It would not be used in rivers or streams and thus would not be applied where listed fish are likely to occur.
3. Not proposed for use in this analysis.

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

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

a. All Listed Plant Species

i. **PL1**: A unit botanist will have the following input in all project designs: (a) the botanist will determine whether there are known listed plants or suitable habitat for listed plants in the project area; (b) If a known site of a listed plant is within 0.25-mile of the project action area, or that suitable or potential habitat may be affected by project activities, then a botanist will conduct a site visit/vegetation survey to determine whether listed plants are within the project area. This visit and survey will be conducted at the appropriate time of year to identify the species and determine whether individual listed plants or potential habitat are present and may be adversely affected by project activities (see Table 8).
ii. **PL2**: If one or more listed plants are present and likely to be adversely affected by the project, then the project is not covered by this BO and consultation with the FWS under Section 7 of the ESA must be initiated. If a project will have no effect or is NLAA listed plants it is covered under this ARBA II. Project design criteria should address both the critical life cycle of listed plant species as well as the effective biotic and abiotic environmental factors sustaining rare plant taxa.
iii. **PL3**: Due to soil disturbance that may occur during aquatic restoration activities and use of heavy equipment that could carry seeds and plant parts into project areas, all appropriate prevention measures will be incorporated into contract or equipment rental agreements to avoid introduction of invasive plants and noxious weeds into project areas.

Table 8. Optimal Survey Times for Flowering Periods of Listed Plants in Oregon and Washington

Species	**Optimal Survey Time Period**[1]
Howell's Spectacular Thelypody	June through July
MacFarlane's four o'clock	May through June
Spalding's Catchfly	July through August

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

Appendix G – Process and Criteria Considered for Integrated Invasive Plant Management Utilizing Competitive Seeding and Planting

This EA proposes to incorporate seeding treatments as a component of the Vale District's Integrated Invasive Plant Management. The objective of competitive seeding and planting is to provide a vegetative component to compete with invasive plants in treatment areas where existing native plants are unlikely to establish in sufficient quantity or quickly enough to prevent undesirable vegetation from taking over a site. In compliance with BLM's Integrated Vegetation Management Handbook (USDI 2008a), native plants are given the first consideration for competitive seeding and planting. The Handbook states, "Diverse, healthy, and resilient native plant communities provide the greatest opportunity to be successful in meeting multiple use objectives within BLM. [BLM is required to] set resource management objectives that can be met using native species for most situations. However, as a last resort, it may be necessary to introduce nonnative, non-invasive plant materials to break unnatural disturbance cycles or to prevent further site degradation by noxious or invasive plants" (USDI 2008a:87).

Reestablishing vegetation with native seed mixtures can be challenging depending on site conditions. One study in the Great Basin found nearly 50 percent of the sites seeded with native species failed to meet restoration objectives (Hull 1973). Other studies found poor results especially in lower precipitation zones (less than 11 inches annually), lower elevations (less than 4,000 feet), in drought years, and in areas that are already dominated by nonnative perennial grasses and weedy annual grass (i.e. high competition environments) (Knutson et al. 2014). Native seedings are more likely to meet management objectives in higher precipitation zones (greater than 11 inches), at higher elevations, in non-drought years when normal or above normal winter and spring precipitation results in increased germination and establishment, and in areas that had more intact native plant communities that existed prior to the treatment (i.e. not weedy sites).

There are potential treatment areas on the Vale District that have limited ecological site potential or are in such a degraded state that attempting to reintroduce exclusively native plants immediately following invasive plant treatments would be unsuccessful and would not meet the objective of the treatment. These sites tend to be low elevation, dry sites in Malheur County with less than eight inches of annual precipitation or in active or recently vacated mining areas.

Some of the non-invasive, nonnative species like crested wheatgrass are effective competitors against invasive annual grasses, but also can outcompete native species that are sown in the same mix (Knutson et al. 2014) or native grasses and forbs that try to recolonize seeded sites (Miles and Karl 1995, Pellant and Lysne 2005). Areas seeded with nonnative grasses, especially forage species like Siberian and crested wheatgrass have largely been successful but can result in monocultures of nonnative forage grasses, usually with lowered species diversity than what was observed prior to the disturbance.

The development of efforts such as the Great Basin Restoration Initiative (1999) and the Great Basin Native Plant Project (2015) is improving the science and cultural practices of seeding native grasses and forbs and reestablishing shrubs like sagebrush. There is a high probability that native seeding in low elevation low precipitation areas with high levels of invasive annual grasses would continue to have mixed success. However, using selective herbicides like imazapic in these areas will reduce competition of invasive annual grasses and allow the native seed to establish.

Areas burned by wildfire on the Vale District are assessed by an interdisciplinary team to identify whether and where there is a need to implement Emergency Stabilization and Rehabilitation projects. The assessment includes looking at the need to implement competitive seeding to prevent increases in (or spread from) existing invasive plants. Seeding objectives are identified and multiple factors are assessed to recommend seeding treatment needs. Factors analyzed include burn intensity, vegetative community, and risk of invasive plants. Seed mixes are developed by analyzing the pre-fire vegetation community; adjacent, unburnt vegetation communities; site potential; seed availability; and, annual precipitation. Seeding methods are chosen based on topography, rockiness, accessibility, and size of area to be seeded. These assessment considerations are noted in the *Integrated Invasive Plant Management, Competitive Seeding and Planting Methods* section of Chapter 2 (see below). The same process would be used before competitive seeding for invasive plant control purposes.

How Seeding is Described in the EA:

Chapter 2: Integrated Invasive Plant Management

Competitive seeding and planting occurs in conjunction with other treatments. Seeding is accomplished with hand spreaders, OHV spreaders, harrows, or drills, or is aerially seeded. Plugs or potted plants are planted using hand tools. Seeding with a rangeland drill entails the use of a tractor to pull a drill featuring a high-clearance reinforced frame, and single-disk openers that are independently suspended on trailing arms. The drill creates a shallow furrow, deposits seed and uses chains to drag soil to cover the seed. The depth of disturbance depends on the type of seed being planted. When drill seeding, it is critical to cover the seed properly and firm the soil once seed is placed between 0.25 and 0.50 inches below the surface (Shewmaker and Bohle 2004). It is difficult to control seed depth and soil firming with broadcast seeding or a harrow, but not all sites are conducive to a rangeland drill operation. To ensure best results when broadcast seeding, increasing the seed rate by 30 to 100 percent is suggested to offset for poorly placed seed. Broadcasting in two directions perpendicular to one another is suggested.

The objective of competitive seeding and planting is to provide a desirable vegetative component to compete with invasive plants in treatment areas. BLM's Integrated Vegetation Management Handbook states, "Diverse, healthy, and resilient native plant communities provide the greatest opportunity to be successful in meeting multiple use objectives within BLM. [BLM is required to] set resource management objectives that can be met using native species for most situations. However, as a last resort, it may be necessary to introduce nonnative, non-invasive plant materials to break unnatural disturbance cycles or to prevent further site degradation by noxious or invasive plants" (USDI 2008a:87). There are potential treatment areas on the Vale District that have limited ecological site potential or are in such a degraded state that attempting to reintroduce exclusively native plants immediately following invasive plant treatments would be unsuccessful and would not meet the objective of the treatment. These sites tend to be low elevation, dry sites in Malheur County with less than eight inches of annual precipitation or in active or recently vacated mining areas.

In each treatment area proposed for seeding, environmental conditions such as average annual precipitation, elevation, aspect, soils, percent composition of desirable perennial species, site potential as identified in the ecological site description and the availability of desired seed are considered when determining appropriate seed mixes. If the environmental conditions indicate native species would not establish well enough after seeding to compete with invasive species, a nonnative species (such as Siberian wheatgrass or crested wheatgrass) is used. For example, medusahead monocultures in clay soils treated with herbicide would need to be seeded to keep the medusahead from reestablishing. There are currently limited native species available that would thrive on these soils and compete well with medusahead; thus, a desirable nonnative such as crested wheatgrass would be used.

Another example of a harsh environmental condition that may warrant consideration of seeding with nonnative species is mining sites where the topsoil has been removed.

Table G-2. Summary of Seeding - Proposed and Revised Proposed Actions[1]

Category	Size of Treatment	Other Information
Category 1. Existing known sites Category 2. Future spread from existing sites	- Generally less than 20 acres/project. - Approximately 15 sites/year - Larger areas (a few hundred acres) possible	- Mostly in uplands. - Natives where possible. - Nonnatives where previously planted with crested or Siberian wheatgrass, or in mining areas where topsoil has been removed.
Category 4. Post-fire Emergency Stabilization and Rehabilitation[2]	Varies based on size/intensity of wildfire	- Within 3 years of wildfire - On sites highly susceptible to erosion - Where remaining perennials won't provide soil and watershed protection - Areas prone to noxious weed invasion - To protect Special Status species habitat - To protect cultural resources
Category 5. Perennial plant communities at risk due to the presence of invasive annual grasses	Up to 20,000 acres per project, not to exceed 100,000 acres a year or 300,000 acres over the life of the plan.	- Light to moderate infestation by invasive annual grasses - Native species emphasized. - Projects are smaller than Category 6, since native plants remain.
Category 6. Perennial plant communities that are dominated by invasive annual grasses		- Heavy infestation/monocultures of invasive annual grasses - Seeding areas would tend to be larger and more frequent in Category 6. - Mix of natives and nonnatives.
Category 3. New invaders Category 7. Low priority invasive plants	Seeding would not occur	

1. Seeding does not occur under the No Action Alternative.
2. Covered by the Vale District Programmatic Fire Emergency Stabilization and Rehabilitation Environmental Assessment (USDI 2005b), and not analyzed or authorized as part of this EA.

Example Projects

The following are recent examples of the results of the interdisciplinary assessment process used to determine the seed mixes and seeding methods used on recent wildfires on the Vale District:

Long Draw Fire

The 2012 Long Draw Fire burned 558,198 acres. The interdisciplinary team identified 24,843 acres to be seeded with a nonnative seed mix. Areas identified to be seeded receive 6 to 10 inches of precipitation annually, were at risk of a dramatic increase in invasive annual grasses, and were considered to have a minimal likelihood of natural vegetation success. A rangeland drill was recommended for seeding because the areas were mostly flat or had less than 30% slope, had good road access and minimal rocky areas.

<u>*Proposed Seed Mix:*</u>

Siberian wheatgrass	4.5 pounds per acre
Russian wildrye	4 pounds per acre

Leslie Gulch Fire

The Leslie Gulch Fire burned 8,680 acres in 2015. The interdisciplinary team identified 260 acres to be seeded with a native seed mix composed of local genetics. Areas to be seeded were chosen because they were adjacent to special status plant sites at risk for annual grass invasion, and had very low likelihood of natural revegetation of the native species. The native seed mix with local genetics was chosen because the annual precipitation is 10 to 13 inches, and BLM did not want to introduce genetics from another area that might compete with the special status plants. An OHV and blanket harrow was recommended for planting because the areas to be seeded are very narrow and have small rock outcrops that are easier for OHVs to navigate.

Proposed Seed Mix:

Bluebunch wheatgrass	5 pounds per acre
Bottlebrush squirreltail	3 pounds per acre
Great Basin wildrye	2.5 pounds per acre
Sandberg bluegrass	0.5 pound per acre

Bendire Fire

The Bendire Fire burned 49,628 acres in 2015. The interdisciplinary team identified 7,480 acres to be seeded with a native seed mix. Areas identified to be seeded were chosen because of the high burn intensity and risk of invasion from medusahead, an invasive annual grass. A native seed mix was recommended because the area receives 10 to 13 inches of rain annually. The seed will be applied aerially because the area is very steep and rocky.

Proposed Seed Mix:

Bluebunch wildrye	10 pounds per acre
Idaho fescue	1 pound per acre
Sandberg bluegrass	0.5 pound per acre
Western yarrow	0.1 pound per acre

Appendix H – Monitoring of Targeted Grazing Treatments for Invasive Annual Grass Management

This EA proposes to use targeted grazing as one of the tools to control invasive plants, particularly invasive annual grasses. Targeted grazing (also referred to as directed livestock grazing, prescribed grazing and other terms) 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 by removing the target plant or plants. Sheep, goats, and cattle can be used. In general, sheep and goats eat broadleaf plants, while cattle graze on grasses. Targeted grazing can be seasonally timed for when the invasive plant is most palatable to livestock and to minimize effects to non-target plants and surrounding resources. Employing grazing prescriptions may be particularly useful in areas with limited access, steep slopes, or where herbicides cannot be applied (e.g. near water). Targeted grazing with livestock can effectively reduce the vigor and seed production of invasive plants while having no adverse effects to native forage species (Stroud et al. 1985, Ganskopp 1988, Vallentine and Stevens 1994, Brewer et al. 2007, Diamond et al. 2009). However, targeted grazing alone is not likely to provide long-term control of invasive plants (Vallentine and Stevens 1994). As with many other treatments, targeted grazing can be most effective when used in combination with other treatments (USDI 2010a:75).

Targeted grazing treatments with cattle to control invasive annual grasses occur in the late fall / early winter or early spring to reduce the seeds, annual vegetative production, and residual biomass of annual grasses. Cattle readily eat cheatgrass from fall green-up through early spring when it is palatable. Medusahead rye appears less palatable than cheatgrass because it has courser awns and concentrates silica. Cattle are currently being used for targeted grazing of invasive annual grasses on the Vale District in limited areas.

How Targeted Grazing is Described in the Alternatives:

No Action Alternative

Targeted grazing would be used in conjunction with herbicide treatments; targeted grazing would break up thatch before herbicide is applied, as well as removing seed sources. Targeted grazing using sheep, goats, and cattle would be used on just over 500 acres over the life of the plan in Categories 1, 2, and 3.

Proposed and Revised Proposed Actions

Targeted grazing with sheep and goats for broadleaf invasive plant control would occur similar to the No Action Alternative. A Project Design Feature adopted in the *Riparian Habitats* sections states that in riparian areas, targeted grazing will only occur on armored stream banks with sheep or goats (not cattle). Invasive annual grass treatments in Categories 5 and 6 would be implemented as an integrated approach, generally through a sequence of treatments of prescribed fire or targeted grazing by cattle followed by herbicide application (imazapic in both alternatives or rimsulfuron in the Revised Proposed Action. Typically, individual treatment projects with targeted grazing would be approximately 20,000 acres per project, not to exceed 100,000 acres a year or 300,000 acres over the life of the plan.

Treatment projects which include targeted grazing using cattle would occur in areas dominated by invasive annual grasses. These projects would occur in selected pastures within grazing allotments and may occur outside the authorized pasture use dates. Prior to implementation of targeted grazing, the selected pastures would be identified in the District's *Annual Treatment Plan* and would be subject to a required interdisciplinary review; in some cases, additional NEPA may be required prior to implementing the treatment in order to address such things as unique site conditions, the need for additional public input, or discrepancies between the proposed treatment and the terms and conditions in the existing grazing authorizations.

Options for implementing targeted grazing treatments could include contracts (e.g., stewardship or indefinite delivery/indefinite quantity) or permits (e.g., a free use permit[96]). If targeted grazing takes place under a permit (43 C.F.R 4100 Grazing Regulations), then a subsequent Decision would be issued. Targeted grazing treatments generally would be implemented under contract (separate from a grazing permit).

Targeted grazing with cattle would be prescribed at a rate that would allow for reduced biomass, density, and vegetative production of invasive annual grasses while also breaking up thatch layers. Targeted grazing prescriptions would occur during the growth stage when native and desirable non-native species are resilient to grazing and when livestock preference is shifted towards consumption of targeted species (typically in early spring and fall/winter). In Category 6, *Plant communities that are dominated by invasive annual grasses,* targeted grazing prescriptions on invasive annual grasses may have heavier utilization prescriptions, with residual stubble heights of 3 inches or less (Mosley and Rosell 2006).

There would be no net impact (increase or decrease) in preference permits / leases and associated animal unit months (AUMs) as a result of targeted grazing. Field observations would occur to make sure that livestock grazing ceases before invasive annual grasses become non-palatable to livestock. Research has shown that this type of grazing can reduce the vegetative production of invasive annual grass and seeds while promoting growth and establishment of native grass species (Vallentine and Stevens 1994, Diamond et al. 2009).

Monitoring of Targeted Grazing :

Monitoring of targeted grazing treatments using cattle for the management of invasive annual grasses is included as a project design feature in this analysis:

- Monitoring will be done to determine anticipated vegetative production of invasive annual grasses targeted grazing use rates and implementation timing. Monitoring plans for each targeted grazing prescription would be developed as part of the Annual Treatment Plan. The monitoring plan and associated monitoring activities would determine the biomass of the invasive annual grass infestation, the timing of the targeted grazing treatments, and the level of grazing needed to aid in the control of invasive annual grasses or pre-treatment to improve the effectiveness of herbicide treatments.

Upon identification of a Category 5 or 6 area that would utilize targeted grazing as part of an integrated approach for the management of invasive annual species, BLM would complete a monitoring plan specific for the treatment area. The primary goals of these integrated treatments are to reduce the scale and occurrence of invasive annual grasses as well as their potential to invade and dominate neighboring sites. The development of a treatment monitoring plan will allow BLM to assess progress towards meeting treatment objectives as well as any impacts non-target resources such as vegetation and soils.

[96] A free use permit could be authorized under the following circumstances (43 C.F.R. 4130.5):

4) the primary objective of authorizing use is for the management of vegetation to meet resource objectives other than the production of livestock forage;
5) the primary purpose of grazing is for scientific research or administrative studies; or,
6) the primary purpose of grazing use is the control of noxious weeds.

Monitoring Protocol

The following monitoring protocol would be utilized, at a minimum, in the development of a site-specific monitoring plan when incorporating targeted grazing:

1. Pre-Integrated Treatment/Baseline Information Monitoring: Identifies current condition of the treatment areas
    - Production to estimate above-ground biomass and species composition of invasive and perennial species
    - Soil site stability
    - Long-Term Trend (including species composition)
    - Carrying capacity assessment to determine level and timing of targeted grazing use to meet treatment objectives.

2. Implementation Monitoring for Targeted Grazing: Monitors vegetative conditions during the targeted grazing treatment and post removal of livestock to ensure that non-target vegetation (e.g. native perennial grasses) is not affected during targeted grazing and determine next steps in integrated treatment plan.
    - Stubble height or residual biomass (pounds per acre) of target vegetative species
    - Utilization of non-target species (in cases where native and desirable non-native species do occur as a minor component of the site or where adjacent range sites are in a functioning state)

3. Long-Term Trend/Post- Treatment Monitoring: Monitors the changes to baseline and the attainment of objectives identified in the annual treatment plan.
    - Production to estimate above-ground biomass and species composition of invasive and perennial species
    - Soil site stability
    - Long-Term Trend and other methodologies consistent with the Assessment and Inventory Monitoring (AIM) strategy for terrestrial habitats.
    - Carrying capacity assessment to determine level and timing of use to meet treatment objectives.

Technical References, Handbooks, and Manuals

The following guidance documents would be referenced when designing monitoring plans for targeted grazing treatments:

- Technical Reference 4400-3, *Utilization Studies and Residual Measurements*, 1996: An interagency monitoring guide that provides the basis for "consistent, uniform and standard utilization studies and residual measurements that are economical, repeatable, statistically reliable, and technically adequate." The guide is not all inclusive but does identify the primary study methods used across much of the West (USDA and USDI 1999a).

- Technical Reference 1730-1, *Measuring and Monitoring Plant Populations,* 1998: Development of study designs for monitoring single plant species, such as an indicator species, key species or weed. The technical reference describes a logical progression of planning and objective setting, designing of methodologies, taking field measurements, analyzing and presenting data, and making management responses (Elzinga et al. 1998).

- Technical Reference 4400-4, *Sampling Vegetation Attributes*, 1999: An interagency monitoring guide that provides consistent, uniform, and standard vegetation attribute sampling such as trend, cover, density, vegetative production, structure, and composition (USDA and USDI 1999b).

- Technical Reference 1734-6, *Interpreting Indicators, Version 4*, 2005: Establishes a consistent protocol for a qualitative assessment of the functional status of the 17 indicators for rangeland health. The 17 indicators are used to gauge the attributes of rangeland health: soil/site stability, hydrologic function, and biotic integrity (Pellant et al. 2005).

- *Monitoring Manual for Grassland, Shrubland, and Savanna Ecosystems Vol I and II*, 2005: These manuals provide information regarding monitoring methodologies associated with BLM's "Assessment, Inventory, and Monitoring (AIM) Strategy for Integrated Renewable Resources Management. The AIM Strategy enhances the effectiveness of BLM's resource monitoring activities and establishes a framework for collection of monitoring data that is consistent and compatible across scales, programs, and administrative boundaries. The manuals describe how to monitor three rangeland attributes: Soil/site stability, watershed function, and biotic integrity. Volume I provides a quick start and basic instructions for the establishment of a monitoring program as well as short and long-term methods. Volume II provides a more detailed guide on monitoring program design, data analysis and interpretation. Volume II identifies: 1) how to design a monitoring program, 2) supplementary monitoring methods and alternatives not included in Volume I, 3) the organization, analysis and interpretation of monitoring data, and 4) specific recommendations for designing monitoring programs to address the management of multiple resource values (Herrick et al. 2005).